

M7 PAPER A

ANSWERS

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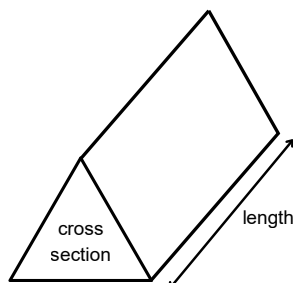
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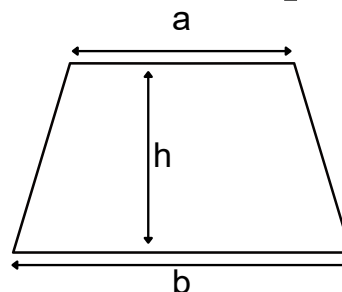


Formula Sheet

Volume of prism = area of cross section $\times$ length

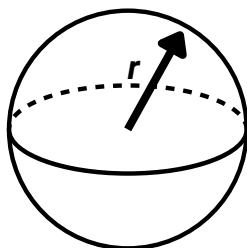


Area of a trapezium = $\frac{1}{2}(a + b)h$



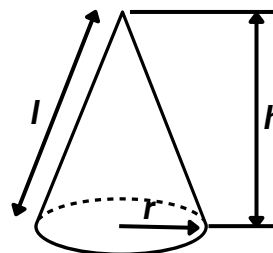
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

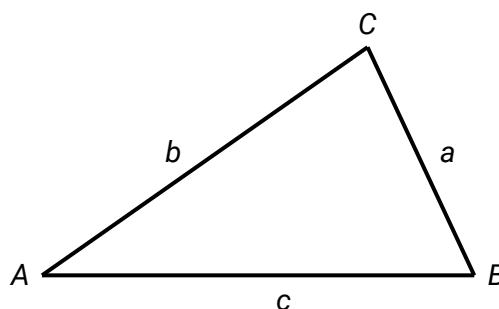


Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

In any triangle ABC



Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle: $\frac{1}{2}ab \sin C$



- 1 A square has sides of length 4×10^4 m.



What is the area of the square? Give your answer in standard form.

$$(4 \times 10^4) \times (4 \times 10^4)$$

$$4 \times 4 \times 10^{4+4}$$

$$16 \times 10^8$$

$(\div 10) \quad \times 10$

$$1.6 \times 10^9$$

Answer 1.6×10^9 [3]

- 2 a) Simplify $(2x^{-3})^2$

$$2^2 x^{-3 \times 2}$$

$$4x^{-6}$$

Answer $4x^{-6}$ [2]

- b) Evaluate 2^{-3}



$$\left(\frac{1}{2}\right)^3 = \frac{1^3}{2^3} = \frac{1}{8}$$

Answer $\frac{1}{8}$ [2]



3 a) Make x the subject of $y = \sqrt[3]{x} + 4$

$$\begin{aligned} & \quad \quad \quad -4 \quad \quad -4 \\ y - 4 &= \sqrt[3]{x} \\ (y - 4)^3 &= x \end{aligned}$$

Answer $x = (y - 4)^3$ [2]

b) Make x the subject of $y + 4x = 5 - ax$

$$\begin{aligned} & \quad \quad \quad +ax \quad \quad +ax \\ y + 4x + ax &= 5 \\ -y \quad \quad \quad -y \\ 4x + ax &= 5 - y \\ x(4 + a) &= 5 - y \\ x &= \frac{5 - y}{4 + a} \end{aligned}$$

Answer $x = \frac{5 - y}{4 + a}$ [3]

4 Find an expression for the nth term of the sequence:

3, 6, 11, 18, 27

2nd diff = +2
So n^2

	T	3	6	11	18	27
$-n^2$	1	4	9	16	25	
	2	2	2	2	2	

$\begin{matrix} \text{+3} & \text{+6} & \text{+7} & \text{+9} \\ \text{+2} & \text{+2} & \text{+2} & \end{matrix}$

Answer $n^2 + 2$ [3]



5 Solve the simultaneous equations.

$$2x + 3y = 53 \quad \textcircled{1}$$

$$3x - y = 19 \quad \textcircled{2}$$

Do not use trial and improvement.

