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MATHEMATICS **0580/21**

Paper 2 Non-calculator (Extended) **May/June 2026**

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

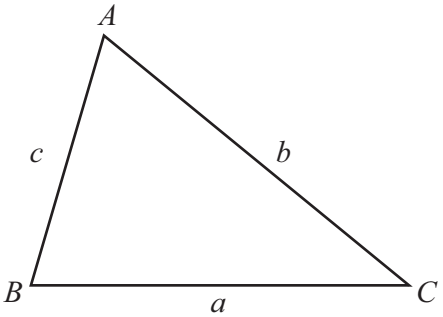
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List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



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

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

$$\text{Area} = \frac{1}{2}ab\sin C$$

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Calculators must **not** be used in this paper.

1 Write down the value of 143^0.

$143^0 = 1$

Examii Insight Any number (except 0) to the power 0 is 1.

.....1..... [1]

2 Solve $7x + 4 = 25$.

Remove the +4 (keep it balanced)

$7x + 4 = 25$

$7x + 4 - 4 = 25 - 4$

$7x = 21$

Remove the 7 from 7x

$\frac{7x}{7} = \frac{21}{7}$

$x = 3$

$\therefore x = 3$

Examii Insight

01 Remove the +4 (keep it balanced)
- To remove +4 on the left, we minus 4.
- To be fair, we must also minus 4 on the right.
- Both sides stay balanced.

02 Remove the 7 from 7x
- 7x means 7 × x, so we divide by 7.
- Divide the right side by 7 too, to keep it fair.

$x =$ .....3..... [2]

3 Find the value of $4x^2 + 3y$ when $x = 5$ and $y = 10$.

Substitute

$4(5)^2 + 3(10) = 4 \times 25 + 30$

$= 100 + 30 = 130$

$\therefore$ 130

Examii Insight

01 Substitute
- Square first: $5^2 = 25$, then × 4 (BIDMAS).

.....130..... [2]

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4



NOT TO SCALE

The diagram shows a rectangle with width 6 cm.

The width of the rectangle is $\frac{1}{12}$ of the perimeter of the rectangle.

Work out the length of the rectangle.

Perimeter

$\frac{1}{12} \times$ perimeter $= 6$

perimeter $= 6 \times 12 = 72$

Length

$2(L + 6) = 72$

$L + 6 = 36 \Rightarrow L = 30$

$\therefore$ 30 cm

Examii Insight

01 Perimeter
- The width is one twelfth of the perimeter.

02 Length
- Perimeter = 2 × (length + width).

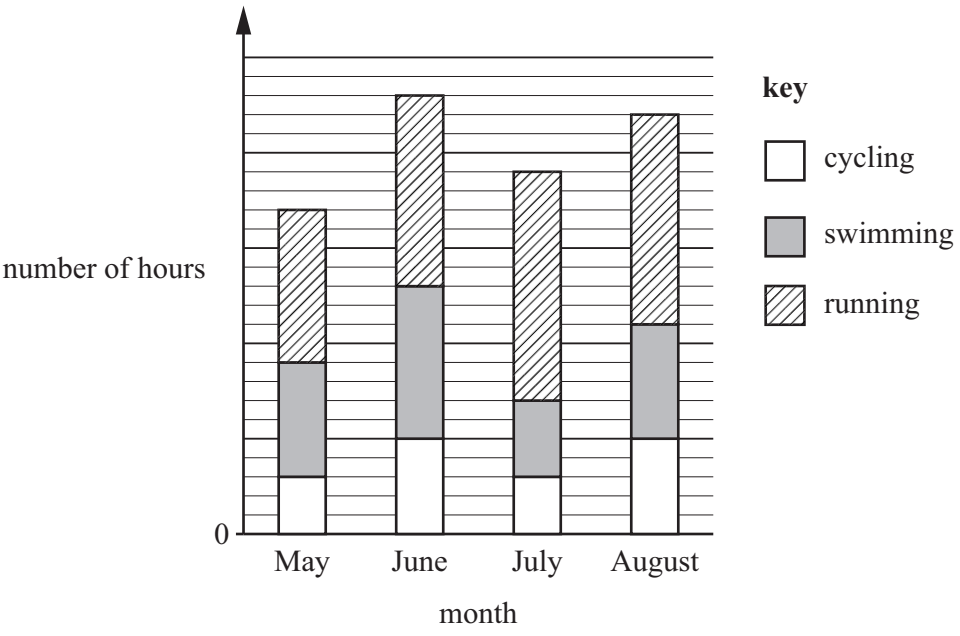
30 cm [2]

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5 For four months, Hannah records the amount of time that she spends swimming, running and cycling.

