IMO-Style · Original Practice Content

# Class 6 | Mathematics Olympiad

40 Questions · With Answer Key
Syllabax Olympiad Series
syllabax.com

**Instructions:** Each question has one correct answer. Choose the best option (A/B/C/D). Answer key is provided at the end. This paper is for practice only — not an official exam paper. Recommended time: **45 minutes**.

**Q1.** If α and β are the roots of $x^2 - 7x + 12 = 0$, what is $\alpha^2 + \beta^2$?

**A.** 13
**B.** 17
**C.** 25
**D.** 31

**Q2.** Factorize: $2x^2 + 5x + 3$

**A.** (2x+1)(x+3)
**B.** (2x+3)(x+1)
**C.** (2x−3)(x+1)
**D.** (x+3)(x+1)

**Q3.** If $\sin\theta = 4/5$ and $\cos\theta = 3/5$, what is $\sin 2\theta$?

**A.** 7/25
**B.** 16/25
**C.** 24/25
**D.** 12/25

**Q4.** How many real solutions does $|2x - 3| = 7$ have?

**A.** 0
**B.** 1
**C.** 2
**D.** 3

**Q5.** A circle has center O(2, 3) and passes through A(5, 7). What is its radius?

**A.** 3
**B.** 4
**C.** 5
**D.** 6

**Q6.** If $f(x) = 3x^2 - 2x + 1$, what is $f(2) - f(-1)$?

**A.** 1
**B.** 2
**C.** 3
**D.** 4

**Q7.** The sum of first n terms of an AP is $S_n = 2n^2 + n$. What is the common difference?

**A.** 2
**B.** 4
**C.** 6
**D.** 8

**Q8.** How many positive integers up to 100 are coprime to 100? (Euler's φ(100))

**A.** 20 **B.** 30

**C.** 40 **D.** 50

**Q9.** What is the area enclosed by the rectangle with vertices (0,0), (4,0), (4,3), (0,3)?

**A.** 8 **B.** 10

**C.** 12 **D.** 14

**Q10.** Solve: $(x - 1)/(x + 2) = 2/3$

**A.** 5 **B.** 6

**C.** 7 **D.** 8

**Q11.** In how many ways can 5 boys and 3 girls be seated in a row if all 3 girls must sit together?

**A.** 2160 **B.** 4320

**C.** 8640 **D.** 720

**Q12.** In a circle, what is the central angle subtended by a chord equal in length to the radius?

**A.** 30° **B.** 45°

**C.** 60° **D.** 90°

**Q13.** A GP has first term 2 and common ratio 3. What is the sum of the first 5 terms?

**A.** 162 **B.** 182

**C.** 242 **D.** 254

**Q14.** A bag has 3 white and 5 black balls. Two drawn without replacement. P(exactly one white) = ?

**A.** 3/8 **B.** 5/14

**C.** 15/28 **D.** 3/14

**Q15.** Find the median of: 3, 5, 7, 9, 11, 13, 15, 17

**A.** 9 **B.** 10

**C.** 11 **D.** 12

**Q16.** The quadratic $ax^2 + bx + c = 0$ has equal roots when $b^2$ equals:

**A.** 2ac
**B.** 4ac
**C.** ac/4
**D.** 8ac

**Q17.** What is the distance between the points (1, 2) and (4, 6)?

**A.** 3
**B.** 4
**C.** 5
**D.** 6

**Q18.** In how many distinct ways can the letters of BANANA be arranged?

**A.** 30
**B.** 60
**C.** 120
**D.** 360

**Q19.** What is the sum of the GP $1 + 2 + 4 + 8 + \ldots + 2^9$?

**A.** 512
**B.** 1023
**C.** 1024
**D.** 2046

**Q20.** Evaluate: $1/(1+\sqrt{2}) + 1/(\sqrt{2}+\sqrt{3}) + 1/(\sqrt{3}+\sqrt{4}) + \ldots + 1/(\sqrt{8}+\sqrt{9})$

**A.** 1
**B.** 2
**C.** $\sqrt{2}$
**D.** 3

**Q21.