You must show your working.

$$\begin{array}{r} \textcircled{1} + 3 \textcircled{2} \\ 2x + 3y = 53 \\ + (9x - 3y = 57) \\ \hline 11x = 110 \\ x = 10 \\ \text{Sub } x=10 \text{ into } \textcircled{1} \text{ to find } y \\ 2(10) + 3y = 53 \\ 20 + 3y = 53 \\ 3y = 33 \\ y = 11 \\ \text{Sub } x=10, y=11 \text{ into } \textcircled{2} \text{ to check} \\ 3(10) - (11) = 19 \\ 30 - 11 = 19 \\ 19 = 19 \checkmark \end{array}$$

Answer $x = 10$ $y = 11$ [4]

6 A student is choosing an outfit.

They have:

- 5 T-shirts
- 3 pairs of trousers
- 2 pairs of shoes

How many different outfits can they make?

$$5 \times 3 \times 2$$

Answer 30 [2]



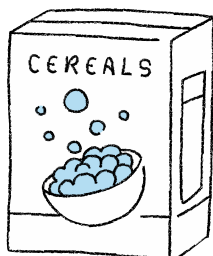
7 Two cereal boxes are mathematically similar.

The surface area of the smaller box is 200 cm^2 .

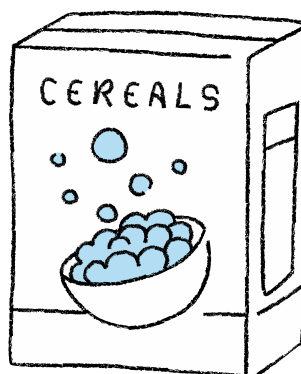
The surface area of the larger box is 450 cm^2 .

The volume of the smaller box is 320 cm^3 .

Find the volume of the larger box.



