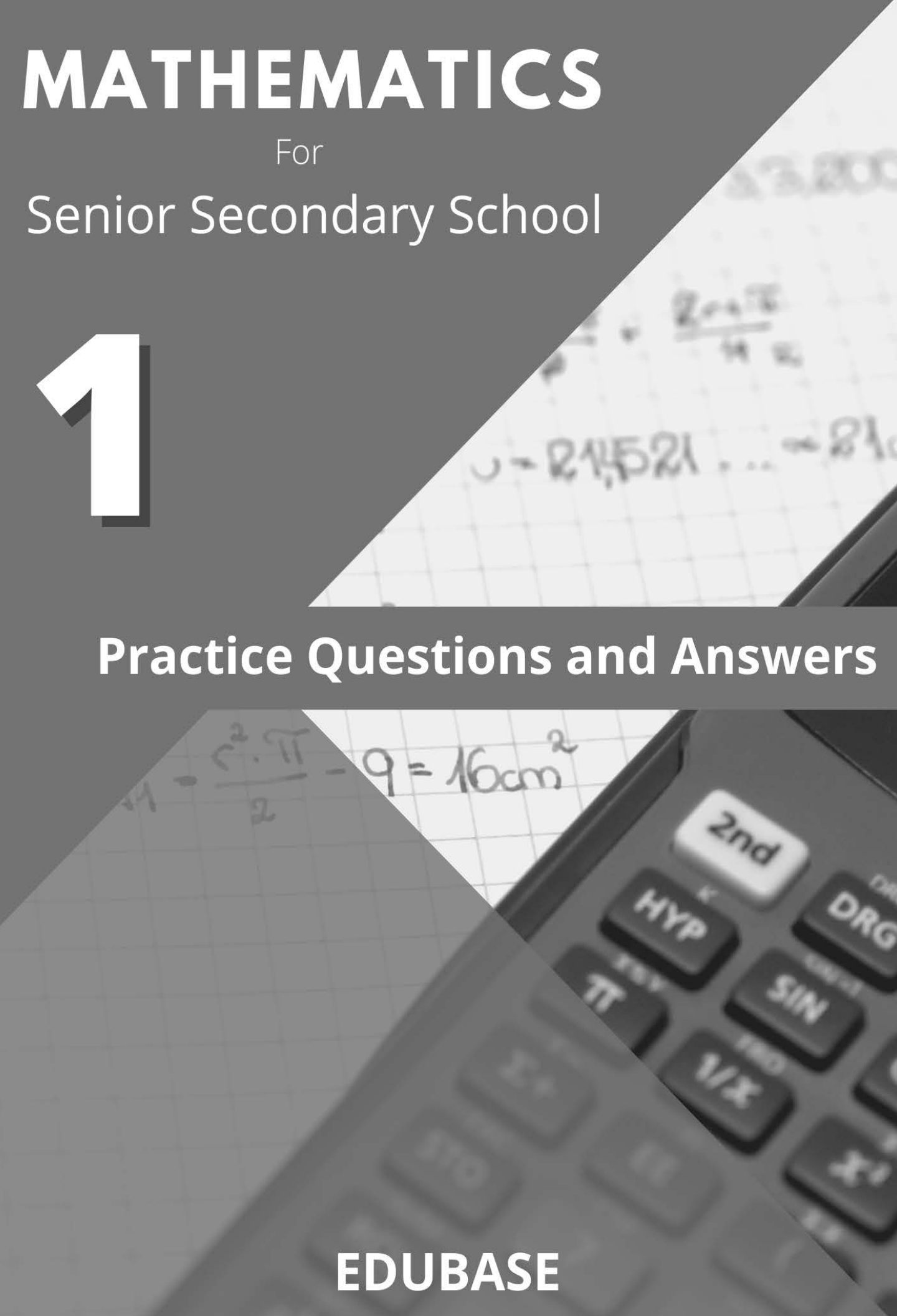
MATHEMATICS

For

Senior Secondary School

1

Practice Questions and Answers



EDUBASE

QUESTIONS

TOPIC: ALGEBRAIC PROCESSES

DIRECTION: Choose the correct answers from the lettered options.

1. A student travelled for x hours at 5km/hr and for y hours at 10km/hr. The journey was 35km altogether, which of the following equations represent the given information if the average speed for the journey was 7km/hr?

A. x + y = 5; 5x + 10y = 35

B. x + y = 7; 5x + 10y = 35

C. 5x + 10y = 7; x + y = 35

D. 5x + 10y = 5; x + y = 35

2. Solve the equation $2a^2 - 3a - 27 = 0$.

A. 3/2, 9

B. - 3/2, 9

C. 3, 9/2

D. - 3, 9/2

3.

Given that $p = 1+\sqrt{2}$ *and* $q = 1-\sqrt{2}$, **evaluate** $\frac{p^2-q^2}{2pq}$ 3

A. $2\left(2+\sqrt{2}\right)$

B. $-2\left(2+\sqrt{2}\right)$

C. $2\sqrt{2}$

D. $-2\sqrt{2}$

4. Factorize $x^2 + 2a + ax + 2x$.

A. (x + 2a)(x + 1)

B. (x + 2a)(x − 1)

C. (x2 − 1)(x − a)

D. (x + 2)(x + a)

5. A motorist drives for m hours at 120km/hr and n hours at 18km/hr. Altogether Somina drives 78km in 5 hours. Find m and n.

A. 3hrs;3hrs

B. 2hrs;3hrs

C. 4hrs;1hr

D. 3hrs;2hrs

6.

Simplify $4-\frac{1}{2-\sqrt{3}}$

A. 2√3

B. -2 - √3

C. -2 + √3

D. 2 - √3

7.

Given that $p = x-\frac{1}{x}$ **and** $q = x^2+\frac{1}{x^2}$, **express q in terms of p.**

A. $(p^2 + 2)$

B. $(p - 2)^2$

C. $(p + 2)^2$

D. $(p^2 - 2)$

8. $m^2 - 8m + k$. What value of k makes the given expression a perfect square?

A. 2

B. 4

C. 8

D. 16

9. Solve the equation 3x + 4y = 5 and 7x + 2y = 8.

A. x = 21/2; y = 4

B. x = 41/3; y = 31/2

C. x = 21/4; y = 31/5

D. x = 1; y = 1/2

10.

What is the least possible value of $\frac{9}{1+2x^2}$, if $0 \le x \le 2$?

A. 9

B. 0

C. 1

D. 2

11. **If $9^{\left(x-\frac{1}{2}\right)} = 3^{x^2}$, find x.**

A. 1/2

B. 1

C. 2

D. 3

12. If $a = u^2 - 3v^2$ and $b = 2uv + v^2$, evaluate $(2a - b)(a - b2)$ when $u = 1$ and $v = -1$.

A. 9

B. 15

C. 27

D. 33

13. In a positive number of two digits, the sum of the digits is 15. If the digits are interchanged the number is increased by 9. Find the number.

A. 87

B. 78

C. 96

D. 69

14.

If

$$\frac{9^{2x-1}}{27^{x+1}} = 1$$

find the value of x.

A. 3

B. 8

C. 2

D. 5

15.

Three numbers x, y, z are connected by the relationship

$y = \frac{4}{9}x + 1$ *and* $z = \frac{4}{9}y + 1$

if x = 99 find z.

A. 6 1/3

B. 20

C. 21

D. $176\ ^{4}/_{9}$

17. Find the value of x in 0.5x + 2.6 = 5x + 0.35.

A. 0.5

B. 2

C. 2.6

D. 5

18. Factorize: $5y^2 + 2ay - 3a^2$.

A. (5y - a)(y + 3a)

B. (5y +a)(y - 3a)

C. 5y2 + a(2y - 3a)

D. (y + a)(5y - 3a)

19. A student travelled for x hours at 5km/hr and for y hours at 10km/hr. The journey was 35km altogether, find x and y if the average speed for the journey was 7 km/hr.

A. 3hrs & 3hrs

B. 3hrs & 2hrs

C. 1hrs & 4hrs

D. 2hrs & 3hrs

20. Solve the inequality x - 1 > 4(x + 2).

A. x > - 3

B. x < - 3

C. 2 < x < 3

D. -3 < x < -2

21. A man travels 10km in 5 minutes if he runs for 8km and walks for 2km. If he runs 4km and walks 6km, his time is 1hr 15mins, which of the following expresions best explains the information given?

A. $\frac{8}{x} + \frac{2}{y} = 50; \frac{4}{x} + \frac{6}{y} = 135$

B. $\frac{8}{x} + \frac{2}{y} = 12; \frac{4}{x} + \frac{6}{y} = 8$

C. $8x + 2y = \frac{5}{6}; 4x + 6y = \frac{5}{4}$

D. $\frac{8}{x} + \frac{2}{y} = \frac{5}{6}; \frac{4}{x} + \frac{6}{y} = \frac{5}{4}$

22. Factorize $x^2 + 4x - 192$.

A. (x - 4)(x + 48)

B. (x - 48)(x + 4)

C. (x - 12)(x + 16)

D. (x - 12)(x - 16)

23. **For what values of x is the expression from the given equation $\frac{x - 5}{x^2 + 6x + 9}$ undefined**

A. -3 or +3

B. +3 or +3

C. +3 or -3

D. -3 or -3

24. The minimum value of y in the equation y = x2 - 6x + 8 is _____.

A. 8

B. 3

C. 0

D. -1

25.

Simplify $\frac{1}{x^2+5x+6}+\frac{1}{x^2+3x+2}$

A. $\frac{x+3}{(x+1)(x+2)}$

B. $\frac{1}{(x+1)(x+2)(x+3)}$

C. $\frac{2}{(x+1)(x+3)}$

D. $\frac{4}{(x+1)(x+3)}$

The correct answer is option [C].

$$\frac{1}{x^2+5x+6}+\frac{1}{x^2+3x+2}$$

$$=\frac{x+1+x+3}{(x+1)(x+2)(x+3)}=\frac{2x+4}{(x+1)(x+2)(x+3)}$$

$$=\frac{2(x+2)}{(x+1)(x+2)(x+3)}=\frac{2}{(x+1)(x+3)}$$

26.

Simplify the given equation

$$\frac{1}{1-x}+\frac{2}{1+x}$$

A. $\frac{(x+3)}{(1-x^2)}$

B. $\frac{(x-3)}{(1+x^2)}$

C. $\frac{(3-x)}{(1-x^2)}$

D. $\frac{(3-x)}{(1+x^2)}$

27.

If $\sqrt{x^2+9} = x+1$, solve for x.

A. 5

B. 4

C. 3

D. 1

28. Seven books and eight pens cost ₦ 1750. Eight books and seven pens cost ₦ 1700. Calculate the cost of a book and a pen.

A. ₦ 210; ₦ 90

B. ₦ 140; ₦ 80

C. ₦ 210; ₦ 80

D. ₦ 140; ₦ 90

29.

Given that x = – 3 and y = – 7, evaluate $\frac{x^2-y}{y^2-x}$

A. - 1/11

B. 1/23

C. 4/13

D. 12/17

30. To arrive on schedule, a train is to cover a distance of 60 km at 72 km/hr. If it starts 10 minutes late, at what speed must it move to arrive on schedule?

A. 60 km/hr

B. 80 km/hr

C. 90 km/hr

D. 108 km/hr

31. If (-3, -4) is a point on the line y = mx + 2, find the value of m.

A. -2

B. 7/4

C. 2

D. 8/3

32. Which of the following has the same value as 0.0162560?

A. 1.6256×10^{2}

B. 1.6256×10^{1}

C. 1.6256×10^{0}

D. 1.6256×10^{-2}

33. Solve the equation $7y^2 = 3y$.

A. y = 3 or 7

B. y = 0 or 7

C. y = 0 or 3/7

D. y = 0 or 9

34.

Make y the subject of the formula: $z = x^2 + \frac{1}{y^3}$

A. $y = \frac{1}{(z - x^2)^3}$

B. $y = \frac{1}{(z + x^2)^{1/3}}$

C. $y = \frac{1}{(z - x^2)^{1/3}}$

D. $y = \frac{1}{(x - z^2)^3}$

35.

Simplify $\sqrt[3]{\left(64r^{-6}\right)^{\frac{1}{2}}}$

A. r/2

B. 2r

C. 1/2r

D. 2/r

36. If 5 times a certain integer is subtracted from twice the square of the integer, the result is 63. Find the integer.

A. 21

B. 9

C. 7

D. 4

37. David cycles for x hours at 16km/hr and y hours at 12km/hr. Altogether he cycles 96km in 7 hours. Find x and y.

A. 3;4

B. 4;3

C. 5;2

D. 6;1

38. Which of the following is in descending order?

A. 9/10, 4/5,3/4, 17/10

B. 4/5, 9/10,3/4, 17/20

C. 9/10, 17/20,4/5, 3/4

D. 4/5, 9/10, 17/10, 3/4

39.

Simplify

$$\frac{1}{x-3} - \frac{3(x-1)}{x^2-9}$$

A. $\frac{x-1}{x-3}$

B. $\frac{-2}{x+3}$

C. $\frac{x-1}{x+3}$

D. $\frac{x-4}{x^3-9}$

40. Solve the simultaneous linear equations

2x + 5y = 11 ---------- (i)

7x + 4y = 2 ---------- (ii)

A. x = - 8, y = 1

B. x = -2, y = 4

C. x = 2, y = -3

D. x = -34/27, y = 73/27

41.

If $a\left[\frac{x+1}{x-2}-\frac{x-1}{x+2}\right]=6x$; find *a* in its simplest form.

A. $x^2 - 1$

B. $x^2 + 1$

C. $x^2 + 4$

D. $x^2 - 4$

42. Factorize $2e^2 - 3e + 1$.

A. (2e - 1)(e - 1)

B. (e + 1)(2e + 1)

C. (2e + 3)(e - 2)

D. (2e - 3)(e - 1)

43. Factorize the expression $2x^2 + x - 15$.

A. (2x+5)(x-3)

B. (2x-5)(x+3)

C. (2x-5)(x-3)

D. (2x-3)(x+5)

44. If 1 is added to both the numerator and denominator of a fraction, the fraction becomes 1/2. If 8 is added to both, the fraction becomes 2/3. What is the fraction?

A. 7/15

B. 21/7

C. 11/15

D. 22/7

45. The sum of the digits of a two-digit number is five. If the digits are reversed, the new number is nine greater than the original number. If the digits of the original number are x and y is the units digit, find the numbers.

A. 32

B. 42

C. 23

D. 24

46. Find x and y from the equations

$2x^2 + y^2 = 19$

$x + 3y = 0$

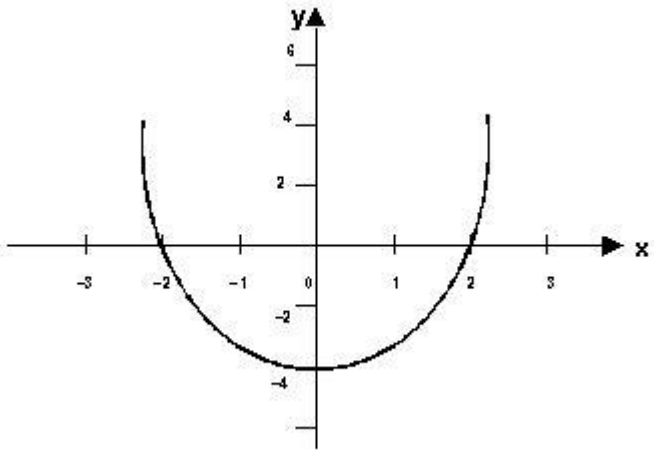
A. [−3,−1]

B. [3,−1]

C. [3,1]

D. [−3,1]

47. The sketch above is the curve of y = ax2 + bx + c. Find a, b and c respectively.



A. 1, 0, − 4

B. 2, − 2, − 4

C. – 2, 2, – 4

D. 0, 1, –4

48. Solve for x: (x^2 + 2x + 1) = 25.

A. – 6, – 4

B. 6, – 4

C. 6, 4

D. – 6, 4

49. If q oranges are sold for t Naira, how many oranges can be bought for p Naira?

A. P/2 t

B. q t/p

C. q/p t

D. pq/t

50. If 2x + y = 7 and 3x – 2y = 3, by how much is 7x greater than 10?

A. 1

B. 3

C. 7

D. 17

51. If f(x) = 2x2 – 5x + 3, find f(x + 1).

A. 2x2 – x

B. 2x2 – x +10

C. 4x2 + 3x + 2

D. 4x2 + 3x + 12

TOPIC: FRACTIONS

DIRECTION: Choose the correct answers from the lettered options.

1. 3/4 of a class of 32 students study english and 3/8 study mathematics. Every student studies at least one of these subjects. How many students study both subjects?

A. 36

B. 12

C. 4

D. 24

2. There are 572 students in a mixed school. 5/11 of them are boys. How many girls are in the school?

A. 260

B. 270

C. 312

D. 321

3. 3/4 of a class of 32 students study english and 3/8 study mathematics. Every student studies at least one of these subjects. What fraction of the class studies mathematics but not english?

A. 1/4

B. 5/8

C. 3/8

D. 8/9

4. Cromwell can hoe a yam plot in 3 hours and Itunuola can hoe it in 4 hours. How long will it take them to hoe the whole plot working together?

A. 11/5

B. 12/13

C. 15⁄7

D. 22⁄5

5. Arrange 3/4, 4/5, 2/3, 2/5, 6/7 in ascending order.

A. 2/5, 2/3, 3/4, 4/5, 6/7.

B. 2/3, 3/4, 6/7, 4/5, 2/5.

C. 2/5, 4/5, 6/7, 3/4, 2/3.

D. 6/7, 2/5, 3/4, 4/5, 2/3.

6. Cromwell can hoe a yam plot in 3 hours and Itunuola can hoe it in 4 hours. If they work together, what fraction of the plot will they hoe in 1 hour?

A. 7/12

B. 5/6

C. 11/12

D. 17/12

7. During two years in a school, 7/8 of the students had malaria, 3/4 had catarrh and 5/6 had neither. What fraction of the school had both malaria and catarrh?

A. 11/2

B. 111/24

C. 11/24

D. 1/2

8. What fraction of 5 weeks is 5 days?

A. 7

B. 1

C. 1/6

D. 1/7

9. How much more than 7 is the sum of 32/5 and 31/6?

A. $13^{17}/30$

B. $6^{17}/30$

C. $45^{29}/30$

D. 13/30

10. During two years in a school, 7/8 of the students had malaria, 3/4 had catarrh and 5/6 had neither. If the number of students that had both malaria and catarrh is 280. Find the number of students in the school.

A. 320

B. 336

C. 129

D. 192

12

Simplify $\frac{1}{9} x \frac{3}{4} + \frac{2}{3} \div \frac{2}{5} + \frac{1}{7} - \frac{1}{3}$

A. 3.6

B. 4.7

C. 5.6

D. 6.7

13. Cromwell can hoe a yam plot in 3 hours and Itunuola can hoe it in 4 hours. What fraction of the plot can each of them hoe in 1 hour?

A. 1/3; 1/ 2

B. 1/3; 3 /4

C. 1/4; 11/3

D. 1/3; 1/4

14. Simplify the equation [21/3 + 313 / 15] ¸ 61/5

A. 1/5

B. 1

C. 61 /5

D. 51 /5

14. Simplify the equation [21/3 + 313/15] ¸ 61/5

A. $^{1}/_{5}$

B. 1

C. $6\frac{1}{5}$

D. $5^{1}/5$

15. Simplify: 11/2 + 21/3 × 3/4 – 1/2.

A. -2 1/3

B. -2 1/4

C. 2 1/8

D. 2 3/4

16. Determine which is the greatest of 5/6, 3/4, 7/8, 9/10.

A. 9/10

B. 5/6

C. 3/4

D. 7/8

17. There are 572 students in a mixed school. 5/11 of them are boys. How many fraction of girls are there?

A. 6/11

B. 1/11

C. 3/11

D. 2/11

18. Arrange 21/3, 25/12, 29/25, 214/37 in ascending order.

A. $2^{1}/3$, $2^{5}/12$, $2^{9}/25$, $2^{14}/37$

B. $2^{14}/37$, $2^{9}/25$, $2^{5}/12$, $2^{1}/3$

C. $2^{1}/3$, $2^{9}/25$, $21^{14}/37$, $2^{5}/12$

D. $2^{9}/25$, $2^{5}/12$, $2^{1}/3$, $2^{14}/37$

19. In an election there were four candidates, 5/6 of the electors voted for the winner. The runner-up received 4/7 of the remaining votes. The third candidates received twice the votes of the fourth candidates. What fraction of the electors voted for the third candidate?

A. 1/42

B. 1/21

C. 1/14

D. 41/42

20. A flag pole 8.4 m long is driven 1.4m into the ground. What fraction of the pole is above the ground?

A. 1/6

B. 6

C. $1^{1}/_{5}$

D. 5/6

TOPIC: INDICES AND LOGARITHMS

DIRECTION: Choose the correct answers from the lettered options.

1. Evaluate [0.00385 × 0.00061]/[0.0025 × 0.08] and leave your answer in standard form.

A. 1.347×10^{-3}

B. 2.43×10^{-2}

C. 1.174×10^{-2}

D. 2.18×10^{-3}

2. Evaluate $\log_3 405 - \log_3 5$.

A. 2

B. 3

C. 4

D. 5

3. Find p in terms of q if $\log_3 p + 3\log_3 q = 3$.

A. $(3/q)^3$

B. $(3/q)^{1/3}$

C. $(q/3)^3$

D. $(q/3)^{1/3}$

4. Given $dy/dx = 2x^3 + 4x^2 - x + 2$, what is the value of y?

A. $x^4/2 + 4x^3/3 - x^2/2 + x + c$

B. $6x^2 + 8x - 1$

C. $x^2 - 3x + 2$

D. $x^5/3 + x^2 - 2x^2/5 + c$

5. Simplify

$\log_5(3/5) + 3\log_5(15/2) - \log_5(81/8)$.

A. 2

B. 9

C. 7

D. 5

6.

Simplify $\frac{2\sqrt{3}+3\sqrt{5}}{3\sqrt{5}-2\sqrt{3}}$

A. $\frac{19+4\sqrt{15}}{11}$

B. $\frac{19+4\sqrt{15}}{19}$

C. $\frac{19+2\sqrt{15}}{11}$

D. $\frac{19+2\sqrt{15}}{19}$

7.

Evaluate, using logarithm tables; $\frac{5.34 \times 67.4}{2.7}$

A. 1.332

B. 13.32

C. 133.2

D. 1 332

8. Evaluate 1/2$\log_x$ 81 = 2.

A. -4

B. 4

C. -3

D. 3

9. Evaluate $\log_{10}6 + \log_{10}45 - \log_{10}27$ without using logarithm tables.

A. O

B. 1

C. 1.1738

D. 1.38O2

10. If 2log3 y + log3 x2 = 4, then y is _____.

A. $\frac{4-\log_3 x^2}{2}$

B. $\frac{4}{\log_3 x^2}$

C. $\frac{2}{x}$

D. $\frac{9}{x}$

11. $\log_3$ 15 = x.

A. 6.57

B. 11.12

C. 2.47

D. 7.24

12.

Simplify: $125^{-1/3} x 49^{-1/2} x 10^{0}$

A. 350

B. 35

C. 1/35

D. 1/350

13. Evaluate $(2^{\circ} + 4^{-1/2})^2$.

A. 1/4

B. 5/4

C. 9/4

D. 4

E. -1/2

14. Find the value of $p^2 + q$, correct to 2 decimal places, if $\log_{10}p = 0.1120$ and $\log_{10}q = 0.1100$.

A. 4.43

B. 4.42

C. 4.05

D. 0.37

15. If $\log_a y = 1 - 3\log_a x$, express y in terms of x and a.

A. $y = -x^3/a$

B. $y = a/x^3$

C. $y = -a/x^3$

D. $y = x^3$

16.

If $8^{x/2} = \left(2^{3/8}\right)\left(4^{3/4}\right)$, find x.

A. 3/8

B. 3/4

C. 4/5

D. 5/4

17. Evaluate $(2^x)^2 - 3 \times 2^x + 2 = 0$.

A. 1 or 0

B. 1 or 2

C. 2 or -2

D. -1 or -2

18. Given that $1/3\log_{10}P = 1$, find the value of P.

A. 0

B. 10

C. 100

D. 1000

19. If $\log_{10}a = 4$, what is a?

A. 0.4

B. 40

C. 400

D. 10 000

20.

Simplify $\frac{\sqrt{2}}{\sqrt{3}-\sqrt{2}} - \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

A. $2\sqrt{2}-\sqrt{3}$

B. $3\left(\sqrt{6}-1\right)$

C. $\sqrt{6}-3$

D. $-\frac{1}{2}$

21. Evaluate $64^{-2}/3$.

A. 1/16

B. -1/16

C. 16

D. -16

22.

Simplify $\frac{2^{\frac{1}{2}} \times 8^{\frac{1}{2}}}{4}$

A. 1

B. 2

C. 4

D. 16

23. If $\log_{10} q = 2.7078$, what is q?

A. 5102

B. 849.9

C. 510.2

D. 84.99

24. If $3^{2x} = 27$, what is x?

A. 1

B. 1.5

C. 4.5

D. 18

25.

Given that $\frac{5^{n+3}}{25^{2n-3}} = 5^0$, find n.

A. n = 1

B. n = 2

C. n = 3

D. n = 5

The correct answer is option [C].

26. If $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, evaluate, without using logarithm tables, $\log_{10} 4.5$.

A. 0.3010

B. 0.4771

C. 0.6532

D. 0.9542

27. Evaluate, using logarithm tables, log $(0.65)^2$.

A. 1.6258

B. 0.6272

C. $\bar{1}.6258$

D. $\bar{1}.6272$

28. Use mathematical tables to evaluate (cos 40° sin 30°).

A. 0.2660

B. 0.0266

C. 0.0266

D. 0.2660

29. Find the value of x, given that 1/3 of $9^{2x} = 27^x$.

A. -2

B. -1

C. 0

D. 1

The correct answer is option [D].

30.

Simplify: $\frac{\log \sqrt{8}}{8}$

A. 1/3

B. 1/2

C. 1/3log √2

D. 1/3log √8

31. Simplify 0.63954 / 0.003 giving your answer correct to two significant figures.

A. 213.18

B. 213.00

C. 213

D. 210

32. Solve the simultaneous equation.

$2^{x+y} = 32$

$33^{y-x} = 27$

A. (3, 2)

B. (- 3, 2)

C. (3, -2)

D. (-3, -2)

33. If 3 log a + 5 log a - 6 log a = log 64, what is a?

A. 4

B. 6

C. 8

D. 16

TOPIC: MENSURATION

DIRECTION: Choose the correct answers from the lettered options.

1. The lengths, in cm, of the sides of a right-angled triangle are x, (x + 2) and (x + 1) where x > 0. Find, in cm, the length of its hypotenuse.

A. 4

B. 5

C. 13

D. 17

2. Water flows through a 3cm diameter pipe at the rate of 3 metres/second. How many water flow through the pipe in one second and express the flow of water as a rate in litres/minute?

A. 3.5×10^{-2}L/minutes

B. 3535OL/minutes

C. 127.26L/minutes

D. 1272.6L/minutes

3. Abidjan is 4° west of Accra and on the same circle of latitude. If the radius of this circle of latitude is 6370 km, how far is Abidjan west of Accra, correct to the nearest kilometre? (Take π = 22/7).

A. 222km

B. 445km

C. 890km

D. 5 005km

4. A measuring cylinder of radius 3.5cm contains water to a height of 56cm. If this water is poured into a similar cylinder of radius 14cm, what will be the height of the water column?

A. 3.5cm

B. 14cm

C. 1.75cm

D. 5.3cm

5. The base diameter of a cone is 14 cm, and its volume is 462 cm^3. Find the height. [Takeπ= 22/7].

A. 3.5 cm

B. 5 cm

C. 7 cm

D. 9 cm

6. A rectangle has length x cm and width (x – 1)cm. If the perimeter is 16cm, find the value of x.

A. 3 1/2cm

B. 4cm

C. 5cm

D. 6cm

7. A solid cylinder of radius 3cm has a total surface area of 36πcm^2. Find its height.

A. 2 cm

B. 3 cm

C. 4 cm

D. 5 cm

8. A chord subtends an angle of 160° at the centre of a circle of radius 14cm. Calculate the area of the minor segment of the circle.

A. 256.92cm^2.

B. 273.67cm^2.

C. 16.75cm^2.

D. 240.15cm^2.

9. A frustum of a pyramid is 20 cm square at the bottom 10cm square at the top and 14cm high. Find the volume of the frustum.

A. 1351.3 cm^3

B. 3266.3 $3cm^3$

C. 1531.3 cm^3

D. 5311.3 cm^3

The correct answer is option [B]

10. If the length of a square is increased by 20% while it's width is decreased by 20% to form a rectangle, what is the ratio of the area of the rectangle to the area of the square?

A. 6 : 5

B. 25 : 24

C. 5 : 6

D. 24 : 25

11. Find the perimeter of a sector of a circle of radius 14cm subtended by angle 120° at the centre.

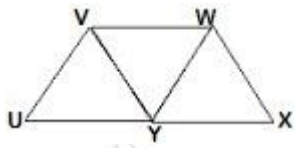
A. 57.33cm

B. 14.00cm

C. 28.67cm

D. 29.33cm

12. The diagram is formed by arranging three equilateral triangles in such a way that UVWY and YVWX are parallelograms. Calculate the difference between ĐUYX and ĐUVY.



A. 120°

B. 180°

C. 260°

D. 270°

13. The volume of a cylinder of radius 14 cm is 210cm^3. What is the curved surface area of the cylinder?

A. 15 cm^2

B. 30 cm^2

C. 616 cm^2

D. 1262 cm^2

14. Calculate the surface area of a sphere of radius 7cm. (Take π = 22/7).

A. 86 cm^2

B. 154 cm^2

C. 616 cm^2

D. 1434 cm^2

15. A sector of a circle of radius 3.5cm subtending an angle of 265° at the centre of the circle is used to form a cone. Calculate the area of the base of the cone correct to the nearest square centimeter.

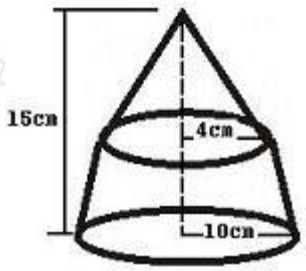
A. 2cm^2.

B. 7cm^2.

C. 21cm^2.

D. 9cm^2.

16. A lampstand shown in the diagram, has a height of 15 cm and upper and lower diameters of 8 cm and 20 cm. Find the area of material that is required to cover the curved surface of the frustum.



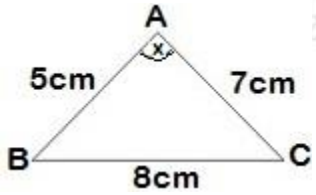
A. 372.34 cm^2

B. 710.96 cm^2

C. 263.89 cm^2

D. 710.69 cm^2

17. In the triangle ABC, what is the size, correct to 1 decimal place, of the angle marked x?



A. 49.1°

B. 81.8°

C. 98.2°

D. 115.0°

18. Find the volume of a cone of radius 3.5cm and vertical height 12cm.

(Take π = 22/7).

A. 15.5cm^2

B. 21.0cm^2

C. 42.0cm^2

D. 154.0cm^2

19. What is the mass in kg of a cylindrical metal bar 0.14m long and 0.06m in diameter if 1cm^3 of the metal has a mass of 70g?

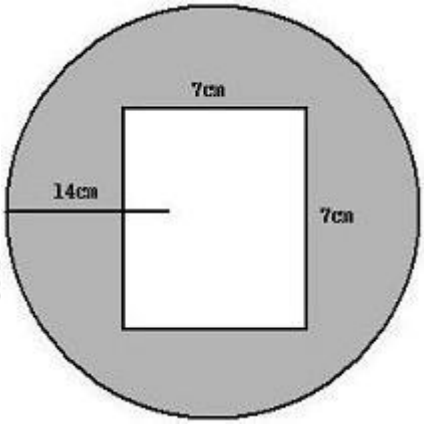
A. 27.71kg.

B. 27,708kg.

C. 0.027708kg.

D. 2.7708 $\times 10^{-5}$kg.

20. Calculate the area of the shaded portion of the diagram drawn.



A. 615.75cm^2

B. 49cm^2

C. 104.94cm^2

D. 566.75cm^2

21. Calculate the radius of a cylinder of height 2.5cm and volume 154cm^3. Leave your answer correct to 1 decimal place.

A. 4.4cm

B. 13.9cm

C. 15.4cm

D. 19.6cm

The correct answer is option [A].

22. Find the radius of a sphere whose surface area is 154 cm^3.

($\pi = 22/7$)

A. 7.00 cm

B. 3.50 cm

C. 3.00 cm

D. 1.75 cm

23. What is the length of a rectangular garden whose perimeter is 32 cm and area 39cm^2 ?

A. 25cm

B. 18cm

C. 13cm

D. 9cm

24. Two square boards are made of the same material and their diagonals measure 40cm and 45cm respectively. If the smaller costs ₦192 to make, what should be the other cost?

A. ₦243.08.

B. ₦216.03.

C. ₦234.08.

D. ₦261.03.

25. A chord of a circle is 10cm from the centre of the circle. Calculate the length of the chord given that the radius of the circle is 31cm.

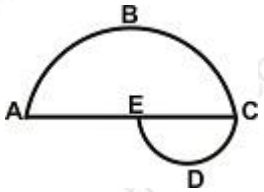
A. 20cm

B. 29.3cm

C. 41cm

D. 58.7cm

26. In the figure, ABC and CDE are semicircles with radii 11cm and 7cm respectively. Calculate the area of the figure.



A. 380.29cm^2

B. 267.14cm^2

C. 190.14^2

D. 154.00cm^2

TOPIC: MISCELLANEOUS EQUATIONS

DIRECTION: Choose the correct answers from the lettered options.

1. A trader bought 200 oranges at 5 for ₦1.20, 40 oranges got spoilt and the remaining were sold at 4 for ₦1.50. Find the percentage gain or loss.

