

WA3 Practice Paper

Pythagoras' theorem, similarity, mensuration and statistics

35 marks | Suggested time: 55 minutes

Name: Class: Date:

Answer all questions. Show your working. A scientific calculator may be used. Give non-exact answers to 3 significant figures unless stated otherwise.

School WA topic coverage may differ. Suggested solutions start after the question paper.

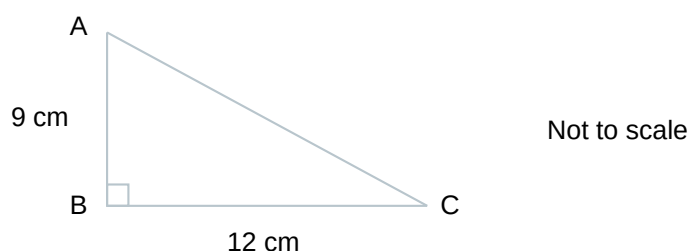
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1. Right-angled triangle [3 marks]

Triangle ABC is right-angled at B. $AB = 9$ cm and $BC = 12$ cm.

(a) Find AC. [2]

(b) Find the area of triangle ABC. [1]



Answer: [3]

2. Ladder against a wall [4 marks]

A ladder 6.5 m long rests against a vertical wall on horizontal ground. Its foot is 2.5 m from the wall.

(a) Find the height reached by the ladder. [2]

(b) The foot is moved 1.4 m farther from the wall. Find the new height reached, correct to 3 significant figures. [2]

Answer: [4]

3. Similar triangles [4 marks]

Triangles ABC and PQR are similar, with A corresponding to P, B to Q and C to R.

$AB = 6$ cm, $BC = 8$ cm and $AC = 10$ cm. $PQ = 9$ cm.

(a) Find QR. [2]

(b) Find the ratio of the area of ABC to the area of PQR. [2]

Answer: [4]

4. Map scale [4 marks]

A map has a scale of 1 : 25 000.

(a) A path measures 7.2 cm on the map. Find its actual length in kilometres. [2]

(b) A park has actual area 0.50 km². Find its area on the map in cm². [2]

Answer: [4]

5. Cylinder [4 marks]

A closed cylindrical tin has radius 3.5 cm and height 12 cm. Give answers to 3 significant figures.

(a) Find its volume. [2]

(b) Find its total surface area. [2]

Answer: [4]

6. Cone and capacity [5 marks]

A right circular cone has radius 6 cm and vertical height 8 cm.

(a) Find its slant height. [2]

(b) Find its curved surface area, correct to 3 significant figures. [1]

(c) A container of this shape is filled to 75% of its total capacity. Find the volume of liquid in cm³, correct to 3 significant figures. [2]

Answer: [5]

7. Frequency table [5 marks]

The table shows the number of books read by 20 students in one month.

Books	0	1	2	3	4
Frequency	2	5	7	4	2

(a) Find the mean number of books read. [2]

(b) Find the median. [1]

(c) One student is chosen at random. Find the probability that the student read at least 3 books. [2]

Answer: [5]

8. A missing observation [6 marks]

Five positive whole numbers in ascending order are 4, 7, 9, 12, k , where $k \geq 12$.

Their mean is 10.

(a) Find k . [2]

(b) Find the median and range of the five numbers. [2]

(c) A sixth number is added. The new mean is 11. Find the added number and the new median. [2]

Answer: [6]

End of question paper

WA3 Suggested Worked Solutions

Use these solutions after attempting the paper. Other mathematically valid methods may be accepted. The mark allocations are suggestions for this practice paper, not an official school marking scheme.

1. Right-angled triangle [3]

(a) $AC^2 = 9^2 + 12^2 = 225$, so $AC = 15$ cm.

$$(b) \text{ Area} = \frac{1}{2} \times 9 \times 12 = 54 \text{ cm}^2.$$

Suggested marking: (a) 1 theorem, 1 length; (b) 1 area.

Watch out: AC is the hypotenuse opposite the right angle.

2. Ladder against a wall [4]

(a) Height = $\sqrt{6.5^2 - 2.5^2} = \sqrt{36} = 6$ m.

(b) New horizontal distance = $2.5 + 1.4 = 3.9$ m.

New height = $\sqrt{6.5^2 - 3.9^2} = \sqrt{27.04} = 5.20$ m.

Suggested marking: Each part: 1 Pythagoras calculation, 1 height.

Watch out: The ladder length stays constant.

3. Similar triangles [4]

(a) Scale factor from ABC to PQR = $9 \div 6 = 1.5$.

QR = $8 \times 1.5 = 12$ cm.

(b) Length ratio ABC:PQR = 2:3. Area ratio = $2^2:3^2 = 4:9$.

Suggested marking: Each part: 1 ratio/scale method, 1 answer.

Watch out: Square the length ratio to get the area ratio.

4. Map scale [4]

(a) Actual length = $7.2 \times 25\,000 = 180\,000$ cm = 1.8 km.

(b) $0.50 \text{ km}^2 = 5\,000\,000\,000 \text{ cm}^2$.

Map area = $5\,000\,000\,000 \div 25\,000^2 = 8 \text{ cm}^2$.

Suggested marking: Each part: 1 scale method, 1 answer with units.

Watch out: Area scale factors are squared; $1 \text{ km}^2 = 10^{10} \text{ cm}^2$.

5. Cylinder [4]

(a) $V = \pi r^2 h = \pi(3.5)^2(12) = 147\pi = 462 \text{ cm}^3$ (3 s.f.).

(b) $A = 2\pi r^2 + 2\pi r h = 24.5\pi + 84\pi = 108.5\pi = 341 \text{ cm}^2$ (3 s.f.).

Suggested marking: Each part: 1 correct formula/substitution, 1 rounded answer.

Watch out: A closed tin includes both circular ends.

6. Cone and capacity [5]

(a) Slant height $= \sqrt{6^2 + 8^2} = 10 \text{ cm}$.

(b) Curved area $= \pi r l = \pi(6)(10) = 60\pi = 188 \text{ cm}^2$.

(c) Cone volume $= \frac{1}{3} \times \pi \times 6^2 \times 8 = 96\pi \text{ cm}^3$.

Liquid volume $= 0.75(96\pi) = 72\pi = 226 \text{ cm}^3$.

Suggested marking: (a) 1 method, 1 length; (b) 1; (c) 1 cone volume, 1 liquid volume.

Watch out: Curved surface area uses slant height; volume uses vertical height.

7. Frequency table [5]

(a) Total books $= 0(2) + 1(5) + 2(7) + 3(4) + 4(2) = 39$.

$$\text{Mean} = \frac{39}{20} = 1.95 \text{ books.}$$

(b) The 10th and 11th values are both 2; median = 2 books.

$$(c) P(\text{at least } 3) = \frac{4 + 2}{20} = \frac{3}{10}.$$

Suggested marking: (a) 1 weighted total, 1 mean; (b) 1; (c) 1 favourable count, 1 probability.

Watch out: Use frequencies when finding the mean and locating the median.

8. A missing observation [6]

(a) Total = $5 \times 10 = 50$. Therefore $k = 50 - (4 + 7 + 9 + 12) = 18$.

(b) Median = 9; range = $18 - 4 = 14$.

(c) New total = $6 \times 11 = 66$. Added number = $66 - 50 = 16$.

Ordered list: 4, 7, 9, 12, 16, 18. New median = $(9 + 12) \div 2 = 10.5$.

Suggested marking: (a) 1 total, 1 k; (b) 1 each; (c) 1 added value, 1 new median.

Watch out: Reorder the data before finding the new median.