Complete Solutions to Intro(b)

1. (a) $8^2 = 8 \times 8 = 64$

(b) $8^3 = 8 \times 8 \times 8 = 512$ (by calculator).

(c) Use the x^y button on your calculator:

$$8^8 = \underbrace{8 \times 8 \times \ldots \times 8}_{8 \text{ copies}} = 16777216$$

(d) $45^2 = 2025$

(e) $264^2 = 264 \times 264 = 69696$

(f) Any number to the index 0 is equal to 1, so $20001^0 = 1$.

(g) Use your calculator. To evaluate $(-3)^5$ on a calculator, PRESS:

(-) 3 x^y 5 = shows -243.

(Odd power of a negative number gives a negative number).

2. (a) Since $7 \times 7 = 49$ and $(-7) \times (-7) = 49$, so

$$\pm\sqrt{49} = \pm 7 \quad (+7 \text{ or } -7)$$

(b) On calculator $\pm\sqrt{1681} = \pm 41$.

(c) Similarly $\sqrt{183184} = 428$.

(d) Use the $\sqrt[3]{\ }$ button on your calculator. Hence

$$\sqrt[3]{2197} = 13$$

(e) $\sqrt[3]{729} = 9$

(f) Since we need the 4th (even) roots of 16, we have two numbers. Using a calculator, $\pm\sqrt[4]{16} = \pm 2$.

(g) To evaluate $\sqrt[4]{2401}$ on a calculator, PRESS;

4 SHIFT x^y 2401 = shows 7.

Hence

$$\sqrt[4]{2401} = 7$$

(h) Again, the calculator shows the 8th (even) root of 256 as 2. Are there any other roots?

Yes, -2. Hence

$$\pm\sqrt[8]{256} = \pm 2$$

(i) By using our calculator we have $\sqrt[5]{243} = 3$.

(j) What is $\sqrt[5]{-(243)}$ equal to?

Since we are interested in the 5th (odd) root of -243, it can only be one number, -3. Thus

$$\sqrt[5]{-(243)} = -3$$

That is

$$\underbrace{(-3) \times (-3) \times (-3) \times (-3) \times (-3)}_{5 \text{ copies}} = -243$$

3. For this question we have to first execute the arithmetic and then take the root of the result.

(a) $\sqrt{100 - 36} = \sqrt{64} = 8$

(b) $\sqrt{129 + 40} = \sqrt{169} = 13$

Use your calculator for the remaining parts of this question.

(c) $\sqrt{7225 - 5929} = \sqrt{1296} = 36$

(d) $\sqrt[4]{7225-5929}=6$

Note that on the calculator you have to place brackets, ( ), around (7225 - 5929) otherwise it calculates $\sqrt[4]{7225}-5929$. Remember the subtraction first and then the root.

(e) $500+500=1000,$ so

$$\sqrt[3]{500+500}=\sqrt[3]{1000}=10$$

(f) $-500-500=-1000,$ so

$$\sqrt[3]{-500-500}=\sqrt[3]{-1000}=-10$$

That is $(-10)\times(-10)\times(-10)=-1000$.

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4. In this question order does not matter. Easier to take root inside and then implement the multiplication or division.

(a) $\sqrt{16\times25}=\sqrt{16}\times\sqrt{25}=4\times5=20$

(b) Similarly $\sqrt{144\times81}=\sqrt{144}\times\sqrt{81}=12\times9=108$

(c) The same method applies to division:

$$\begin{aligned}\sqrt{\frac{144}{36}}&=\frac{\sqrt{144}}{\sqrt{36}}\\&=\frac{12}{6}\\&=12\div6\\&=2\end{aligned}$$

(d) We have

$$\sqrt{\frac{225}{25}}=\frac{\sqrt{225}}{\sqrt{25}}=\frac{15}{5}=3$$

For (e) and (f) use your calculator. Remember to place brackets around $\left(\frac{7776}{243}\right)$. The output from the calculator should show 2 and -2 for (e) and (f) respectively.