A. 30% gain.

B. 25% gain.

C. 30% loss.

D. 25% loss.

2. Three types of drinks Fanta, Coke and Lemon are sold for ₦900.00, ₦1,500.00 and ₦x.00 respectively per litre. If the cost per litre of the mixture is ₦1,430.00 and ratio of their mixture is 3 : 3 : 4, find x.

A. 200.00

B. 1,170.00

C. 1,775.00

D. 2,400.00

3.

a = 4, b = 4, c = 6. Therefore simplify $\frac{(b^2 + c^2 - a^{\frac{1}{2}})}{(2b + 2a - 3c)}$

A. -25

B. -117

C. -28.8

D. -115

4. Factorise $4a^2 + 28a + 49$.

A. $[2a^2 + 14]$

B. $[2a + 7]^2$

C. [3a + 4]

D. $[4a - 7]^2$

5. A certain number is formed of two digits; its value equals four times the sum of its digits. If 27 is added to it, the sum is the number obtained by interchanging the digits. What is the number?

A. 63

B. 25

C. 36

D. 88

6. Solve the equation 3/a + 5/2a.

A. 11/2a

B. 11/a

C. $11/2a^2$

D. $11/a^2$

7. Daniel's Plc declared a dividend of 75 kobo for one unit of share held by shareholder. Find the amount of shares a shareholder who has 6,000 shares will receive if there is a withholding tax of 15%.

A. 3825

B. 8253

C. 2583

D. 4000

8. A labourer's new monthly home take is ₦ 432 due to a 20% increase effected. How much was his monthly take home prior to the increase?

A. ₦ 220

B. ₦ 360

C. ₦ 1500

D. ₦ 390

9. The sum of two numbers is twice their difference. If difference of the numbers is p, find the larger of the two numbers.

A. p/2.

B. 3p/2.

C. 5p/2.

D. 3p.

10. A trader bought 200 oranges at 5 for ₦1.20, 40 oranges got spoilt and the remaining were sold at 4 for ₦1.50. How much money did the trader receive for the remaining oranges?

A. ₦48.

B. ₦240.

C. ₦60.

D. ₦270.

11. A man is given 1/7th of his salary as tax free. He then pays 25% on what is left on tax. If he pays tax of ₦ 550. Calculate his income.

A. ₦ 2656.67

B. ₦ 2566.67

C. ₦ 2665.67

D. ₦ 2666.57

12. Zenith bank shares are sold in bundles. If one bundle of 6 shares is sold for ₦ 42.00, how many shares can ₦ 180.00 buy?

A. 28.

B. 27.

C. 37.

D. 26.

13. Evaluate the given matrix as shown.

$$\begin{vmatrix} -3 & -2 & -1 \\ 4 & 2 & -2 \\ 2 & 4 & 2 \end{vmatrix}$$

A. 24

B. 36

C. -24

D. -36

14. Find the interest on two million dollars at 12% saved for 4 months.

A. $40,000

B. $60,000

C. $80,000

D. $4,000

15. A car travels 60 kilometres in one hour before a piston breaks, then travels at 30 kilometers per hour for the remaining 60 kilometers to its destination. What is its average speed in kilometers per hour for the entire trip?

A. 45km/h

B. 40km/h

C. 50km/h

D. 60km/h

16.

Find the value for which x is undefined in the equation

$$\frac{2x - 3}{x^2 - 6x + 9}.$$

A. [3,3].

B. [−3,3].

C. [−2,3].

D. [2,−3].

17. Find the value of the equation $[25x^2]/64 + 35x/25 - [16x^3]/9$, given that x = 1/2.

A. 6629/11520

B. 2597/5760

C. 2597/11520

D. 1869/5760

18. The thickness of a 700 pages of a book is 22mm. Find the thickness of one leaf of the book. Show your answer in standard form and in meters.

A. 3.143×10^{-5}

B. 3.143×10^{-4}

C. 3.143×10^{-2}

D. 3.143×10^{-3}

19. The cost of painting 7m square room is ₦420. What is the cost of painting a 12m square room?

A. ₦850.

B. ₦580.

C. ₦405.

D. ₦720.

20. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], calculate their total annual profit.

A. ₦ 22,000

B. ₦ 14,000

C. ₦ 16,000

D. ₦ 20,000

21. Simplify 1/4x - 4 + 1/6x - 6.

A. 6 - 2x/33x^2.

B. 2x^2 - 2/1 - x.

C. 5/12[x - 1].

D. 5x^2/x - 1.

22. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], how much did Daniel [D] get all together?

A. ₦ 15,000

B. ₦ 11,000

C. ₦ 12,000

D. ₦ 14,000

23. Find a two-digit number such that four times the tens digit is 2 less than twice the units digit, and the number is 18 greater than the number obtained by reversing the digits.

A. 31

B. 29

C. 13

D. 11

24. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], also how much did James [J] get as total?

A. ₦ 8,000

B. ₦ 6,000

C. ₦ 9,000

D. ₦ 7,000

25. Three types of drinks Fanta, Coke and Lemon are sold for ₦900.00, ₦1,500.00 and ₦x.00 respectively per litre. If the cost per litre of the mixture is ₦1,430.00 and ratio of their mixture is 3 : 3 : 4, find x.

A. 200.00

B. 1,170.00

C. 1,775.00

D. 2,400.00

26. Factorise [5 - y] y = 6.

A. [y + 2][y + 3]

B. [y - 2][y + 3]

C. [y - 2][y - 3]

D. [y + 2][y - 3]

27. Given two points on the earth's surface between two cities, A[Lat 75°N, Long 25°E] and B[Lat 75°N, Long 35°W]. Calculate the distance.

A. 4190.5km

B. 1656.4km

C. 1734.6km

D. 6702.1km

28. A lorry moves for 6hrs maintaining a particular speed. The lorry trippled its speed and moved for another 7hrs. Then the lorry covered a total of 900km/h. Calculate the speed at which the lorry moved for the last 7hrs.

A. 43.33km/h.

B. 33.33km/h.

C. 53.33km/h.

D. 63.33km/h.

29. Find the value of x in the equation $x^2 + 8x + 15 = 0$.

A. [5 or 3]

B. [-5 or 3]

C. [5 or -3]

D. [-5 or -3]

30.

Evaluate $\frac{a}{a+2} - \frac{a-2}{a-3}$

A. $\frac{4-3a}{a^2-a-6}$

B. $\frac{-4-3a}{a^2+a+6}$

C. $\frac{4+3a^2}{a^2+6}$

D. $\frac{-4+3a^2}{a^2-3}$

31.

Solve $\frac{3.724 \times 10^{-4} \times 2.174}{6.748 \times 10^{-3}}$ and leave your answer in 2 s.f.

A. 0.13

B. 0.12

C. 0.10

D. 1.4

32. Kate is n years old. Pat is 6 years younger than Kate and 2 years older than Dan. What is the sum of the ages of all three?

A. 3n + 4

B. 3n - 4

C. 3n - 8

D. 3n - 14

33. Change 3.275 into an improper fraction.

A. 131/40.

B. 152/41.

C. 11/40.

D. 37/39.

34. What is the product of 36/7, $[4]^{-3}$ and $[1/3]^{-1}$.

A. 35/121

B. 27/112

C. 18/41

D. 26/131

35. Solve the equation x - 4/4 - x - 6/6 = 3.

A. 33.

B. 34.

C. 35.

D. 36.

36. Divide $2x^3 - 5x^2 - 5x + 6$ by $x - 3$.

A. $2x^2 + x - 2$

B. $-2x^2 + x - 3$

C. $3x^2 - x - 1$

D. $3x^2 + x - 2$

37.

Find the value for which x is undefined in the equation

$$\frac{2x - 3}{x^2 - 6x + 9}.$$

A. [3,3].

B. [-3,3].

C. [-2,3].

D. [2,-3].

38. Three types of drinks Fanta, Coke and Lemon are sold for ₦900.00, ₦1,500.00 and ₦x.00 respectively per litre. If the cost per litre of the mixture is ₦1,430.00 and ratio of their mixture is 3 : 3 : 4, find x.

A. 200.00

B. 1,170.00

C. 1,775.00

D. 2,400.00

39. Simplify $6[a^2 - 2a - 3] - 3a[2a - 5]$.

A. 3[a + 6]

B. 3[a - 6]

C. 3[2a + 6]

D. 3[a - 2]

40. The thickness of a 700 pages of a book is 22mm. Find the thickness of one leaf of the book. Show your answer in standard form and in meters.

A. 3.143×10^{-5}

B. 3.143×10^{-4}

C. 3.143×10^{-2}

D. 3.143×10^{-3}

41. A cylinder having a radius of 4m, with a total surface area of 64π m^2. Find the cylinder height.

A. 6

B. 5

C. 11

D. 4

42. Multiply $[a^2 - 3a + 1]$ by $[a - b]$.

A. $a[-3b + a^2]$

B. $a^{2[}3 + a]a^2 + [1 + 3a]a - b.$

C. $a^2 + b^2 - 3b^2$

D. $a^3[a - 3 - b] + a[1 + 3a] - b$

43. The diagonals of a rhombus are 16cm and 30cm long. What is the perimeter of the rhombus?

A. 68cm

B. 72cm

C. 80cm

D. 92cm

44. Given that 8a/[a − 1][a + 2] = c/[a − 1] + d/[a + 2]. Find d/c.

A. 4

B. 1/2

C. 2

D. 1/4

45. A trader makes a profit of 15% when he sells an item for ₦ 70. How much should he have sold so as to make a 45% profit?

A. ₦ 88.26

B. ₦ 41.98

C. ₦ 110.67

D. ₦ 122.70

The correct answer is option [A]. Solution: Cost price [CP] = ₦70 at 15%, CP = 100/115×70

= ₦60.87. At 45% profit, selling price [SP], SP = 145/100 × 60.87 = ₦88.26.

46. Seven years ago, the age of a father was three times that of his son, but in six years time the age of the son will be half that of the father. Find the age of the son.

A. 20

B. 8

C. 46

D. 10

47. Mr. Dele invested ₦ 30,000 in ₦ 10.00 ordinary shares of Zenith bank. He bought the shares at ₦ 20.00 each. How many shares did he buy?

A. 1,200

B. 1,250

C. 3,000

D. 1,500

48. Find the product of 27 /5, $[3]^{-3}$ and $[1/5]^{-1}$.

A. 1/25

B. 9

C. 1

D. 3

49. Two geometrically similar cans have heights of 7cm and 21cm. If the smaller holds 250g of sugar, how many kg does the large one hold?

A. 3/4

B. $1^{1}/2$

C. $2^{1}/4$

D. $3^{1}/2$

50. The length of a given object is 6cm and an error of 0.2cm is measured. Calculate the percentage error.

A. 33.3%

B. 96.7%

C. 9.67%

D. 3.33%

51. Solve 3[x – 5] > 4[x – 2].

A. 23.

B. 43.

C. 53.

D. 13.

52. If ₦ 25,000 amount to ₦ 35,000 in four years. Find the simple interest rate.

A. 22%.

B. 14%.

C. 42%.

D. 10%.

53. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], calculate their total annual profit.

A. ₦ 22,000

B. ₦ 14,000

C. ₦ 16,000

D. ₦ 20,000

54. A car travels 60 kilometres in one hour before a piston breaks, then travels at 30 kilometers per hour for the remaining 60 kilometers to its destination. What is its average speed in kilometers per hour for the entire trip?

A. 45km/h

B. 40km/h

C. 50km/h

D. 60km/h

55. A trader bought 200 oranges at 5 for ₦1.20, 40 oranges got spoilt and the remaining were sold at 4 for ₦1.50. Find the percentage gain or loss.

A. 30% gain.

B. 25% gain.

C. 30% loss.

D. 25% loss.

56. Find the value of $a^2 + 12a + 27$.

A. [-3,-3]

B. [-3,3]

C. [-9,3]

D. [-3,-9]

57. An encyclopedia salesman make a 10% commission on any sales. If he sells a set of encyclopedia at ₦ 700 instead of the original price of ₦ 800, how much less of a commission does he earn?

A. ₦ 7

B. ₦ 8

C. ₦ 10

D. ₦ 70

58. Find the value of x in $x^{1/3} = 4$.

A. 64

B. 66

C. 74

D. 76

59.

Evaluate $\frac{a}{a+3} + \frac{a+2}{a+4}$

A. $\frac{a^2 - 9a + 3}{6 + 2a}$

B. $\frac{2a + 3a^2}{4}$

C. $\frac{2a^2 + 9a + 6}{a^2 + 7a + 12}$

D. $\frac{2a^2 - 9a + 6}{a^2 + 7a + 12}$

60. Emma bought a deep freezer at the cost of ₦ 350,000. Because the freezer is a fairly use one, he then spent addition ₦ 50,000 to refurbish and put it in order. He then sold it at ₦ 550,000. Find his loss or profit percentage on the transaction.

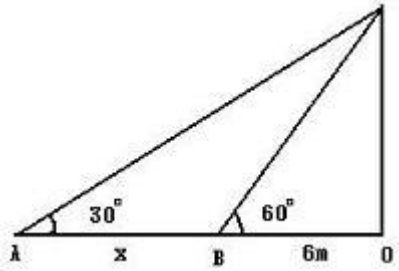
A. 47.5%

B. 45.7%

C. 37.5%

D. 35.7%

61. The angle of elevation of the top of a vertical tower from a point A on the ground is 30° as drawn. From a point B, 6m nearer the tower, the angle of elevation is 60°. Calculate the distance further from A.



A. 12m

B. 18m

C. 6m

D. 6√3m

62. Simplify 4a + 2/3 + 3/4a.

A. $16a^2/12a3$

B. $16a^2 + 8a/12a$

C. $12a^2 - 8a/12$

D. $16a^2 + 8a + 9/12a$

63.

If a:b = 6:5, find the value of $\left[\frac{4a + 6b}{3a - b}\right] \div \left[\frac{4a}{5b}\right]$

A. -73

B. 73

C. -7.03

D. 7.03

64. Divide $2x^3 - 5x^2 - 5x + 6$ by x - 3.

A. $2x^2 + x - 2$

B. $-2x^2 + x - 3$

C. $3x^2 - x - 1$

D. $3x^2 + x - 2$

The correct answer is option [A]

$$
\begin{array}{r|l}
x - 3 & 2x^2 + x - 2 \\
\hline
 & 2x^3 - 5x^2 - 5x + 6 \\
 & 2x^3 - 6x^2 \\
\hline
 & \quad x^2 - 5x \\
 & \quad x^2 - 3x \\
\hline
 & \quad\quad - 2x + 6 \\
 & \quad\quad - 2x + 6
\end{array}
$$

65. Emma bought a deep freezer at the cost of ₦ 350,000. Because the freezer is a fairly use one, he then spent addition ₦ 50,000 to refurbish and put it in order. He then sold it at ₦ 550,000. Find his loss or profit percentage on the transaction.

A. 47.5%

B. 45.7%

C. 37.5%

D. 35.7%

TOPIC: NUMBER AND NUMERATION

DIRECTION: Choose the correct answers from the lettered options.

1. A taxpayer is allowed 1/8th of his annual income tax-free, and he pays 20% on the remainder. If he pays ₦ 490.00 k tax, what is his income?

A. ₦ 560.00 k

B. ₦ 2,450.00 k

C. ₦ 2,800.00 k

D. ₦ 3,920.00 k

2.

Simplify the equation given

$$5\frac{1}{4} \div (1\frac{2}{3} - \frac{1}{2})$$

A. $1\,{}^{3}/4$

B. $3\,{}^{1}/2$

C. $4\,{}^{1}/2$

D. $8\,{}^{1}/2$

3. Evaluate correct to 4 decimal places 827.51 x 0.015.

A. 8.8415

B. 12.4127

C. 124.1265

D. 12.4120

4. Simplify 0.000215×0.000028 and express your answer in standard form.

A. 6.03×10^{9}

B. 6.02×10^{9}

C. 6.03×10^{-9}

D. 6.02×10^{-9}

5. Express the product of 0.06 and 0.09 in standard form.

A. 5.4×10^{-3}

B. 5.4×10^{-2}

C. 5.4×10^{-1}

D. 5.4×10^{2}

6. When a dealer sells a bicycle for ₦ 81 he makes a profit of 8%. What did he pay for the bicycle?

A. ₦ 71.00

B. ₦ 74.52

C. ₦ 75.00

D. ₦ 75.52

7. If $(1P03)_4 = 115_{10}$, find P.

A. 0

B. 1

C. 2

D. 3

8. If $^6P_r = 6$, find the value of $^6P_{r+1}$.

A. 30

B. 33

C. 35

D. 15

9.

Make a/x the subject of the formula $\frac{x+a}{x-a} = m$

A. $\frac{m-1}{m+1}$

B. $\frac{1+m}{1-m}$

C. $\frac{1-m}{1+m}$

D. $\frac{m+1}{m-1}$

10. A sales girl gave a change of ₦ 1.15 to a customer instead of ₦ 1.25. Calculate her percentage error.

A. 10%

B. 8.7%

C. 8.0%

D. 2.4%

11. Evaluate 21.05347 - 1.6324 x 0.43, to 3 decimal places.

A. 20.980

B. 20.351

C. 20.981

D. 20.352

12. Evaluate 0.009/0.012, leaving your answer in standard form.

A. 7.5×10^{2}

B. 7.5×10^{1}

C. 7.5×10^{-1}

D. 7.5×10^{-2}

13. If P varies inversely as v and v varies directly as R2, find the relationship between P and R, given that R = 7 and P = 2.

A. $P = 98R^2$

B. $PR^2 = 98$

C. $P = 1/98R^2$

D. $P = R^2/98$

14. If ₦225.00 yields ₦27.00 in X years simple interest at the rate of 4% per annum, find X.

A. 3

B. 4

C. 12

D. 27

15. Given that for sets A and B in a universal set E, A ϵB, then A ∩(A ∩ B)' is _____.

A. A

B. ∅

C. B

D. E

16. Make C the subject of the equation

a(b + c) + (5/d) - 2 = 0

A. c = (2d - 5 - b)/ad

B. c = (5 - 2d - b)/ad

C. c = (5 - 2d - abd)/ad

D. c = (2d - abd - 5)/ad

17. Instead of recording the number 1.23cm for the radius of a tube, a student recorded 1.32cm. Find the percentage error, correct to one decimal place.

A. 6.8%

B. 7.3%

C. 9.6%

D. 14.4%

18. Two brothers invested a total of ₦ 5,000:00 k on a farm project. The farm yield was sold for ₦ 15,000:00 k at the end of the season. If the profit was shared in the ratio 2 : 3, what is the difference in the amount of profit received by the brothers?

A. ₦ 2,000:00 k

B. ₦ 4,000:00 k

C. ₦ 6,000:00 k

D. ₦ 10,000:00 k

19.

Simplify $\frac{\left(\frac{2}{3}-\frac{1}{5}\right)-\frac{1}{3}of\frac{2}{5}}{3-\frac{1}{1\frac{1}{2}}}$

A. 1/7

B. 7

C. 1/3

D. 3

20. A trapezium has two parallel sides of length 5cm and 9cm. If the area is 21cm², find the distance between the parallel sides.

A. 4cm

B. 7cm

C. 3cm

D. 6cm

21. Simplify 0.0589 + 7.382 - 0.7953, correct to 2 decimal places.

A. 6.60

B. 6.64

C. 6.65

D. 8.20

22. Find the number of ways of selecting 8 subjects from 12 subjects for an examination.

A. 490

B. 495

C. 496

D. 498

23. If A = {a, b, c}, B = {a, b, c, d, e} and C = {a, b, c, d, e, f}

Find {A Ç B} Ç {A Ç C}.

A. {a,b,c,d}

B. {a,b,c,d,e}

C. {a,b,c,d,e,f}

D. Ø

24. If M 5_{ten} = 1001011_{two}, find the value of M.

A. 15

B. 6

C. 7

D. 8

25. A student measured the length of a room and obtained the measurement of 3.99m. If the percentage error of his measurement was 5% and his own measurement was smaller than the length, what is the true length of the room?

A. 3.78

B. 3.80

C. 4.18

D. 4.20

26. If Q = {all perfect squares less than 30} and

P = {all odd numbers from 1 to 10}, find QnP.

A. {1, 4, 9, 16, 25}

B. {1, 3, 4, 5, 7, 9, 16, 25}

C. {1, 3, 5, 7, 9}

D. {1, 9}

27. If $12_e = X_7$, find X where e =12.

A. 20_7

B. 15_7

C. 14_7

D. 12_7

28. Two binary operations x and # are defined as m x n = mn − n − 1 and m # n = mn + n − 2 for all real numbers m,n. Find the value of 3 # (4 x 5).

A. 60

B. 57

C. 54

D. 42

29. A number is selected at random between 20 and 30, both numbers inclusive. Find the probability that the number is a prime.

A. 2/11

B. 5/11

C. 6/11

D. 8/11

30. If 7 and 189 are the first and fourth terms of a geometric progression respectively, find the sum of the first 3 terms of the progression.

A. 182

B. 91

C. 63

D. 28

31. Correct 0.002473 to 3 significant figures.

A. 0.002

B. 0.0024

C. 0.00247

D. 0.0025

32. Calculate, correct to two significant figures, the percentage error in approximating 0.375 to 0.4.

A. 2.0%

B. 2.5%

C. 6.6%

D. 6.7%

33. Peter's weekly wages are ₦ 20:00 k. for the first 20 weeks and ₦ 36:00 k for the next 24 weeks. Find his average weekly wage for the remaining 8 weeks of the year, if his average weekly wage for the whole year is ₦ 30:00 k.

A. ₦ 37:00 k

B. ₦ 35:00 k

C. ₦ 30:00 k

D. ₦ 25:00 k

34. A survey of 100 students in an institution shows that 80 speak fluent Hausa and 20 students speak Igbo, while only 9 students speak both languages. How many students speak neither Hausa nor Igbo?

A. 0

B. 9

C. 11

D. 20

35. Given that P = {b, d, e, f} and Q = {a, c, f, g} are subsets of the universal set U = {a, b, c, d, e, f, g}. Find $P^1 \cap Q$.

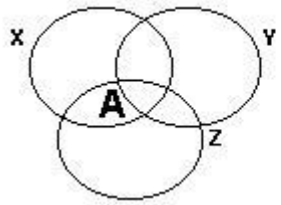
A. {a, c}

B. {a, c, d, g}

C. {c, d, g}

D. {a, c, g}

36.



The area lettered A in the diagram is

A. X∩Z

B. X°∩Y∩ Z

C. X∩Y°ÇZ

D. X∩Z°

37. When an aeroplane is 800m above the ground, its angle of elevation from a point P on the ground is 30°. How far is the plane from P by line of sight?

A. 400m

B. 800m

C. 1500m

D. 1600m

38. In a class of 40 students, 32 offer Mathematics, 24 offer Physics and 4 offer neither Mathematics nor Physics. How many offer both Mathematics and Physics?

A. 4

B. 8

C. 16

D. 20

39. Find the smallest number by which 252 can be multiplied to obtain a perfect square.

A. 2

B. 3

C. 5

D. 7

40. While doing his Physics practical, Idowu recorded a reading as 1.12cm instead of 1.21cm. Calculate his percentage error.

A. 1.17%

B. 6.38%

C. 7.44%

D. 8.05%

41. Express 7.841×10^{-4} as a decimal fraction correct to 3 significant figures.

A. 0.0000784

B. 0.000784

C. 0.00784

D. 0.0784

42. The size of a quantity first doubles then increases by a further 16%. After a short time, it's size decreases by 16%. What is the net increase in size of the quantity?

A. 59300/625%

B. 50900/625%

C. 200%

D. 100%

43.

Make f the subject of the formula $t = \sqrt{\frac{v}{\left(\frac{1}{f} + \frac{1}{g}\right)}}$

A. $\frac{gv - t^2}{gt^2}$

B. $\frac{gt^2}{gv - t^2}$

C. $\frac{v}{\frac{1}{t^2} - \frac{1}{g}}$

D. $\frac{gv}{t^2 - g}$

44. If U = {s,p,l,e,n,d,o,u,r},

X = {s,p,e,n,d},

Y = {s,e,n,o,u,r},

Z = {p,n,o,u,r}

Find X ∩ {Y∪Z}.

A. {p,o,u,r}

B. {s,p,e,n}

C. {p,n,d}

D. {n,d,u}

45. Evaluate $(101.5)^2 - (100.5)^2$.

A. 1

B. 2.02

C. 20.02

D. 202

46. The sum of four numbers is 1214_5. What is the average expressed in base five?

A. 411

B. 401

C. 114

D. 141

47. Let the universal set be the set of integers, = {x : 0 < x = 10};

Find the complement of the set

P = {x : x , J, (x is NOT divisible by 4)}.

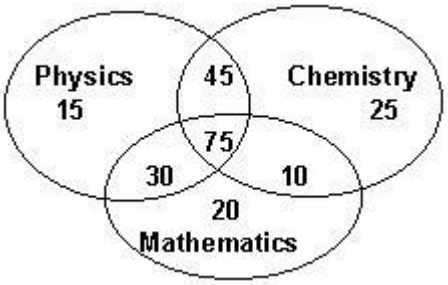
A. {4}

B. {4,8}

C. {1,2,3}

D. {4,8,12,16,20}

48. The Venn diagram shows the number of students who studied physics, chemistry and mathematics in a certain school. How many students took at least two of the three subjects?



A. 165

B. 160

C. 155

D. 135

49. Let the probability function on set S, where S = {a_1, a_2, a_3, a_4}. Find P(a_1) if P(a_2) = 1/3, P(a_3) = 1/6 and P(a_4) = 1/5.

A. 7/10

B. 2/3

C. 1/3

D. 3/10

50. The thickness of an 800-paged book is 18 mm. Calculate the thickness of one leaf of the book giving your answer in meters and in standard form.

A. 2.25×10^{-4} m

B. 4.50×10^{-4} m

C. 2.25×10^{-5} m

D. 4.50×10^{-5} m

51. After getting a raise of 15%, a man' s new monthly salary is ₦ 345. How much per month did he earn before the increase?

A. ₦ 330.00 k

B. ₦ 396.75 k

C. ₦ 300.00 k

D. ₦ 293.25 k

52. In a class of 80 students, every student had to study economics or geography, or both economics and geography. If 65 students studied economics and 50 studied geography, how many studied both subjects?

A. 15

B. 30

C. 35

D. 45

53. Express 0.00629946 to 3 significant figures.

A. 0.00630

B. 0.000

C. 0.006

D. 0.006210

54. The number 186 047 was corrected to 186 000. Which of the following can correctly describe the degree of approximation?

I to the nearest hundred

II to the nearest thousand

III to 3 significant figures

A. I & III only

B. I & II only

C. II & III only

D. All of them

55.

Evaluate $\frac{1}{3}+\left[\frac{5}{7}\left(\frac{9}{10}-1+\frac{3}{4}\right)\right]$

A. 28/39

B. 13/84

C. 67/84

D. 84/13

56. The number 25 when converted from the tens and units base to the binary base (base 2) is one of the following _____.

A. 10011

B. 111011

C. 111000

D. 11001

57. The mean of twelve positive numbers is 3. When another number is added, the mean becomes 5. Find the thirteenth number.

A. 29

B. 26

C. 25

D. 24

58. The ratio of the number of men to women in a 20-member committee is 3 : 1. How many women must be added to the number so as to make the ratio of men to women 3:2?

A. 2

B. 5

C. 7

D. 9

59. The ratio of the price of a loaf of bread to the price of a packet of sugar in 1975 was r : t. In 1980, the price of a loaf of bread went up by 25% and that of a packet of sugar by 10%. Their new ratio is now _____.

A. 20r : 25t

B. 22r : 25t

C. 25r : 22t

D. 27r :22t

60. The range of 4, 3, 11, 9, 6, 15, 19, 23, 27, 24, 21 and 16 is

A. 24

B. 23

C. 21

D. 16

TOPIC: NUMBER BASES

DIRECTION: Choose the correct answers from the lettered options.

1. What is the product of 612_5 and 45_5?

A. 111200_5

B. 100120_5

C. 211100_5

D. 121010_5

2.

Evaluate $\frac{(110100)_{two}}{(100)_{two}}$

A. 10011_{two}

B. 1010_{two}

C. 1101_{two}

D. 1100_{two}

3. Find the value of X, if $278_5 - X_6 = 330_5$.

A. 3

B. 4

C. 2

D. 5

4. The subtraction below is in base seven. Find the missing number.

$$\begin{array}{r} 5162 \\ -2644 \\ \hline 2*15 \\ \hline \end{array}$$

A. 2

B. 3

C. 4

D. 5

5. What is the octal equivalent of 465_{10}?

A. 611_8

B. 811_8

C. 711_8

D. 411_8

6. Simplify $Log_6 36 + Log_6[1/6]$.

A. 2

B. 3

C. 1

D. 4

7. Given that $139_5 = A_6$, What is A?

A. 121_6

B. 113_6

C. 131_6

D. 227_6

8. Evaluate $Log_5 12.5 + Log_5 2$.

A. 4

B. 2.5

C. 2.6

D. 2

9. Find the value of k if $15_k + 36_k = 65_k$.

A. 4

B. 16

C. 7

D. 3

10. **Evaluate $\frac{2434_6}{42_6}$.**

A. 35_6

B. 75_6

C. 45_6

D. 72_6

11. Solve the equation $[\log_{10}3125 + \log_{10}125]/[\log_{10}625 - \log_{10}25]$.

A. 1

B. 4

C. 6

D. 9

12. $\log_2 8 + \log_2 12 - \log_2 X = 1$. Find X.

A. 48

B. 40

C. 35

D. None of the above

13. Convert 448_6 to denary.

A. 476_{10}

B. 764_{10}

C. 176_{10}

D. 112_{10}

14. $65_x = 11011_3$, find x.

A. 17

B. 19

C. 18

D. 21

15.

Evaluate $\frac{\text{Log } 16 + \text{Log } 4}{\text{Log } 16 - \text{Log } 4}$.

A. 4

B. 8

C. 3

D. 1

16. Subtract 413_8 from 675_8.

A. 343_8

B. 262_8

C. 348_8

D. 143_8

17. Find X if $1110_3 + X_6 = 85_{10}$.

A. 124_6

B. 118_6

C. 114_6

D. 141_6

The correct answer is option [C].

18. If $Log_{10}2 = 0.3010$ and $Log_{10}3 = 0.4771$, evaluate $Log_{10}4.5$.

A. 1.7895

B. 0.6532

C. 6.532

D. 17.895

19. Find the number base used when $343_x + 275_x = 812_x$.

A. x = 5

B. x = 4

C. x = 9

D. x = 8

20. Convert 49_{10} to a binary number.

A. 10101_2

B. 110000_2

C. 011010_2

D. 110001_2

21. Subtract 14436_7 from 50123_7.

A. 4352_7

B. 32354_7

C. 43525_7

D. 3235_7

22. Convert 564_9 to base 6 and divide by 10.

A. 305.5

B. 205.1

C. 105.3

D. 20.51

23. Given the decimal number 49.0 to base 3.

A. 1311_3

B. 1411_3

C. 1511_3

D. 1211_3

24. What is $Log_5 16.42$?

A. 1.74

B. 11.74

C. 0.174

D. 17.4

25. Convert 72_{10} to base 7.

A. 132_7

B. 123_7

C. 213_7

D. 321_7

26. Multiply 334 by 13 in base 5.

A. 10120_5

B. 00120_5

C. 21010_5

D. 11002_5

27.

Solve for a if all the numbers are in base 3; $\frac{12}{a} = \frac{1110}{(a + 110)}$

A. 10.90

B. 1.2022

C. 1.090

D. 19.01

28. $B455_5 - O5B3_5 = OBB3_5$.

A. 1/90

B. 6/81

C. 4/73

D. 11/43

29. Solve $5^{-3Log2} \times 5^{2Log3}$.

A. 2

B. 13

C. 4

D. 1 1/8

30. Evaluate $Log_{10}\sqrt{32}$.

A. 7.526

B. 75.26

C. 0.7526

D. 0.07526

31. Solve the inequality x – 1 > 6[x + 3].

A. 5x < -19

B. 6x > -18

C. 5x > -19

D. 5x > -18

TOPIC: POLYNOMIALS

DIRECTION: Choose the correct answers from the lettered options.

1. Find the zeros of the polynomial $x^3 + 2x^2 - 5x - 6$.

A. 2, 3, 1.

B. −2, −3, −1.

C. −2, 3, 1.

D. 2, −3, −1.

3. When the expression $a + 7x + bx^3$ is divided by $x + 2$, the remainder is −12. One of its factors is $x - 2$. Find the values of a and b.

A. −1, 6.

B. −6, −1.

C. −1, −6.

D. 1, 6.

4. What is the result when $(2x^3 + x^2 - 3)$ is divided by $(2x - 1)$.

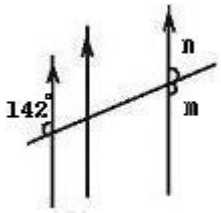
A. $x^2 - x$, R = x − 3.

B. $x^2 - x + 1$, R = −x − 2.

C. x + x + 1/2, R = −21/2.

D. $x^2 - x - 1/2$, R = 21/2.

5. Find the angle m in the diagram drawn.



A. 52°

B. 218°

C. 38°

D. 142°

6. (x + 1) is a factor of $a + 2x + 2x^2 + bx^3$ and the remainder, when this expression is divided by x + 3, is 64. Find the values of a and b.

A. −2, 2.

B. 2, 2.

C. −2, −2.

D. 2, −2.

7. When a polynomial f(x) is divided by $x^2 + x - 2$ the quotient is x + 1 and the remainder is 2x − 3. Find f(x).

A. $x^3 + 2x2 + x - 5$

B. $x^3 + 2x2 + x + 5$.

C. $x^3 + x2 + x - 5$.

D. $x^3 + 2x2 - x - 5$.

8. What is the remainder when $x^2 + x + 2$ is divided by x − 1.

A. −4.

B. x + 2.

C. 2.

D. 4.

9. Expand, $(2x^2 - x - 4)(x^2 + x - 1)$.

A. $2x^4 - 7x^2 + x^3 - 3x + 4$.

B. $2x^4 - x^3 - 7x^2 - 3x + 4$.

C. $2x^4 + x^3 - 7x^2 - 3x + 4$.

D. $2x^4 - 3x + x^3 - 7x^2 + 4$.

10. Given that $P(x) = ax^3 - bx^2 + cx - d$, $P(2) = 6$, $P(0) = -1$, $P(1) = 3$ and $P(-1) = 3$. Find the values of a, b, c and d.