The composite bar chart shows this information.



Examii Insight
01 Find the scale
- In May, swimming is 3 squares more than cycling.
- July swimming is 4 squares.

(a) Complete the statement with the correct month.

Hannah spends more time running in .....July..... than in any of the other months. [1]

Examii Insight The running (striped) section is longest in July.

(b) In May, Hannah spends 9 more hours swimming than she spends cycling.

Find the number of hours Hannah spends swimming in July.

Find the scale

3 squares = 9 h → 1 square = 3 h; July: 4 × 3 = 12 hours

.....12..... hours [2]

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6 Solve the simultaneous equations.

$$2x - y = 3$$
$$x + y = 12$$

Add to eliminate y

$3x = 15 \Rightarrow x = 5$

Substitute back

$5 + y = 12 \Rightarrow y = 7$

$\therefore$ $x = 5$, $y = 7$

Examii Insight

01 Add to eliminate y
- Adding the equations cancels –y and +y.

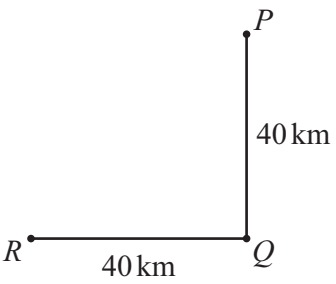
02 Substitute back
- Put x = 5 into the easier equation.

$x =$ 5

$y =$ 7

[2]

7



NOT TO SCALE

The diagram shows the positions of three ships P, Q and R.
Ship Q is 40 km due east of ship R.
Ship P is 40 km due north of ship Q.

Work out the bearing of ship R from ship P.

Direction from P

R is south-west of P

$180° + 45° = 225°$

$\therefore$ 225°

Examii Insight

01 Direction from P
- Equal distances (40 km and 40 km) → the angle with south is 45°.
- Bearings: clockwise from North, 3 figures.

225°

[2]

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8 P is the point (0, 4) and Q is the point (1, 8).

(a) Find the coordinates of the midpoint of PQ.

Average the coordinates

$\left(\frac{0+1}{2}, \frac{4+8}{2}\right) = (0.5, 6)$

Examii Insight

01 Average the coordinates
- Midpoint = mean of the x-values and of the y-values.

(.....0.5..... , ...6.....) [2]

(b) Find the vector $\overrightarrow{QP}$.

End – start

$\vec{QP} = \begin{pmatrix} 0-1 \\ 4-8 \end{pmatrix} = \begin{pmatrix} -1 \\ -4 \end{pmatrix}$

Examii Insight

01 End – start
- From Q to P: subtract Q from P.

$\overrightarrow{QP} = \begin{pmatrix} -1 \\ -4 \end{pmatrix}$ [2]

(c) The graph of $y = x^2 + ax + b$ passes through the points P and Q.
This graph also passes through the point $(-2, c)$.

Find the value of c.

Use P(0, 4)

$4 = 0 + 0 + b \Rightarrow b = 4$

Use Q(1, 8)

$8 = 1 + a + 4 \Rightarrow a = 3$

Find c

$c = (-2)^2 + 3(-2) + 4$

$= 4 - 6 + 4 = 2$

$\therefore c = 2$

Examii Insight

01 Use P(0, 4)
- Substitute x = 0, y = 4.

02 Use Q(1, 8)
- Substitute x = 1, y = 8.

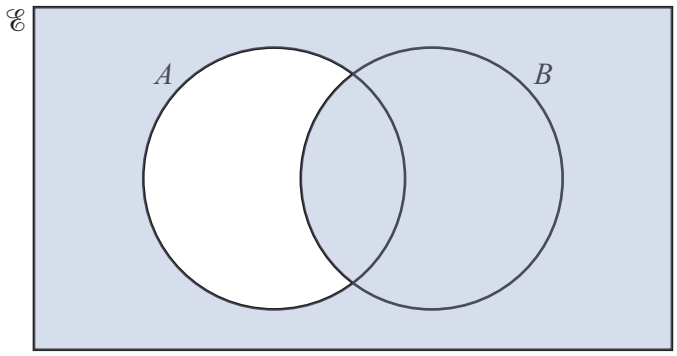
03 Find c
- Now $y = x^2 + 3x + 4$; put x = –2.

$c =$ .....2..... [4]

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9 In this Venn diagram, shade the region $A' \cup B$.