- Surface Area 200 cm^2
- Volume 320 cm^3



- Surface Area 450 cm^2

$$\text{SA SF} = \frac{450}{200} = \frac{9}{4}$$

$$\text{Linear SF} = \sqrt{\frac{9}{4}} = \frac{3}{2}$$

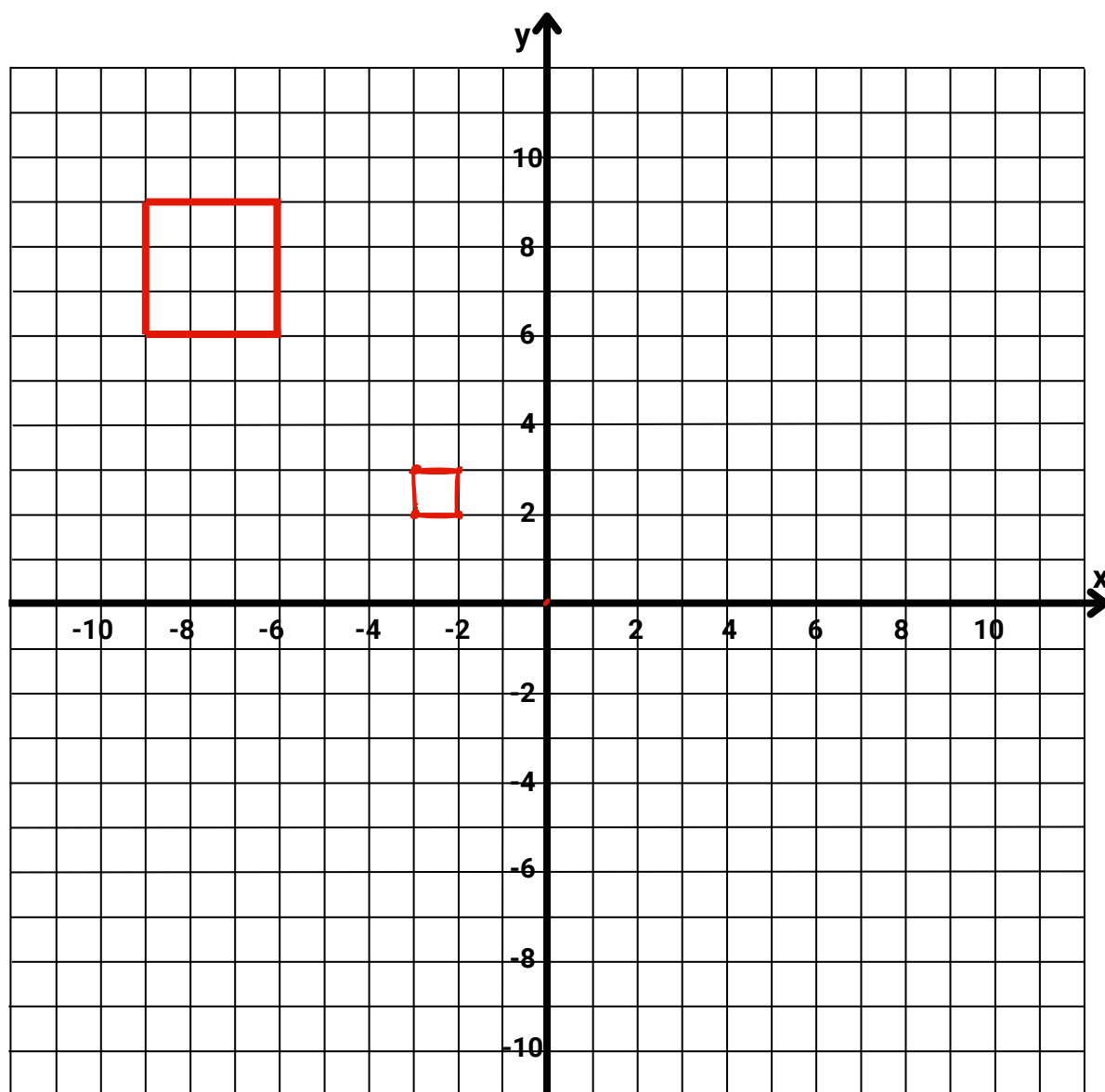
$$\text{Volume SF} = \left(\frac{3}{2}\right)^3 = \frac{27}{8}$$

$$320 \times \frac{27}{8} = 1080 \text{ cm}^3$$

Answer 1080 cm^3 [3]



- 8 Enlarge the shape by scale factor $\frac{1}{3}$ about the origin.



[3]



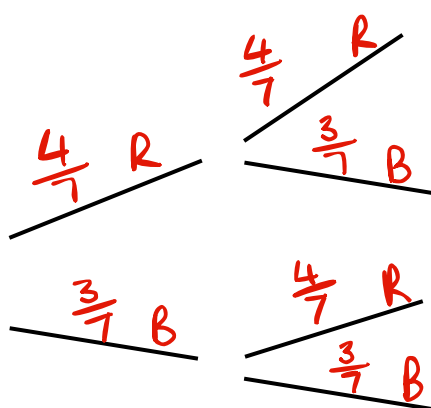
- 9 A bag contains 4 red counters and 3 blue counters.



A counter is chosen at random, its colour is recorded, and then it is replaced.

A second counter is then chosen.

- a) Complete the tree diagram and label all probabilities.



[2]

- b) Find the probability of getting two red counters

$$RR = \left(\frac{4}{7} \times \frac{4}{7}\right) = \frac{16}{49}$$

Answer $\frac{16}{49}$ [1]

- c) Find the probability of getting at least one blue.

$$1 - P(RR)$$

$$1 - \frac{16}{49} = \frac{33}{49}$$

Answer $\frac{33}{49}$ [2]



9

A sphere has a radius of 3cm.

Find the volume of the sphere.

Give your answer in terms of π .



$$\frac{4}{3} \pi r^3$$

$$\frac{4}{3} \pi \times 3^3$$

$$\frac{4}{3} \pi \times 27$$

$$\frac{4}{3} \times 27 \times \pi \text{ cm}^3$$

$$36\pi \text{ cm}^3$$

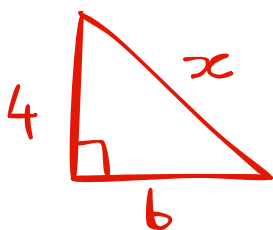
Answer $36\pi \text{ cm}^3$ [3]

10

A right angled triangle has sides of 4cm and 6cm.