A. -4, -11/2, 1, 11/2.

B. 1, -4, 11/2, 1.

C. -11/2, -4, 11/2, 1.

D. 11/2, -4, -11/2, 1.

11. Find the quotient when $x + 3x - 6$ is divided by $2x + 3$.

A. x2/2 + 3x/4 + 3/8.

B. -x2/2 - 3x/4 + 3/8.

C. -x2/2 + 3x/4.

D. x2/2 - 3/8.

12. Simplify, $(x^2 - 2x - 3)(x^2 + x + 1)$.

A. $x^4 - x^3 - 4x^2 - x - 3$.

B. $x^4 - x^3 - 4x^2 + 5x + 3$.

C. $x^4 - x^3 - 4x^2 - 5x - 3$.

D. $x^4 + x^3 - 3x^2 - x - 3$.

13. A polynomial P is divided by $2x - 1$. The quotient is $x + x + 1$ and the remainder is -2. Find P?

A. $2x^3 - 3x^2 + x - 3$.

B. $2x^3 + x - x^2 - 3$.

C. $2x^3 - x^2 - x - 3$.

D. $2x^3 + x^2 + x - 3$.

14. Simplify, $(x^2 + \sqrt{2}x + 1)(x^2 - \sqrt{2}x + 1)$.

A. $(x^2 - 1)(x^2 + 1)$.

B. $x^4 + 1$.

C. $x^4 - x^2 + x + 1$.

D. $x^4 + x + 1$.

15. Find the remainder when $x^3 + 3x - 6$ is divided by $2x + 3$.

A. $7^1/8$.

B. $6^7/8$.

C. $5^1/8$.

D. $-7^1/8$.

16. Given that $P_1(x) = 5x^3 + 3x^2 - 2x + 6$, $P_2(x) = x^3 + 4x - 3x + 1$ and $P_3(x) = 2x^3 - 3x^2 + 3x + 2$. Find P_1P_3.

A. $10x^6 - 9x^5 + 2x^4 + 37x^3 - 18x^2 + 18x + 12$.

B. $10x^6 - 9x^5 - 2x^4 + 37x^3 - 18x^2 + 18x + 12$.

C. $10x^6 - 9x^5 + 2x^4 + 37x^3 - 18x^2 + 14x + 12$.

D. $10x^6 - 9x^5 + 2x^4 - 37x^3 - 18x^2 + 14x + 12$.

17. What is the remainder when $3x + 1$ is divided by $x + 1$.

A. 2.

B. 3.

C. -2.

D. -3.

18. If $P_1 = x^2 - 2x + 4$, $P_2 = x^2 + 5$ and $P_3 = 2x - 3$, find P_2P_3.

A. $2x^3 - 3x^2 + 10x - 15$.

B. $2x^3 + 10x - 3x^2 - 15$.

C. $2x^3 - 3x^2 + 10x + 15$.

D. $2x^3 - 10x - 3x^2 - 15$.

19. Given that $P_1(x) = 5x^3 + 3x^2 - 2x + 6$, $P_2(x) = x^3 + 4x - 3x + 1$ and $P_3(x) = 2x^3 - 3x^2 + 3x + 2$. Find P_2P_3.

A. $2x^6 + 5x^5 - 15x^4 + 25x^3 - 4x^2 - 3x + 2$.

B. $2x^6 - 3x^5 - 7x^4 + 23x^3 + 5x^2 - 3x + 2$.

C. $2x^6 - 3x^5 - 11x^4 + 25x^3 + 5x^2 - 3x + 2$.

D. $2x^6 + 5x^5 - 15x^4 + 25x^3 + 5x^2 - 3x + 2$.

20. Expand, $(2x^2 - x - 4)(x^2 + x - 1)$.

A. $2x^4 - 7x^2 + x^3 - 3x + 4$.

B. $2x^4 - x^3 - 7x^2 - 3x + 4$.

C. $2x^4 + x^3 - 7x^2 - 3x + 4$.

D. $2x^4 - 3x + x^3 - 7x^2 + 4$.

21. Given that $F(x) = ax^3 + bx^2 - c$, $F(-2) = 3$, $F(1) = 3$ and $F(0) = -1$. Find the values of a, b and c.

A. 1, 1, 3.

B. -3, 7, 1.

C. -5, 9, 1.

D. 1, 3, 1.

22. Find the zeros of the polynomial $x^3 + 2x^2 - 5x - 6$.

A. 2, 3, 1.

B. -2, -3, -1.

C. -2, 3, 1.

D. 2, -3, -1.

23. Which of the following option is the correct mathematical expression of the polynomial.

A. D × R + Q.

B. R × Q + D.

C. Q × D - R.

D. Q × D + R.

24. Find the remainder when x + 3x - 6 is divided by 3x - 1.

A. $4^{26}/27$.

B. $4^{2}/27$.

C. $-4^{25}/27$.

D. $-4^{26}/27$.

25. Find the quotient when x + 3x - 6 is divided by 3x - 1.

A. x/3 + 28/27.

B. -x2/3 - x/9 + 28/9.

C. x2/3 + 28/9.

D. x2/3 + x/9 + 28/27.

TOPIC: QUADRATIC EQUATIONS

DIRECTION: Choose the correct answers from the lettered options.

1. Two square rooms have a total floor area of 89m². One room is 3m longer each way than the other. Find the dimensions of the two rooms.

A. 5m square and 8m square

B. 4m square and 6m square

C. 5m square and 12m square

D. 6m square and 8m square

2. If the sum of the roots of the equation (x – p)(2x + 1) = 0 is 1, find the value of p.

A. $1^{1}/2$

B. 1/2

C. $-^{1}/2$

D. -1 -1

3. What value of k makes the expression y^2 – 6y + k a perfect square?

A. 1

B. 2

C. 9

D. 3

4. A woman is 3 times as old as her son. 8 years ago the product of their ages was 112. Find the woman's age.

A. 32 years

B. 36 years

C. 42 years

D. 30 years

5. A certain number is subtracted from 18 and from 13. The product of the two numbers obtained is 66. Find the first number.

A. 7

B. 24

C. 10

D. 15

6. A quadratic equation with roots 3/2 and 2/3 is _____.

A. $6x^2 - 13x + 6 = 0$

B. $6x^2 + 13x + 6 = 0$

C. $6x^2 - 13x - 6 = 0$

D. $6x^2 + 5x + 6 = 0$

7. A rectangular piece of cardboard measures 17cm by 14cm. Strips of equal width are cut off one side and one end. The area of the remaining piece is 108cm2. Find the width of the strips removed.

A. 26cm

B. 17cm

C. 5cm

D. 17cm

8. The ages of two children are 11 and 8 years. In how many years' time will the product of their ages be 208?

A. 24 years

B. 10 years

C. 6 years

D. 5 years

9. Boneri's age and Meebari's age add up to 25 years. 8 years ago Boneri was twice as old as Meebari. Find Meebari's present age.

A. 7 years

B. 14 years

C. 10 years

D. 11 years

10. What are the factors of $16n^2 - 16n + 4$?

A. $4(4n - 1)(4n - 1)$

B. $4(4n - 1)(4n + 1)$

C. $4(2n + 1)(2n - 1)$

D. $4(2n - 1)(2n - 1)$

11. The area of a rectangle is 60cm2. The length is 11cm more than the width. Find the width.

A. 6cm

B. 15cm

C. 11cm

D. 4cm

12. Boneri's age and Meebari's age add up to 25 years. 8 years ago Boneri was twice as old as Meebari. How old is Boneri now?

A. 11 years

B. 7 years

C. 14 years

D. 10 years

13. A rectangular plot measures 12m by 5m. A path of constant width runs along one side and one end. If the total area of the plot and the path is 120m2, find the width of the path.

A. 10m

B. 12m

C. 5m

D. 17m

14. Two numbers have a difference of 3. The sum of their squares is 89. Find the numbers.

A. [5,8] ; [8,-5]

B. [5,-8] ; [-8,-5]

C. [-5,8] ; [8,-5]

D. [5,8] ; [-8,-5]

15. Find the quadratic equation whose roots are x = 3 or x = 5.

A. $x^2 - 8x + 15 = 0$

B. $x^2 - 2x - 15 = 0$

C. $x^2 - 8x - 15 = 0$

D. $x^2 + 2x - 15 = 0$

16. The base of a triangle is 3cm longer than its corresponding height. If the area is 44cm^2, find the length of its base.

A. 11cm

B. 8cm

C. 4cm

D. 7cm

17. Find two consecutive even numbers whose product is 224.

A. 14 & 16
B. 20 & 22
C. 11 & 13
D. 26 & 28

18. Find two consecutive odd numbers whose product is 195.

A. 21 & 23
B. 15 & 17
C. 18 & 20
D. 13 & 15

19. If $x^2 - 5x + C = (x - 8)(x + 3)$, find the value of C.

A. -24

B. -9

C. 24

D. 5

20. The square of a certain number is 22 less than 13 times the original number. Find the number.

A. 2 or 11

B. 11 or 3

C. 4 or 9

D. 2 or 9

21. A man is 37 years old and his child's age is 8. How many years ago was the product of their ages 96?

A. 40 years

B. 5 years

C. 8 years

D. 37 years

22. The width of a classroom is 4m less than the length. Its area is 45m2. Find the dimensions of the classroom.

A. 9m by 4m

B. 15m by 3m

C. 9m by 5m

D. 5m by 15m

23. Find the value of x if the lengths of the sides of a right angled triangle are given as follows [4x + 1]cm, [4x – 1]cm and xcm.

A. x = 0 or 16.

B. x = 2 or 8.

C. x = 2 or 11.

D. 0.

24. Twice a certain whole number subtracted from 3 times the square of the number leaves 133. Find the number.

A. 61/3

B. 19

C. 7

D. 21

25. Twice the square of a certain whole number added to 3 times the number makes 90. Find the number.

A. 6

B. 15

C. 12

D. 9

26. A woman is 3 times as old as her son. 8 years ago the product of their ages was 112. Find the son's age.

A. 12 years

B. 14 years

C. 16 years

D. 10 years

27. Find two consecutive numbers whose product is 156.

A. 17,18

B. 8,9

C. 27,28

D. 12,13

28. A girl is 6 years younger than her brother. The product of their ages is 135. Find their ages.

A. 15 years ; 6 years

B. 9 years ; 3 years

C. 12 years ; 5 years

D. 15 years ; 9 years

29. What must be added to 4x2 - 20xy to make it a perfect square?

A. $25y^2$

B. 25y

C. $5y^2$

D. 25

30. Factorise the expression $42 - 15x - 3x^2$.

A. $3(x + 7)(x - 2)$

B. $3(7 - x)(2 - x)$

C. $3(x-7)(2-x)$

D. $3(7 + x)(2 - x)$

31. Find the number which, when added to its square, makes 90.

A. 10

B. 9

C. 15

D. 6

32. Find two numbers which differ by 4 and whose product is 45.

A. [5,-9] ; [-5,-9]

B. [5,9] ; [-5,-9]

C. [5,9] ; [-5,9]

D. [5,-9] ; [5,9]

TOPIC: SEQUENCES AND SERIES

DIRECTION: Choose the correct answers from the lettered options.

1. How many terms has the A.P whose first term is 1.5 and the last term is 57 given that the common difference is 3?

A. 35

B. 45

C. 15

D. 11

2. The sum of 11 terms of an A.P is 891. Find the 28^{th} and 45^{th} terms if the common difference is 15.

A. 816 and 1,782

B. 1,632 and 4,415

C. 1,221 and 1,476

D. 1,415 and 2,715

3. If the nth term of a sequence is denoted by the formula $n(2^{n+1}) - 3n$, find the sum of the first four terms.

A. 166

B. 178

C. 211

D. 342

4. Find the difference between the 4^{th} and 11^{th} terms of the sequence whose n^{th} term is $5 - {}^{n^2}/_{2n}$.

A. 2.768

B. 5.322

C. 3.895

D. 4.561

5. The 16^{th} term of an A.P is 93, given that its common difference is 6, find the first term.

A. 6

B. 3

C. 9

D. 7

6. How many terms has the G.P whose second term is $^1/_2$ and the common ratio and the last term are $^1/_4$ and $^1/_{120}$ respectively.

A. 3

B. 7

C. 2

D. 5

7. The 14^{th} term of an A.P is 96 while the 25^{th} term is 173. Find the 19^{th} term.

A. 128

B. 176

C. 131

D. 155

8. The following gives a geometric sequence: 2, P, Q, 250. Find the values of P and Q.

A. 50 and 125

B. 65 and 150

C. 10 and 50

D. 25 and 80

The correct answer is option [C]

9. The sum of 8 terms of an A.P is 160 while the sum of 20 terms is 880. Find the 43^{rd} term.

A. 174

B. 188

C. 235

D. 212

10. The 3^{rd} and the 9^{th} terms of a G.P are 54 and 39,366 respectively. Find the sum of the 4^{th} and 7^{th} terms.

A. 3,557

B. 4,536

C. 2,865

D. 5,267

11. The n^{th} term of a sequence is given by $3 \times 2^{n-2}$. What is the 3^{rd} term?

A. 7

B. 6

C. 4

D. 9

12. The following is an A.P, 9, x, y, z, 25, ... Find the values of x, y and z.

A. 13, 17, 21

B. 18, 23, 34

C. 11, 15, 29

D. 4, 9, 16

13. The 8^{th} term of a G.P is 640. If the first term is 5, find the common ratio and the 10^{th} term.

A. 2 and 2,560

B. 5 and 512

C. 4 and 3,412

D. 3 and 2,673

14. An n^{th} term of the sequence is $3^n - 2^{n+1}$. Find the sum of the 7^{th} and 9^{th} terms.

A. 1,931

B. 18,659

C. 10,931

D. 20,590

15. The 9^{th} and the 22^{nd} terms of an A.P are 29 and 55 respectively. Find the sum of its first 60 terms.

A. 5,212

B. 4,320

C. 2,876

D. 3,826

16. Find the sum of the first 25 terms of the sequence 11, 15, 19, 23, 27, ...

A. 2,050

B. 1,112

C. 3,657

D. 1,475

17. A particular term of a sequence is represented by the formula 3 2^{n+2}. What is the sum of the fifth and sixth terms?

A. 4, 932

B. 2, 342

C. 1, 899

D. 1, 152

18. What is the product of the 9^{th} and 12^{th} terms of a sequence when the n^{th} term equals $4n^2 - 2^{n-1}$.

A. -1,472

B. -100,096

C. -20,480

D. -14720

19. Find the nth term for the sequence 3, 12, 27, 48, 75, ...

A. $2n^2$

B. 4n

C. $2n^3$

D. $3n^2$

20. Find the sum of the sum of the series $n^2 + 5n$ up to the 4^{th} term.

A. 45

B. 80

C. 98

D. 105

21. Find the sum of the 9 terms of the sequence 4, 20, 100, 500, _____.

A. 1,953,124

B. 1,534,231

C. 936,532

D. 789,345

22. The third term of a G.P is 63 while its fifth term is 567. What is the sum of its first seven terms?

A. 10,234

B. 8,459

C. 7,651

D. 6,905

TOPIC: SET THEORY

DIRECTION: Choose the correct answers from the lettered options.

1. Given U = [x : x is an integer and 1 x 30]. A = [x : x is a multiple of 4], B = [x : x is a multiple of 5], C = [x : x is a multiple of 3], an integer is picked at random, find the probability that it is a multiple of 5 and 4.

A. $^{6}/_{25}$

B. $^{7}/_{90}$

C. $^{7}/_{150}$

D. $^{1}/_{15}$

2. U = [1, 2, 3, ,.., 20], list the numbers of [multiple of 5].

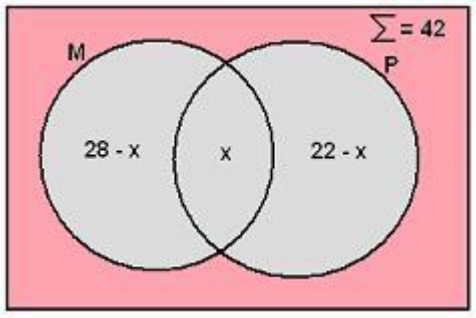
A. [1, 5, 10, 15, 20]

B. [6, 9, 12, 16]

C. [5, 10, 15, 20]

D. [5, 15, 20, 25]

3. In a group of 42 students, each student offers at least one of mathematics and physics. If 22 students offer physics and 28 offer mathematics, find how many students offer physics only.



A. 15

B. 16

C. 14

D. 10

4. If E = [a, b, c, d, e, f, g, h]; X = [a, d, f, h] and Y = [d, e, g]. Find X' n Y'. From question find X'nY'.

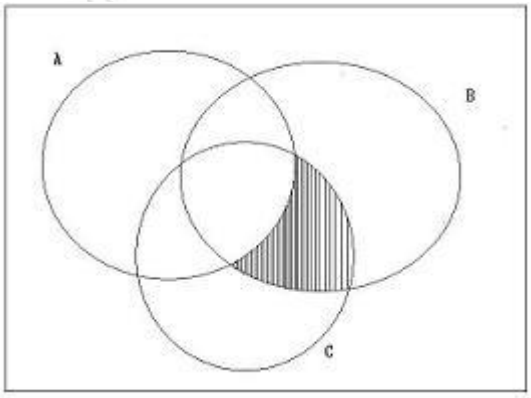
A. [b, c, g]

B. [c, f, g]

C. [c, f, h]

D. [b, c]

5. The shaded portion in the diagram is



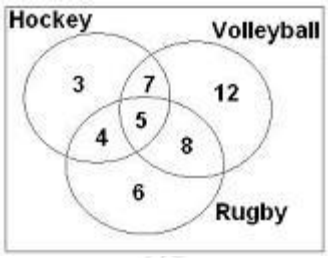
A AuCuB

B. AnBnC'

C. B'uCnA

D. BnCuA'

6. The venn diagram shows a class of 60 students with the games they play. How many of the students play two games only?



A. 15

B. 23

C. 14

D. 19

7. In a class of 50 students, 25 play chess, 17 play squash and 13 do not play any game at all. Find the number of students who play both chess and squash.

A. 6

B. 3

C. 9

D. 5

8. In a class of 50 students, every student had to study Government or Economics or both. If 38 students studied Government and 28 studied Economics, how many students studied both subjects?

A. 16

B. 24

C. 28

D. 36

9. Which of the following is a pythagorean triplet?

A. [3, 7, 11]

B. [6, 17, 19]

C. [3, 4, 5]

D. [4, 9, 6]

10. Given two sets X and Y. n[X] = 15 and n[Y] = 10. The universal set = 20. Find the value of n[AnB] [i.e. the smallest possible value].

A. 10

B. 6

C. 5

D. 7

11. Given that U = [3, 4, 5, 6, 7, 8]; A = [6, 7, 8], B = [3, 5, 6] and C = [5, 6, 7]. Find A' B' C'.

A. 3

B. 5

C. 6

D. 4

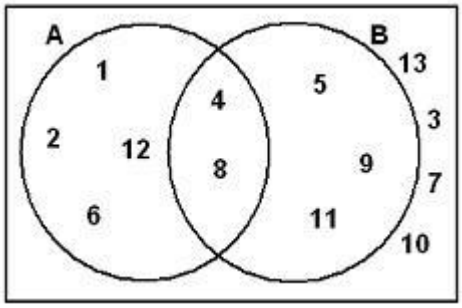
12. From the diagram, what is AnB?

A. [3, 2, 1]

B. [4, 8]

C. [6, 2]

D. [5, 9, 11]



13. Given U = [SHARPENZLY], A = [RAPEN] and B = [SHAZLY]. Find A' and B'.

A. A' = [SHLY]; B' = [PENR]]

B. A' = [SHZLY]; B' = [NPR]

C. A' = [SHYZ]; B' = [REP]

D. A' = [SHZLY]; B' = [RPEN]

14. A = [9, 10, 11, 12, 13, 14, 15, 16], B = [9, 12, 15], and C = [10, 12, 16]. Find [A B] C.

A. [9, 10, 12, 15, 16]

B. [9, 11, 12, 15, 16]

C. [9, 12, 14, 15, 16]

D. [9, 13, 14, 15, 16]

15. If E = [a, b, c, d, e, f, g, h]; X = [a, d, f, h] and Y = [d, e, g]. Find X' Y'. From question find X' Y'.

A. [b, c, g]

B. [c, f, g]

C. [c, f, h]

D. [b, c]

16. Given the universal set U. U = [2, 4, 6, 8, 10, 12] and A = [2, 4, 6, 8], B = [6, 8, 10], C = [4, 8, 12]. Find [A B].

A. [6, 8]

B. [8, 10]

C. [2, 8]

D. [10, 12]

17. U = [1, 2, 3, ..., 20], list the numbers of [multiple of 5].

A. [1, 5, 10, 15, 20]

B. [6, 9, 12, 16]

C. [5, 10, 15, 20]

D. [5, 15, 20, 25]

18. Given the universal set U. U = [2, 4, 6, 8, 10, 12] and A = [2, 4, 6, 8], B = [6, 8, 10], C = [4, 8, 12]. Find AU[BUC].

A. [2, 4, 6, 10]

B. [4, 6, 12]

C. [2, 8, 12]

D. [2, 4, 6, 8, 10, 12]

19. U = [25, 26, 27, 28, ..., 50], D = [x : x 42], and E = [x : x prime number]. Find EnD'.

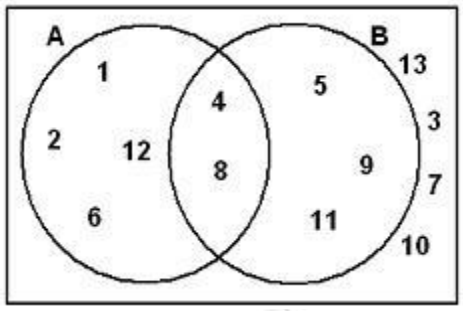
A. [50]

B. [29, 31, 44, 46]

C. [32, 33, 38]

D. [0]

20. From the diagram, what is AnB?



A. [3, 2, 1]

B. [4, 8]

C. [6, 2]

D. [5, 9, 11]

21. If U = [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]; A = [12, 13, 15], B = [13, 16, 19, 20]. Find A' B'. From the information given, find A' U B'.

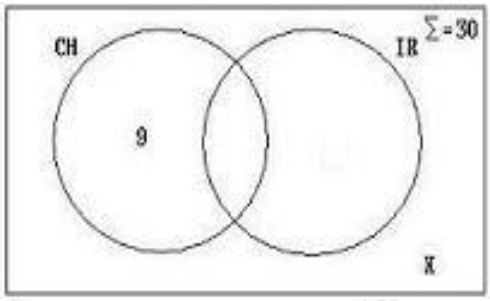
A. [12, 13, 15, 16, 19, 20]

B. [11, 12, 14, 15, 16, 17, 18, 19, 20]

C. [12, 13, 14, 15, 16, 17, 18, 19, 20]

D. [11, 12, 13, 14, 15, 16, 17, 19, 20]

22. In a social gathering of 30 elites, 9 drink champagne, 15 drink irish cream and 6 drink both champagne and irish cream. How many do not drink either champagne or irish cream?



A. 15

B. 9

C. 12

D. 6

TOPIC: ALGEBRAIC PROCESSES

DIRECTION: Choose the correct answers from the lettered options.

1. A student travelled for x hours at 5km/hr and for y hours at 10km/hr. The journey was 35km altogether, which of the following equations represent the given information if the average speed for the journey was 7km/hr?

A. x + y = 5; 5x + 10y = 35

B. x + y = 7; 5x + 10y = 35

C. 5x + 10y = 7; x + y = 35

D. 5x + 10y = 5; x + y = 35

The correct answer is option [A].

Solution: Let the number of hours be x and y => time for the journey

= Distance/Average speed = 35/7 hours;

x + y = 5 ----- [i];

5x + 10y = 35 ---- [ii]

2. Solve the equation $2a^2 - 3a - 27 = 0$.

A. 3/2, 9

B. - 3/2, 9

C. 3, 9/2

D. - 3, 9/2

The correct answer is option [D].

Two factors with product -54 and sum -3 are: -9 and +6.

$(2a^2 - 9a + 6a - 27) = 0$ (2a (a + 3) - 9 (a + 3)

= (a + 3)(2a - 9) = 0. (a + 3 = 0 (a = -3

or 2a - 9 = 0 => a = 9/2

3. **Given that** $p = 1+\sqrt{2}$ *and* $q = 1-\sqrt{2}$, **evaluate** $\frac{p^2 - q^2}{2pq}$

A. $2(2+\sqrt{2})$

B. $-2(2+\sqrt{2})$

C. $2\sqrt{2}$

D. $-2\sqrt{2}$

The correct answer is option [D].

$p = 1+\sqrt{2} \Rightarrow p^2 = 1+2\sqrt{2}+2$

$q = 1-\sqrt{2} \Rightarrow q^2 = 1-2\sqrt{2}+2$

$\therefore \frac{p^2-q^2}{2pq} = \frac{1+2\sqrt{2}+2-(1-2\sqrt{2}+2)}{2(1+\sqrt{2})(1-\sqrt{2})} = \frac{4\sqrt{2}}{-2} = -2\sqrt{2}$

4. Factorize $x^2 + 2a + ax + 2x$.

A. (x + 2a)(x + 1)

B. (x + 2a)(x − 1)

C. (x2 − 1)(x − a)

D. (x + 2)(x + a)

The correct answer is option [D].

It can be rewritten as: $x^2 + ax + 2a + 2x = (x + 2)(x + a)$

5. A motorist drives for m hours at 120km/hr and n hours at 18km/hr. Altogether Somina drives 78km in 5 hours. Find m and n.

A. 3hrs;3hrs

B. 2hrs;3hrs

C. 4hrs;1hr

D. 3hrs;2hrs

The correct answer is option [B].

Solution: m + n = 5 ---- [i];

12m + 18n = 78 ---- [ii]

make m subject from equation [i] and substitute into equation [ii]

m = 5 - n ---- [iii]

12[5 - n] + 18n = 78

60 - 12n + 18n = 78

6n = 18;

n = 3hours

m = 5 - n = 5 - 3 = 2hours

The answer = 2hours;3hours.

6. **Simplify** $4-\frac{1}{2-\sqrt{3}}$

A. 2√3

B. -2 - √3

C. -2 + √3

D. 2 - √3

The correct answer is option [D].

$$4-\frac{1}{2-\sqrt{3}}=\frac{4(2-\sqrt{3})-1}{2-\sqrt{3}}=\frac{8-4\sqrt{3}-1}{2-\sqrt{3}}=\frac{7-4\sqrt{3}}{2-\sqrt{3}}$$

Rationalizing, we have:

$$\frac{7-4\sqrt{3}}{2-\sqrt{3}}x\frac{2+\sqrt{3}}{2+\sqrt{3}}=\frac{2-\sqrt{3}}{1}=2-\sqrt{3}$$

7. **Given that** $p=x-\frac{1}{x}$ **and** $q=x^2+\frac{1}{x^2}$, **express q in terms of p.**

A. $(p^2 + 2)$

B. $(p - 2)^2$

C. $(p + 2)^2$

D. $(p^2 - 2)$

The correct answer is option [A].
Squaring p gives

$$p^2 = x^2 - 2 + \frac{1}{x^2} \Rightarrow$$

$$p^2 + 2 = x^2 + \frac{1}{x^2} = q \therefore q = p^2 + 2$$

8. m^2 - 8m + k. What value of k makes the given expression a perfect square?

A. 2

B. 4

C. 8

D. 16

The correct answer is option [D].

m^2 - 8m + k

Square half the coefficient of m.

$(8/2)^2 = 4^2 = 16$

For k = 16, the eqn. is a perfect square.

9. Solve the equation 3x + 4y = 5 and 7x + 2y = 8.

A. x = 21/2; y = 4

B. x = 41/3; y = 31/2

C. x = 21/4; y = 31/5

D. x = 1; y = 1/2

The correct answer is option [D]. Solution: 3x + 4y = 5 ® [i], 7x + 2y = 8 ® [ii].

Multiply equation [i] by 7 and equation [ii] by 3 gives 21x + 28y = 35 ® [iii], 21x + 6y = 24 ® [iv].

Subtract equation [iv] from equation [iii], therefore, y = 11/22 = 1/2.

Substitute the value of y in equation [i] then x = 1.

10. **What is the least possible value of $\frac{9}{1+2x^2}$, if $0 \le x \le 2$?**

A. 9

B. O

C. 1

D. 2

The correct answer is option [C].
If $0 \leq x \leq 2$, then x = 0, 1 or 2.
Substitute the values of x in the equation
When x = 0, $\frac{9}{1+2(0)^2} = 9$
When x = 1, $\frac{9}{1+2(1)^2} = 3$
When x = 2, $\frac{9}{1+2(2)^2} = 1$
∴ 1 is the least possible value.

11. **If** $9^{\left(x-\frac{1}{2}\right)} = 3^{x^2}$**, find x.**

A. 1/2

B. 1

C. 2

D. 3

The correct answer is option [B].
$9^x \times 9^{-\frac{1}{2}} = 3^{x^2}$
$3^{2x} \times 3^{-1} = 3^{x^2}$
$2x - 1 = x^2; x^2 - 2x + 1 = 0$
Factorizing the above equation, we have that:
$x^2 - x - x + 1 = 0$
$x(x - 1) - 1(x - 1) = 0$
$(x - 1)(x - 1) = 0$
∴ x = 1.

12. If $a = u^2 - 3v^2$ and $b = 2uv + v^2$, evaluate $(2a - b)(a - b2)$ when u = 1 and v = − 1.

A. 9

B. 15

C. 27

D. 33

The correct answer is option [A].

$a = (1)^2 - 3(-1)^2 = 1 - 3 = -2$

$b = 2(-1)(1) + (-1)^2 = -2 + 1 = -1$

$((2a - b)(a - b^2) = [2(-2) - (-1)][-2 - (-1)^2]$

$= (-4 + 1)(-2 - 1) = (-3)(-3) = 9.$

13. In a positive number of two digits, the sum of the digits is 15. If the digits are interchanged the number is increased by 9. Find the number.

A. 87

B. 78

C. 96

D. 69

The correct answer is option [B]. Solution:

Let the digits number be xy;

$x + y = 15$ ----- [i];

$10y + x = 10x + y + 9$

$\rightarrow y - x = 1$ ---- [ii]

®from equation [i] make x the subject;

$x = 15 - y$ ---- [iii] and substitute into equation [ii]

$\rightarrow y - [15 - y] = 1;$

$2y = 16;$

$y = 16/2 = 8$

Substitute the value of y into equation [iii]

$\rightarrow x = 15 - 8 = 7$

Since the digit number is xy the answer = 78.

14. **If**
$\frac{9^{2x-1}}{27^{x+1}} = 1$
find the value of x.

A. 3

B. 8

C. 2

D. 5

The correct answer is option [D].

$\frac{9^{2x-1}}{27^{x+1}} = 1 \Rightarrow \frac{3^{(2)^{2x-1}}}{3^{(3)^{x+1}}} = 3^0$

From the theory of indices,

$3^{4x-2-(3x+3)} = 3^0$

$\therefore 4x-2-3x-3=0 \Rightarrow x-5=0 \Rightarrow x=5$

15. **Three numbers x, y, z are connected by the relationship**
$y = \frac{4}{9}x + 1 \text{ and } z = \frac{4}{9}y + 1$
if x = 99 find z.

A. 6 1/3

B. 20

C. 21

D. 176 4/9

The correct answer is option [C].

Substituting x = 99 for y in the first equation gives y = 4/9(99) + 1 = 45

z = 4/9(45) + 1 = 21

16. Factorize m (2a - b) - 2n (b - 2a).

A. (2a - b)(2n - m)

B. (2a + b)(m - 2n)

C. (2a - b)(m + 2n)

D. (2a - b)(m - 2n)

The correct answer is option [C]

17. Find the value of x in 0.5x + 2.6 = 5x + 0.35.

A. 0.5

B. 2

C. 2.6

D. 5

The correct answer is option [A]

18. Factorize: $5y^2 + 2ay - 3a^2$.

A. (5y - a)(y + 3a)

B. (5y +a)(y - 3a)

C. 5y2 + a(2y - 3a)

D. (y + a)(5y - 3a)

The correct answer is option [D]. Here a = 5, b = 2, c = -3, and ac = -15.

5 and -3 are factors which when summed give +2 and a product of - 15.

Replacing the middle term (2y) by 5 and -3,

$5y^2 + 5y - 3y - 3 = 5y (y + 1) -3(y + 1)$

(5y - 3)(y + 1)

Now add (a) in the second term in the brackets

$(5y - 3a)(y +a) = 5y^2 + 2ay - 3a^2$

19. A student travelled for x hours at 5km/hr and for y hours at 10km/hr. The journey was 35km altogether, find x and y if the average speed for the journey was 7 km/hr.

A. 3hrs & 3hrs

B. 3hrs & 2hrs

C. 1hrs & 4hrs

D. 2hrs & 3hrs

The correct answer is option [B]. Solution: Let the number of hours be x and y→time for the journey = Distance/Average speed

= 35/7hours; x + y = 5 ----- [i]; 5x + 10y = 35 ---- [ii] →make x subject from equation

[i]; x = 5 - y ---- [iii] → substitute into equation [ii]; 5[5 - y] + 10y = 35;

25 - 5y + 10y = 35 → 5y = 10; y = 10/5 = 2hrs substitute the value of y into equation

[iii] → x = 5 - y = 5 - 2 = 3hrs. The answer = 3hrs

2hrs.