Examii Insight

01 A′ ∪ B
- A′ = everything outside A.
- ∪ B adds all of B back.
- Only "A but not B" stays white.

[1]

10 (a) $24\,192 = 2^7 \times 3^3 \times 7$

$245\,000 = 2^3 \times 5^4 \times 7^2$

Find the highest common factor (HCF) of 24 192 and 245 000.

Common primes, lowest powers

$2^3 \times 7 = 56$

$\therefore$ 56

Examii Insight

01 Common primes, lowest powers
- Only 2 and 7 are in both.
- Take the smaller power of each: 2^3 and 7^1.

56 ..... [1]

(b) A number, k, is written as a product of its prime factors.

$k = 2^3 \times 3^4 \times 5 \times c^2$

where c is a prime number greater than 5.

Write the number $20k^2$ as a product of its prime factors.
Give your answer in terms of c in its simplest form.

Square k, then × 20

$k^2 = 2^6 \times 3^8 \times 5^2 \times c^4$

$20 = 2^2 \times 5$

$20k^2 = 2^8 \times 3^8 \times 5^3 \times c^4$

Examii Insight

01 Square k, then × 20
- Squaring doubles every power.
- Add powers when multiplying the same prime.

$2^8 \times 3^8 \times 5^3 \times c^4$ ..... [2]

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11 **(a)** A, B and C are linear sequences.
The table gives some information about these sequences.

sequence	1st term	2nd term	3rd term	4th term	nth term
A	3	5	7	9	$2n + 1$
B	-4	-3	-2	-1	$B_n = n - 5$
C	-1	2	5	8	$3n - 4$

For these sequences, $C_n = A_n + B_n$.

Work out A_n, the nth term of sequence A.

nth term of C
$C_n = 3n - 4$

Subtract B
$A_n = C_n - B_n = (3n - 4) - (n - 5)$
$= 2n + 1$

$\therefore A_n = 2n + 1$

Examii Insight
01 nth term of C
- C goes up by 3: 3n, and 3 – 4 = –1 ✓.

02 Subtract B
- Rearrange $C_n = A_n + B_n$.
- Careful: –(–5) = +5.

$A_n =$ 2n + 1 ..... [3]

(b) These are the first five terms of another sequence.

$\frac{1}{2}$ 1 2 4 8

(i) Find the next term in this sequence.

Doubling
$8 \times 2 = 16$

$\therefore$ 16

Examii Insight
01 Doubling
- Each term is double the one before.

16 ..... [1]

(ii) Find the nth term of this sequence.

Powers of 2
$\frac{1}{2} = 2^{-1}$, $1 = 2^0$, $2 = 2^1$

nth term = 2^{n-2}

$\therefore 2^{n-2}$

Examii Insight
01 Powers of 2
- Term 1 is 2^{-1}, so the power is n – 2.

2^{n-2} ..... [2]

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12 The coordinates of A are (3, 20).
The coordinates of B are (5, 10).

Work out the gradient of AB.

Rise over run

$$\frac{10-20}{5-3} = \frac{-10}{2} = -5$$

$\therefore$ -5

Examii Insight

01 Rise over run
- Gradient = change in y ÷ change in x.
- Going down → negative.

-5 ..... [2]

13 **(a)** Work out.

$$0.9\dot{2}\dot{4} - 0.213$$

Give your answer as a decimal correct to 5 decimal places.

Write out the recurring decimal

$0.924242\ldots - 0.213 = 0.711242\ldots$

$\therefore$ 0.71124

Examii Insight

01 Write out the recurring decimal
- The dots mean 24 repeats.
- Then round to 5 decimal places.

0.71124 ..... [2]

(b) Write $0.6\dot{7}$ as a fraction.

