Marking guide | Real numbers

Real numbers - Applications test

16 questions | 43 marks | 60 minutes

Use roots, pi, bounds and rounding to make practical decisions.

Equivalent correct methods earn the corresponding marks.

1. A square sign has area $144\ \text{cm}^2$. Find its side. [2 marks]

$s = \sqrt{144} = 12\ \text{cm}.$

Answer: $12\ \text{cm}.$

2. A square mosaic has area $30\ \text{cm}^2$. Is its exact side rational or irrational? [2 marks]

The side is $\sqrt{30}\ \text{cm}$; 30 is not a perfect square.

Answer: Irrational.

3. A gauge records $1.875\ \text{L}$. Write this as a simplified fraction of a litre. [2 marks]

$\frac{1875}{1000} = \frac{15}{8}.$

Answer: $\frac{15}{8}\ \text{L}.$

4. Two square mats have areas $45\ \text{cm}^2$ and $49\ \text{cm}^2$. Which has the longer side? Explain without a calculator. [2 marks]

Positive square roots increase as their inputs increase.

$\sqrt{49} = 7 > \sqrt{45}.$

Answer: The mat with area forty-nine square centimetres.

5. A square plot has area $380\ \text{m}^2$. Show its side is between 19 and 20 metres. [2 marks]

$361 < 380 < 400.$

Answer: $19 < \sqrt{380} < 20.$

6. Find the side of a square plot with area $380\ \text{m}^2$ to one decimal place. [2 marks]

$\sqrt{380} = 19.493588\ldots\ \text{m}.$

Answer: $19.5\ \text{m}.$

7. A square mat has area $63\ \text{cm}^2$. Can it lie flat inside a square opening of side $8\ \text{cm}$? Explain. [3 marks]

$\sqrt{63} < 8$ because $63 < 64 = 8^2$.

The mat is shorter than the opening along both dimensions.

Answer: Yes.

8. A circular pond has radius $2.5\ \text{m}$. Give its exact circumference. [2 marks]

$C = 2\pi(2.5) = 5\pi\ \text{m}$.

Answer: $5\pi\ \text{m}$.

9. Edging for the radius-$2.5\ \text{m}$ pond is sold in whole metres. Find the least length to buy. [3 marks]

$5\pi = 15.707963\ldots\ \text{m}$.

Round up to sixteen metres.

Answer: $16\ \text{m}$.

10. Show with squared rounding boundaries that $\sqrt{48}$ rounds to 6.9 to one decimal place. [3 marks]

$6.85^2 = 46.9225 < 48 < 48.3025 = 6.95^2$.

All values strictly between these boundaries round to six point nine.

Answer: $6.85 < \sqrt{48} < 6.95$.

11. A display rounds a positive length to $4.2\ \text{m}$ to one decimal place. State the interval of possible unrounded lengths. [3 marks]

The rounding boundaries are 0.05 below and above 4.2.

The upper endpoint rounds to four point three and is excluded.

Answer: $4.15 \le s < 4.25\ \text{m}$.

12. A square has exact area $18\ \text{m}^2$. Does its side round to $4.2\ \text{m}$ to one decimal place? Explain. [3 marks]

$4.15^2 = 17.2225 < 18 < 18.0625 = 4.25^2$.

The side $\sqrt{18}$ lies between the rounding boundaries.

Answer: Yes.

13. A route formula is $L=\sqrt{p^2+q^2}$. For $p=15\ \text{km}$ and $q=8\ \text{km}$ calculate L and check by squaring. [3 marks]

$L=\sqrt{225+64}=\sqrt{289}=17\ \text{km}.$

$17^2=289.$

Answer: $17\ \text{km}.$

14. A square garden has area $80\ \text{m}^2$. Edging costs 6.50 dollars per metre and is sold in any length. Find the total cost to the nearest cent. [4 marks]

Length $=4\sqrt{80}=35.777087\ldots\ \text{m}.$

Cost $=6.50(4\sqrt{80})=232.551069\ldots$ dollars.

Answer: 232.55 dollars.

15. A student enters $60\div 2\times\pi$ for $r=\frac{60}{2\pi}$. [3 marks]

(a) Explain the bracket error. [2 marks]

The entry computes $(\frac{60}{2})\pi$, rather than $\frac{60}{2\pi}$.

Answer: The whole denominator must be grouped.

(b) Give the correct radius to two decimal places. [1 mark]

$\frac{60}{2\pi}=9.549296\ldots.$

Answer: 9.55 units.

16. A square has area $17\ \text{m}^2$. A builder rounds the side to $4.1\ \text{m}$ before finding the perimeter. How much smaller is this estimate than the exact perimeter, to two decimal places? [4 marks]

True perimeter $=4\sqrt{17}=16.492422\ldots\ \text{m}.$

Estimate $=4(4.1)=16.4\ \text{m}.$

Difference $=0.092422\ldots\ \text{m}.$

Answer: $0.09\ \text{m}.$