20. Solve the inequality x - 1 > 4(x + 2).

A. x > - 3

B. x < - 3

C. 2 < x < 3

D. -3 < x < -2

The correct answer is option [B].

x - 1 > 4x + 8

-3x > 9

-x > 3

x < -3

21. A man travels 10km in 5 minutes if he runs for 8km and walks for 2km. If he runs 4km and walks 6km, his time is 1hr 15mins, which of the following expresions best explains the information given?

A. $\frac{8}{x} + \frac{2}{y} = 50; \frac{4}{x} + \frac{6}{y} = 135$

B. $\frac{8}{x} + \frac{2}{y} = 12; \frac{4}{x} + \frac{6}{y} = 8$

C. $8x + 2y = \frac{5}{6}; 4x + 6y = \frac{5}{4}$

D. $\frac{8}{x} + \frac{2}{y} = \frac{5}{6}; \frac{4}{x} + \frac{6}{y} = \frac{5}{4}$

The correct answer is option [D]. Solution: Let the running speed be x and walking speed by y; 8/x + 2/y = 5/6 ---- [i];4/x + 6/y = 5/4 ----- [ii].

22. Factorize $x^2 + 4x - 192$.

A. (x - 4)(x + 48)

B. (x - 48)(x + 4)

C. (x - 12)(x + 16)

D. (x - 12)(x - 16)

The correct answer is option [C].

Two factors with product - 192 and sum + 4 are +16 and - 12.

=> $x^2 + 16x - 12x - 192$

= x (x + 16) - 12 (x + 16)

= (x - 12)(x + 16).

23. **For what values of x is the expression from the given equation** $\frac{x - 5}{x^2 + 6x + 9}$ **undefined**

A. -3 or +3

B. +3 or +3

C. +3 or -3

D. -3 or -3

The correct answer is option [D]

24. The minimum value of y in the equation y = x2 - 6x + 8 is _____.

A. 8

B. 3

C. 0

D. -1

The correct answer is option [C].

$y = x^2 - 6x + 8$

i.e. $x^2 - 6x + 8 = 0$

$x^2 - 4x - 2(x - 4) = 0$

$x(x - 4) - 2(x - 4) = 0$

$(x - 2)(x - 4) = 0$

$x = 2$ or $x = 4$

Substitute the value of x in $y = x^2 - 6x + 8$

When x = 2: $y = (2)2 - 6(2) + 8$

$= 4 - 12 + 8 = 0$

When x = 4: $y = (4)2 - 6(4) + 8$

$= 16 - 24 + 8 = 0$

y = 0 is the minimum value in the equation.

25. **Simplify** $\frac{1}{x^2+5x+6} + \frac{1}{x^2+3x+2}$

A. $\frac{x+3}{(x+1)(x+2)}$

B. $\frac{1}{(x+1)(x+2)(x+3)}$

C. $\frac{2}{(x+1)(x+3)}$

D. $\frac{4}{(x+1)(x+3)}$

The correct answer is option [C].

$$\frac{1}{x^2+5x+6}+\frac{1}{x^2+3x+2}$$

$$=\frac{x+1+x+3}{(x+1)(x+2)(x+3)}=\frac{2x+4}{(x+1)(x+2)(x+3)}$$

$$=\frac{2(x+2)}{(x+1)(x+2)(x+3)}=\frac{2}{(x+1)(x+3)}$$

26. **Simplify the given equation**

$$\frac{1}{1-x}+\frac{2}{1+x}$$

A. $\frac{(x+3)}{(1-x^2)}$

B. $\frac{(x-3)}{(1+x^2)}$

C. $\frac{(3-x)}{(1-x^2)}$

D. $\frac{(3-x)}{(1+x^2)}$

The correct answer is option [C]

27. **If $\sqrt{x^2+9}=x+1$, solve for x.**

A. 5

B. 4

C. 3

D. 1

The correct answer is option [B]

$x^2 + 9 = (x + 1)^2 x^2 + 9 = x^2 + 2x + 1,$

Therefore $2x = 8$; $x = 8/2 = 4$.

28. Seven books and eight pens cost ₦ 1750. Eight books and seven pens cost ₦ 1700. Calculate the cost of a book and a pen.

A. ₦ 210; ₦ 90

B. ₦ 140; ₦ 80

C. ₦ 210; ₦ 80

D. ₦ 140; ₦ 90

The correct answer is option [D]. Solution: Let the cost of a book be n and the cost of a pen be

m; 7n + 8m = ₦ 1750 ------- [i]; 8n + 7m =

₦ 1700 ------- [ii] → Multiply equation [i] by 8 and equation [ii] by 7 ®

56n + 64m = ₦ 14,000 ----- [iii]; 56n + 49m =

₦ 11,900 ------ [iv] →

subtract equation [iv] from [iii]; 15m =

₦ 2100 →

m = ₦ 2100/15 =

₦ 140. Substitute the value of

m into equation [ii] and solve for n; 8n + 7[140] = 1700 →

8n = 1700 - 980; 8n = 720 →

n = ₦ 720/8 = ₦ 90. The answer = ₦ 140; ₦ 90

29. **Given that x = – 3 and y = – 7, evaluate** $\frac{x^2 - y}{y^2 - x}$

A. - 1/11

B. 1/23

C. 4/13

D. 12/17

The correct answer is option [C].

$$\frac{x^2-y}{y^2-x}=\frac{(-3)^2-(-7)}{(-7)^2-(-3)}$$

$$=\frac{9+7}{49+3}=\frac{16}{52}=\frac{4}{13}$$

30. To arrive on schedule, a train is to cover a distance of 60 km at 72 km/hr. If it starts 10 minutes late, at what speed must it move to arrive on schedule?

A. 60 km/hr

B. 80 km/hr

C. 90 km/hr

D. 108 km/hr

The correct answer is option [A]

31. If (-3, -4) is a point on the line y = mx + 2, find the value of m.

A. -2

B. 7/4

C. 2

D. 8/3

The correct answer is option [C]

32. Which of the following has the same value as 0.0162560?

A. 1.6256×10^{2}

B. 1.6256×10^{1}

C. 1.6256×10^{0}

D. 1.6256×10^{-2}

The correct answer is option [D].

33. Solve the equation $7y^2 = 3y$.

A. y = 3 or 7

B. y = 0 or 7

C. y = 0 or 3/7

D. y = 0 or 9

The correct answer is option [C].

$7y^2 - 3y = 0 \Rightarrow y(7y - 3) = 0$

$\Rightarrow y = 0$ or $3/7$.

34. **Make y the subject of the formula:** $z = x^2 + \frac{1}{y^3}$

A. $y = \frac{1}{(z - x^2)^3}$

B. $y = \frac{1}{(z + x^2)^{1/3}}$

C. $y = \frac{1}{(z - x^2)^{1/3}}$

D. $y = \frac{1}{(x - z^2)^3}$

The correct answer is option [C]. $y^3z = x^2y^3 + 1$

$y^3z - x^2y^3 = 1$, $y^3(z - x^2) = 1$

35. **Simplify** $\sqrt[3]{(64r^{-6})^{\frac{1}{2}}}$

A. r/2

B. 2r

C. 1/2r

D. 2/r

The correct answer is option [D].

$$\sqrt[3]{\left(64r^{-6}\right)^{\frac{1}{2}}} = \sqrt[3]{8r^{-3}}$$

$$= 2r^{-1} = \frac{2}{r}$$

36. If 5 times a certain integer is subtracted from twice the square of the integer, the result is 63. Find the integer.

A. 21

B. 9

C. 7

D. 4

The correct answer is option [C].

Let the integer be x.

$2x^2 - 5x = 63$

$2x^2 - 5x - 63 = 0$

Factorizing the equation gives:

Two numbers with product -126 and sum -5 are -14 & +9.

$2x^2 - 14x + 9x - 63 = 0$

$2x(x - 7) + 9(x - 7) = 0$

$(x - 7)(2x + 9) = 0$, $x - 7 = 0$, $x = 7$ or $2x - 9 = 0$,

$x = 4.5$

But 4.5 is not an integer

Thus the correct answer is 7.

37. David cycles for x hours at 16km/hr and y hours at 12km/hr. Altogether he cycles 96km in 7 hours. Find x and y.

A. 3; 4

B. 4; 3

C. 5; 2

D. 6; 1

The correct answer is option [A].

38. Which of the following is in descending order?

A. 9/10, 4/5, 3/4, 17/10

B. 4/5, 9/10, 3/4, 17/20

C. 9/10, 17/20, 4/5, 3/4

D. 4/5, 9/10, 17/10, 3/4

The correct answer is option [C].

9/10 = 0.9, 17/20 = 0.85, 4/5 = 0.8,

3/4 = 0.75

The descending order is 9/10,

17/20, 4/5, 3/4

39. **Simplify**

$$\frac{1}{x-3} - \frac{3(x-1)}{x^2-9}$$

A. $\frac{x-1}{x-3}$

B. $\frac{-2}{x+3}$

C. $\frac{x-1}{x+3}$

D. $\frac{x-4}{x^3-9}$

The correct answer is option [B].

$$\frac{1}{x-3} - \frac{3(x-1)}{x^2-9}$$
$$= \frac{(x+3)-3(x-1)}{x^2-9}$$
$$= \frac{x+3-3x+3}{x^2-9} = \frac{-2(x-3)}{(x-3)(x+3)} = \frac{-2}{x+3}$$

40. Solve the simultaneous linear equations

2x + 5y = 11 ---------- (i)

7x + 4y = 2 ---------- (ii)

A. x = - 8, y = 1

B. x = -2, y = 4

C. x = 2, y = -3

D. x = -34/27, y = 73/27

The correct answer is option [D].

2x + 5y = 11..... (i)

7x + 4y = 2..... (ii)

Multiply (i) by the coefficient

of x in (ii) and (iii) by the the coefficient of x in (i)

14x + 35y = 77..... (iii)

14x + 8y = 4..... (iv)

Subtract (iv) from (iii) to get:

27y = 73;

y = 73/27

Substitute for x in (i) to get:

2x + 5(73/27) = 11 (multiplying through gives...)

54x + 365 = 297

54x = 297 - 365 = - 68

x = - 68/54 = -34/27, y = 73/27, x = -34/27

41. **If** $a\left[\frac{x+1}{x-2}-\frac{x-1}{x+2}\right]=6x$; **find** a **in its simplest form.**

A. $x^2 - 1$

B. $x^2 + 1$

C. $x^2 + 4$

D. $x^2 - 4$

The correct answer is option [D].

42. Factorize $2e^2 - 3e + 1$.

A. (2e - 1) (e - 1)

B. (e + 1) (2e + 1)

C. (2e + 3) (e - 2)

D. (2e - 3) (e - 1)

The correct answer is option [A].

Two factors with product +2 and sum -3 are -2 and -1.

$2e^2 - 2e - e = 2e (e - 1) - 1 (e - 1)$

$= (e - 1) (2e - 1)$.

43. Factorize the expression $2x^2 + x - 15$.

A. (2x+5) (x-3)

B. (2x-5) (x+3)

C. (2x-5) (x-3)

D. (2x-3) (x+5)

The correct answer is option [B].

Two numbers with a product of - 30 and a sum of 1 are + 6 and - 5.

$=>2x^2 + 6x - 5x - 15$

$= 2x (x + 3) - 5 (x + 3) = (x + 3) (2x - 5)$.

44. If 1 is added to both the numerator and denominator of a fraction, the fraction becomes 1/2. If 8 is added to both, the fraction becomes 2/3. What is the fraction?

A. 7/15

B. 21/7

C. 11/15

D. 22/7

The correct answer is option [A]. Solution: Let the numerator be x and denominator be y;

x + 1/y + 1 = 1/2 ---- [i];

x + 8/y + 8 = 2/3 ----- [ii]

→ 2x + 2 = y + 1 ® 2x - y = -1 ---- [iii];

3x + 24 = 2y + 16 ® 3x - 2y = -8 ----- [iv]

→ from equation [iii] make y subject and substitute into equation [iv]

→ y = 2x + 1 ---- [v];

3x - 2[2x + 1] = -8; 3x - 4x - 1 = -8; -x = -7; x = 7, substitute the value of

x into equation [v]

→ y = 2[7] + 1 = 15.

The fraction is x/y = 7/15.

45. The sum of the digits of a two-digit number is five. If the digits are reversed, the new number is nine greater than the original number. If the digits of the original number are x and y is the units digit, find the numbers.

A. 32

B. 42

C. 23

D. 24

The correct answer is option [C]. Solution: Let the digits number be xy; x + y = 5 ----- [i]; 10y + x = 10x + y + 9; 9y - 9x = 9; y - x = 1 ---- [ii] → make x subject from equation [i]; x = 5 - y ---- [iii] and substitute into equation [ii]; y - [5 - y] = 1; 2y = 6; y = 6/2 = 3 substitute the value of y into equation [iii] ® x = 5 - 3 = 2. The digits number is xy = 23.

46. Find x and y from the equations

$2x^2 + y^2 = 19$

x + 3y = 0

A. [-3,-1]

B. [3,-1]

C. [3,1]

D. [-3,1]

The correct answer is option [D]. Solution:

$2x^2 + y^2 = 19$ ---- [i];

x + 3y = O ---- [ii]

→ from equation [ii] make x subject and substitute into equation [i];

x = -3y ---- [iii]

→ 2[-3y]2 + y2 = 19;

18y2 + y2 = 19;

19y2 = 19 → y2 = 19/19 = 1;

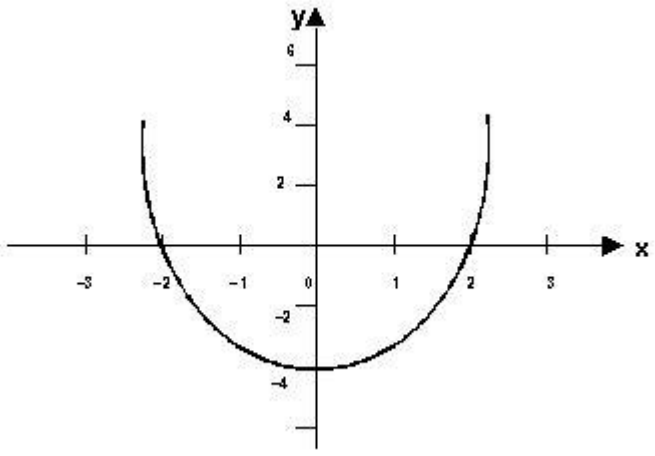
y = Ö1

Substitute the value of y into equation [iii]

® x = -3y = -3[1] = -3

The answer = [-3,1].

47. The sketch above is the curve of y = ax2 + bx + c. Find a, b and c respectively.



A. 1, O, - 4

B. 2, - 2, - 4

C. - 2, 2, - 4

D. 0, 1, -4

The correct answer is option [A].

The roots of the equation are x = - 2 and x = 2

the equation of the curve is: y = (x + 2)(x - 2)

=> y = x2 - 4.

a = 1, b = 0, and c = - 4

48. Solve for x: $(x^2 + 2x + 1) = 25$.

A. - 6, - 4

B. 6, - 4

C. 6, 4

D. - 6, 4

The correct answer is option [D].

Two numbers with product - 24 and sum +2 are +6 and - 4.

=> $x^2 + 6x - 4x - 24 = 0$

=>

x(x + 6) - 4(x + 6) = 0

=> (x + 6) = 0 i.e. x = - 6

or => x - 4) = 0 i.e. x = 4

49. If q oranges are sold for t Naira, how many oranges can be bought for p Naira?

A. P/2 t

B. q t/p

C. q/p t

D. pq/t

The correct answer is option [D]

50. If 2x + y = 7 and 3x - 2y = 3, by how much is 7x greater than 10?

A. 1

B. 3

C. 7

D. 17

The correct answer is option [C].

Solving the two equations simultaneously gives;

2x + y = 7; y = 7 - 2x ..... .(i)

3x - 2y = 3 ..... .(ii)

substituting (i) in (ii) for y,

we have that 3x - 2(7 - 2x) =3

=> 3x - 14 + 4x = 3

7x = 17, therefore 7x > 10 by 7

51. If f(x) = 2x2 - 5x + 3, find f(x + 1).

A. 2x2 - x

B. 2x2 - x +10

C. 4x2 + 3x + 2

D. 4x2 + 3x + 12

The correct answer is option [A].

f (x) = 2x2 - 5x + 3

f (x +1) = 2(x +1)2 - 5(x+1) + 3

= 2(x2 + 2x + 1) - 5x - 5 + 3

= 2x2 + 4x + 2 - 5x - 2

= 2x2 + 4x - 5x

= 2x2 - x = x (2x - 1).

ANSWERS

TOPIC: FRACTIONS

DIRECTION: Choose the correct answers from the lettered options.

1. 3/4 of a class of 32 students study English and 3/8 study mathematics. Every student studies at least one of these subjects. How many students study both subjects?

A. 36

B. 12

C. 4

D. 24

The correct answer is option [C]. Solution: Number of students that study English = 3/4 × 32 = 24 students; Number of students that study mathematics = 3/8 × 32 = 12 students. Add the number of students that offer English and mathematics and subtract from the number of students in the class = 36 - 32 = 4 students offer both subjects.

2. There are 572 students in a mixed school. 5/11 of them are boys. How many girls are in the school?

A. 260

B. 270

C. 312

D. 321

The correct answer is option [C]. Solution: 1 - 5/11 = 6/11 × 572 = 312.

3. 3/4 of a class of 32 students study English and 3/8 study mathematics. Every student studies at least one of these subjects. What fraction of the class studies mathematics but not English?

A. 1/4

B. 5/8

C. 3/8

D. 8/9

The correct answer is option [A]. Solution: Number of student that offer mathematics = 3/8 × 32 = 12 students; Number of students that study mathematics = 12 - 4 = 8. Fraction that study mathematics only = 8/32 = 1/4. Since 3/8 of the class study mathematics 1/4 of students study mathematics not English.

4. Cromwell can hoe a yam plot in 3 hours and Itunuola can hoe it in 4 hours. How long will it take them to hoe the whole plot working together?

A. 11/5

B. 12/13

C. 15/7

D. 22/5

The correct answer is option [C]. Solution: Since it takes 7/12 to hoe the plot of land working together then 12/7 = 15/7 to hoe the whole plot of land when they work together.

5. Arrange 3/4, 4/5, 2/3, 2/5, 6/7 in ascending order.

A. 2/5, 2/3, 3/4, 4/5, 6/7.

B. 2/3, 3/4, 6/7, 4/5, 2/5.

C. 2/5, 4/5, 6/7, 3/4, 2/3.

D. 6/7, 2/5, 3/4, 4/5, 2/3.

The correct answer is option [A]. Solution: Hint [Convert the given numbers to decimal numbers and arrange accordingly, from the number with the smallest decimal number to the largest decimal number].

6. Cromwell can hoe a yam plot in 3 hours and Itunuola can hoe it in 4 hours. If they work together, what fraction of the plot will they hoe in 1 hour?

A. 7/12

B. 5/6

C. 11/12

D. 17/12

The correct answer is option [A]. Solution: Each working for an hour is 1/3; 1/4. Then the fraction of the plot hoed when both work together is 1/3 + 1/4 = 4 + 3/12 = 7/12.

7. During two years in a school, 7/8 of the students had malaria, 3/4 had catarrh and 5/6 had neither. What fraction of the school had both malaria and catarrh?

A. 11/2

B. 111/24

C. 11/24

D. 1/2

The correct answer is option [B]. Solution: Let the students that had both malaria and catarrh be x; [7/8 – x] + 5/6 + [3/4 – x] + x = 1; 211/24 – x = 1; x = 111/24.

8. What fraction of 5 weeks is 5 days?

A. 7

B. 1

C. 1/6

D. 1/7

The correct answer is option [D].

9. How much more than 7 is the sum of 32/5 and 31/6?

A. $13^{17}/30$

B. $6^{17}/30$

C. $45^{29}/30$

D. 13/30

The correct answer is option [A]. Solution: 7 + [32/5 + 31/6] = 7 + 617/30 = 1317/30.

10. During two years in a school, 7/8 of the students had malaria, 3/4 had catarrh and 5/6 had neither. If the number of students that had both malaria and catarrh is 280. Find the number of students in the school.

A. 320

B. 336

C. 129

D. 192

The correct answer is option [D]. Solution: Let the total number of students in the school be x. The fraction of students that had both malaria and catarrh is 111/24 → 111/24 of x = 280; x = 280/111/24 = 192.

12. **Simplify** $\frac{1}{9} \times \frac{3}{4} + \frac{2}{3} \div \frac{2}{5} + \frac{1}{7} - \frac{1}{3}$

A. 3.6

B. 4.7

C. 5.6

D. 6.7

The correct answer is option [A]. Solution: Hint [Solve the numerator first and then the denominator and get your value].

13. Cromwell can hoe a yam plot in 3 hours and Itunuola can hoe it in 4 hours. What fraction of the plot can each of them hoe in 1 hour?

A. 1/3; 1/2

B. 1/3; 3/4

C. 1/4; 11/3

D. 1/3; 1/4

The correct answer is option [D]. Solution: Cromwell hoes in 3 hours; Itunuola hoes in 4 hours →Therefore, for an hour each would hoe 1/3;1/4.

14. Simplify the equation [21/3 + 313/15] ¸ 61/5

A. 1/5

B. 1

C. 61/5

D. 51/5

The correct answer is option [B]. Solution: First solve the fraction in the bracket 'BODMAS'; 21/3 + 313/15 = 5 + 5 + 3/15 = 5 + 18/15 = 5 + 11/5 = 61/5 ¸ 61/5 = 1.

14. Simplify the equation [21/3 + 313/15] ¸ 61/5

A. $^{1}/_{5}$

B. 1

C. $6\frac{1}{5}$

D. 5^{1}/5

The correct answer is option [B]. Solution: First solve the fraction in the bracket 'BODMAS'; 21/3 + 313/15 = 5 + 5 + 3/15 = 5 + 18/15 = 5 + 11/5 = 61/5 ¸ 61/5 = 1.

15. Simplify: 11/2 + 21/3 × 3/4 - 1/2.

A. -2 1/3

B. -2 1/4

C. 2 1/8

D. 2 3/4

The correct answer is option [D].

16. Determine which is the greatest of 5/6, 3/4, 7/8, 9/10.

A. 9/10

B. 5/6

C. 3/4

D. 7/8

The correct answer is option [A]. Solution: Find the L. C. M of the denominator 100, 90, 105, 108/120; from the numerator the greatest number is 108. Therefore, 9/10 is the greatest.

17. There are 572 students in a mixed school. 5/11 of them are boys. How many fraction of girls are there?

A. 6/11

B. 1/11

C. 3/11

D. 2/11

The correct answer is option [A]. Solution: 1 – 5/11 = 6/11.

18. Arrange 21/3, 25/12, 29/25, 214/37 in ascending order.

A. $2^{1}/3$, $2^{5}/12$, $2^{9}/25$, $2^{14}/37$

B. $2^{14}/37$, $2^{9}/25$, $2^{5}/12$, $2^{1}/3$

C. $2^{1}/3$, $2^{9}/25$, $21^{14}/37$, $2^{5}/12$

D. $2^{9}/25$, $2^{5}/12$, $2^{1}/3$, $2^{14}/37$

The correct answer is option [B].

19. In an election there were four candidates, 5/6 of the electors voted for the winner. The runner-up received 4/7 of the remaining votes. The third candidates received twice the votes of the fourth candidates. What fraction of the electors voted for the third candidate?

A. 1/42

B. 1/21

C. 1/14

D. 41/42

The correct answer is option [B]. Solution:

Let the fraction of the fourth candidate be x

5/6 + (1/6 ×4/7) + 2x + x = 1

70 + 8 + 168x + 84x = 84

252x = 6

x = 6/252 = 1/42

20. A flag pole 8.4 m long is driven 1.4m into the ground. What fraction of the pole is above the ground?

A. 1/6

B. 6

C. $1^1/_5$

D. 5/6

The correct answer is option [D]. Solution: 8.4 - 1.4/8.4 = 7.0/8.4 = 5/6.

The fraction of the third candidate is twice the fourth = 1/21.

TOPIC: INDICES AND LOGARITHMS

DIRECTION: Choose the correct answers from the lettered options.

1. Evaluate [0.00385 × 0.00061]/[0.0025 × 0.08] and leave your answer in standard form.

A. 1.347×10^{-3}

B. 2.43×10^{-2}

C. 1.174×10^{-2}

D. 2.18×10^{-3}

The correct answer is option [C]. Solution:

[0.00385 × 0.00061] / [0.0025 × 0.08] = 0.017425 = 1.174×10^{-2}.

2. Evaluate $\log_3 405 - \log_3 5$.

A. 2

B. 3

C. 4

D. 5

The correct answer is option [C].

$\log_3 405 - \log_3 5 = \log_3 (405/5)$

$= \log_3 81$

$= \log_3 34$

$= 4 \log_3 3$

3. Find p in terms of q if $\log_3 p + 3\log_3 q = 3$.

A. $(3/q)^3$

B. $(3/q)^{1/3}$

C. $(q/3)^3$

D. $(q/3)^{1/3}$

The correct answer is option [A]. $\log_3 p + 3\log_3 q = 3$

=> $\log_3 pq^3 = 3$

$pq^3 = 3^3$

. Therefore, $p = 3^3/q^3 = [3/q]\ 3$.

4. Given $dy/dx = 2x^3 + 4x^2 - x + 2$, what is the value of y?

A. $x^4/2 + 4x^3/3 - x^2/2 + x + c$

B. $6x^2 + 8x - 1$

C. $x^2 - 3x + 2$

D. $x^5/3 + x^2 - 2x^2/5 + c$

The correct answer is option [A]. Solution: $dy = [2x^3 + 4x^2 - x + 2]\ dx$,

Integrate the equation $\int dy = \int [2x^3 + 4x^2 - x + 2]dx \rightarrow y = x^4/2 + 4x^3/3 - x^2/2 + x + c$.

5. Simplify

$\log_5 (3/5) + 3\log_5 (15/2) - \log_5 (81/8)$.

A. 2

B. 9

C. 7

D. 5

The correct answer is option [A].

6. **Simplify** $\frac{2\sqrt{3} + 3\sqrt{5}}{3\sqrt{5} - 2\sqrt{3}}$

A. $\frac{19+4\sqrt{15}}{11}$

B. $\frac{19+4\sqrt{15}}{19}$

C. $\frac{19+2\sqrt{15}}{11}$

D. $\frac{19+2\sqrt{15}}{19}$

The correct answer is option [A].

$$\frac{2\sqrt{3}+3\sqrt{5}}{3\sqrt{5}-2\sqrt{3}}=\frac{2\sqrt{3}+3\sqrt{5}}{3\sqrt{5}-2\sqrt{3}}\times\frac{3\sqrt{5}+2\sqrt{3}}{3\sqrt{5}+2\sqrt{3}}$$

$$\Rightarrow\frac{6\sqrt{15}+12+45+6\sqrt{15}}{45+6\sqrt{5}-6\sqrt{5}-12}=\frac{12\sqrt{15}+57}{33}=\frac{19+4\sqrt{15}}{11}$$

7. **Evaluate, using logarithm tables; $\frac{5.34 \times 67.4}{2.7}$**

A. 1.332

B. 13.32

C. 133.2

D. 1 332

The correct answer is option [C].

5.34 × 67.4/2.7 = 359.916/2.7 = 133.2

8. Evaluate $1/2\log_x 81 = 2$.

A. -4

B. 4

C. -3

D. 3

The correct answer is option [D]. Solution: $1/2\log_x 81 = 2 \rightarrow \log_x [81]1/2 = 2 \rightarrow \log_x 9 = 2 \rightarrow x^2 = 9$, therefore, $x = \sqrt{9} = 3$.

9. Evaluate $\log_{10}6 + \log_{10}45 - \log_{10}27$ without using logarithm tables.

A. 0

B. 1

C. 1.1738

D. 1.3802

The correct answer is option [B]. $\text{Log}_{10}\ 6 + \log_{10}\ 45 - \log_{10}\ 27$

$\text{Log}_{10}\ (6 \times 45)/27$

$\log_{10}\ (270/27) = \log_{10}10 = 1$

10. If 2log3 y + log3 x2 = 4, then y is _____.

A. $\frac{4-\log_3 x^2}{2}$

B. $\frac{4}{\log_3 x^2}$

C. $\frac{2}{x}$

D. $\frac{9}{x}$

The correct answer is option [D].

$\log_3 y^2 + \log_3 x^2 = 4$

$\log_3 (y^2 x^2) = 4$

$y^2 x^2 = 3^4$

$y^2 x^2 = 81$

$\therefore y^2 = {}^{81}/_{x^2} \Rightarrow y = \frac{\sqrt{81}}{x} = {}^{9}/_{x}$

A. 6.57

B. 11.12

C. 2.47

D. 7.24

The correct answer is option [C]. Solution: $\log_3 15 = x \rightarrow 15 = 3x$,

Find the log of both sides; log 15 = xlog 3,

Therefore, x = log 15/log 3 →1.1761/0.465 → 2.465 » 2.47.

12. **Simplify:** $125^{-1/3} x 49^{-1/2} x 10^0$

A. 350

B. 35

C. 1/35

D. 1/350

The correct answer is option [C].

$125^{-1/3} = \frac{1}{\sqrt[3]{125}} = \frac{1}{5}$

$49^{-1/2} = \frac{1}{\sqrt{49}} = \frac{1}{7}$

$10^0 = 1$

$\Rightarrow \frac{1}{5} x \frac{1}{7} x 1 = \frac{1}{35}$

13. Evaluate $(2^\circ + 4^{-1/2})^2$.

A. 1/4

B. 5/4

C. 9/4

D. 4

E. -1/2

The correct answer is option [C].

$2^\circ = 1$;

$4^{-} ½ = 1/√4 = ½ \Rightarrow (1 + ½)^2 = (3/2)^2 = 9/4$.

14. Find the value of $p^2 + q$, correct to 2 decimal places, if $\log_{10}p = 0.1120$ and $\log_{10}q = 0.1100$.

A. 4.43

B. 4.42

C. 4.05

D. 0.37

The correct answer is option [D].

15. If $\log_a y = 1 - 3\log_a x$, express y in terms of x and a.

A. $y = -x^3/a$

B. $y = a/x^3$

C. $y = -a/x^3$

D. $y = x^3$

The correct answer is option [B].

16. **If** $8^{x/2} = \left(2^{3/8}\right)\left(4^{3/4}\right)$, **find x.**

A. 3/8

B. 3/4

C. 4/5

D. 5/4

The correct answer is option [D].

Taking the powers, we have that:

3x/2 = 3/8 + 3/2; 3x/2 = 15/8

3x = 15/4

x = 5/4

17. Evaluate $(2^x)^2 - 3 \times 2^x + 2 = 0$.

A. 1 or 0

B. 1 or 2

C. 2 or -2

D. -1 or -2

The correct answer is option [A].

18. Given that $1/3\log_{10}P = 1$, find the value of P.

A. 0

B. 10

C. 100

D. 1000

The correct answer is option [D].

$^1/_3\log_{10}P = 1$

$$\Rightarrow \log_{10} P^{1/3} = 1 = \log_{10} 10$$

$$\Rightarrow P^{1/3} = 10$$

$$\therefore P = 10^3 = 1000$$

19. If $\log_{10}a = 4$, what is a?

A. 0.4

B. 40

C. 400

D. 10 000

The correct answer is option [D]. $\text{Log}_{10}a = 4 = 4\log_{10}10 = \log_{10}10^4$

$a = 10^4$

a =10 000

20. **Simplify** $\frac{\sqrt{2}}{\sqrt{3}-\sqrt{2}}-\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

A. $2\sqrt{2}-\sqrt{3}$

B. $3\left(\sqrt{6}-1\right)$

C. $\sqrt{6}-3$

D. $-1/2$

The correct answer is option [B].

$$\frac{\sqrt{2}}{\sqrt{3}-\sqrt{2}}-\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}=\frac{\sqrt{2}\left(\sqrt{3}+\sqrt{2}\right)-\left(\sqrt{3}-\sqrt{2}\right)^2}{\left(\sqrt{3}-\sqrt{2}\right)\left(\sqrt{3}+\sqrt{2}\right)}$$

$$\frac{\sqrt{6}+2-\left(3-2\sqrt{6}+2\right)}{3-2}=3\sqrt{6}-3$$

$$=3\left(\sqrt{6}-1\right)$$

21. Evaluate $64^{-2}/3$.

A. 1/16

B. -1/16

C. 16

D. -16

The correct answer is option [A]. Solution: $64^{-2}/3 = 1/3\sqrt{[64]2} = 1/42 = 1/16$.

22. **Simplify** $\frac{2^{1/2} \times 8^{1/2}}{4}$

A. 1

B. 2

C. 4

D. 16

The correct answer is option [A].
Applying the laws of indices we obtain

$$\frac{2^{1/2} x\, 8^{1/2}}{4}=\frac{2^{1/2} x\, 2^{3(1/2)}}{2^2}=2^{1/2+3/2-2}=2^0=1$$

23. If $\log_{10}q = 2.7078$, what is q?

A. 5102

B. 849.9

C. 510.2

D. 84.99

The correct answer is option [C]

$\log_{10}q = \log_{10}{}^{102.7078}\, q = 10^{2.7078}$

From tables, antilog. Of 2.7078 = 510.2

24. If $3^{2x} = 27$, what is x?

A. 1

B. 1.5

C. 4.5

D. 18

The correct answer is option [B].

$3^{2x} = 27 = 3^3$

=> 2x =3

=> x = 3/2 = 1.5

25. **Given that $\frac{5^{n+3}}{25^{2n-3}} = 5^0$, find n.**

A. n = 1

B. n = 2

C. n = 3

D. n = 5

The correct answer is option [C].

26. If $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, evaluate, without using logarithm tables, $\log_{10} 4.5$.

A. 0.3010

B. 0.4771

C. 0.6532

D. 0.9542

The correct answer is option [C].

$\log_{10} 4.5 = \log_{10} (3 \times 3)/2$

$\log_{10} 3 + \log_{10} 3 - \log_{10} 2 = 0.4771 + 0.4771 - 0.3010 = 0.6532$.