Two equations

$10x = 6.777\ldots$

$100x = 67.777\ldots$

Subtract

$90x = 61$

$x = \frac{61}{90}$

$\therefore$ $\frac{61}{90}$

Examii Insight

01 Two equations
- Only the 7 recurs.

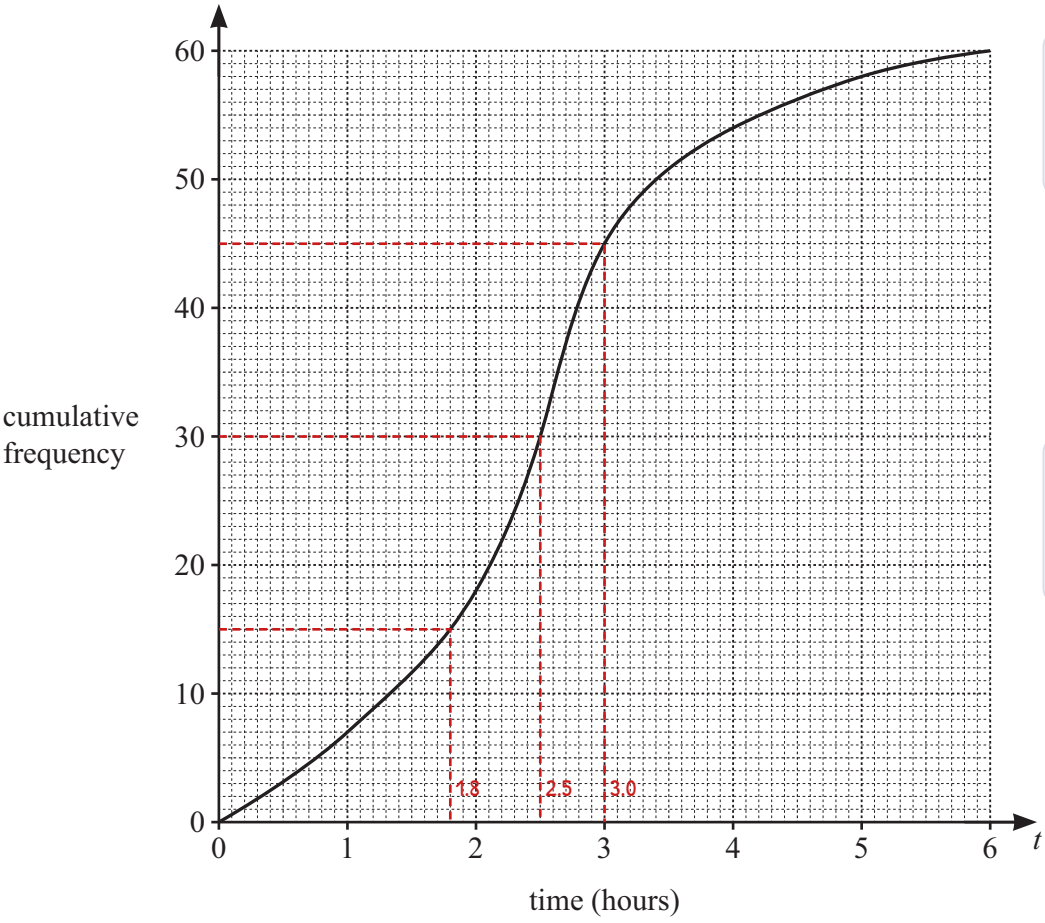
02 Subtract
- The recurring parts cancel.

$\frac{61}{90}$ ..... [2]

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14 The cumulative frequency diagram shows information about the amount of time 60 students spend watching television on one day.



Examii Insight
01 Median
- Half of 60 = 30.
- Across from 30, down: 2.5 h.

Examii Insight
01 IQR
- LQ at 15 → 1.8 h.
- UQ at 45 → 3.0 h.
- IQR = 3.0 – 1.8 = 1.2 h.

(a) Find an estimate for

(i) the median

2.5 hours [1]

(ii) the interquartile range.

1.2 hours [2]

(b) Use the cumulative frequency diagram to complete this frequency table.

time spent watching television (t hours)	$0 < t \leqslant 1$	$1 < t \leqslant 2$	$2 < t \leqslant 3$	$3 < t \leqslant 4$	$4 < t \leqslant 5$	$5 < t \leqslant 6$
frequency	7	11	27	9	4	2

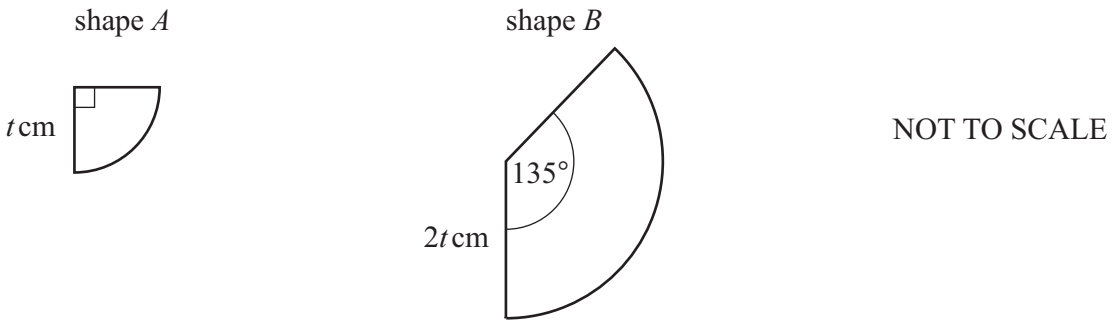
[2]