Find the length of the hypotenuse.

Give your answer in simplest surd form.



$$x^2 = 4^2 + 6^2$$

$$= 16 + 36$$

$$= 52$$

$$x = \sqrt{52}$$

$$= \sqrt{4} \sqrt{13}$$

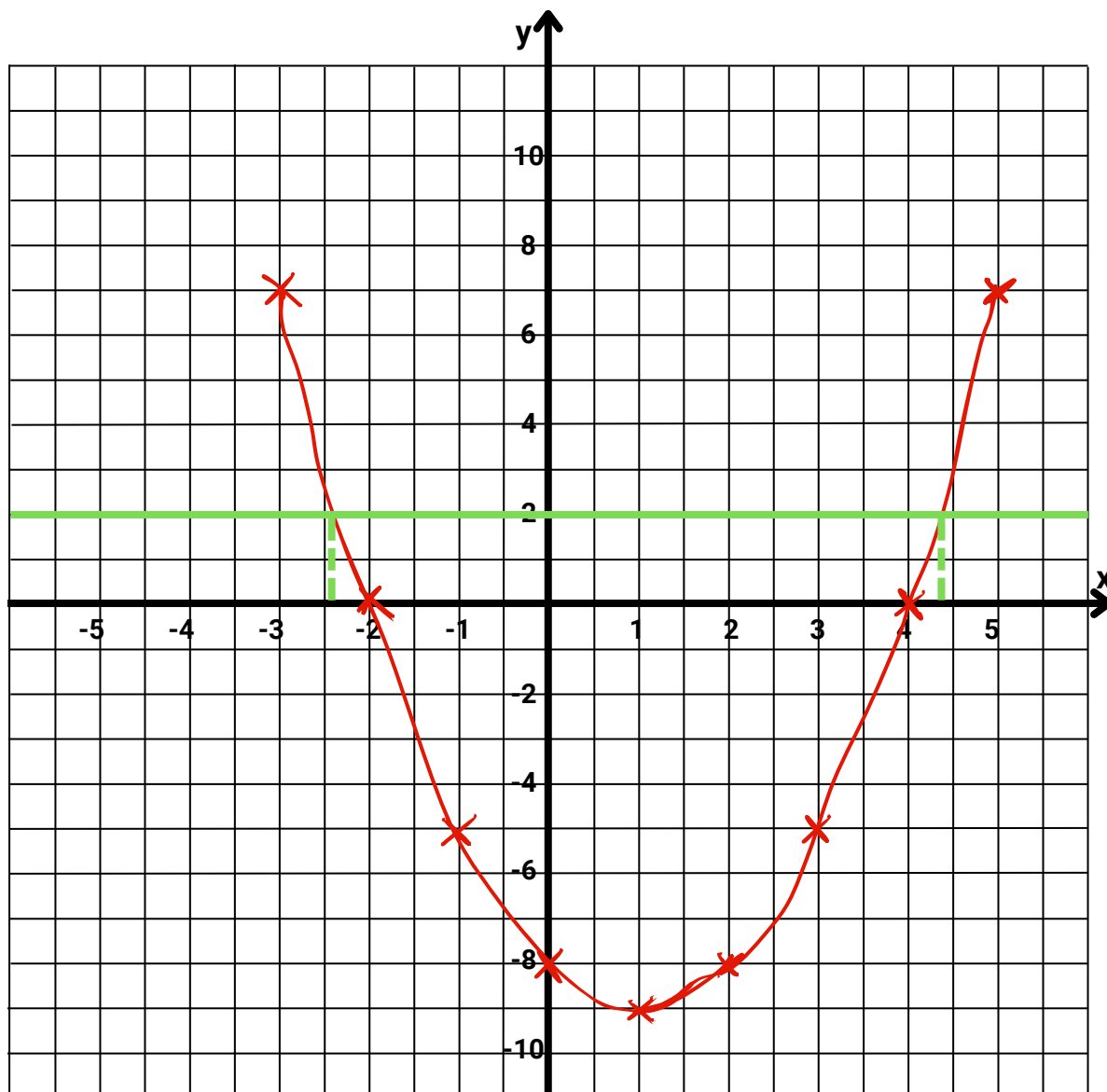
$$= 2\sqrt{13}$$

Answer $2\sqrt{13} \text{ cm}$ [3]