27. Evaluate, using logarithm tables, $\log (0.65)^2$.

A. 1.6258

B. 0.6272

C. $\bar{1}.6258$

D. $\bar{1}.6272$

The correct answer is option [C].

28. Use mathematical tables to evaluate (cos 40° sin 30°).

A. 0.2660

B. 0.0266

C. 0.0266

D. 0.2660

The correct answer is option [D].

Cos 40° = 0.7660; sin 30° = 0.5000

0.7660 0.5000 = 0.2660

29. Find the value of x, given that 1/3 of $9^{2x} = 27^x$.

A. -2

B. -1

C. 0

D. 1

The correct answer is option [D].

30. **Simplify:** $\frac{\log \sqrt{8}}{8}$

A. 1/3

B. 1/2

C. 1/3log √2

D. 1/3log √8

The correct answer is option [B].

$$let \ \frac{\log \sqrt{8}}{8} = x$$
$$\Rightarrow x \log 8 = \log \sqrt{8}$$
$$x \log 2^3 = \log 2^{3/2}$$
$$\log 2^{3x} = \log 2^{3/2}$$
$$\therefore 3x = 3/2$$
$$\Rightarrow x = 1/2$$

31. Simplify 0.63954 / 0.003 giving your answer correct to two significant figures.

A. 213.18

B. 213.00

C. 213

D. 210

The correct answer is option [D].

0.63954/0.003 =

$6.3954 \times 10^{-1/3} \times 10^{-3} = 2.1318 \times 10^2 = 213.18 \approx 210.00$.

32. Solve the simultaneous equation.

$2^{x+y} = 32$

$33^{y-x} = 27$

A. (3, 2)

B. (- 3, 2)

C. (3, -2)

D. (-3, -2)

The correct answer is option [A].

Applying the laws of indices, we have

$2^x \times 2^y = 2^S$..... (i)

$(3^{3y}/3^x) = 3^3$..... (ii)

Taking powers into consideration gives x + y = 5 (x = 5 - y)..... (iii)

3y - x = 3..... (iv)

Substituting the value of x in (iii) in (iv) gives 3y - (5 - y) = 3

Therefore 3y - 5 + y = 8 therefore 4y = 8 => y = 2.

Substituting this value of y in (iii) for x gives x = 5 - 2 = 3 (x, y) = (3, 2)

33. If 3 log a + 5 log a - 6 log a = log 64, what is a?

A. 4

B. 6

C. 8

D. 16

The correct answer is option [C].

Log a^3 + log a^5 - log a^6 = log 64 = log 2^6

Log $(a^3 \times a^5)/ a^6$ = log 2^6

Log $(a^8 - 6)$ = log a^2 = log 2^6, $a^2 = 2^6$, a = 26/2 = 2^3

Therefore a = 8.

TOPIC: MENSURATION

DIRECTION: Choose the correct answers from the lettered options.

1. The lengths, in cm, of the sides of a right-angled triangle are x, (x + 2) and (x + 1) where x > 0. Find, in cm, the length of its hypotenuse.

A. 4

B. 5

C. 13

D. 17

The correct answer is option [B]

2. Water flows through a 3cm diameter pipe at the rate of 3 metres/second. How many water flow through the pipe in one second and express the flow of water as a rate in litres/minute?

A. 3.5 x 10^{-2}L/minutes

B. 35350L/minutes

C. 127.26L/minutes

D. 1272.6L/minutes

The correct answer is option [C]. Solution: 1000cm^3 = 1 litre; 60 secs = 1 minutes → 1 secs = 1/60minutes;

2121/1000L/s → 2121/1000 ÷1/60; 2121/1000 × 60/1 = 127.26L/minutes.

3. Abidjan is 4° west of Accra and on the same circle of latitude. If the radius of this circle of latitude is 6370 km, how far is Abidjan west of Accra, correct to the nearest kilometer? (Take π = 22/7).

A. 222km

B. 445km

C. 890km

D. 5 005km

The correct answer is option [B].

Longitudinal difference between Abidjan and Accra is 4°.

Note here that r (given as 6370km) = Rcos?

The circumference of this circle of latitude is

2pr = 2 x (22/7) x 6370 = 40 040km

Length of the arc of Abidjan from Accra

= q/360 x 2 π r = (4/360) x 40040

= 444.89km = 445km (correct to the nearest km)

4. A measuring cylinder of radius 3.5cm contains water to a height of 56cm. If this water is poured into a similar cylinder of radius 14cm, what will be the height of the water column?

A. 3.5cm

B. 14cm

C. 1.75cm

D. 5.3cm

The correct answer is option [A]. Solution: Volume of cylinder = $\pi \times r^2 \times H = \pi \times R^2 h$,

Where r = 3.5cm, H = 56cm, R = 14cm, h =?

$h = \pi \times 3.5^2 \times 56/\pi \times 14^2 = 3.5cm$.

5. The base diameter of a cone is 14 cm, and its volume is 462 cm^3. Find the height. [Takeπ= 22/7].

A. 3.5 cm

B. 5 cm

C. 7 cm

D. 9 cm

The correct answer is option [D].
V = 462cm^3, d = 14 cm ∴ r = 7 cm
The volume of the cone is given by the equation

$$V = \frac{1}{3}\pi r^2 h \Rightarrow h = \frac{3V}{\pi r^2} = \frac{3x462}{\frac{22}{7} x 7^2} = 9cm$$

6. A rectangle has length x cm and width (x - 1) cm. If the perimeter is 16cm, find the value of x.

A. 3 1/2cm

B. 4cm

C. 5cm

D. 6cm

The correct answer is option [A].

7. A solid cylinder of radius 3cm has a total surface area of $36\pi cm^2$. Find its height.

A. 2 cm

B. 3 cm

C. 4 cm

D. 5 cm

The correct answer is option [B].

Total surface area of a solid cylinder is given as $2\pi r^2 + 2\pi rh$

Where r, and h are the radius and height respectively.

$36\pi = 2\pi(3)^2 + 2\ \pi\ (3)h$

$36\pi = 18\pi + 6\pi h = 6\pi h$

Therefore $h = 18\pi/6\pi = 3cm$

8. A chord subtends an angle of 160° at the centre of a circle of radius 14cm. Calculate the area of the minor segment of the circle.

A. $256.92cm^2$.

B. $273.67cm^2$.

C. $16.75cm^2$.

D. $240.15cm^2$.

The correct answer is option [D].

9. A frustum of a pyramid is 20 cm square at the bottom 10cm square at the top and 14cm high. Find the volume of the frustum.

A. 1351.3 cm^3

B. 3266.3 $3cm^3$

C. 1531.3 cm^3

D. 5311.3 cm^3

The correct answer is option [B]

10. If the length of a square is increased by 20% while it's width is decreased by 20% to form a rectangle, what is the ratio of the area of the rectangle to the area of the square?

A. 6: 5

B. 25: 24

C. 5: 6

D. 24: 25

The correct answer is option [D].

Area of a rectangle = length x breadth = l x b

Area of rectangle = (l + 20%l) x (b - 20%b)

= (l + l/5) (b - b/5)

= (5l + l)/5 (5b - b)/5 = (6l/5) (4b/5) = 24lb/25

Ratio of area of the rectangle to area of the square is 24(lb): 25(s^2) = 24: 25

11. Find the perimeter of a sector of a circle of radius 14cm subtended by angle 120° at the centre.

A. 57.33cm

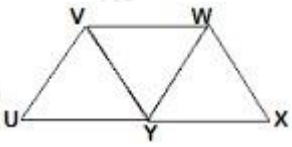
B. 14.00cm

C. 28.67cm

D. 29.33cm

The correct answer is option [A].

12. The diagram is formed by arranging three equilateral triangles in such a way that UVWY and YVWX are parallelograms. Calculate the difference between ĐUYX and ĐUVY.



A. 120°

B. 180°

C. 260°

D. 270°

The correct answer is option [A].

13. The volume of a cylinder of radius 14 cm is 210cm^3. What is the curved surface area of the cylinder?

A. 15 cm^2

B. 30 cm^2

C. 616 cm^2

D. 1262 cm^2

The correct answer is option [B].
Curved surface area = 2πrh

Volume of cylinder = $\pi r^2 h = 210 \Rightarrow h = \frac{210}{14x\frac{22}{7}} = 0.34cm$

∴ curved surface area = 2π x 14 x 0.34 = 30 cm^2

22/7).

A. 86 cm^2

B. 154 cm^2

C. 616 cm^2

D. 1434 cm^2

The correct answer is option [C].

Surface area of a sphere = $4\pi r^2$

= 4 x 22/7 x 7^2

= 616cm^2

15. A sector of a circle of radius 3.5cm subtending an angle of 265° at the centre of the circle is used to form a cone. Calculate the area of the base of the cone correct to the nearest square centimeter.

A. 2cm^2.

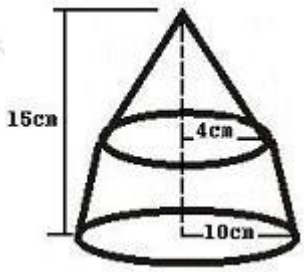
B. 7cm^2.

C. 21cm^2.

D. 9cm^2.

The correct answer is option [C]. Solution: Area of circle base of a cone = $\pi r^2 = \pi \times [2.58]^2 = 20.91cm^2 \approx 21cm^2$.

16. A lampstand shown in the diagram, has a height of 15 cm and upper and lower diameters of 8 cm and 20 cm. Find the area of material that is required to cover the curved surface of the frustum.



A. 372.34 cm^2

B. 710.96 cm^2

C. 263.89 cm^2

D. 710.69 cm^2

The correct answer is option [D]. Solution: Find the height of the top frustum;

x/15 + x = 4/10; x/15 + x = 2/5 →® 5x – 2x = 30 → 3x = 30; x = 10cm.

Calculate the slant height L_2 and L_1 by using Pythagoras;

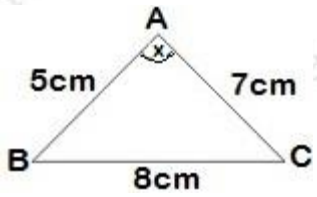
$L_2 = \sqrt{[25^2 + 10^2]} = \sqrt{725} = 26.93cm$;

$L_1 = \sqrt{[10^2 + 4^2]} = \sqrt{116} = 10.77cm$.

To find the area of the material use the equation;

$p \times R \times L_2 - p \times r \times L_1 \rightarrow p \times 10 \times 26.93 - p \times 4 \times 10.77 = 710.69cm^2$.

17. In the triangle ABC, what is the size, correct to 1 decimal place, of the angle marked x?



A. 49.1°

B. 81.8°

C. 98.2°

D. 115.0°

The correct answer is option [B].

18. Find the volume of a cone of radius 3.5cm and vertical height 12cm.

(Take π = 22/7).

A. 15.5cm^2

B. 21.0cm^2

C. 42.0cm^2

D. 154.0cm^2

The correct answer is option [D]. Volume of cone = 1/3πr^2h

(Where r = radius; h = perpendicular height).

Volume = 1/3 x 3.142 x 3.5^2 x 12

= 153.9 = 154.0cm.

19. What is the mass in kg of a cylindrical metal bar 0.14m long and 0.06m in diameter if 1cm^3 of the metal has a mass of 70g?

A. 27.71kg.

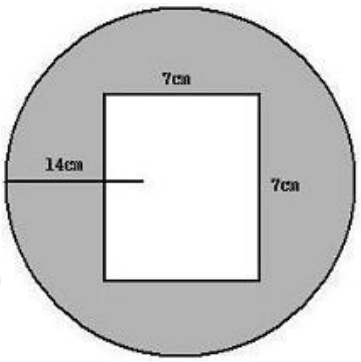
B. 27,708kg.

C. 0.027708kg.

D. 2.7708 $\times 10^{-5}$kg.

The correct answer is option [A].

20. Calculate the area of the shaded portion of the diagram drawn.



A. 615.75cm^2

B. 49cm^2

C. 104.94cm^2

D. 566.75cm^2

The correct answer is option [D]. Solution: Area of shaded portion = Area of circle - Area of square;

Area of circle

$= \pi r^2 = \pi 14^2 = 615.75cm^{2;}$ Area of square = $7 \times 7 = 49cm^2$;

Area of shaded portion = 615.75 - 49 = $566.75cm^2$.

21. Calculate the radius of a cylinder of height 2.5cm and volume $154cm^3$. Leave your answer correct to 1 decimal place.

A. 4.4cm

B. 13.9cm

C. 15.4cm

D. 19.6cm

The correct answer is option [A].

22. Find the radius of a sphere whose surface area is 154 cm^3.

(π = 22/7)

A. 7.00 cm

B. 3.50 cm

C. 3.00 cm

D. 1.75 cm

The correct answer is option [B].
Surface Area of a sphere = $4\pi r^2$, where $\pi = {}^{22}/_{7}$,
S.A = 154 cm^2, r =?

$$\therefore r = \sqrt{\frac{S.A}{4\pi}} = \frac{154}{12.57} = 3.50cm$$

23. What is the length of a rectangular garden whose perimeter is 32 cm and area $39cm^2$?

A. 25cm

B. 18cm

C. 13cm

D. 9cm

The correct answer is option [C].

24. Two square boards are made of the same material and their diagonals measure 40cm and 45cm respectively. If the smaller costs ₦192 to make, what should be the other cost?

A. ₦243.08.

B. ₦216.03.

C. ₦234.08.

D. ₦261.03.

The correct answer is option [A].

25. A chord of a circle is 10cm from the centre of the circle. Calculate the length of the chord given that the radius of the circle is 31cm.

A. 20cm

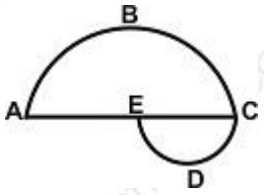
B. 29.3cm

C. 41cm

D. 58.7cm

The correct answer is option [D].

26. In the figure, ABC and CDE are semicircles with radii 11cm and 7cm respectively. Calculate the area of the figure.



A. 380.29cm^2

B. 267.14cm^2

C. 190.14^2

D. 154.00cm^2

The correct answer is option [B].

TOPIC: MISCELLANEOUS EQUATIONS

DIRECTION: Choose the correct answers from the lettered options.

1. A trader bought 200 oranges at 5 for ₦1.20, 40 oranges got spoilt and the remaining were sold at 4 for ₦1.50. Find the percentage gain or loss.

A. 30% gain.

B. 25% gain.

C. 30% loss.

D. 25% loss.

The correct answer is option [B]. Solution:

200 at 5 = 40 x ₦20 = ₦48.00. 40 got spoilt;

200 - 40 = 160 at 4 = 40;

40

x ₦1.50 = ₦60.00

-----> Gain % = Selling Price - Cost Price/Cost Price x 100% = 60 - 48/48 x 100 = 25% gain.

2. Three types of drinks Fanta, Coke and Lemon are sold for ₦900.00, ₦1,500.00 and ₦x.00 respectively per litre. If the cost per litre of the mixture is ₦1,430.00 and ratio of their mixture is 3 : 3 : 4, find x.

A. 200.00

B. 1,170.00

C. 1,775.00

D. 2,400.00

The correct answer is option [C].

3. $a = 4, b = 4, c = 6$. Therefore simplify $\frac{(b^2 + c^2 - a^{\frac{1}{2}})}{(2b + 2a - 3c)}$

A. -25

B. -117

C. -28.8

D. -115

The correct answer is option [D]. Solution: Hint [Substitute into the given formula]. [42 + 63 - 41/2]/ [2(4) + 2(4) - 3(6)] = 230/-2 = -115.

4. Factorize $4a^2 + 28a + 49$.

A. $[2a^2 + 14]$

B. $[2a + 7]^2$

C. [3a + 4]

D. $[4a - 7]^2$

The correct answer is option [B]. Solution: $4a^2 + 28a + 49$ ® $4a^2 + 14a + 14a + 49$ → 2a [2a + 7] + 7[2a + 7] → [2a + 7] [2a + 7] → $[2a + 7]^2$.

5. A certain number is formed of two digits; its value equals four times the sum of its digits. If 27 is added to it, the sum is the number obtained by interchanging the digits. What is the number?

A. 63

B. 25

C. 36

D. 88

The correct answer is option [C]. Let the digit number be xy; 10x + y = 4[x + y] ------- [i]; 10x + y + 27 = 10y + x ------- [ii]. From both equations solve for x and y.

6. Solve the equation 3/a + 5/2a.

A. 11/2a

B. 11/a

C. $11/2a^2$

D. $11/a^2$

The correct answer is option [A]. Solution: 3/a + 5/2a; 6 + 5/2a = 11/2a.

7. Daniel's Plc declared a dividend of 75 kobo for one unit of share held by shareholder. Find the amount of shares a shareholder who has 6,000 shares will receive if there is a withholding tax of 15%.

A. 3825

B. 8253

C. 2583

D. 4000

The correct answer is option [A]. Solution: 75k per unit share. Number of shares = 6,000 shares.

Amount = 6000 × 75/100 = 4500, tax = 15% Of 4500 = 675. The shareholder owns 4500 - 675 = 3825.

8. A labourer's new monthly home take is ₦ 432 due to a 20% increase effected. How much was his monthly take home prior to the increase?

A. ₦ 220

B. ₦ 360

C. ₦ 1500

D. ₦ 390

The correct answer is option [B]. Solution: Hint [Let his previous monthly home take be x]. [432 - x]/x = 20/100; x + 0.2x = 432, therefore, x = ₦ 432/1.2 = 360.

9. The sum of two numbers is twice their difference. If difference of the numbers is p, find the larger of the two numbers.

A. p/2.

B. 3p/2.

C. 5p/2.

D. 3p.

The correct answer is option [B]. Solution:

x - y = p ---- [i];

x + y = 2[x - y] ---- [ii]

® make x subject of formula form equation [i];

x = p + y --- [iii];

Equation [ii] x + y = 2p

® p + y + y = 2p;

2y = p;

y = p/2 substitute the value of y into equation [iii];

p + p/2 = 2p + p/2 = 3p/2

Therefore, the larger number is 3p/2.

10. A trader bought 200 oranges at 5 for ₦1.20, 40 oranges got spoilt and the remaining were sold at 4 for ₦1.50. How much money did the trader receive for the remaining oranges?

A. ₦48.

B. ₦240.

C. ₦60.

D. ₦270.

The correct answer is option [C]. Solution:

40 got spoilt; 200 - 40 = 160 at 4 = 40;

4 x ₦1.50 = ₦60.00

11. A man is given 1/7th of his salary as tax free. He then pays 25% on what is left on tax. If he pays tax of ₦ 550. Calculate his income.

A. ₦ 2656.67

B. ₦ 2566.67

C. ₦ 2665.67

D. ₦ 2666.57

The correct answer is option [B]. Solution: He pays tax on 1 - 1/7 = 6/7

25% = 550, then 100% = 550/0.25 = 2200

His income = 1/6/7 × 2200 = (7 ××2200) /6 = ₦ 2566.67

12. Zenith bank shares are sold in bundles. If one bundle of 6 shares is sold for ₦ 42.00, how many shares can ₦ 180.00 buy?

A. 28.

B. 27.

C. 37.

D. 26.

The correct answer is option [D].

13. Evaluate the given matrix as shown.

$$\begin{vmatrix} -3 & -2 & -1 \\ 4 & 2 & -2 \\ 2 & 4 & 2 \end{vmatrix}$$

A. 24

B. 36

C. -24

D. -36

The correct answer is option [C].

$$\begin{vmatrix} -3 & -2 & -1 \\ 4 & 2 & -2 \\ 2 & 4 & 2 \end{vmatrix}$$

Solution: Hint [Be very careful with the negative sign]

$$-3\begin{vmatrix} 2 & -2 \\ 4 & 2 \end{vmatrix} + [-2]\begin{vmatrix} 4 & -2 \\ 2 & 2 \end{vmatrix} - [-1]\begin{vmatrix} 4 & 2 \\ 2 & 4 \end{vmatrix} =$$

$-3[(2x2) - (4x-2)] + (-2)[(2x-2) - (4x2)] - (-1)[(2x2) - (4x4)]$

$-3[12] -2[-12] + 1[-12] = -36 + 24 -12 = -24.$

14. Find the interest on two million dollars at 12% saved for 4 months.

A. $40,000

B. $60,000

C. $80,000

D. $4,000

The correct answer is option [C]. Solution: Interest = PRT/100, where P = $2,000,000,

R = 12%, T = 4 months. 2×6 × 12 × 4/100 × 12 = $80,000.

15. A car travels 60 kilometers in one hour before a piston breaks, then travels at 30 kilometers per hour for the remaining 60 kilometers to its destination. What is its average speed in kilometers per hour for the entire trip?

A. 45km/h

B. 40km/h

C. 50km/h

D. 60km/h

The correct answer is option [B]. Solution: The time it takes for it to travel for 60km at 30km/h is Distance/Average Speed = 60/30 hours = 2 hours. Therefore, the average speed for the entire trip is Total Distance/Total Time, where Total Distance = 60km + 60km = 120km, Total Time = 1hr + 2hrs = 3hrs. Average SpeedT = 120/3 = 40km/h.

16. **Find the value for which x is undefined in the equation** $\frac{2x - 3}{x^2 - 6x + 9}$.

A. [3,3].

B. [-3,3].

C. [-2,3].

D. [2,-3].

The correct answer is option [A].

17. Find the value of the equation $[25x^2]/64 + 35x/25 - [16x^3]/9$, given that $x = 1/2$.

A. 6629/11520

B. 2597/5760

C. 2597/11520

D. 1869/5760

The correct answer is option [A]. Solution: Put the value of x directly into the equation and solve.

18. The thickness of a 700 pages of a book is 22mm. Find the thickness of one leaf of the book. Show your answer in standard form and in meters.

A. 3.143×10^{-5}

B. 3.143×10^{-4}

C. 3.143×10^{-2}

D. 3.143×10^{-3}

The correct answer is option [A]. Solution: Recall that 1000mm = 1m. Then, 22mm = 22×10^{-3}

Therefore, 1 leaf page = $22 \times 10^{-3}/700 = 3.143 \times 10^{-5}$

19. The cost of painting 7m square room is ₦420. What is the cost of painting a 12m square room?

A. ₦850.

B. ₦580.

C. ₦405.

D. ₦720.

The correct answer is option [D].

20. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], calculate their total annual profit.

A. ₦ 22,000

B. ₦ 14,000

C. ₦ 16,000

D. ₦ 20,000

The correct answer is option [D]. Solution: Hint [Find the amount from the ratio and ₦4,000]. The ratio 4:6, let James amount be x, Daniel amount will be [x + 4000], 4/6 = x/[x + 4000]; 4[x + 4000] = 6x, the total amount is ₦8,000 + ₦12,000 + ₦4,000 = ₦20,000.

21. Simplify 1/4x - 4 + 1/6x - 6.

A. 6 - 2x/33x^2.

B. 2x^2 - 2/1 - x.

C. 5/12[x - 1].

D. 5x^2/x - 1.

The correct answer is option [C]. Solution:

[6x - 6 + 4x - 4]/[4(x - 1)6(x - 1)] = 10x - 10/24$[x - 1]^2$ = 10[x - 1]/24$[x - 1]^2$

→ 10/24[x - 1] → 5/12[x - 1].

22. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], how much did Daniel [D] get all together?

A. ₦ 15,000

B. ₦ 11,000

C. ₦ 12,000

D. ₦ 14,000

The correct answer is option [C]. Solution: ₦20,000 - ₦4,000 = ₦16,000; ₦16,000 ¸ 2 = ₦8,000, therefore, the amount Daniel [D] got is ₦8,000 + ₦4,000 = ₦12,000.

23. Find a two-digit number such that four times the tens digit is 2 less than twice the units digit, and the number is 18 greater than the number obtained by reversing the digits.

A. 31

B. 29

C. 13

D. 11

The correct answer is option [C]. Solution:

Let the two-digit number be represented by x and y;

4x = 2y - 2;

4x - 2y = -2;

2x - y = -1 ------ [i];

18 + 10x + y = 10y + x;

18 = 10y - y + x -10x;

18 = 9y - 9x;

y - x = 2 ----- [ii];

Solve for x in equation [ii] by making x subject of formula;

x = y - 2 ----- [iii],

Substitute the value of x in equation [i];

2[y - 2] - y = -1 → 2y - 4 -y = -1;

y = -1 + 4 = 3,

Substitute the value of y into equation [iii];

x = y - 2 = 3 - 2 = 1.

Therefore, the two-digit number 'xy' is 13.

24. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], also how much did James [J] get as total?

A. ₦ 8,000

B. ₦ 6,000

C. ₦ 9,000

D. ₦ 7,000

The correct answer is option [A]. Solution: ₦20,000 - ₦4,000 = ₦16,000. Therefore, ₦16,000/2 = ₦8,000.

25. Three types of drinks Fanta, Coke and Lemon are sold for ₦900.00, ₦1,500.00 and ₦x.00 respectively per litre. If the cost per litre of the mixture is ₦1,430.00 and ratio of their mixture is 3 : 3 : 4, find x.

A. 200.00

B. 1,170.00

C. 1,775.00

D. 2,400.00

The correct answer is option [C].

26. Factorize [5 - y] y = 6.

A. [y + 2] [y + 3]

B. [y - 2] [y + 3]

C. [y - 2] [y - 3]

D. [y + 2] [y - 3]

The correct answer is option [C]. Solution: [5 - y]y = 6 → y^2 - 5y + 6 = 0; y^2 - 3y - 2y + 6 →y[y - 3] -2[y - 3] → [y - 2][y - 3].

27. Given two points on the earth's surface between two cities, A[Lat 75°N, Long 25°E] and B[Lat 75°N, Long 35°W]. Calculate the distance.

A. 4190.5km

B. 1656.4km

C. 1734.6km

D. 6702.1km

The correct answer is option [C]. Solution: Using the equation [q × 2 × p × r]/360, where θ

= Long 25°E + Long 35°W [since the location or coordinates are different],

r = Rcos θ and θ= 75°

60 x 2 x πx 6400

Cos 75/360

28. A lorry moves for 6hrs maintaining a particular speed. The lorry trippled its speed and moved for another 7hrs. Then the lorry covered a total of 900km/h. Calculate the speed at which the lorry moved for the last 7hrs.

A. 43.33km/h.

B. 33.33km/h.

C. 53.33km/h.

D. 63.33km/h.

The correct answer is option [B]. Solution: Hint [Speed tripled → × 3].

Speed = Total distance travelled/Total time taken.

Let S = speed, d = distance. 6S = d, 3S = [900 - d]/7.

Therefore, 3S = [900 - 6S]/7, 21S = 900 - 6S, 21S + 6S = 900,

Therefore, S = 900/27 = 33.33km/h.

29. Find the value of x in the equation $x^2 + 8x + 15 = 0$.

A. [5 or 3]

B. [-5 or 3]

C. [5 or -3]

D. [-5 or -3]

The correct answer is option [D]. Solution: $x^2 + 8x + 15 = 0 \rightarrow x^2 + 5x + 3x + 15 \rightarrow x[x + 5] + 3[x + 5] = [x + 3][x + 5] = 0$. Therefore, x = -5 or -3.

30. **Evaluate** $\frac{a}{a+2} - \frac{a-2}{a-3}$

A. $\frac{4 - 3a}{a^2 - a - 6}$

B. $\frac{-4 - 3a}{a^2 + a + 6}$

C. $\frac{4 + 3a^2}{a^2 + 6}$

D. $\frac{-4 + 3a^2}{a^2 - 3}$

The correct answer is option [A]. Solution: $a/a + 2 - a - 2/a - 3 \rightarrow a\,[a - 3] - [a + 2][a - 2]/[a + 2][a - 3] = a^2 - 3a - [a^2 - 4]/a^2 - a - 6 = 4 - 3a/a^2 - a - 6$

31. **Solve** $\frac{3.724 \times 10^{-4} \times 2.174}{6.748 \times 10^{-3}}$ **and leave your answer in 2 s.f.**

A. 0.13

B. 0.12

C. 0.10

D. 1.4

The correct answer is option [B]. Solution: $3.724 \times 10^{-4} \times 2.174/6.748 \times 10^{-3} = 0.119 \approx 0.12$.

32. Kate is n years old. Pat is 6 years younger than Kate and 2 years older than Dan. What is the sum of the ages of all three?

A. 3n + 4

B. 3n - 4

C. 3n - 8

D. 3n - 14

The correct answer is option [D]. Solution: Kate's age is n years; Pat's age is n - 6 years; Dan's age is n - 6 - 2 = n - 8. Therefore, the sum of the ages is n + [n - 6] + [n - 8] = n + n - 6 + n - 8 = 3n - 14.

33. Change 3.275 into an improper fraction.

A. 131/40.

B. 152/41.

C. 11/40.

D. 37/39.

The correct answer is option [A]. Solution: $3^{275}/1000 \rightarrow 3^{11/}40 \rightarrow 131/40$.

34. What is the product of 36/7, $[4]^{-3}$ and $[1/3]^{-1}$.

A. 35/121

B. 27/112

C. 18/41

D. 26/131

The correct answer is option [B]. Solution: 36/7 × 1/43 × 1/1/3 = 36/7 × 1/64 × 3 = 27/112.

35. Solve the equation x - 4/4 - x - 6/6 = 3.

A. 33.

B. 34.

C. 35.

D. 36.

The correct answer is option [D].

36. Divide $2x^3 - 5x^2 - 5x + 6$ by x - 3.

A. $2x^2 + x - 2$

B. $-2x^2 + x - 3$

C. $3x^2 - x - 1$

D. $3x^2 + x - 2$

The correct answer is option [A]

$$
\begin{array}{r|l}
x - 3 & 2x^2 + x - 2 \\
\hline
 & 2x^3 - 5x^2 - 5x + 6 \\
 & 2x^3 - 6x^2 \\
\hline
 & \quad x^2 - 5x \\
 & \quad x^2 - 3x \\
\hline
 & \quad\quad - 2x + 6 \\
 & \quad\quad - 2x + 6
\end{array}
$$

37. **Find the value for which x is undefined in the equation**

$$\frac{2x - 3}{x^2 - 6x + 9}.$$

A. [3, 3].

B. [-3, 3].

C. [-2, 3].

D. [2,-3].

The correct answer is option [A].

38. Three types of drinks Fanta, Coke and Lemon are sold for ₦900.00, ₦1,500.00 and ₦x.00 respectively per litre. If the cost per litre of the mixture is ₦1,430.00 and ratio of their mixture is 3 : 3 : 4, find x.

A. 200.00

B. 1,170.00

C. 1,775.00

D. 2,400.00

The correct answer is option [C].

39. Simplify $6[a^2 - 2a - 3] - 3a [2a - 5]$.

A. 3[a + 6]

B. 3[a - 6]

C. 3[2a + 6]

D. 3[a - 2]

The correct answer is option [B]. Solution: $6[a^2 - 2a - 3] - 3a [2a - 5] = 6a^2 - 12a - 18 - 6a^2 + 15a = 3a - 18 = 3[a - 6]$.

40. The thickness of a 700 pages of a book is 22mm. Find the thickness of one leaf of the book. Show your answer in standard form and in meters.

A. 3.143×10^{-5}

B. 3.143×10^{-4}

C. 3.143×10^{-2}

D. 3.143×10^{-3}

The correct answer is option [A]. Solution: Recall that 1000mm = 1m. Then, 22mm = 22×10^{-3}

Therefore, 1 leaf page = $22 \times 10^{-3}/700 = 3.143 \times 10^{-5}$

41. A cylinder having a radius of 4m, with a total surface area of 64π m^2. Find the cylinder height.

A. 6

B. 5

C. 11

D. 4

The correct answer is option [D]. Solution: Use the equation $2\pi r^2 + 2\pi rh$ to solve. Total surface area = 64π $m^2 = 2\pi r[r + h]$.

42. Multiply $[a^2 - 3a + 1]$ by [a - b].

A. a $[-3b + a^2]$

B. a^2 [3 + a] a2 + [1 + 3a] a - b.

C. $a^2 + b^2 - 3b^2$

D. a^3 [a - 3 - b] + a [1 + 3a] - b

The correct answer is option [D]. Solution: Hint [Open brackets]; $[a^2 - 3a + 1]$ [a - b]

$a^3 - a^2b - 3a^2 + 3ab + a - b$. Collect like terms $a^3 - 3a^2 - a^2b + 3ab + a - b$

a^2 [a - 3 - b] + a[1 + 3a] - b.

43. The diagonals of a rhombus are 16cm and 30cm long. What is the perimeter of the rhombus?

A. 68cm

B. 72cm

C. 80cm

D. 92cm

The correct answer is option [A]. Solution: Let one of the sides be L, by

Pythagoras L = $\sqrt{15^2 + 8^2}$]

= $\sqrt{289}$ = 17cm. Perimeter = 2[L + L] = 2[17 + 17] = 2×34 = 68cm.

44. Given that 8a/ [a - 1] [a + 2] = c/[a - 1] + d/[a + 2]. Find d/c.

A. 4

B. 1/2

C. 2

D. 1/4

The correct answer is option [C]. Solution: Multiply through by [a - 1] [a + 2]. Then, 8a = c[a + 2] + d[a - 1], where a = 1, 8 = c + d + 2c - d, therefore, c = 8/3 = 22/3, where a = -2, 8[-2] = [-2][c + d] + 2c - d; -16 = -2c -2d + 2c - d, therefore, d = -16/-3 = 51/3.Therefore, d/c = 51/3/22/3 = 16/3 × 3/8 = 2.

45. A trader makes a profit of 15% when he sells an item for ₦ 70. How much should he have sold so as to make a 45% profit?

A. ₦ 88.26

B. ₦ 41.98

C. ₦ 110.67

D. ₦ 122.70

The correct answer is option [A]. Solution: Cost price [CP] = ₦70 at 15%, CP = 100/115×70

= ₦60.87. At 45% profit, selling price [SP], SP = 145/100 × 60.87 = ₦88.26.

46. Seven years ago, the age of a father was three times that of his son, but in six years time the age of the son will be half that of the father. Find the age of the son.