Examii Insight At t = 2 the total is 18 → 18 – 7 = 11. At t = 3 the total is 45 → 45 – 18 = 27. Check: 7 + 11 + 27 + 9 + 4 + 2 = 60 ✓

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15



Shape A is one quarter of a circle with radius t cm.
Shape B is a sector of a circle with radius $2t$ cm and sector angle 135°.
The area of shape B is k times the area of shape A.

Work out the value of k.

Area of A

$A = \frac{1}{4}\pi t^2$

Area of B

$B = \frac{135}{360} \times \pi(2t)^2 = \frac{3}{8} \times 4\pi t^2 = \frac{3}{2}\pi t^2$

Divide

$k = \frac{3}{2} \div \frac{1}{4} = 6$

$\therefore\ k = 6$

Examii Insight

01 Area of A
- Quarter of a circle with radius t.

02 Area of B
- $(2t)^2 = 4t^2$ — square the 2 as well.

03 Divide
- k = area B ÷ area A; πt^2 cancels.

$k =$ 6 [4]

16 Expand and simplify $(3x+a)(x+4a)$.

Four products

$3x^2 + 12ax + ax + 4a^2$

$= 3x^2 + 13ax + 4a^2$

$\therefore$ simplified ✓

Examii Insight

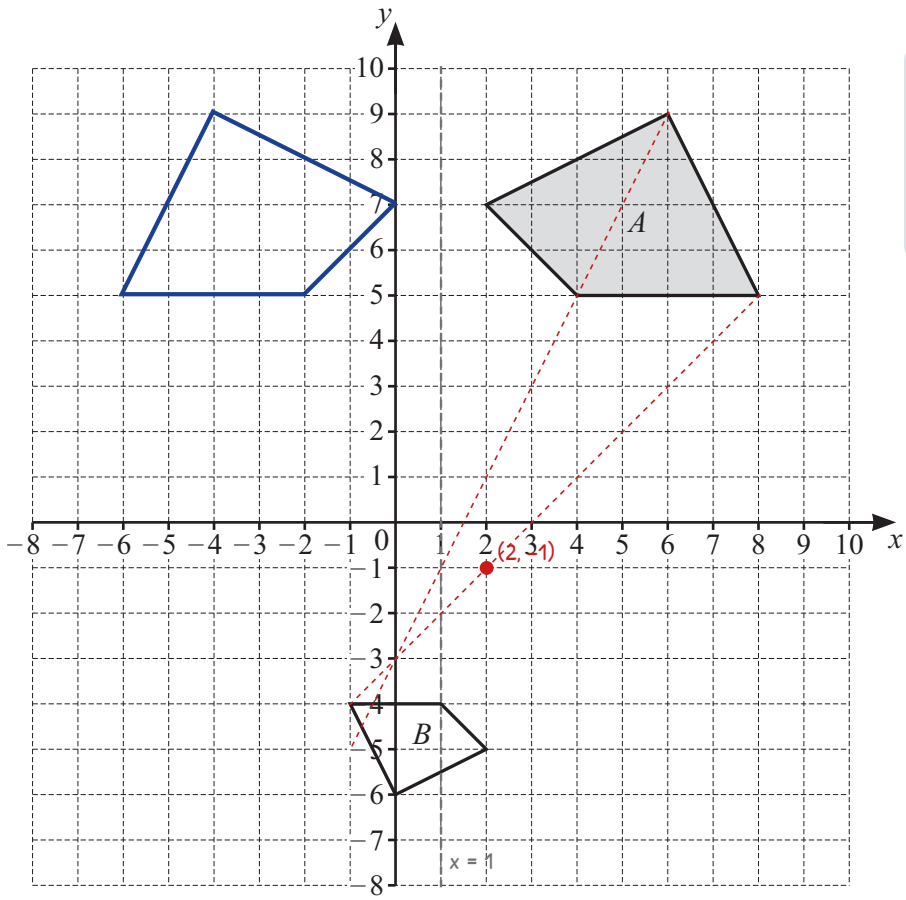
01 Four products
- Multiply each term in the first bracket by each in the second.