** What is $\varphi(36)$? (Euler's totient — count of integers $\leq 36$ coprime to 36)

**A.** 8
**B.** 10
**C.** 12
**D.** 14

**Q22.** A chord of length 8 cm is at a perpendicular distance of 3 cm from the center. What is the radius?

**A.** 4 cm
**B.** 5 cm
**C.** 6 cm
**D.** 7 cm

**Q23.** If $a + b + c = 0$, what is the value of $a^3 + b^3 + c^3$?

**A.** 0
**B.** abc
**C.** 3abc
**D.** $a^2 + b^2 + c^2$

**Q24.** P(passes) = 2/3. P(passes | studied) = 4/5. P(studied) = 3/4. What is P(studied AND passes)?

**A.** 1/2 **B.** 3/5
**C.** 2/3 **D.** 4/5

**Q25.** How many diagonals does a decagon (10-sided polygon) have?

**A.** 25 **B.** 30
**C.** 35 **D.** 40

**Q26.** What is the standard deviation of 2, 4, 6, 8, 10?

**A.** 2 **B.** $2\sqrt{2}$
**C.** 4 **D.** 6

**Q27.** Find the sum: $1\times2 + 2\times3 + 3\times4 + \ldots + 10\times11$

**A.** 360 **B.** 400
**C.** 440 **D.** 480

**Q28.** What is the value of the infinite nested radical $\sqrt{(6 + \sqrt{(6 + \sqrt{(6 + \ldots)})})}$?

**A.** 2 **B.** 3
**C.** 4 **D.** 6

**Q29.** Evaluate: $\log_2 8 + \log_3 27 + \log_5 125$

**A.** 6 **B.** 9
**C.** 12 **D.** 15

**Q30.** ABCD is a cyclic quadrilateral with angle A = 70°. What is angle C?

**A.** 90° **B.** 100°
**C.** 110° **D.** 120°

**Q31.** In how many distinct ways can 2 red, 2 blue, and 2 green balls be arranged in a row?

**A.** 60 **B.** 90
**C.** 120 **D.** 180

**Q32.** What is the value of $i^{41} + i^{-41}$ where $i = \sqrt{(-1)}$?

**A.** $-2$ **B.** $-1$

**C.** $0$ **D.** $1$

**Q33.** For what positive value of k does $3x^2 - kx + 3 = 0$ have equal roots?

**A.** 3 **B.** 4

**C.** 5 **D.** 6

**Q34.** What is the slope of the line through (2, 3) and (5, 9)?

**A.** 1 **B.** 2

**C.** 3 **D.** 4

**Q35.** A sphere of radius r is inscribed in a cube. What is the surface area of the cube?

**A.** $12r^2$ **B.** $24r^2$

**C.** $36r^2$ **D.** $48r^2$

**Q36.** If α and β are roots of $x^2 - 3x + 2 = 0$, what is $\alpha^2 + \beta^2$?

**A.** 3 **B.** 4

**C.** 5 **D.** 7

**Q37.** A number from 1 to 30 is chosen at random. P(divisible by 3 but NOT by 5) = ?

**A.** 1/3 **B.** 4/15

**C.** 3/10 **D.** 1/5

**Q38.** If α and β are roots of $2x^2 - 5x + 3 = 0$, what is $1/\alpha + 1/\beta$?

**A.** 3/5 **B.** 5/2

**C.** 5/3 **D.** 2/3

**Q39.** A fair coin is tossed 4 times. What is the probability of getting exactly 2 heads?

**A.** 1/4 **B.** 5/16

**C.** 3/8 **D.** 1/2

**Q40.** Two lines y = 2x + 3 and y = 2x − 5 are:

**A.** Parallel

**B.** Perpendicular

**C.** Coincident

**D.** Intersecting

## Answer Key

Q1: C  Q2: B  Q3: C  Q4: C  Q5: C  Q6: C  Q7: B  Q8: C  Q9: C  Q10: C

Q11: B  Q12: C  Q13: C  Q14: C  Q15: B  Q16: B  Q17: C  Q18: B  Q19: B

Q20: B  Q21: C  Q22: B  Q23: C  Q24: B  Q25: C  Q26: B  Q27: C  Q28: B

Q29: B  Q30: C  Q31: B  Q32: C  Q33: D  Q34: B  Q35: B  Q36: C  Q37: B

Q38: C  Q39: C  Q40: A