A. 20

B. 8

C. 46

D. 10

The correct answer is option [A]. Solution:

Let the son's age be represented by x and the father's age be represented by y;

y - 7 = 3[x - 7];

y - 7 = 3x - 21;

y - 3x = -14 ---- [i]

y + 6/2 = x + 6;

y + 6 = 2[x + 6];

y + 6 = 2x + 12;

y - 2x = 6 ----- [ii].

From equation [i] make y the subject of formula

y = 3x - 14 ----- [iii] and substitute into equation [ii];

3x - 14 - 2x = 6;

x = 20.

47. Mr. Dele invested ₦ 30,000 in ₦ 10.00 ordinary shares of Zenith bank. He bought the shares at ₦ 20.00 each. How many shares did he buy?

A. 1,200

B. 1,250

C. 3,000

D. 1,500

The correct answer is option [D]. Solution: Amount invested = ₦ 30,000.

Selling price = ₦ 10.00. Buying price = ₦ 20.00.

Therefore, number of shares bought = 30000/20 = 1,500.

48. Find the product of 27 /5, $[3]^{-3}$ and $[1/5^{]-1}$.

A. 1/25

B. 9

C. 1

D. 3

The correct answer is option [C]. Solution: 27/5, $[3]^{-3}$ and $[1/5]^{-1}$; 27/5 × 1/33 × 5 = 27/5 × 1/27×5 = 1.

49. Two geometrically similar cans have heights of 7cm and 21cm. If the smaller holds 250g of sugar, how many kg does the large one hold?

A. 3/4

B. $1^{1}/2$

C. $2^{1}/4$

D. $3^{1}/2$

The correct answer is option [A]. Solution:

50. The length of a given object is 6cm and an error of 0.2cm is measured. Calculate the percentage error.

A. 33.3%

B. 96.7%

C. 9.67%

D. 3.33%

The correct answer is option [D]. Solution: 0.2/6 x 100 = 3.33%

51. Solve 3[x - 5] > 4[x - 2].

A. 23.

B. 43.

C. 53.

D. 13.

The correct answer is option [A].

52. If ₦ 25,000 amount to ₦ 35,000 in four years. Find the simple interest rate.

A. 22%.

B. 14%.

C. 42%.

D. 10%.

The correct answer is option [D]. Solution:

P = ₦25,000, I = ₦35,000 - ₦25,000 = ₦10,000, T = 4 years

R = I100/PT = 100 x 10,000/25,000 x 4 = 10%.

53. James and Daniel owners of J. D. chemicals shared their end of the year profit in the ratio of 4:6. If Daniel [D] got ₦ 4,000 more than James [J], calculate their total annual profit.

A. ₦ 22,000

B. ₦ 14,000

C. ₦ 16,000

D. ₦ 20,000

The correct answer is option [D]. Solution: Hint [Find the amount from the ratio and ₦4,000]. The ratio 4:6, let James amount be x, Daniel amount will be [x + 4000], 4/6 = x/[x + 4000]; 4[x + 4000] = 6x, the total amount is ₦8,000 + ₦12,000 + ₦4,000 = ₦20,000.

54. A car travels 60 kilometres in one hour before a piston breaks, then travels at 30 kilometers per hour for the remaining 60 kilometers to its destination. What is its average speed in kilometers per hour for the entire trip?

A. 45km/h

B. 40km/h

C. 50km/h

D. 60km/h

The correct answer is option [B]. Solution: The time it takes for it to travel for 60km at 30km/h is Distance/Average Speed = 60/30 hours = 2 hours. Therefore, the average

speed for the entire trip is Total Distance/Total Time, where Total Distance = 60km + 60km = 120km, Total Time = 1hr + 2hrs = 3hrs. Average Speed T = 120/3 = 40km/h.

55. A trader bought 200 oranges at 5 for ₦1.20, 40 oranges got spoilt and the remaining were sold at 4 for ₦1.50. Find the percentage gain or loss.

A. 30% gain.

B. 25% gain.

C. 30% loss.

D. 25% loss.

The correct answer is option [B]. Solution:

200 at 5 = 40 x ₦20 = ₦48.00. 40 got spoilt;

200 - 40 = 160 at 4 = 40;

40 x ₦1.50 = ₦60.00

-----> Gain % = Selling Price - Cost Price/Cost Price x 100% = 60 - 48/48 x 100 = 25% gain.

56. Find the value of $a^2 + 12a + 27$.

A. [-3,-3]

B. [-3, 3]

C. [-9, 3]

D. [-3,-9]

The correct answer is option [D]. Solution: $a^2 + 12a + 27 = 0$ -----> $a^2 + 3a + 9a + 27$ ----> $a [a + 3] + 9[a + 3] = [a + 9] [a + 3] = 0$ -----> $a = -3$ or -9.

57. An encyclopedia salesman make a 10% commission on any sales. If he sells a set of encyclopedia at ₦ 700 instead of the original price of ₦ 800, how much less of a commission does he earn?

A. ₦ 7

B. ₦ 8

C. ₦ 10

D. ₦ 70

The correct answer is option [C]. Solution: 10% of ₦ 700 = ₦ 70; 10% of ₦ 800 = ₦ 80, therefore, the less commission he receives is ₦ 80 – ₦ 70 = ₦ 10.

58. Find the value of x in $x^{1/3} = 4$.

A. 64

B. 66

C. 74

D. 76

The correct answer is option [A]. Solution: $x^{1/3} = 4$;

$3\sqrt{x} = 4$, therefore, $x = 4^3$

59. **Evaluate** $\frac{a}{a+3} + \frac{a+2}{a+4}$

A. $\frac{a^2 - 9a + 3}{6 + 2a}$

B. $\frac{2a + 3a^2}{4}$

C. $\frac{2a^2 + 9a + 6}{a^2 + 7a + 12}$

D. $\frac{2a^2 - 9a + 6}{a^2 + 7a + 12}$

The correct answer is option [C]. Solution: a/a + 3 + a + 2/a + 4-------> a[a + 4] + [a + 2][a + 3]/[a + 3][a + 4] = $a^2 + 4a + a^2 + 5a + 6/[a + 3][a + 4] = 2a^2 + 9a + 6/a^2 + 7a + 12$.

60. Emma bought a deep freezer at the cost of ₦ 350,000. Because the freezer is a fairly use one, he then spent addition ₦ 50,000 to refurbish and put it in order. He then sold it at ₦ 550,000. Find his loss or profit percentage on the transaction.

A. 47.5%

B. 45.7%

C. 37.5%

D. 35.7%

The correct answer is option [C]. Solution: Hint [Cost price = total price];

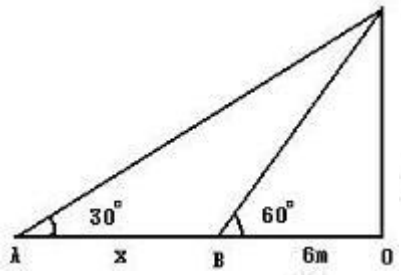
Total cost price = ₦ 350,000 + ₦ 50,000 = ₦ 400,000. Selling price = ₦ 550,000;

Profit = Selling price - Cost price = ₦ 550,000 - ₦ 400,000 = ₦ 150,000;

Percentage profit = profit/cost price x 100.

Therefore, percentage profit = 150,000/400,000 x 100 = 37.5%.

61. The angle of elevation of the top of a vertical tower from a point A on the ground is 30° as drawn. From a point B, 6m nearer the tower, the angle of elevation is 60°. Calculate the distance further from A.



A. 12m

B. 18m

C. 6m

D. 6√3m

The correct answer is option [A]. Solution: First calculate the height of the tower, which is represented by h; tan 60° = √3 = h/6; h = 6√3m; To obtain the distance further from A represented by x as shown in the diagram is tan 30° = 1/√3 = h/x + 6; Therefore, x = [6√3 x √3] - 6 = [6 x 3] - 6 = 18 - 6 = 12m.

62. Simplify 4a + 2/3 + 3/4a.

A. $16a^2/12a3$

B. $16a^2 + 8a/12a$

C. $12a^2 - 8a/12$

D. $16a^2 + 8a + 9/12a$

The correct answer is option [D]. Solution: 4a + 2/3 + 3/4a -----> 4a[4a + 2] + 3[3]/12a = $16a^2 + 8a + 9/12a$.

63. If a:b = 6:5, find the value of $\left[\frac{4a + 6b}{3a - b}\right] \div \left[\frac{4a}{5b}\right]$

A. -73

B. 73

C. -7.03

D. 7.03

The correct answer is option [D]. Solution: [(4 × 6) + (6 ×5)/(3 × 6) - (2×5)] ÷[4×6/5 × 5]

= [54/8]÷[24/25] → 54 × 25/24×8 = 7.03

64. Divide $2x^3 - 5x^2 - 5x + 6$ by x - 3.

A. $2x^2 + x - 2$

B. $-2x^2 + x - 3$

C. $3x^2 - x - 1$

D. $3x^2 + x - 2$

The correct answer is option [A]

$$
\begin{array}{r|l}
x - 3 & 2x^2 + x - 2 \\
\hline
 & 2x^3 - 5x^2 - 5x + 6 \\
 & 2x^3 - 6x^2 \\
\hline
 & \quad x^2 - 5x \\
 & \quad x^2 - 3x \\
\hline
 & \quad\quad - 2x + 6 \\
 & \quad\quad - 2x + 6
\end{array}
$$

65. Emma bought a deep freezer at the cost of ₦ 350,000. Because the freezer is a fairly use one, he then spent addition ₦ 50,000 to refurbish and put it in order. He then sold it at ₦ 550,000. Find his loss or profit percentage on the transaction.

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Profit = Selling price - Cost price = ₦ 550,000 - ₦ 400,000 = ₦ 150,000;

Percentage profit = profit/cost price x 100.

Therefore, percentage profit = 150,000/400,000 x 100 = 37.5%.

TOPIC: NUMBER AND NUMERATION

DIRECTION: Choose the correct answers from the lettered options.

1. A taxpayer is allowed 1/8th of his annual income tax-free, and he pays 20% on the remainder. If he pays ₦ 490.00 k tax, what is his income?

A. ₦ 560.00 k

B. ₦ 2,450.00 k

C. ₦ 2,800.00 k

D. ₦ 3,920.00 k

The correct answer is option [C].

Let the taxpayer's income be X. He is allowed 1/8th of his income tax free hence remaining (7/8) X.

He pays 20% of (7/8) X which equals ₦ 490.00 k.

=> X= (490 x 8 x 100) /140 = 2,800.00

The taxpayers income = ₦ 2,800.00 k.

2. **Simplify the equation given**

$$5\frac{1}{4} \div (1\frac{2}{3} - \frac{1}{2})$$

A. 1 3/4

B. 3 1/2

C. 4 1/2

D. 8 1/2

The correct answer is option [C].
Applying BODMAS gives

$$\Rightarrow 21/4 \div (5/3 - 1/2) = 21/4 \div (7/6)$$
$$= 21/4 \times 6/7 = 9/2 = 4\,1/2$$

3. Evaluate correct to 4 decimal places 827.51 x 0.015.

A. 8.8415

B. 12.4127

C. 124.1265

D. 12.4120

The correct answer is option [B]. 827.51 x 0.015 = 12.41265 = 12.4127 to 4 decimal places.

4. Simplify 0.000215×0.000028 and express your answer in standard form.

A. 6.03 $\times 10^{9}$

B. 6.02 $\times$ 10^{9}

C. 6.03 $\times 10^{-9}$

D. 6.02$\times 10^{-9}$

The correct answer is option [D].

5. Express the product of 0.06 and 0.09 in standard form.

A. 5.4 x 10^{-3}

B. 5.4 x 10^{-2}

C. 5.4 x 10^{-1}

D. 5.4 x 10^{2}

The correct answer is option [A]. => 0.06 x 0.09 = 6 x 10-2 x 9 x 10^{-2}

= 54 x 10^{-4}

= 5.4 x 10^{-3}

6. When a dealer sells a bicycle for ₦ 81 he makes a profit of 8%. What did he pay for the bicycle?

A. ₦ 71.00

B. ₦ 74.52

C. ₦ 75.00

D. ₦ 75.52

The correct answer is option [C]. Profit = selling price - cost price.

Let the amount he paid for the bicycle be x

8% of x = ₦81 - ₦x 0.08x = 81 - x. Taking like terms gives 1.08x = 81

x = 81/1.08 = ₦75

7. If $(1P03)_4 = 115_{10}$, find P.

A. 0

B. 1

C. 2

D. 3

The correct answer is option [D].

$(1P03)4 = 1 \times 4^3 + P \times 4^2 + 0 \times 4^1 + 3 \times 4^0 = 64 + 16P + 3 = 67 + 16P$

=> 6710 + 16P10 = 11510

16P = 11510 – 6710 = 4810

Therefore P = 48/16 = 3.

8. If ${}^6P_r = 6$, find the value of ${}^6P_{r+1}$.

A. 30

B. 33

C. 35

D. 15

The correct answer is option [A].

9. **Make a/x the subject of the formula** $\frac{x+a}{x-a} = m$

A. $\frac{m - 1}{m + 1}$

B. $\frac{1 + m}{1 - m}$

C. $\frac{1 - m}{1 + m}$

D. $\frac{m + 1}{m - 1}$

The correct answer is option [A].

x + a = m(x – a) = mx – ma

ma + a = mx – x a (m + 1) = x (m – 1).

10. A sales girl gave a change of ₦ 1.15 to a customer instead of ₦ 1.25. Calculate her percentage error.

A. 10%

B. 8.7%

C. 8.0%

D. 2.4%

The correct answer is option [C]. % error = (error × 100)/ (correct change) where error = 1.25 - 1.15 = ₦ 0.10% error = (0.10×100)/1.25 = 8%

11. Evaluate 21.05347 - 1.6324 x 0.43, to 3 decimal places.

A. 20.980

B. 20.351

C. 20.981

D. 20.352

The correct answer is option [D]

12. Evaluate 0.009/0.012, leaving your answer in standard form.

A. 7.5×10^2

B. 7.5×10^{1}

C. 7.5×10^{-1}

D. 7.5×10^{-2}

The correct answer is option [C].

$0.009 / 0.012 = 7.499 \times 10^{-1} = 7.5 \times 10^{-1}$

13. If P varies inversely as v and v varies directly as R2, find the relationship between P and R, given that R = 7 and P = 2.

A. $P = 98R^2$

B. $PR^2 = 98$

C. $P = 1/98R^2$

D. $P = R^2/98$

The correct answer is option [B].

$P \propto 1/v$ and $v \propto R^2$

Therefore $P = k/R^2$ or $k = 98$ (by substituting R = 7 and P =2 in the equation)

$\Rightarrow P = 98/R^2$ or $PR^2 = 98$.

14. If ₦225.00 yields ₦27.00 in X year's simple interest at the rate of 4% per annum, find X.

A. 3

B. 4

C. 12

D. 27

The correct answer is option [A].

Where P = ₦225.00, R = 4%, S.I = ₦27.00, X =?

Note: Simple Interest = P × R × T/100,

Where P = Principal = ₦225.00, R = 4%, Interest = ₦27.00,

T =?; T = I × 100/P × T = 27 × 100/225 × 4 = 3 years.

15. Given that for sets A and B in a universal set E, A ϵB, then A ∩(A ∩ B)' is _____.

A. A

B. ∅

C. B

D. E

The correct answer is option [B].

(A ∩ B) = ∅A ∩ ϕ= ∅

16. Make C the subject of the equation a (b + c) + (5/d) - 2 = 0

A. c = (2d - 5 - b)/ad

B. c = (5 - 2d - b)/ad

C. c = (5 - 2d - abd)/ad

D. c = (2d - abd - 5)/ad

The correct answer is option [D]. ab + ac + (5/d) - 2 = 0

abd + acd + 5 - 2d = 0

acd = 2d - abd - 5

c = (2 d - abd - 5)/ad

17. Instead of recording the number 1.23cm for the radius of a tube, a student recorded 1.32cm. Find the percentage error, correct to one decimal place.

A. 6.8%

B. 7.3%

C. 9.6%

D. 14.4%

The correct answer is option [B]

18. Two brothers invested a total of ₦ 5,000:00 k on a farm project. The farm yield was sold for ₦ 15,000:00 k at the end of the season. If the profit was shared in the ratio 2: 3, what is the difference in the amount of profit received by the brothers?

A. ₦ 2,000:00 k

B. ₦ 4,000:00 k

C. ₦ 6,000:00 k

D. ₦ 10,000:00 k

The correct answer is option [A].

Amount invested = ₦ 5,000:00 k

Amount realized = ₦ 15,000:00 k Profit = ₦ (15,000 - 5,000) = ₦ 10,000: k

Let the first brother be X and the other be Y.

Ratio = 2: 3; X' s share = (2/5) x 10,000 = ₦ 4,000:00 k

Y' s share = (3/5) x 10,000 = ₦ 6,000:00 k

(Difference in amount of profit received by the brothers is

Amount invested = ₦ 5,000:00 k

(6,000 - 4,000) = ₦ 2,000:00 k (6,000 - 4,000)

= ₦ 2,000:00 k

19. **Simplify** $\frac{\left(\frac{2}{3}-\frac{1}{5}\right)-\frac{1}{3}of\frac{2}{5}}{3-\frac{1}{1\frac{1}{2}}}$

A. 1/7

B. 7

C. 1/3

D. 3

The correct answer is option [A]. Applying BODMAS: For the numerator: 2/3 1/5 = (10 3)/ 15 = 7/15

1/3 of 2/5 = 1/3 × 2/5 = 2/15

For the denominator: 3 – [(3/2)-1] = 3 – 2/3 = 7/3

(7/15 – 2/15)/ (7/3) = (7/15 - 2/15) ×(3/7)

5/15 x 3/7 = 1/7

20. A trapezium has two parallel sides of length 5cm and 9cm. If the area is 21cm^2, find the distance between the parallel sides.

A. 4cm

B. 7cm

C. 3cm

D. 6cm

The correct answer is option [C].

Area of trapezium= (a+b) h/2;

Given A = 21cm, a & b = 5cm & 9cm respectively;

h=2A/ (a+b) = 3cm.

21. Simplify 0.0589 + 7.382 - 0.7953, correct to 2 decimal places.

A. 6.60

B. 6.64

C. 6.65

D. 8.20

The correct answer is option [C].

22. Find the number of ways of selecting 8 subjects from 12 subjects for an examination.

A. 490

B. 495

C. 496

D. 498

The correct answer is option [B].

23. If A = {a, b, c}, B = {a, b, c, d, e} and C = {a, b, c, d, e, f}

Find {A Ç B} Ç {A Ç C}.

A. {a, b, c, d}

B. {a, b, c, d, e}

C. {a, b, c, d, e, f}

D. ∅

The correct answer is option [B].

(A ∪ B) = {a, b, c, d, e};

(A ∪ C) = {a, b, c, d, e, f}

(A∪ B) ∩

(A ∪ C) = (a, b, c, d, e)

24. If M 5_{ten} = 1001011_{two}, find the value of M.

A. 15

B. 6

C. 7

D. 8

The correct answer is option [A]

25. A student measured the length of a room and obtained the measurement of 3.99m. If the percentage error of his measurement was 5% and his own measurement was smaller than the length, what is the true length of the room?

A. 3.78

B. 3.80

C. 4.18

D. 4.20

The correct answer is option [D]. 5% = (correct measurement - 3.99)/ (correct measurement)

= 0.05 x correct measurement = correct measurement - 3.99

= (correct measurement - 3.99) = 4.20m

26. If Q = {all perfect squares less than 30} and

P = {all odd numbers from 1 to 10}, find QnP.

A. {1, 4, 9, 16, 25}

B. {1, 3, 4, 5, 7, 9, 16, 25}

C. {1, 3, 5, 7, 9}

D. {1, 9}

The correct answer is option [D].

Q = {1, 4, 9, 16, 25} P = {1, 3, 5, 7, 9}

QnP = {1, 9}

27. If $12_e = X_7$, find X where e =12.

A. 20_7

B. 15_7

C. 14_7

D. 12_7

The correct answer is option [A]

Solution:

First convert 12 base 12 to base 10.

$1 \times 12^{1} + 2 \times 12^{0} =$

$12 + 2 = 14$

7 |	14
7 |	2 R 0
	0 R 2

$X_{7} = 20_{7}$

28. Two binary operations x and # are defined as m x n = mn - n - 1 and m # n = mn + n - 2 for all real numbers m,n. Find the value of 3 # (4 x 5).

A. 60

B. 57

C. 54

D. 42

The correct answer is option [C].

4x5 = 4(5) - 5 - 1 = 14

3 # (4x5) = 3 #14 = 3(14) + 14 - 2 = 42 + 12 = 54.

29. A number is selected at random between 20 and 30, both numbers inclusive. Find the probability that the number is a prime.

A. 2/11

B. 5/11

C. 6/11

D. 8/11

The correct answer is option [A].

Prime numbers between 20 and 30 = 23 and 29.

There are 11 numbers between 20 and 30.

Probability of a prime number = 2/11.

30. If 7 and 189 are the first and fourth terms of a geometric progression respectively, find the sum of the first 3 terms of the progression.

A. 182

B. 91

C. 63

D. 28

The correct answer is option [B].

Sum of a G.P $= \frac{a(1-r^n)}{1-r}$, **where a = 7 and n = 3**

$ar^3 = 189$

$r^3 = {}^{189}/_{7} = 27$

$\Rightarrow r = 3$

$\therefore$ **Sum of the G.P** $= \frac{7(1-3^3)}{1-3} = \frac{7(1-27)}{-2} = 91$

31. Correct 0.002473 to 3 significant figures.

A. 0.002

B. 0.0024

C. 0.00247

D. 0.0025

The correct answer is option [C].

32. Calculate, correct to two significant figures, the percentage error in approximating 0.375 to 0.4.

A. 2.0%

B. 2.5%

C. 6.6%

D. 6.7%

The correct answer is option [D]

33. Peter's weekly wages are ₦ 20:00 k. for the first 20 weeks and ₦ 36:00 k for the next 24 weeks. Find his average weekly wage for the remaining 8 weeks of the year, if his average weekly wage for the whole year is ₦ 30:00 k.

A. ₦ 37:00 k

B. ₦ 35:00 k

C. ₦ 30:00 k

D. ₦ 25:00 k

The correct answer is option [A].

For the first 20 weeks, Peter earns ₦ 400:00 k,

I.e. 20 x 20 = 400

For the next 24 weeks, he earns ₦ 864:00 k (i.e. 36 x 24 = 864)

Let his average weekly wage for the remaining 8 weeks be X. There are 52 weeks in a year.

(400 + 864 + X)/52 = 30; X = ₦ 296:00 k for the whole 8 weeks remaining

Amount received by Peter per week = 296/8 = ₦ 37:00 k.

34. A survey of 100 students in an institution shows that 80 speak fluent Hausa and 20 students speak Igbo, while only 9 students speak both languages. How many students speak neither Hausa nor Igbo?

A. 0

B. 9

C. 11

D. 20

The correct answer is option [B].

35. Given that P = {b, d, e, f} and Q = {a, c, f, g} are subsets of the universal set U = {a, b, c, d, e, f, g}. Find $P^1 \cap Q$.

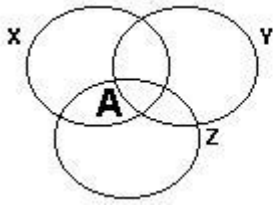
A. {a, c}

B. {a, c, d, g}

C. {c, d, g}

D. {a, c, g}

The correct answer is option [D]

36. 

The area lettered A in the diagram is

A. X∩Z

B. X°∩Y∩ Z

C. X∩Y°ÇZ

D. X∩Z°

The correct answer is option [C].

X∩Y°∩Z

37. When an aeroplane is 800m above the ground, its angle of elevation from a point P on the ground is 30°. How far is the plane from P by line of sight?

A. 400m

B. 800m

C. 1500m

D. 1600m

The correct answer is option [D].

A sin 30° = opp/hyp =

800/x × sin 30° = 800m (x = 1600m /800m)

38. In a class of 40 students, 32 offer Mathematics, 24 offer Physics and 4 offer neither Mathematics nor Physics. How many offer both Mathematics and Physics?

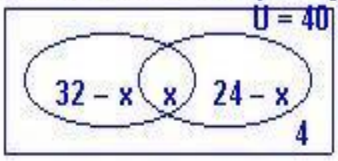
A. 4

B. 8

C. 16

D. 20

The correct answer is option [D].



From the Venn diagram, the universal set U = 40
⇒ 32 – x + 24 – x + 4 + x = 40 ⇒ 60 – x = 40
∴ x = 60 – 40 = 20

39. Find the smallest number by which 252 can be multiplied to obtain a perfect square.

A. 2

B. 3

C. 5

D. 7

The correct answer is option [D]. 252 = 2 x 2 x 3 x 3 x 7

To make 252 a perfect square we must divide by 7.

40. While doing his Physics practical, Idowu recorded a reading as 1.12cm instead of 1.21cm. Calculate his percentage error.

A. 1.17%

B. 6.38%

C. 7.44%

D. 8.05%

The correct answer is option [C]

41. Express 7.841×10^{-4} as a decimal fraction correct to 3 significant figures.

A. 0.0000784

B. 0.000784

C. 0.00784

D. 0.0784

The correct answer is option [B].

42. The size of a quantity first doubles then increases by a further 16%. After a short time, its size decreases by 16%. What is the net increase in size of the quantity?

A. 59300/625%

B. 50900/625%

C. 200%

D. 100%

The correct answer is option [C]. Initial quantity = X

After doubling, quantity = 2X

Increment by 16% = 2X + 0.16X

After a short period, decrement = (2X + 0.16X - 0.16X) %

= (2X) %

Net increment in size of the quantity = (2X) % = (2 x 100%) = 200%.

43. **Make f the subject of the formula** $t = \sqrt{\frac{v}{\left(\frac{1}{f} + \frac{1}{g}\right)}}$

A. $\frac{gv - t^2}{gt^2}$

B. $\frac{gt^2}{gv - t^2}$

C. $\frac{v}{\frac{1}{t^2} - \frac{1}{g}}$

D. $\frac{gv}{t^2 - g}$

The correct answer is option [B].

44. If U = {s, p, l, e, n, d, o, u, r},

X = {s, p, e, n, d},

Y = {s, e, n, o, u, r},

Z = {p, n, o, u, r}

Find X ∩ {Y∪Z}.

A. {p, o, u, r}

B. {s, p, e, n}

C. {p, n, d}

D. {n, d, u}

The correct answer is option [B]

YÈZ = {s,e,n,o,u,r} ∩{p,n,o,u,r} = {s,p,e,n,o,u,r}

X Ç {Y È Z} = {s,p,e,n,d}∪{s,p,e,n,o,u,r} = {s,p,e,n,}

45. Evaluate $(101.5)^2 - (100.5)^2$.

A. 1

B. 2.02

C. 20.02

D. 202

The correct answer is option [D]. This is simplification by difference of two squares.

$a^2 - b^2 = (a + b)(a - b)$.

$(101.5 + 100.5)(101.5 - 100.5)$

$= 202$.

46. The sum of four numbers is 1214_5. What is the average expressed in base five?

A. 411

B. 401

C. 114

D. 141

The correct answer is option [D].

$1 \times 5^3 + 2 \times 5^2 + 1 \times 5^1 + 4 \times 5^0$

$125 + 50 + 5 + 4 = 184$

$\frac{184}{4} = 46$

Converting back to base five gives

5	46	
5	9	1
5	1	4
5	0	1

i.e. 141

47. Let the universal set be the set of integers, = {x: 0 < x = 10};

Find the complement of the set

P = {x: x, J, (x is NOT divisible by 4)}.

A. {4}

B. {4, 8}

C. {1, 2, 3}

D. {4, 8, 12, 16, 20}

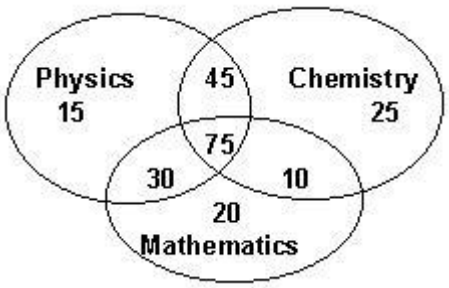
The correct answer is option [B].

J = {x: 0} = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

P ={x: x, J, x is not divisible by 4} = {1, 2, 3, 5, 6, 7, 9, 10}

PI = {4, 8}

48. The Venn diagram shows the number of students who studied physics, chemistry and mathematics in a certain school. How many students took at least two of the three subjects?



A. 165

B. 160

C. 155

D. 135

The correct answer is option [B]

49. Let the probability function on set S, where S = {a_1, a_2, a_3, a_4}. Find P (a_1) if P (a_2) = 1/3, P (a_3) = 1/6 and P (a_4) = 1/5.

A. 7/10

B. 2/3

C. 1/3

D. 3/10

The correct answer is option [D].

$P(a_1) + P(a_2) + P(a_3) + P(a_4) = 1$

$(Pa_1) + 1/3 + 1/6 + 1/5 = 1$

$(Pa_1) + 10/30 + 5/30 + 6/30 = 1$

$P(a_1) + 21/30 = 1$

$P(a_1) = 1$

$21/30 = 9/30$

$P(a_1) = 3/10$

50. The thickness of an 800-paged book is 18 mm. Calculate the thickness of one leaf of the book giving your answer in meters and in standard form.

A. 2.25×10^{-4} m

B. 4.50×10^{-4} m

C. 2.25×10^{-5} m

D. 4.50×10^{-5} m

The correct answer is option [C].

18 mm = 0.018 m

Now, 800 pages are 0.018 m thick

1 page will be (0.018/800) m thick

I.e. 0.0000225 m thick = 2.25×10^{-5} m thick.

51. After getting a raise of 15%, a man's new monthly salary is ₦ 345. How much per month did he earn before the increase?

A. ₦ 330.00 k

B. ₦ 396.75 k

C. ₦ 300.00 k

D. ₦ 293.25 k

The correct answer is option [C]. Let the monthly salary be represented by X.

15% of the monthly salary = 15/100 × (X) = 0.15X

But X + 0.15X = 345

Or 1.15 X = 345

Therefore X = ₦ 300.00 k

52. In a class of 80 students, every student had to study economics or geography, or both economics and geography. If 65 students studied economics and 50 studied geography, how many studied both subjects?

A. 15

B. 30

C. 35

D. 45

The correct answer is option [C].

53. Express 0.00629946 to 3 significant figures.

A. 0.00630

B. 0.000

C. 0.006

D. 0.006210

The correct answer is option [A].

54. The number 186 047 was corrected to 186 000. Which of the following can correctly describe the degree of approximation?

I to the nearest hundred

II to the nearest thousand

III to 3 significant figures

A. I & III only

B. I & II only

C. II & III only

D. All of them

The correct answer is option [C].

55. **Evaluate** $\frac{1}{3}+\left[\frac{5}{7}\left(\frac{9}{10}-1+\frac{3}{4}\right)\right]$

A. 28/39

B. 13/84

C. 67/84

D. 84/13

The correct answer is option [C]. 1/3 + {5/7[9/10 - 1 + 3/4]}

1/3+ {5/7 [9/10 – 1/4]} = 1/3+ [5/7 (13/20)] = 1/3 + 13/28 = 67/84.

56. The number 25 when converted from the tens and units base to the binary base (base 2) is one of the following _____.

A. 10011

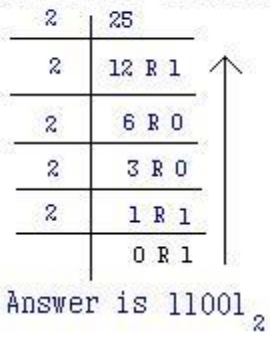
B. 111011

C. 111000

D. 11001

The correct answer is option [D]

Solution: Convert 25_{10} to base 2



Answer is 11001_2

57. The mean of twelve positive numbers is 3. When another number is added, the mean becomes 5. Find the thirteenth number.

A. 29

B. 26

C. 25

D. 24

The correct answer is option [A].

Let the sum of the first twelve positive numbers be x.

x/12 = 3

x = 36.

Let the thirteenth number added be y; the sum of the thirteen positive numbers

Will be 36 + y

Mean of the thirteen numbers = (36 + y)/13 = 5

36 + y = 13 x 5 = 65

y = 65 – 36 = 29.

58. The ratio of the number of men to women in a 20-member committee is 3: 1. How many women must be added to the number so as to make the ratio of men to women 3:2?

A. 2

B. 5

C. 7

D. 9

The correct answer is option [B]

59. The ratio of the price of a loaf of bread to the price of a packet of sugar in 1975 was r: t. In 1980, the price of a loaf of bread went up by 25% and that of a packet of sugar by 10%. Their new ratio is now _____.

A. 20r: 25t

B. 22r: 25t

C. 25r: 22t

D. 27r:22t

The correct answer is option [C].
In 1975, Price of a loaf of bread = r
Price of a packet of sugar = t
∴ Ratio of prices = r : t
In 1980, Increment in price of bread = $^{25}/_{100} = ¼$
$= (25 + 100)\% = 125\%$
Increment in the price of sugar = $^{10}/_{100} = {}^{1}/_{10}$
$= (10 + 100)\% = 110\%$
∴ Ratio of prices in 1980 is given as:
125 : 110 = 25 : 22
r : t = 25r : 22t

60. The range of 4, 3, 11, 9, 6, 15, 19, 23, 27, 24, 21 and 16 is

A. 24

B. 23

C. 21

D. 16

The correct answer is option [A].

The range is the difference between the highest and lowest numbers.

=> 27 - 3 = 24

TOPIC: NUMBER BASES

DIRECTION: Choose the correct answers from the lettered options.

1. What is the product of 612_5 and 45_5?

A. 111200_5

B. 100120_5

C. 211100_5

D. 121010_5

The correct answer is option [A]

Solution: Hint [Convert to base 10]

$612_5 = [6 \times 5^2] + [1 \times 5^1] + [2 \times 5^0] =$

$150 + 5 + 2 = 157$

$45_5 = [4 \times 5^1] + [5 \times 5^0] = 20 + 5 = 25$

$612_5 \times 45_5 = 157_{10} \times 25_{10} = 3925_{10}$

5	3925
5	785 R 0
5	157 R 0
5	31 R 2
5	6 R 1
5	1 R 1
	0 R 1

Answer = 111200_5

2. **Evaluate** $\dfrac{(110100)_{two}}{(100)_{two}}$

A. 10011_{two}

B. 1010_{two}

C. 1101_{two}

D. 1100_{two}

The correct answer is option [C].