$3x^2 + 13ax + 4a^2$ [2]

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17 The diagram shows shape A and shape B drawn on a grid.



Examii Insight

01 Reflect in x = 1

- Each corner moves to the same distance on the other side of x = 1.
- Image: (0, 7), (−4, 9), (−6, 5), (−2, 5).

(a) On the grid, draw the image of shape A after a reflection in the line $x = 1$. [2]

(b) Describe fully the **single** transformation that maps shape A onto shape B.

Enlargement, scale factor $-\frac{1}{2}$

centre (2, −1) [3]

Examii Insight B is smaller and upside down → negative scale factor. Sides halve → factor −½. Join matching corners: they cross at (2, −1).

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18 $y = \sin 60° \times \tan 30°$.

Find the value of y.

Exact values

$\frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}} = \frac{1}{2}$

$\therefore\ y = \frac{1}{2}$

Examii Insight

01 Exact values
- sin 60° = √3 ÷ 2, tan 30° = 1 ÷ √3.
- The √3 cancels.

$y =$ $\frac{1}{2}$ [2]

19 $710\,000.03 = (7.1 \times 10^{a}) + (3 \times 10^{b})$

Find the value of a and the value of b.

Split the number

$710\,000 = 7.1 \times 10^{5}$

$0.03 = 3 \times 10^{-2}$

$\therefore\ a = 5,\ b = -2$

Examii Insight

01 Split the number
- Count how far the decimal point moves.
- Small numbers have negative powers.

$a =$ 5

$b =$ −2

[2]

20 Find the value of $27^{-\frac{2}{3}} \times (6^{4})^{0.5}$.

First part

$27^{-\frac{2}{3}} = \frac{1}{(\sqrt[3]{27})^{2}} = \frac{1}{9}$

Second part

$(6^{4})^{0.5} = 6^{2} = 36$

Multiply

$\frac{1}{9} \times 36 = 4$

$\therefore\ 4$

Examii Insight

01 First part
- Negative power → 1 over. Denominator 3 → cube root.

02 Second part
- Multiply the powers: 4 × 0.5 = 2.

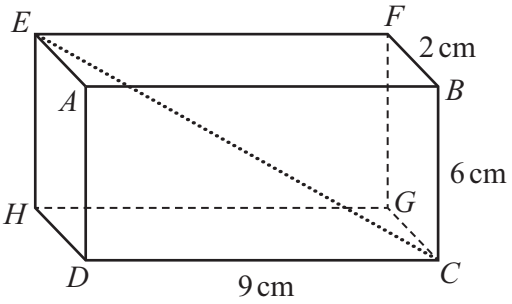
03 Multiply
- 36 ÷ 9 = 4.

4 [4]

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NOT TO SCALE

The diagram shows a solid cuboid $ABCDEFGH$.
$BF = 2$ cm, $BC = 6$ cm and $CD = 9$ cm.

(a) Calculate the volume of the cuboid.

Volume
$2 \times 6 \times 9 = 108$

Examii Insight
01 Volume
- Length × width × height.

108 ..... cm^3 [1]

(b) Calculate the surface area of the cuboid.

Three pairs of faces
$2(2 \times 6 + 2 \times 9 + 6 \times 9)$
$= 2(12 + 18 + 54) = 168$
$\therefore$ 168 cm^2

Examii Insight
01 Three pairs of faces
- A cuboid has 3 pairs of equal faces.

168 ..... cm^2 [3]

(c) Calculate CE.

3D Pythagoras
$CE = \sqrt{2^2 + 6^2 + 9^2}$
$= \sqrt{121} = 11$
$\therefore$ 11 cm

Examii Insight
01 3D Pythagoras
- Space diagonal = $\sqrt{(a^2 + b^2 + c^2)}$.

$CE =$ 11 ..... cm [3]

(d) The angle between CE and the base $CDHG$ is $x°$.

Find the value of $\sin x°$.

Right-angled triangle EHC
$\sin x = \frac{EH}{CE} = \frac{6}{11}$

Examii Insight
01 Right-angled triangle EHC
- EH is the height (6 cm) above the base.
- SOH: opposite ÷ hypotenuse.

$\frac{6}{11}$ ..... [2]

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22 The table shows some information about the lengths of 145 pieces of wire.

