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 cm^2. Find its side. [2 marks]

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

Answer: 12 cm.

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

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

Answer: Irrational.

3. A gauge records 1.875 L. Write this as a simplified fraction of a litre. [2 marks]

$1875/1000 = 15/8$.

Answer: 15/8 L.

4. Two square mats have areas 45 cm^2 and 49 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 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 m^2 to one decimal place. [2 marks]

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

Answer: 19.5 m.

7. A square mat has area 63 cm^2. Can it lie flat inside a square opening of side 8 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 m. Give its exact circumference. [2 marks]

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

Answer: 5π m.

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

$5\pi = 15.707963\ldots$ m.

Round up to sixteen metres.

Answer: 16 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 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: $4.15 \le s < 4.25$ m.

12. A square has exact area 18 m^2. Does its side round to 4.2 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 $p = 15$ km and $q = 8$ km calculate L and check by squaring. [3 marks]

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

$17^2 = 289$.

Answer: 17 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 $= 4\sqrt{80} = 35.777087\ldots$ 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 $r = 60/(2\pi)$. [3 marks]

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

The entry computes $(60/2)\pi$, rather than $60/(2\pi)$.

Answer: The whole denominator must be grouped.

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

$60/(2\pi) = 9.549296\ldots$

Answer: 9.55 units.

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

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

Estimate $= 4(4.1) = 16.4$ m.

Difference $= 0.092422\ldots$ m.

Answer: 0.09 m.