- 11 a) Draw the graph of $y = x^2 - 2x - 8$

x	-3	-2	-1	0	1	2	3	4	5
y	7	0	-5	-8	-9	-8	-5	0	7



[2]

- b) Use your graph to solve: $2 = x^2 - 2x - 8$

Draw $y = 2$

Answer $x = -2.4$ and $x = 4.4$ [2]



12

T varies as the square of y.
When $y = 4$, $T = 48$

- a) Express T in terms of y.

$$\begin{aligned} T &\propto y^2 \\ T &= ky^2 \\ 48 &= k(4)^2 \\ 48 &= 16k \\ 3 &= k \end{aligned}$$

$$T = 3y^2$$

Answer $T = 3y^2$ [3]

- b) Find a value of y for which $T = 75$

$$\begin{aligned} T &= 3y^2 \\ 75 &= 3y^2 \\ 25 &= y^2 \\ 5 &= y \end{aligned}$$

Answer 5 [2]



13

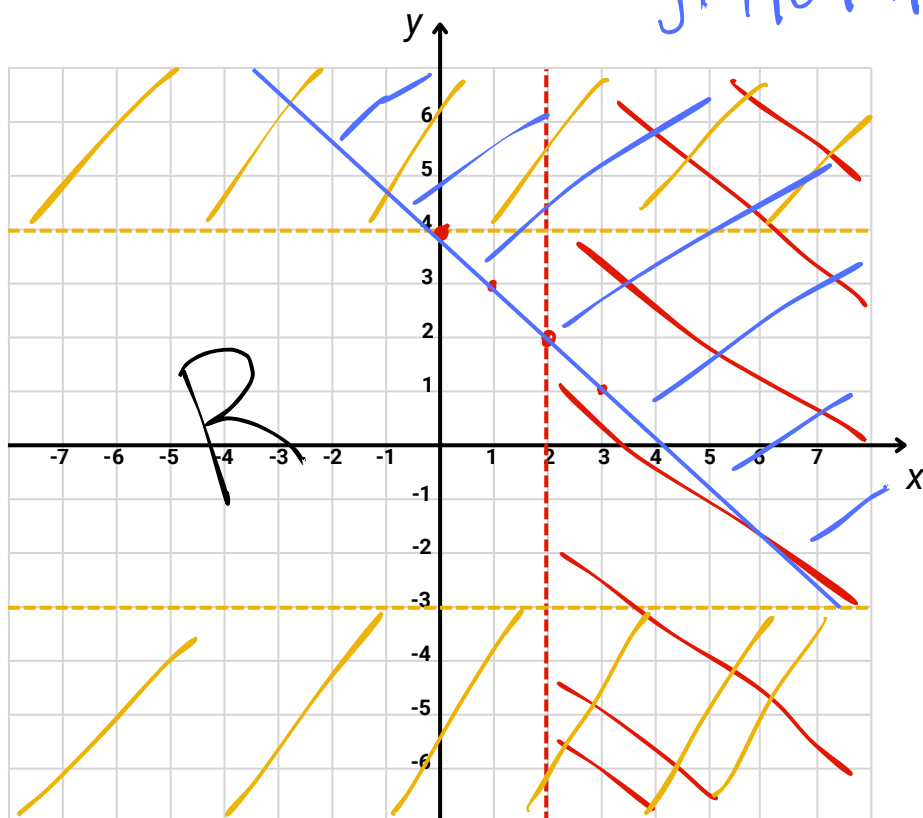
On the grid, show the region that satisfies all of the following inequalities

$x < 2$

$-3 < y < 4$

$y \leq -x + 4$

x	0	1	2	3
y	4	3	2	1



Test (0,0) $y \leq -x + 4$
 $0 \leq -0 + 4$
 $0 \leq 4$ Yes

[3]