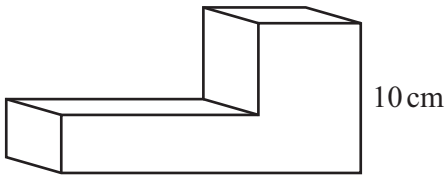
length (L cm)	$70 < L \leqslant 90$	$90 < L \leqslant 100$	$100 < L \leqslant 115$	$115 < L \leqslant 120$
frequency	40	35	45	25
height of bar in histogram (cm)	4	7	6	10

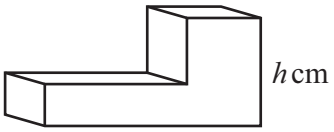
Stanley wants to draw a histogram to represent the information.

Complete the table. [3]

Examii Insight Height ∝ frequency ÷ width. First bar: 40 ÷ 20 = 2 → 4 cm, so height = 2 × fd. 35 ÷ 10 = 3.5 → 7; 45 ÷ 15 = 3 → 6; 25 ÷ 5 = 5 → 10.

23





NOT TO SCALE

The two solids are mathematically similar.
The volume of the larger solid is $64\,\text{cm}^3$ and the volume of the smaller solid is $27\,\text{cm}^3$.
The height of the larger solid is 10 cm and the height of the smaller solid is h cm.

Find the value of h.

Volume to length

$\frac{64}{27} \Rightarrow \frac{\sqrt[3]{64}}{\sqrt[3]{27}} = \frac{4}{3}$

Smaller height

$h = 10 \times \frac{3}{4} = 7.5$

$\therefore\ h = 7.5$

Examii Insight

01 Volume to length
- Length scale factor = cube root of volume scale factor.

02 Smaller height
- Smaller solid → multiply by ¾.

$h =$ 7.5 [3]

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24 **(a)** Find the coordinates of the turning points of the graph of $y = x^3 - 6x^2 + 7$.

Differentiate

$\frac{dy}{dx} = 3x^2 - 12x$

Set to zero

$3x(x - 4) = 0$

$x = 0$ or $x = 4$

Find y

$x = 0$: $y = 7$

$x = 4$: $y = 64 - 96 + 7 = -25$

$\therefore$ $(0, 7)$, $(4, -25)$

Examii Insight

01 Differentiate
- Bring down the power, reduce it by 1.

02 Set to zero
- Turning points have gradient 0.
- Factorise: 3x is common.

03 Find y
- Substitute into the ORIGINAL equation.

(.....0..... , ...7.....)

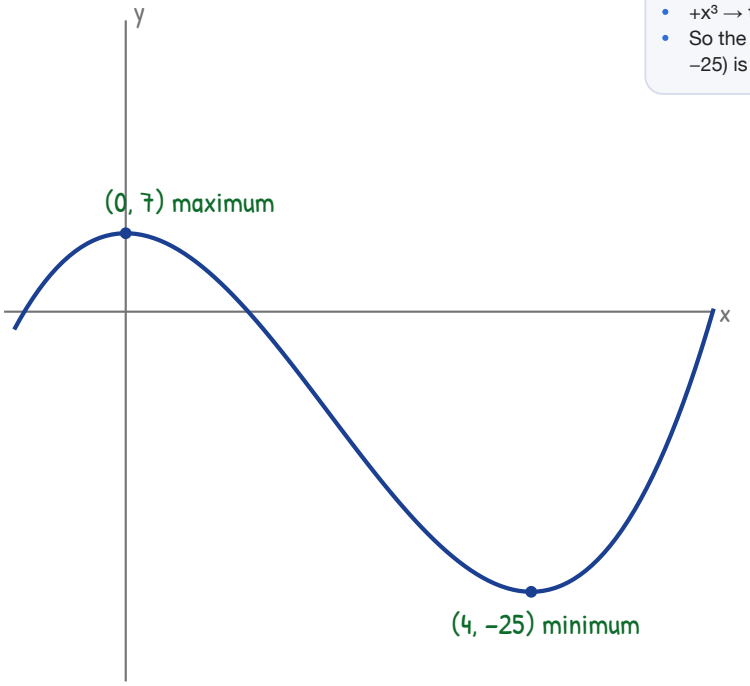
(.....4..... , ...−25.....)

[6]

(b) By drawing a suitable sketch, determine whether each turning point is a maximum or a minimum.

Examii Insight

01 Shape of a positive cubic
- $+x^3 \rightarrow$ the curve goes up on the right.
- So the first turning point (0, 7) is a maximum, the second (4, −25) is a minimum.