3. Find the value of X, if $278_5 - X_6 = 330_5$.

A. 3

B. 4

C. 2

D. 5

The correct answer is option [A]. Solution: $278_5 - X_6 = 330_5$; $278_5 = [2 \times 5^2] + [7 \times 5] + [8 \times 5^0]$

$= 50 + 35 + 8 = 93$; $330_5 = [3 \times 5^2] + [3 \times 5] + [0 \times 5^0] = 75 + 15 + 0 = 90$.

Therefore, $93 - X_6 = 90$; $X_6 = 93 - 90 = 3$.

4. The subtraction below is in base seven. Find the missing number.

```
  5162
 -2644
 ------
  2*15
 ------
```

A. 2

B. 3

C. 4

D. 5

The correct answer is option [A].

5. What is the octal equivalent of 465_{10}?

A. 611_8

B. 811_8

C. 711_8

D. 411_8

The correct answer is option [C].

Solution:

Hint [Octal means 8, divide through by 8 because the number is in base 10 already]

8	465
8	58 R 1
8	7 R 1
	0 R 7

Answer = 711_8

A. 2

B. 3

C. 1

D. 4

The correct answer is option [C]. Solution: [Hint: $Log_A A$] $Log_6 36 + Log_6 [1/6] = Log_6 [36 \times 1/6] = Log_6 6 = 1 Log_6 6$. Therefore, the answer is 1.

7. Given that $139_5 = A_6$, What is A?

A. 121_6

B. 113_6

C. 131_6

D. 227_6

The corret answer is option [A].

Solution: $139_5 = [1 \times 5^2] + [3 \times 5^1] + [9 \times 5^0] =$

$25 + 15 + 9 = 49_{ten}$

6	49
6	8 R 1
6	1 R 2
	0 R 1

$139_5 = 49_{ten} = 121_6$

8. Evaluate $Log_5 12.5 + Log_5 2$.

A. 4

B. 2.5

C. 2.6

D. 2

The correct answer is option [D].

9. Find the value of k if $15_k + 36_k = 65_k$.

A. 4

B. 16

C. 7

D. 3

The correct answer is option [D]. Solution:

10. **Evaluate** $\frac{2434_6}{42_6}$.

A. 35_6

B. 75_6

C. 45_6

D. 72_6

The correct answer is option [A].

11. Solve the equation $[Log_{10}3125 + Log_{10}125]/[Log_{10}625 - Log_{10}25]$.

A. 1

B. 4

C. 6

D. 9

The correct answer is option [B]. Solution: $[Log_{10}3125 + Log_{10}125]/ [Log10625 - Log_{10}25]$

$= [Log_{10}55 - Log_{10}53]/ [Log_{10}54 - Log_{10}52] = [Log_{10}5 (5+3)]/ [Log_{10}5 (4-2)]$

$= [(5+3) Log105]/ [(4-2) Log105]$. Cancelling $Log_{10}5/Log_{10}5$, therefore, $[5+3]/ [4-2] = 8/2 = 4$.

12. $Log_2 8 + Log_2 12 - Log_2 X = 1$. Find X.

A. 48

B. 40

C. 35

D. None of the above

The correct answer is option [A]. Solution: $Log_2 8 + Log_2 12 - Log_2 X = 1$; $Log_2 [8 \times 12] - Log_2 X = Log_2 2$; $Log_2 96 - Log_2 2 = Log_2 X$; $Log_2 [96/2] = Log_2 X$. Therefore, $Log_2 X = Log_2 48$, then X = 48.

13. Convert 448_6 to denary.

A. 476_{10}

B. 764_{10}

C. 176_{10}

D. 112_{10}

The correct answer is option [C]. Solution: Hint [Denary means 10 i.e. convert to base 10]. $448_6 \rightarrow [4 \times 6^2] + [4 \times 6^1] + [8 \times 6^0] = 144 + 24 + 8 = 176_{10}$.

14. $65_x = 11011_3$, find x.

A. 17

B. 19

C. 18

D. 21

The correct answer is option [C]. Solution: Hint [Convert 65_x to base 10 and also 11011_3 to base 10 as well]. $6x + 5 = [1 \times 3^4] + [1 \times 3^3] + [0 \times 3^{2]} + [1 \times 3] + [1 \times 3^0] = 81 + 27 + 0 + 3 + 1$; $6x + 5 = 112$; $6x = 112 - 5 = 107$. Therefore, $x = 107/6 = 17.83 \approx 18$.

15. Evaluate $\frac{\text{Log } 16 + \text{Log } 4}{\text{Log } 16 - \text{Log } 4}$.

A. 4

B. 8

C. 3

D. 1

The correct answer is option [C]. Solution: Hint: [Apply indices and logarithm law];

[Log16 + Log4]/[Log16 - Log4] → [Log(16 x 4)]/[Log(16/4)]

= [Log 64]/[Log 4] = [Log 26]/[Log 22] = [6Log 2]/[2Log 2] = 6/2 = 3.

16. Subtract 413_8 from 675_8.

A. 343_8

B. 262_8

C. 348_8

D. 143_8

The correct answer is option [B].

Solution:

$675_8 = [6 \times 8] + [7 \times 8] + [5 \times 8] = 384 + 56 + 5 = 445_{10}$

$413_8 = [4 \times 8] + [1 \times 8] + [3 \times 8] = 256 + 8 + 3 = 267_{10}$

$445_{10} - 267_{10} = 178_{10}$

8 |	178
8 |	22 R 2
8 |	2 R 6
	0 R 2

Answer = 262_8

17. Find X if $111O_3 + X_6 = 85_{10}$.

A. 124_6

B. 118_6

C. 114_6

D. 141_6

The correct answer is option [C].

18. If $Log_{10}2 = 0.3010$ and $Log_{10}3 = 0.4771$, evaluate $Log_{10}4.5$.

A. 1.7895

B. 0.6532

C. 6.532

D. 17.895

The correct answer is option [B]. Solution: $Log_{10}4.5 = Log_{10}[9/2] = Log_{10}9 - Log_{10}2 = Log_{10}32 - Log_{10}2 = 2Log_{10}3 - Log_{10}2 = 2[0.4771] - 0.3010 \rightarrow 0.95542 - 0.3010 = 0.6532$.

19. Find the number base used when $343_x + 275_x = 812_x$.

A. x = 5

B. x = 4

C. x = 9

D. x = 8

The correct answer is option [B]

20. Convert 49_{10} to a binary number.

A. 10101_2

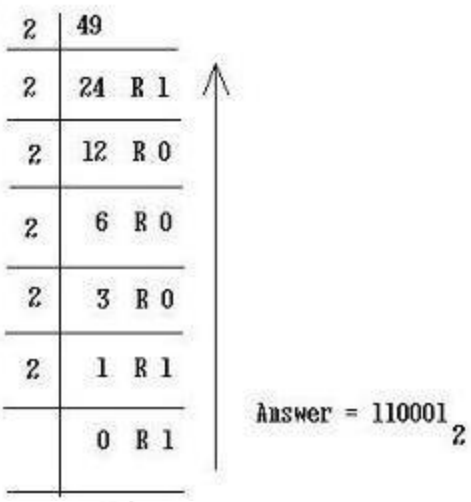
B. 110000_2

C. 011010_2

D. 110001_2

The correct answer is option [D].

Solution: Hint[A binary number means convert to base two



21. Subtract 14436_7 from 50123_7.

A. 4352_7

B. 32354_7

C. 43525_7

D. 3235_7

The correct answer is option [B].

Solution: Hint

[Since both numbers are of the same base subtract directly]

$$\begin{array}{r} 5\,0\,1\,2\,3_7 \\ -\,1\,4\,4\,3\,6_7 \\ \hline 3\,2\,3\,5\,4_7 \end{array}$$

Answer = 32354_7

22. Convert 564_9 to base 6 and divide by 10.

A. 305.5

B. 205.1

C. 105.3

D. 20.51

The corret answer is option [B].

Solution: $564_9 \rightarrow [5 \times 9^2] + [6 \times 9^1] + [4 \times 9^0]$
$= 405 + 54 + 4 = 463$

6	463
6	77 R 1
6	12 R 5
6	2 R 0
	0 R 2

Answer = 2051,
dividing by 10, gives
2051/10 = 205.1.

23. Given the decimal number 49.0 to base 3.

A. 1311_3

B. 1411_3

C. 1511_3

D. 1211_3

The correct answer is option [D]

Solution:
Hint [Convert straight to base 3]. 49.0 to decimal number in base 3.

3	49
3	16 R 1
3	5 R 1
3	1 R 2
	0 R 1

$= 1211_3$

24. What is $Log_5 16.42$?

A. 1.74

B. 11.74

C. 0.174

D. 17.4

The correct answer is option [A]. Solution: $Log_5 16.42 \rightarrow Log_5 16.42 = x$; $16.42 = 5x$ ® Log 16.42 = xLog 5; x = [Log 16.42/Log 5] = 1.2153/0.6990 = 1.738 » 1.74.

25. Convert 72_{10} to base 7.

A. 132_7

B. 123_7

C. 213_7

D. 321_7

The correct answer is option [A].

Solution:

Hint [Work directly because it's already in base 10]

7	72
7	10 R 2
7	1 R 3
	0 R 1

Answer = 132_7

26. Multiply 334 by 13 in base 5.

A. 10120_5

B. 00120_5

C. 21010_5

D. 11002_5

The correct answer is option [D].

Solution: Hint

[Convert both numbers from base 5 to base 10]

$334_5 = [3 \times 5^2] + [3 \times 5^1] + [4 \times 5^0]$

$= 75 + 15 + 4 = 94_{10}$

$13_5 = [1 \times 5^1] + [3 \times 5^0] = 5 + 3$

$= 8_{10}$

$[334_5 \times 13_5] = [94_{10} \times 8_{10}] = 752_{10}$

5	752
5	150 R 2
5	30 R 0
5	6 R 0
5	1 R 1
	0 R 1

Answer = 11002_5

27. **Solve for a if all the numbers are in base 3; $\frac{12}{a} = \frac{1110}{(a + 110)}$**

A. 10.90

B. 1.2022

C. 1.090

D. 19.01

The correct answer is option [B]. Solution: 12[a + 110] = 1110a; 12a + 1320 = 1110a; 1110a - 12a = 1320; 1098a = 1320. Therefore, a = 1320/1098 = 1.2022.

28. $B455_5 - O5B3_5 = OBB3_5$.

A. 1/90

B. 6/81

C. 4/73

D. 11/43

The correct answer is option [A].

Solution:

$B455_5 = [B \times 5^3] + [4 \times 5^2] + [5 \times 5^1] + [5 \times 5^0]$
$= 125B + 100 + 25 + 5 = 125B + 130$

$05B3_5 = [0 \times 5^3] + [5 \times 5^2] + [B \times 5^1] + [3 \times 5^0]$
$= 0 + 125 + 5B + 3 = 5B + 128$

$0BB3_5 = [0 \times 5^3] + [B \times 5^2] + [B \times 5^1] + [3 \times 5^0]$
$= 0 + 25B + 5B + 3 = 30B + 3$

$125B + 130 - [5B + 128] = 30B + 3$
$125B + 130 - 5B - 128 = 30B + 3$
$120B + 2 = 30B + 3$
$120B - 30B = 3 - 2$
$90B = 1$
$B = 1/90$.

29. Solve $5^{-3Log2} \times 5^{2Log3}$.

A. 2

B. 13

C. 4

D. 1 1/8

The correct answer is option [D]. Solution: $5^{-3Log2} \times 5^{2Log3} = 5Log2^{-3} \times 5Log3^2 = 5Log\ 1/23 \times 5^{Log\ 9}$; using indices rule; $5Log\ [1/8 \times 9] = 1/8 \times 9 = 9/8 = 11/8$.

30. Evaluate $Log_{10}\sqrt{32}$.

A. 7.526

B. 75.26

C. 0.7526

D. 0.07526

The correct answer is option [C]. Solution: $Log_{10}\sqrt{32}$ $\rightarrow Log_{10}32^{1/2} \rightarrow 1/2Log_{10}32 \rightarrow 1/2Log_{10}25 \rightarrow 1/2 \times 5Log_{10}2 \rightarrow 1/2 \times 5 \times 0.3010 = 0.7526$.

31. Solve the inequality $x - 1 > 6[x + 3]$.

A. $5x < -19$

B. $6x > -18$

C. $5x > -19$

D. $5x > -18$

The correct answer is option [A]. Solution: $x - 1 > 6[x + 3]$; $x - 1 > 6x + 18$ ® $x - 6x > 18 + 1$; $-5x > 19$, therefore, $5x < -19$.

TOPIC: POLYNOMIALS

DIRECTION: Choose the correct answers from the lettered options.

1. Find the zeros of the polynomial $x^3 + 2x^2 - 5x - 6$.

A. 2, 3, 1.

B. -2, -3, -1.

C. -2, 3, 1.

D. 2, -3, -1.

The correct answer is option [D]. Solution: Find the factor that can easily divide the polynomial without a remainder. X + 1 gives $x^2 + x - 6$; Factorising $x^2 + x - 6$ gives (x - 2)(x + 3); Factors are (x + 1)(x - 2)(x + 3) = 0; The zeros of the polynomial $x^3 + 2x^2 - 5x - 6$ gives x = -1, 2, -3.

3. When the expression $a + 7x + bx^3$ is divided by x + 2, the remainder is -12. One of its factors is x - 2. Find the values of a and b.

A. -1, 6.

B. -6, -1.

C. -1, -6.

D. 1, 6.

The correct answer is option [B]. Solution: x - 2; x = 2; a + 14 + 8b = 0; a + 8b = -14 ® (i); x + 2; x = -2; a - 14 - 8b = -12; a - 8b = 2® (ii); Solve for a in equation (ii) and substitute into equation (i); a = 8b + 2® (iii); 8b + 2 + 8b = -14; b = -1 substitute into equation (iii); a = -8 + 2 = -6; a = -6, -1.

4. What is the result when $(2x^3 + x^2 - 3)$ is divided by $(2x - 1)$.

A. $x^2 - x$, R = x - 3.

B. $x^2 - x + 1$, R = -x - 2.

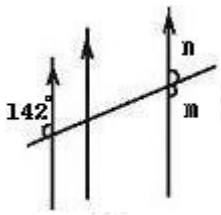
C. x + x + 1/2, R = -21/2.

D. $x^2 - x - 1/2$, R = 21/2.

Solution: The correct answer is option [C].

$$
\begin{array}{r|l}
2x-1 & x^2 + x + \frac{1}{2} \\
\hline
2x^3 + x^2 - 3 & \\
2x^3 - x^2 & \\
\hline
2x^2 - 3 & \\
2x^2 - x & \\
\hline
x - 3 & \\
x - \frac{1}{2} & \\
\hline
-2\frac{1}{2} &
\end{array}
$$

5. Find the angle m in the diagram drawn.



A. 52°

B. 218°

C. 38°

D. 142°

The correct answer is option [D]. Solution: n = 180 - 142 = 38° [corresponding angles are equal]; then angle m = 180° - 38° [angles on a straight line is equal to 180° i.e. sum of angles is 180o]; Therefore, m = 180 - 38 = 142°.

6. $(x + 1)$ is a factor of $a + 2x + 2x^2 + bx^3$ and the remainder, when this expression is divided by $x + 3$, is 64. Find the values of a and b.

A. -2, 2.

B. 2, 2.

C. -2, -2.

D. 2, -2.

The correct answer is option [C]. Solution:

$a + 2x + 2x^2 + bx^3$

$x + 1$ is a factor

Thus $x = -1$

$a - 2 + 2 - b = 0$

$a - b = 0$

$a = b$

$x + 3$ as the divisor is also a factor

Thus $x = -3$

$a - 6 + 18 - 27b = 64$ (recall that remainder = 64)

$a - 27b = 52$

$b - 27b = 52$

$b = -52/26 = -2$

$a = b = -2$

-2, -2.

7. When a polynomial f(x) is divided by $x^2 + x - 2$ the quotient is $x + 1$ and the remainder is $2x - 3$. Find f(x).

A. $x^3 + 2x2 + x - 5$

B. $x^3 + 2x2 + x + 5$.

C. $x^3 + x2 + x - 5$.

D. $x^3 + 2x2 - x - 5$.

The correct answer is option [A]. Solution: $(x^2 + x - 2)(x + 1) + 2x - 3 = x^3 + x^2 - 2x + x2 + x - 2 + 2x - 3 = x^3 + 2x^2 + x - 5$.

8. What is the remainder when $x^2 + x + 2$ is divided by $x - 1$.

A. -4.

B. x + 2.

C. 2.

D. 4.

The correct answer is option [D].

9. Expand, $(2x^2 - x - 4)(x^2 + x - 1)$.

A. $2x^4 - 7x^2 + x^3 - 3x + 4$.

B. $2x^4 - x^3 - 7x^2 - 3x + 4$.

C. $2x^4 + x^3 - 7x^2 - 3x + 4$.

D. $2x^4 - 3x + x^3 - 7x^2 + 4$.

The correct answer is option [C]. Solution: $(2x^2 - x - 4)(x^2 + x - 1) = 2x^4 + 2x^3 - 2x^2 - x^3 - x^2 + x - 4x^2 - 4x + 4 = 2x^4 + x^3 - 7x^2 - 3x + 4$.

10. Given that $P(x) = ax^3 - bx^2 + cx - d$, P (2) = 6, P (0) = -1, P (1) = 3 and P (-1) = 3. Find the values of a, b, c and d.

A. -4, -11/2, 1, 11/2.

B. 1, -4, 11/2, 1.

C. -11/2, -4, 11/2, 1.

D. 11/2, -4, -11/2, 1.

The correct answer is option [C]. Solution: P (2) = 6; 8a - 4b + 2c - d = 6 ® (i); P (0) = -1;

-d = -1; d = 1; 8a - 4b + 2c = 7 ® (ii); P (1) = 3; a - b + c -1 = 3; a - b + c = 4 ® (iii);

(-1) = 3; -a - b - c - 1 = 3; -a - b - c = 4 ® (iv);

Solve for a in equation (iii), substitute in equation (iv) and (ii);

a = 4 + b - c; - (4 + b - c) - b - c = 4; -4 - b + c - b - c = 4; -2b = 8; b = -4;8(4 - 4 - c) + 16 + 2c = 7;

-8c + 16 + 2c = 7; -6c = -9; c = 3/2 = 11/2;

a = 4 - 4 - 11/2 = -11/2; a = -11/2, b = -4, c = 11/2, d = 1.

11. Find the quotient when x + 3x - 6 is divided by 2x + 3.

A. x2/2 + 3x/4 + 3/8.

B. -x2/2 - 3x/4 + 3/8.

C. -x2/2 + 3x/4.

D. x2/2 - 3/8.

The correct answer is option [A].

12. Simplify, $(x^2 - 2x - 3)(x^2 + x + 1)$.

A. $x^4 - x^3 - 4x^2 - x - 3$.

B. $x^4 - x^3 - 4x^2 + 5x + 3$.

C. $x^4 - x^3 - 4x^2 - 5x - 3$.

D. $x^4 + x^3 - 3x^2 - x - 3$.

The correct answer is option [C]. Solution: $(x^2 - 2x - 3)(x^2 + x + 1) = x^4 + x^3 + x^2 - 2x^3 - 2x^2 - 2x - 3x^2 - 3x - 3 = x^4 - x^3 - 4x^2 - 5x - 3$.

13. A polynomial P is divided by 2x - 1. The quotient is x + x + 1 and the remainder is -2. Find P?

A. $2x^3 - 3x^2 + x - 3$.

B. $2x^3 + x - x^2 - 3$.

C. $2x^3 - x^2 - x - 3$.

D. $2x^3 + x^2 + x - 3$.

The correct answer is option [D]. Solution: $(x^2 + x + 1)(2x - 1) - 2 = 2x^3 - x^2 + 2x^2 - x + 2x - 1 - 2 = 2x^3 + x^2 + x - 3$.

14. Simplify, $(x^2 + \sqrt{2}x + 1)(x^2 - \sqrt{2}x + 1)$.

A. $(x^2 - 1)(x^2 + 1)$.

B. $x^4 + 1$.

C. $x^4 - x^2 + x + 1$.

D. $x^4 + x + 1$.

The correct answer is option [B]. Solution: $(x^2 + \sqrt{2}x + 1)(x^2 - \sqrt{2}x + 1) = x4 - \sqrt{2}x^3 + x^2 + \sqrt{2}x3 - 2x^2 + \sqrt{2}x + x2 - \sqrt{2}x + 1 = x^4 + 1$.

15. Find the remainder when $x^3 + 3x - 6$ is divided by 2x + 3.

A. $7^1/8$.

B. $6^7/8$.

C. $5^1/8$.

Solution: The correct answer is option [D].

$$\begin{array}{r} \frac{x^2}{2} + \frac{3x}{4} + \frac{3}{8} \\ 2x + 3 \overline{)\ x^3 + 3x^2 - 6} \\ x^3 + \frac{3x^2}{2} \\ \hline \frac{3x^2}{2} + 3x \\ \frac{3x^2}{2} + \frac{9x}{4} \\ \hline \frac{3x}{4} - 6 \\ \frac{3x}{4} + \frac{9}{8} \\ \hline -\frac{57}{8} = -7\frac{1}{8} \end{array}$$

16. Given that $P_1(x) = 5x^3 + 3x^2 - 2x + 6$, $P_2(x) = x^3 + 4x - 3x + 1$ and $P_3(x) = 2x^3 - 3x^2 + 3x + 2$. Find P_1P_3.

A. $10x^6 - 9x^5 + 2x^4 + 37x^3 - 18x^2 + 18x + 12$.

B. $10x^6 - 9x^5 - 2x^4 + 37x^3 - 18x^2 + 18x + 12$.

C. $10x^6 - 9x^5 + 2x^4 + 37x^3 - 18x^2 + 14x + 12$.

D. $10x^6 - 9x^5 + 2x^4 - 37x^3 - 18x^2 + 14x + 12$.

The correct answer is option [C]. Solution: $(5^3 + 3x^2 - 2x + 6)(2x^3 - 3x^2 + 3x + 2) = 10x^6 - 15x^5 + 10x^3 + 6x^5 - 9x^4 + 9x^3 + 6x^2 - 4x^4 + 6x^3 - 6x^2 - 4x + 12x^3 - 18x^2 + 18x + 12 = 10x^6 - 9x^5 + 2x^4 + 37x^3 - 18x^2 + 14x + 12$.

17. What is the remainder when $3x + 1$ is divided by $x + 1$.

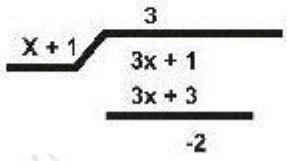
A. 2.

B. 3.

C. -2.

D. -3.

Solution: The correct answer is option [C].



18. If $P_1 = x^2 - 2x + 4$, $P_2 = x^2 + 5$ and $P_3 = 2x - 3$, find P_2P_3.

A. $2x^3 - 3x^2 + 10x - 15$.

B. $2x^3 + 10x - 3x^2 - 15$.

C. $2x^3 - 3x^2 + 10x + 15$.

D. $2x^3 - 10x - 3x^2 - 15$.

The correct answer is option [A]. Solution: $(x^2 + 5)(2x - 3) = 2x^3 - 3x^2 + 10x - 15$.

19. Given that $P_1(x) = 5x^3 + 3x^2 - 2x + 6$, $P_2(x) = x^3 + 4x - 3x + 1$ and $P_3(x) = 2x^3 - 3x^2 + 3x + 2$. Find P_2P_3.

A. $2x^6 + 5x^5 - 15x^4 + 25x^3 - 4x^2 - 3x + 2$.

B. $2x^6 - 3x^5 - 7x^4 + 23x^3 + 5x^2 - 3x + 2$.

C. $2x^6 - 3x^5 - 11x^4 + 25x^3 + 5x^2 - 3x + 2$.

D. $2x^6 + 5x^5 - 15x^4 + 25x^3 + 5x^2 - 3x + 2$.

The correct answer is option [A]. Solution: $(x^3 + 4x^2 - 3x + 1)(2x^3 - 3x^2 + 3x + 2) = 2x^6 - 3x^5 + 3x^4 + 2x^3 + 8x^5 - 12x^4 + 12x^3 + 8x^2 - 6x^4 + 9x^3 - 9x^2 - 6x + 2x^3 - 3x^2 + 3x + 2 = 26 + 5x^5 - 15x^4 + 25x^3 - 4x^2 - 3x + 2$.

20. Expand, $(2x^2 - x - 4)(x^2 + x - 1)$.

A. $2x^4 - 7x^2 + x^3 - 3x + 4$.

B. $2x^4 - x^3 - 7x^2 - 3x + 4$.

C. $2x^4 + x^3 - 7x^2 - 3x + 4$.

D. $2x^4 - 3x + x^3 - 7x^2 + 4$.

The correct answer is option [C]. Solution: $(2x^2 - x - 4)(x^2 + x - 1) = 2x^4 + 2x^3 - 2x^2 - x^3 - x^2 + x - 4x^2 - 4x + 4 = 2x^4 + x^3 - 7x^2 - 3x + 4$.

21. Given that $F(x) = ax^3 + bx^2 - c$, $F(-2) = 3$, $F(1) = 3$ and $F(0) = -1$. Find the values of a, b and c.

A. 1, 1, 3.

B. -3, 7, 1.

C. -5, 9, 1.

D. 1, 3, 1.

The correct answer is option [D]. Solution: $-8a + 4b - c = 3 \rightarrow$ (i) $a + b - c = 3 \rightarrow$ (ii); $-c = -1$;

$c = 1$; $-8a + 4b = 4 \rightarrow$ (iii); $a + b = 4 \rightarrow$ (iv); Solve for a in equation (iii); $a = 4 - b \rightarrow$ (v);

$-8(4 - b) + 4b = 4$; $-32 + 8b + 4b = 4$; $12b = 36$; $b = 36/12 = 3$; $a = 4 - 3 = 1$; $a = 1$, $b = 3$, $c = 1$.

22. Find the zeros of the polynomial $x^3 + 2x^2 - 5x - 6$.

A. 2, 3, 1.

B. -2, -3, -1.

C. -2, 3, 1.

D. 2, -3, -1.

The correct answer is option [D]. Solution: Find the factor that can easily divide the polynomial without a remainder. X + 1 gives x^2 + x - 6; Factorising x^2 + x - 6 gives (x - 2)(x + 3); Factors are (x + 1)(x - 2)(x + 3) = 0; The zeros of the polynomial x^3 + $2x^2$ - 5x - 6 gives x = -1, 2, -3.

23. Which of the following option is the correct mathematical expression of the polynomial.

A. D × R + Q.

B. R × Q + D.

C. Q × D - R.

D. Q × D + R.

The correct answer is option [D]. Solution: P = Q×D + R, where Q = Quotient, D = Divisor and R = Remainder.

24. Find the remainder when x + 3x - 6 is divided by 3x - 1.

A. 4^{26}/27.

B. 4^2/27.

C. -4^{25}/27.

D. -4^{26}/27.

25. Find the quotient when x + 3x - 6 is divided by 3x - 1.

A. x/3 + 28/27.

B. -x2/3 - x/9 + 28/9.

C. x2/3 + 28/9.

D. x2/3 + x/9 + 28/27.

The correct answer is option [D].

TOPIC: QUADRATIC EQUATIONS

DIRECTION: Choose the correct answers from the lettered options.

1. Two square rooms have a total floor area of $89m^2$. One room is 3m longer each way than the other. Find the dimensions of the two rooms.

A. 5m square and 8m square

B. 4m square and 6m square

C. 5m square and 12m square

D. 6m square and 8m square

The correct answer is option [A]. Solution:

Let the dimensions of one of the room be m;

Room A = $m \times m = m^2$;

Room B = [m + 3][m + 3];

Area of the square rooms = $89m^{2;}$

m^2+ [m + 3][m + 3] = 89;

$m^2 + m^2 + 6m + 9 = 89$;

$2m^2 + 6m - 80 = 0$

→ $m^2 + 3m - 40 = 0$;

$m^2 + 8m - 5m - 40 = 0$;

m[m + 8] - 5[m + 8] = 0;

[m - 5][m + 8] = 0

therefore, m = 5 or -8

The positive dimension is 5m square and 5 + 3 = 8m square.

2. If the sum of the roots of the equation (x - p)(2x + 1) = 0 is 1, find the value of p.

A. $1^1/2$

B. 1/2

C. $-1/2$

D. -1 -1

The correct answer is option [C].

3. What value of k makes the expression $y^2 - 6y + k$ a perfect square?

A. 1

B. 2

C. 9

D. 3

The correct answer is option [C].

4. A woman is 3 times as old as her son. 8 years ago the product of their ages was 112. Find the woman's age.

A. 32 years

B. 36 years

C. 42 years

D. 30 years

The correct answer is option [B]. Solution:

Let the son's age be a;

$[3a - 8][a - 8] = 112;$

$3a^2 - 32a + 64 = 112;$

$3a^2 - 32a - 48 = 0;$

$3a^2 - 36a + 4a - 48 = 0$

→ $3a[a - 12] + 4[a - 12] = 0$

→ $[3a + 4][a - 12] = 0$

→ $a = -11/3$ or 12

The son's age is 12 years

The woman's age is 3×12 years = 36 years.

5. A certain number is subtracted from 18 and from 13. The product of the two numbers obtained is 66. Find the first number.

A. 7

B. 24

C. 10

D. 15

The correct answer is option [A]. Solution:

Let the number be x;

[18 - x][13 - x] = 66;

$234 - 31x + x^2 = 66$

$x^2 - 31x + 168 = 0$;

$x^2 - 24x - 7x + 168 = 0$;

x[x - 24] - 7[x - 24] = 0;

[x - 24][x - 7] = 0

x = 7 or 24

The number is 7.

6. A quadratic equation with roots 3/2 and 2/3 is _____.

A. $6x^2 - 13x + 6 = 0$

B. $6x^2 + 13x + 6 = 0$

C. $6x^2 - 13x - 6 = 0$

D. $6x^2 + 5x + 6 = 0$

The correct answer is option [A].

7. A rectangular piece of cardboard measures 17cm by 14cm. Strips of equal width are cut off one side and one end. The area of the remaining piece is 108cm2. Find the width of the strips removed.

A. 26cm

B. 17cm

C. 5cm

D. 17cm

The correct answer is option [C]. Solution:

Let the width of the strip be y;

[17 - y][14 - y] = 108

238 -31y + y^2 = 108;

y^2 - 31y + 130 = 0

y^2 - 26y - 5y + 130 = 0;

y[y - 26] - 5[y - 26] = 0;

The width of the strip removed is 5cm.

8. The ages of two children are 11 and 8 years. In how many years' time will the product of their ages be 208?

A. 24 years

B. 10 years

C. 6 years

D. 5 years

The correct answer is option [D]. Solution:

Let the time the product of their ages be x;

[11 + x][8 + x] = 208

→88 + 19x + x^2 = 208;

x^2 + 19x - 120 = 0;

x^2 + 24x - 5x - 120 = 0;

x[x + 24] - 5[x + 24] = 0

→ [x + 24][x - 5] = 0

The time the product of their ages will be 208 is 5 years.

9. Boneri's age and Meebari's age add up to 25 years. 8 years ago Boneri was twice as old as Meebari. Find Meebari's present age.

A. 7 years

B. 14 years

C. 10 years

D. 11 years

The correct answer is option [D]. Solution:

Let Boneri's age be x and Meebari's age be y;

x + y = 25 ---- [i];

[x - 8] = 2[y - 8];

x - 2y = -8 ---- [ii]

→subtract equation [ii] from [i] → 3y = 33

Therefore, y = 33/3 = 11 years.

10. What are the factors of $16n^2 - 16n + 4$?

A. 4(4n - 1) (4n - 1)

B. 4(4n - 1) (4n + 1)

C. 4(2n + 1) (2n - 1)

D. 4(2n - 1) (2n - 1)

The correct answer is option [D].

11. The area of a rectangle is 60cm2. The length is 11cm more than the width. Find the width.

A. 6cm

B. 15cm

C. 11cm

D. 4cm

The correct answer is option [D]. Solution:

Let the width be n;

Area = L

x W and W = n

n [n + 11] = 60;

n^2 + 11n - 60 = 0

n^2 + 15n - 4n - 60 = 0;

n [n + 15] - 4[n + 15] = 0;

[n - 4][n + 15] = 0;

n = 4 or -15;

The width is 4cm.

12. Boneri's age and Meebari's age add up to 25 years. 8 years ago Boneri was twice as old as Meebari. How old is Boneri now?

A. 11 years

B. 7 years

C. 14 years

D. 10 years

The correct answer is option [C]. Solution:

Let Boneri's age be x and Meebari's age be y;

x + y = 25 ---- [i];

[x - 8] = 2[y - 8];

x - 2y = -8 ---- [ii]

→subtract equation [ii] from [i]

→ 3y = 33

Therefore, y = 33/3 = 11 years.

Substitute the value of y into equation [i]

→x = 25 - y = 25 - 11 = 14 years. Boneri's age is 14 years.

13. A rectangular plot measures 12m by 5m. A path of constant width runs along one side and one end. If the total area of the plot and the path is 120m2, find the width of the path.

A. 10m

B. 12m

C. 5m

D. 17m

The correct answer is option [D]. Solution:

Let the width of the path be m;

Area of plot = L

x B = 12 x 5 = 60m^2;

Area of path = [12 - m][5 - m];

Total area = [12 - m][5 - m] + 60 = 120

60 - 17m + m^2 + 60 = 120

m^2 - 17 = 120 - 120

m[m - 17] = 0; m = 0 or 17

The width of the path = 17m.

14. Two numbers have a difference of 3. The sum of their squares is 89. Find the numbers.

A. [5, 8]; [8,-5]

B. [5,-8]; [-8,-5]

C. [-5, 8]; [8,-5]

D. [5, 8]; [-8,-5]

The correct answer is option [D]. Solution:

Let the numbers be x and y;

x - y = 3 ---- [i];

$x^2 + y^2$ = 89 ---- [ii]

→ make y the subject in equation [i] and substitute into equation [ii]

→ $y = 3 + x$ ---- [iii]

→ $x^2 + 9 + 6x + x^2 = 89$

→ $2x^2 + 6x - 80 = 0$;

$x^2 + 3x - 40 = 0$;

$x^2 + 8x - 5x - 40 = 0$;

$x[x + 8] - 5[x + 8] = 0$ → $[x - 5][x + 8] = 0$

Therefore, x = 5 or -8

Substitute the value of x into equation [iii]

→ When x = 5; y = 3 + 5 = 8;

When x = -8; y = 3 - 8 = -5

The answer = [5,8];[-8,-5].

15. Find the quadratic equation whose roots are x = 3 or x = 5.

A. $x^2 - 8x + 15 = 0$

B. $x^2 - 2x - 15 = 0$

C. $x^2 - 8x - 15 = 0$

D. $x^2 + 2x - 15 = 0$

The correct answer is option [A].

16. The base of a triangle is 3cm longer than its corresponding height. If the area is $44cm^2$, find the length of its base.

A. 11cm

B. 8cm

C. 4cm

D. 7cm

The correct answer is option [A]. Solution:

Let height of triangle be x;

Area of triangle = 1/2b × h

→ Area = 44cm^2, h = x, b = x + 3

→ 44 = 1/2 × x[x + 3]; x^2 + 3x = 88;

x^2 + 3x − 88 = 0

→ x^2 + 11x − 8x − 88 = 0;

x[x + 11] − 8[x + 11] = 0

→ [x − 8][x + 11] = 0

→x = 8 or −11. The height of triangle = 8cm,

Then the base length = 8 + 3 = 11cm.The number is 7.

17. Find two consecutive even numbers whose product is 224.

A. 14
16
B. 20
22
C. 11
13
D. 26
28

The correct answer is option [A]. Solution:

Let the number be y;

[y + 2][y + 4] = 224;

y^2 + 6y + 8 = 224

→ y^2 + 6y − 216 = 0;

y^2 + 18y − 12y − 216 = 0;

y[y + 18] − 12[y + 18] = 0

→ [y + 18][y − 12] = 0;

y = −18 or 12

The number is 12

then the consecutive even numbers are 14

18. Find two consecutive odd numbers whose product is 195.

A. 21
23
B. 15
17
C. 18
20
D. 13
15

The correct answer is option [D]. Solution:

Let the number be n;

[n + 3][n + 5] = 195

→ n^2 + 8n + 15 = 195

→ n^2 + 8n − 180 = 0;

n^2 + 18n − 10n − 180 = 0;

n[n + 18] − 10[n + 18] = 0

→ [n + 18][n − 10] = 0;

n = −18 or 10

The number is 10

Then the consecutive odd numbers are 13

19. If x^2 − 5x + C = (x − 8)(x + 3), find the value of C.

A. −24

B. −9

C. 24

D. 5

The correct answer is option [A].

20. The square of a certain number is 22 less than 13 times the original number. Find the number.

A. 2 or 11

B. 11 or 3

C. 4 or 9

D. 2 or 9

The correct answer is option [A]. Solution:

Let the number be x;

$x^2 = 13x - 22$;

$x^2 - 13x + 22 = 0$;

$x^2 - 11x - 2x + 22 = 0$

→ $x[x - 11] - 2[x - 11] = 0$

→ $[x - 2][x - 11]$; $x = 2$ or 11.

21. A man is 37 years old and his child's age is 8. How many years ago was the product of their ages 96?

A. 40 years

B. 5 years

C. 8 years

D. 37 years

The correct answer is option [B]. Solution:

Let the time the product of their ages be x;

$[37 - x][8 - x] = 96$;

$296 - 45x + x^2 = 96$;

$x^2 - 45x + 200 = 0$

$x^2 - 40x - 5x + 200 = 0$

$x[x - 40] - 5[x - 40] = 0$;

$x = 40$ or 5

The time is 5 years.

22. The width of a classroom is 4m less than the length. Its area is 45m2. Find the dimensions of the classroom.

A. 9m by 4m

B. 15m by 3m

C. 9m by 5m

D. 5m by 15m

The correct answer is option [C]. Solution:

Let length be represented by n;

Length = n; width = n - 4

→ Area = L × W = 45

→ n [n - 4] = 45

→ n^2 - 4n - 45 = 0

→ n^2 - 9n + 5n - 45 = 0;

n[n - 9] + 5[n - 9] = 0;

[n + 5][n - 9] = 0

→ n = -5 or 9

Therefore, n = 9;

Length = 9m;

Width = n - 4 = 9 - 4 = 5m.

23. Find the value of x if the lengths of the sides of a right angled triangle are given as follows [4x + 1] cm, [4x - 1] cm and xcm.

A. x = 0 or 16.

B. x = 2 or 8.

C. x = 2 or 11.

D. 0.

The correct answer is option [A]. Solution: Hint [Use Pythagoras theorem]. [4x + 1]2 = [4x - 1]2 + x^2; $16x^2$ + 8x + 1 = $16x^2$ - 8x + 1 + x^2; 16x = x^2; x^2 - 16x = 0; x[x - 16] = 0. Therefore, x = 0 or 16.

24. Twice a certain whole number subtracted from 3 times the square of the number leaves 133. Find the number.

A. 61/3

B. 19

C. 7

D. 21

The correct answer is option [C]. Solution:

Let the number be p;

$3p^2 - 2p = 133$;

$3p^2 - 2p - 133 = 0$

$\rightarrow 3p^2 - 21p + 19p - 133 = 0$;

$3p [p - 7] + 19[p - 7] = 0$;

$[p - 7][3p + 19] = 0$ ® $p = -19$ or 7

The number is 7.

25. Twice the square of a certain whole number added to 3 times the number makes 90. Find the number.

A. 6

B. 15

C. 12

D. 9

The correct answer is option [A]. Solution:

Let the number be x;

$2x^2 + 3x = 90$;

$2x^2 + 3x - 90 = 0$

$\rightarrow 2x^2 - 12x + 15x - 90 = 0$

$\rightarrow 2x[x - 6] + 15[x - 6] = 0$

$\rightarrow [2x + 15][x - 6] = 0$

The number is 6.

26. A woman is 3 times as old as her son. 8 years ago the product of their ages was 112. Find the son's age.

A. 12 years

B. 14 years

C. 16 years

D. 10 years

The correct answer is option [A]. Solution:

Let the son's age be a;

[3a - 8][a - 8] = 112;

$3a^2$ - 32a + 64 = 112;

$3a^2$ - 32a - 48 = 0;

$3a^2$ - 36a + 4a - 48 = 0

→3a[a - 12] + 4[a - 12] = 0

→ [3a + 4][a - 12] = 0

→ a = -11/3 or 12

The son's age is 12 years.

27. Find two consecutive numbers whose product is 156.

A. 17,18

B. 8,9

C. 27,28

D. 12,13

The correct answer is option [D]. Solution:

Let the number be x;

[x + 2][x + 3] = 156

x^2 + 5x + 6 = 156;

$x^2 + 5x - 150 = 0$

$x^2 + 15x - 10x - 150 = 0$;

$x[x + 15] - 10[x + 15] = 0$ $[x + 15][x - 10]$

Therefore, x = 10 or -15

The number is 10

Then the consecutive numbers is 12,13.

28. A girl is 6 years younger than her brother. The product of their ages is 135. Find their ages.

A. 15 years; 6 years

B. 9 years; 3 years

C. 12 years; 5 years

D. 15 years; 9 years

The correct answer is option [D]. Solution:

Let the boy's age be x;

$x[x - 6] = 135$; $x^2 - 6x - 135 = 0$;

$x^2 - 15x + 9x - 135 = 0$

→ $x[x - 15] + 9[x - 15] = 0$

Therefore, x = 15 or -9

The boy's age is 15 years while the girl's age = 15 - 6 = 9 years.

29. What must be added to 4x2 - 20xy to make it a perfect square?

A. $25y^2$

B. 25y

C. $5y^2$

D. 25

The correct answer is option [C].

30. Factorise the expression $42 - 15x - 3x^2$.

A. $3(x + 7)(x - 2)$

B. $3(7 - x)(2 - x)$

C. $3(x-7)(2-x)$

D. $3(7 + x)(2 - x)$

The correct answer is option [D].

31. Find the number which, when added to its square, makes 90.

A. 10

B. 9

C. 15

D. 6

The correct answer is option [B]. Solution:

Let the number be x;

$x + x^2 = 90$;

$x^2 + x - 90 = 0$

$\rightarrow x^2 + 10x - 9x - 90 = 0$

$\rightarrow x[x + 10] - 9[x + 10] = 0$

$\rightarrow [x - 9][x + 10] = 0$

Therefore, $x = 9$.

32. Find two numbers which differ by 4 and whose product is 45.

A. [5,-9] ; [-5,-9]

B. [5,9] ; [-5,-9]

C. [5,9] ; [-5,9]

D. [5,-9] ; [5,9]

The correct answer is option [B]. Solution:

Let the number be x and y;

x – y = 4 ---- [i];

xy = 45 ---- [ii]

→ Make x subject in equation [i] and substitute in equation [ii]

→x = 4 + y ---- [iii];

[4 + y]y = 45; y^2 + 4y – 45 = 0;

y^2 + 9y – 5y – 45 = 0;

y[y + 9] – 5[y + 9]

→ [y – 5][y + 9] = 0;

y = 5 or -9

→substitute the value of y into equation [iii]

→ when y = -9;

x = 4 + [-9] = -5;

when y = 5; x = 4 + 5 = 9

The answer = [5,9];[-5,-9].

TOPIC: SEQUENCES AND SERIES

DIRECTION: Choose the correct answers from the lettered options.

1. How many terms has the A.P whose first term is 1.5 and the last term is 57 given that the common difference is 3?

A. 35

B. 45

C. 15

D. 11

The correct answer is option [C]

$T_n = 57 = 15 + (n - 1)3$

$= 15 +$
$3n - 3$
$= 12 + 3n$

$57 - 12 = 3n$
$45 = 3n$
$n = {}^{45}/_{3}$
$n = 15$
There are 15 terms.

2. The sum of 11 terms of an A.P is 891. Find the 28^{th} and 45^{th} terms if the common difference is 15.

A. 816 and 1,782

B. 1,632 and 4,415

C. 1,221 and 1,476

D. 1,415 and 2,715

The correct answer is option [C]

$S_n = 891$

$S_n = 891 = {}^{11}/_{2}[2a + (11 - 1)15]$

891
$= {}^{11}/_{2}[2a + 10 \quad 15]$

$891 = {}^{11}/_{2}[2a + 150]$

$1782 = 2a + 150$
$2a = 1782 - 150 = 1632$
$a = 816$

Therefore $T_{28} = 816 + (28 - 1)15$

$= 816 + 27 \quad 15$

$= 1{,}221$

$T_{45} = 816 + (45 - 1)15$

$= 816 + 44 \quad 15$

$= 1{,}476$

3. If the nth term of a sequence is denoted by the formula $n(2^{n+1}) - 3n$, find the sum of the first four terms.

A. 166

B. 178

C. 211

D. 342

The correct answer is option [A]

$T_n = n(2^{n+1}) - 3n$
$T_1 = 1(2^{1+1})$
$- 3 \times 1 = 4 - 3 = 1$
$T_2 = 2(2^{2+1}) - 3 \times 2 = 4 - 3 = 1$

$T_3 = 3(2^{3+1}) - 3 \times 3 = 4 - 3 = 1$

$T_4 = 4(2^{4+1}) - 3 \times 4 = 4 - 3 = 1$
The sum of the first
four terms;
=> 1 + 10 + 39 + 116
= 166

4. Find the difference between the 4th and 11th terms of the sequence whose nth term is $^{5-n2}/_{2n}$.

A. 2.768

B. 5.322

C. 3.895

D. 4.561

The correct answer is option [C]

$T_n = 5 - n^2/_{2n}$
T_{11}
$= 5 - (11)^2/_{2\ 11}$
$= ^{5-121}/_{22}$

$T_4 = 5 - (4)^2/_{2\ 4} = ^{5-16}/_{8}$

$= -1.375$
$T_4 - T_{11} = -1.375 - (-5.27)$
$= 3.895$

5. The 16th term of an A.P is 93, given that its common difference is 6, find the first term.

A. 6

B. 3

C. 9

D. 7

The correct answer is option [B]

$T_n = a + (n - 1)d$

$T_{16} = 93$
$d = 6 ; n = 16 ; a = ?$

Therefore $93 = a + (16 - 1)6$

$93 = a + 15 \quad 6$

$93 = a + 90$
$a = 93 - 90 = 3$
a = first term = 3

6. How many terms has the G.P whose second term is $^1/_2$ and the common ratio and the last term are $^1/_4$ and $^1/_{120}$ respectively.

A. 3

B. 7

C. 2

D. 5

The correct answer is option [D]

$T_2 = {}^1/_2$

$r = {}^1/_4$

$T_n = {}^1/_{126}$

$T_2 = a \quad ({}^1/_4)^1$
$= {}^a/_4$

$^1/_2 = {}^a/_4$
$; a = {}^4/_2 = 2$

Therefore $T_n = {}^1/_{128}$
$= 2 \quad ({}^1/_4)^{n-1}$

Divide both sides by 2

$^1/_{256} = ({}^1/_4)^{n-1} = ({}^1/_4)^n$
$({}^1/_4)^{-1}$

Divide both sides by 4

$^1/_{256} = (^1/_4)^n$

$(^1/_4)^n = (^1/_4)^5$

n = 5

The G.P has 5 terms.

7. The 14^{th} term of an A.P is 96 while the 25^{th} term is 173. Find the 19^{th} term.

A. 128

B. 176

C. 131

D. 155

The correct answer is option [C]

$T_n = a + (n - 1)d$

$T_{14} = 96 = a + (14 - 1)d$
$96 = a + 13d$ ----------(*1*)

$T_{25} = 173 = a + (25 - 1)d$
$173 = a + 24d$ ----------(*2*)

Solving the simultaneous equation, subtract (*1*)
from (*2*)
$a + 24d = 173$
$a + 13d =$
96
$1d = 77$
$d = {}^{77}/_{11}$
$= 7$
Putting d into equation (*1*)

$96 = a + 13 \quad 7$
$96 = a + 91$

a = 96 - 91 = 5

Therefore, the 19th term = T_{19}

T_{19} = 5 + (19 - 1)7

= 5 + 18 7 = 131

8. The following gives a geometric sequence: 2, P, Q, 250. Find the values of P and Q.

A. 50 and 125

B. 65 and 150

C. 10 and 50

D. 25 and 80

The correct answer is option [C]

9. The sum of 8 terms of an A.P is 160 while the sum of 20 terms is 880. Find the 43rd term.

A. 174

B. 188

C. 235

D. 212

The correct answer is option [A]

$S_8 = {}^8/_2[2a + (8 - 1)d]$

$= 4[2a + 7d]$

$160 = 8a + 28d$ ----------(*1*)

$S_{20} = {}^{20}/_2[2a + (20 - 1)d]$

$= 10[2a + 19d]$

$880 = 20a + 190d$ ----------(*2*)

Solving equations (*1*) and (*2*) simultaneously
(×
8) 880 = 20a + 190d

(× 20) 160 = 8a + 28d
Multiply equation (*1*)
by 8 and equation (*2*) by 20

=> 7,040 = 160a + 1520d ----------(*3*)

=> 3,200 = 160a + 560d ----------(*4*)
(Resultant equation)=> 3,840 = 0 + 960d
960d = 3,840

$d = {}^{3,840}/_{960}$
= 4
Put d into equation (*1*) to get a
160 =
8a + 28 × a
= 8a + 112
a =
$^{160 - 112}/_{8}$ = 6

Therefore T_{43} = 6 + (43 - 1)4
= 6 + 42 × 4
= 6 + 168
T_{43}
= 174

10. The 3rd and the 9th terms of a G.P are 54 and 39,366 respectively. Find the sum of the 4th and 7th terms.

A. 3,557

B. 4,536

C. 2,865

D. 5,267

The correct answer is option [B]

11. The n^{th} term of a sequence is given by $3 \times 2^{n-2}$. What is the 3^{rd} term?

A. 7

B. 6

C. 4

D. 9

The correct answer is option [B]

$T_n = 3 \times 2^{n-2}$
Therefore;
$T_3 = 3 \times 2^{3-2}$

$= 3 \times 2^1$

$= 6$

12. The following is an A.P, 9, x, y, z, 25, ... Find the values of x, y and z.

A. 13, 17, 21

B. 18, 23, 34

C. 11, 15, 29

D. 4, 9, 16

The correct answer is option [A]

a = 9
T_n =
25 = 9 +
(5 - 1)d
25 = 9 +
4d

4d = 25 - 9 = 16

45 = 3n
d = $^{16}/_{4}$
= 4
Therefore;
T_2 = x = 9 + (2 - 1)4 = 9 + 4

= 13
T_3 = y = 9 + (3 - 1)4 = 9 + 4 2

= 17

T_4 = z = 9 + (4 - 1)4 = 9 + 4 3

= 21

13. The 8^{th} term of a G.P is 640. If the first term is 5, find the common ratio and the 10^{th} term.

A. 2 and 2,560

B. 5 and 512

C. 4 and 3,412

D. 3 and 2,673

The correct answer is option [A]

14. An n^{th} term of the sequence is $3^n - 2^{n+1}$. Find the sum of the 7^{th} and 9^{th} terms.

A. 1,931

B. 18,659

C. 10,931

D. 20,590

The correct answer is option [B]

$T_n = 3^n - 2^{n+1}$

$T_7 = 3^7 - 2^{7+1}$

= 2187 - 256 = 1,931

$T_9 = 3^9 - 2^{9+1}$
= 19,683 - 1,024

= 18,659

Sum of T_7 and T_9

= 20,590.

15. The 9th and the 22nd terms of an A.P are 29 and 55 respectively. Find the sum of its first 60 terms.

A. 5,212

B. 4,320

C. 2,876

D. 3,826

The correct answer is option [B]

$29 = T_9 = a + 8d$ ----------(*1*)

$55 = T_{22} = a + 21d$ ----------(*2*)

Solving simultaneously by subtracting equation (*1*) from (*2*)

26 = 13d

d = 2a + 150
2a = $^{26}/_{13}$= 2
Putting d into equation (*1*)

29 = a + 8 2 = a + 16
29 - 16 = 9; a = 13

S_n
= $^{n}/_{2}$[2a + (n - 1)d]

= $^{60}/_{2}$[2 x 13 + (60 - 1)2]

= 30[26 + 118]

= 30 144
= 4,320

16. Find the sum of the first 25 terms of the sequence 11, 15, 19, 23, 27.....

A. 2,050

B. 1,112

C. 3,657

D. 1,475

The correct answer is option [D]

S_n = Sum of terms in A.P

S_n = $^{n}/_{2}$[2a + (n - 1)d]
where a = 11,
d = 4, n = 25

S_n = $^{25}/_{2}$[2 11 + (25 - 1) 4]

= $^{25}/_{2}$[22 + 24 4]
=
$^{25}/_{2}$[22 + 96]
S_n = 1,475

17. A particular term of a sequence is represented by the formula 3 2^{n+2}. What is the sum of the fifth and sixth terms?

A. 4, 932

B. 2, 342

C. 1, 899

D. 1, 152

The correct answer is option [D]

18. What is the product of the 9^{th} and 12^{th} terms of a sequence when the n^{th} term equals $4n^2 - 2^{n-1}$.

A. -1,472

B. -100,096

C. -20,480

D. -14720

The correct answer is option [B]

19. Find the nth term for the sequence 3, 12, 27, 48, 75...

A. $2n^2$

B. 4n

C. $2n^3$

D. $3n^2$

The correct answer is option [D]

$T_1 = 3$
$T_2 = 12$
$T_3 = 27$, etc.
The common factor is 3, hence the n^{th} term = $3n^2$.

20. Find the sum of the sum of the series $n^2 + 5n$ up to the 4^{th} term.

A. 45

B. 80

C. 98

D. 105

The correct answer is option [B]

21. Find the sum of the 9 terms of the sequence 4, 20, 100, 500, _____.

A. 1,953,124

B. 1,534,231

C. 936,532

D. 789,345

The correct answer is option [A]

$S_n = a(r^n - 1)/_{r-1}$

r = 5; a = 4

Therefore $S_9 = 4(5^9 - 1)/_{5-1} = 4(1953 - 1)/_4 = 1{,}953{,}124$.

22. The third term of a G.P is 63 while its fifth term is 567. What is the sum of its first seven terms?

A. 10,234

B. 8,459

C. 7,651

D. 6,905

The correct answer is option [C]

$T_3 = ar^2 = 63$---------- (1)

$T_5 = ar^4 = 567$ ---------- (2)

Divide (2) by (1)

$^{567}/_{63} = ar^4/ar^2$

r^2
$= 9 ; r = 3$

Put *r* into equation (1) to get *a*
$63 = a \quad 3^2 = 9a$

$a = {}^{63}/_{9} = 7$

Therefore $S_7 = 7(3^7 - 1)/_{3-1}$

$=$
$^{7(2187-1)}/_{2}$

$S_7 = 7{,}651$

TOPIC: SET THEORY

DIRECTION: Choose the correct answers from the lettered options.

1. Given U = [x : x is an integer and 1 x 30]. A = [x : x is a multiple of 4], B = [x : x is a multiple of 5], C = [x : x is a multiple of 3], an integer is picked at random, find the probability that it is a multiple of 5 and 4.

A. $^{6}/_{25}$

B. $^{7}/_{90}$

C. $^{7}/_{150}$

D. $^{1}/_{15}$

The correct answer is option [C]. Solution: U = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30];

A = [Multiple of 4] = [4, 8, 12, 16, 20, 24, 28] = $^{7}/_{30}$;

B = [Multiple of 5] = [5, 10, 15, 20, 25, 30] = $^{6}/_{30}$ = $^{1}/_{5}$;

C = [Multiple of 3] = [3, 6, 9, 12, 15, 18, 21, 24, 27, 30] = $^{10}/_{30}$ = $^{1}/_{3}$.

Find the probability of the multiple of 5 and 4.

P[Multiple of 5 and 4] = [Multiple of 5] = $^{1}/_{5}$ and [Multiple of 4] = $^{7}/_{30}$,

therefore, P[Multiple of 5 and 4] = $^{1}/_{5}$ $^{7}/_{30}$ = $^{7}/_{150}$.

2. U = [1, 2, 3, ,..., 20], list the numbers of [multiple of 5].

A. [1, 5, 10, 15, 20]

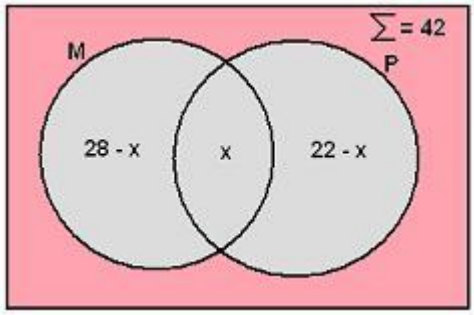
B. [6, 9, 12, 16]

C. [5, 10, 15, 20]

D. [5, 15, 20, 25]

The correct answer is option [C]. Solution: U = [1, 2, 3,..., 20]. Therefore, multiple of 5 = [5, 10, 15, 20].

3. In a group of 42 students, each student offers at least one of mathematics and physics. If 22 students offer physics and 28 offer mathematics, find how many students offer physics only.



A. 15

B. 16

C. 14

D. 10

The correct answer is option [C]. Solution: Hint [Draw the venn diagram to illustrate the question]. 28 - x + x + 22 - x = 42; 50 - x = 42, therefore, x = 50 - 42 = 8. The number of students that offer physics only is 22 - 8 = 14.

4. If E = [a, b, c, d, e, f, g, h]; X = [a, d, f, h] and Y = [d, e, g]. Find X' n Y'. From question find X'nY'.

A. [b, c, g]

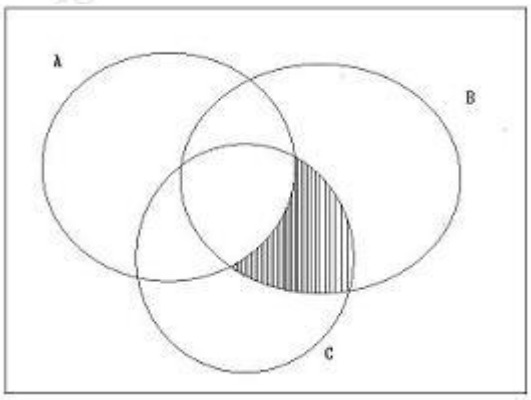
B. [c, f, g]

C. [c, f, h]

D. [b, c]

The correct answer is option [D]. Solution: X' = [b, c, e, g], Y' = [a, b, c, f, h]. Therefore, X'nY' = {b, c].

5. The shaded portion in the diagram is



A AxCxB

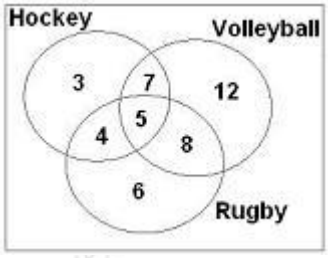
B. AxBxC'

C. BxCxA

D. BxCxA'

The correct answer is option [D]. Solution: Use the diagram to solve the question.

6. The Venn diagram shows a class of 60 students with the games they play. How many of the students play two games only?



A. 15

B. 23

C. 14

D. 19

The correct answer is option [D]. Solution: N [two games only] = 4 + 7 + 8 = 19.

7. In a class of 50 students, 25 play chess, 17 play squash and 13 do not play any game at all. Find the number of students who play both chess and squash.

A. 6

B. 3

C. 9

D. 5

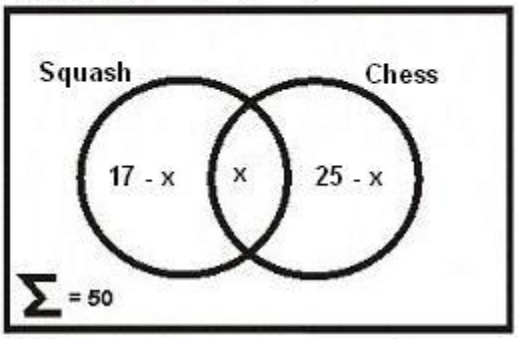
The correct answer is option [D].

Solution: Let the number of students that play both games be x

17 - x + x + 25 - x + 13 = 50

55 - x = 50

Therefore, x = 55 - 50 = 5



8. In a class of 50 students, every student had to study Government or Economics or both. If 38 students studied Government and 28 studied Economics, how many students studied both subjects?

A. 16

B. 24

C. 28

D. 36

The correct answer is option [A].

9. Which of the following is a pythagorean triplet?

A. [3, 7, 11]

B. [6, 17, 19]

C. [3, 4, 5]

D. [4, 9, 6]

The correct answer is option [C]. Solution: Hint [Use the pythagoras equation] This equation, there is no decimal. Also the square of the two numbers added together must equal the square of the third number.

10. Given two sets X and Y. n[X] = 15 and n[Y] = 10. The universal set = 20. Find the value of n[AnB] [i.e. the smallest possible value].

A. 10

B. 6

C. 5

D. 7

The correct answer is option [C]. Solution: [15 - x] + x + [10 - x] = 20 → 15 - x + x + 10 - x = 20. Therefore, x = 25 - 20 = 5.

11. Given that U = [3, 4, 5, 6, 7, 8]; A = [6, 7, 8], B = [3, 5, 6] and C = [5, 6, 7]. Find A' B' C'.

A. 3

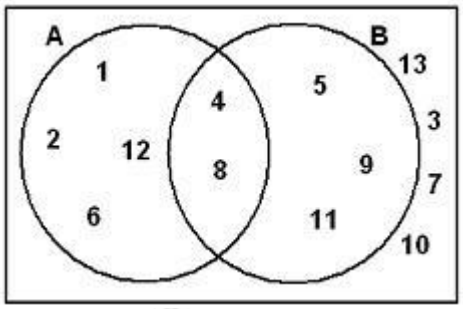
B. 5

C. 6

D. 4

The correct answer is option [D]. Solution: A' = [3, 4, 5], B' = [4, 7, 8], C' = [3, 4, 8]. Therefore, A' B' C' = [4].

12. From the diagram, what is AnB?



A. [3, 2, 1]

B. [4, 8]

C. [6, 2]

D. [5, 9, 11]

The correct answer is option [B]. Solution: A B = [4, 8] as shown from the diagram.

13. Given U = [SHARPENZLY], A = [RAPEN] and B = [SHAZLY]. Find A' and B'.

A. A' = [SHLY]; B' = [PENR]]

B. A' = [SHZLY]; B' = [NPR]

C. A' = [SHYZ]; B' = [REP]

D. A' = [SHZLY]; B' = [RPEN]

The correct answer is option [D]. Solution: A' = [SHZLY] AND B' = [RPEN] since A = [RAPEN] and B = [SHAZLY].

14. A = [9, 10, 11, 12, 13, 14, 15, 16], B = [9, 12, 15], and C = [10, 12, 16]. Find [A B] C.

A. [9, 10, 12, 15, 16]

B. [9, 11, 12, 15, 16]

C. [9, 12, 14, 15, 16]

D. [9, 13, 14, 15, 16]

The correct answer is option [C]. Solution:
Hint [C' is not in C, but in the universal set]. A B C'.

15. If E = [a, b, c, d, e, f, g, h]; X = [a, d, f, h] and Y = [d, e, g]. Find X' Y'. From question find X' Y'.

A. [b, c, g]

B. [c, f, g]

C. [c, f, h]

D. [b, c]

The correct answer is option [D]. Solution: X' = [b, c, e, g], Y' = [a, b, c, f, h]. Therefore, X' Y' = {b, c].

16. Given the universal set U. U = [2, 4, 6, 8, 10, 12] and A = [2, 4, 6, 8], B = [6, 8, 10], C = [4, 8, 12]. Find [A B].

A. [6, 8]

B. [8, 10]

C. [2, 8]

D. [10, 12]

The correct answer is option [A]. Solution: Hint [What is common to A and B]. A = [2, 4, 6, 8]; B = [6, 8, 10]. Therefore, AnB = [6, 8].

17. U = [1, 2, 3, ..., 20], list the numbers of [multiple of 5].

A. [1, 5, 10, 15, 20]

B. [6, 9, 12, 16]

C. [5, 10, 15, 20]

D. [5, 15, 20, 25]

The correct answer is option [C]. Solution: U = [1, 2, 3, ..., 20]. Therefore, multiple of 5 = [5, 10, 15, 20].

18. Given the universal set U. U = [2, 4, 6, 8, 10, 12] and A = [2, 4, 6, 8], B = [6, 8, 10], C = [4, 8, 12]. Find AU[BUC].

A. [2, 4, 6, 10]

B. [4, 6, 12]

C. [2, 8, 12]

D. [2, 4, 6, 8, 10, 12]

The correct answer is option [D]. Solution: [BUC] = [4, 6, 8, 10, 12], then AU[BUC] = [2, 4, 6, 8, 10, 12]

19. U = [25, 26, 27, 28, ..., 50], D = [x : x 42], and E = [x : x prime number]. Find EnD'.

A. [50]

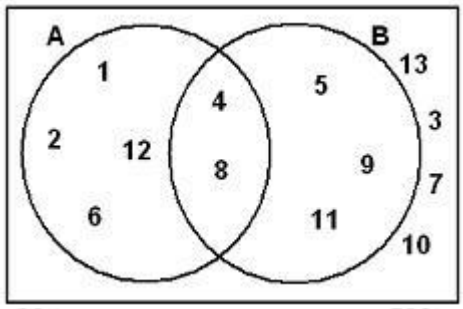
B. [29, 31, 44, 46]

C. [32, 33, 38]

D. [O]

The correct answer is option [D].

20. From the diagram, what is AnB?



A. [3, 2, 1]

B. [4, 8]

C. [6, 2]

D. [5, 9, 11]

The correct answer is option [B]. Solution: AnB = [4, 8] as shown from the diagram.

21. If U = [11, 12, 13, 14, 15, 16, 17, 18, 19, 20]; A = [12, 13, 15], B = [13, 16, 19, 20]. Find A' B'. From the information given, find A' U B'.

A. [12, 13, 15, 16, 19, 20]

B. [11, 12, 14, 15, 16, 17, 18, 19, 20]

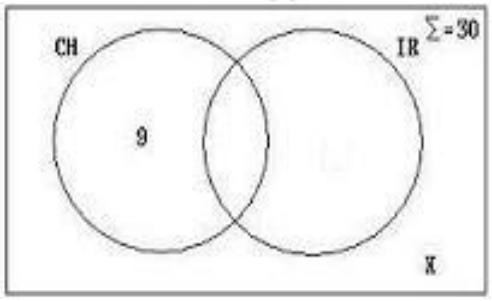
C. [12, 13, 14, 15, 16, 17, 18, 19, 20]

D. [11, 12, 13, 14, 15, 16, 17, 19, 20]

The correct answer is option [B]. Solution: Hint [Elements in both A' and B' without repetition].

A'UB' = [11, 12 , 14, 15, 16, 17, 18, 19, 20].

22. In a social gathering of 30 elites, 9 drink champagne, 15 drink irish cream and 6 drink both champagne and irish cream. How many do not drink either champagne or irish cream?



A. 15

B. 9

C. 12

D. 6

The correct answer is option [C]. Solution: Let the number elites that don't drink either champagne and irish cream be y. A venn diagram is drawn. Total number of elites is 30. Number of elites that drink only champagne is 9 - 6 [i.e. number of elites that drink both champagne and irish cream] = 3. The number of elites that drink only irish cream is 15 - 6 = 9. Then 3 + 6 + 9 + y = 30 18 + y = 30. Therefore, y = 30 - 18 = 12.