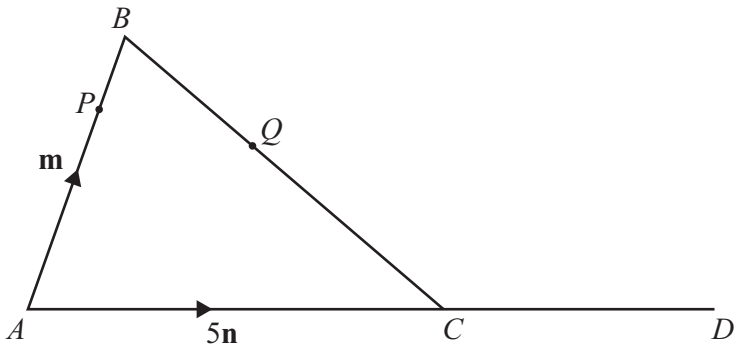


[3]

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NOT TO SCALE

The diagram shows triangle ABC and straight line ACD.
P lies on AB and $AP : PB = 4 : 1$.

Q lies on BC and $BQ = \frac{2}{5}BC$.

$\overrightarrow{AB} = \mathbf{m}$ and $\overrightarrow{AC} = 5\mathbf{n}$.

(a) In each part, give your answer in terms of **m** and **n** in its simplest form.

(i) Find $\overrightarrow{BC}$.

B to A to C

$\overrightarrow{BC} = -\mathbf{m} + 5\mathbf{n}$

Examii Insight

01 B to A to C

- Go back along AB, then along AC.

$\overrightarrow{BC} =$ $-\mathbf{m} + 5\mathbf{n}$ [1]

(ii) Find $\overrightarrow{PQ}$.

PB and BQ

$\overrightarrow{PB} = \frac{1}{5}\mathbf{m}$

$\overrightarrow{BQ} = \frac{2}{5}(5\mathbf{n} - \mathbf{m})$

Add

$\overrightarrow{PQ} = \frac{1}{5}\mathbf{m} + 2\mathbf{n} - \frac{2}{5}\mathbf{m}$

$= 2\mathbf{n} - \frac{1}{5}\mathbf{m}$

$\therefore 2\mathbf{n} - \frac{1}{5}\mathbf{m}$

Examii Insight

01 PB and BQ

- AP : PB = 4 : 1 → PB is 1/5 of AB.

02 Add

- Collect the m terms.

$\overrightarrow{PQ}$ $2\mathbf{n} - \frac{1}{5}\mathbf{m}$ [3]

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(b) $\overrightarrow{CD} = 3\mathbf{n}$

Show that P, Q and D lie on a straight line.

Find QD

$\vec{QD} = \frac{3}{5}(5\mathbf{n} - \mathbf{m}) + 3\mathbf{n}$

$= 6\mathbf{n} - \frac{3}{5}\mathbf{m} = 3\left(2\mathbf{n} - \frac{1}{5}\mathbf{m}\right)$

Compare

$\vec{QD} = 3\vec{PQ}$

parallel and share point Q

$\therefore$ P, Q, D collinear ✓

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01 Find QD
- QC is 3/5 of BC, then add CD.

02 Compare
- A multiple → parallel.
- A common point Q → same straight line.

[3]

Question 26 is on the back page.

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26 **(a)** Expand and simplify.

$$(5+\sqrt{2})(3-\sqrt{8})$$

Simplify √8

$\sqrt{8} = 2\sqrt{2}$

Expand

$(5+\sqrt{2})(3-2\sqrt{2})$

$= 15 - 10\sqrt{2} + 3\sqrt{2} - 4$

$= 11 - 7\sqrt{2}$

$\therefore\ 11 - 7\sqrt{2}$

Examii Insight

01 Simplify √8
- 8 = 4 × 2 and √4 = 2.

02 Expand
- √2 × 2√2 = 4.

$11 - 7\sqrt{2}$ [3]

(b) $\sqrt{2\frac{9}{20}} + \frac{6}{\sqrt{5}} = k\sqrt{5}$

Find the value of k.

First term

$\sqrt{\frac{49}{20}} = \frac{7}{2\sqrt{5}} = \frac{7\sqrt{5}}{10}$

Second term

$\frac{6}{\sqrt{5}} = \frac{6\sqrt{5}}{5} = \frac{12\sqrt{5}}{10}$

Add

$\frac{19\sqrt{5}}{10} = 1.9\sqrt{5}$

$\therefore\ k = 1.9$

Examii Insight

01 First term
- 2 9/20 = 49/20.
- √20 = 2√5, then rationalise.

02 Second term
- Multiply top and bottom by √5.

03 Add
- Same denominator → add the tops.

$k =$ 1.9 [4]

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