Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0123456789

MATHEMATICS (SYLLABUS D) **4024/01**

Paper 1 Non-calculator **For examination from 2025**

SPECIMEN PAPER **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 or correction fluid.
- 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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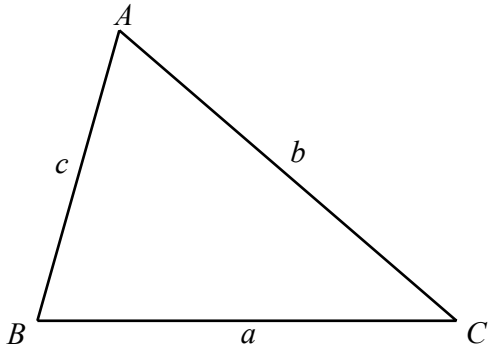
List of formulas

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 2.704 86 correct to 3 decimal places.

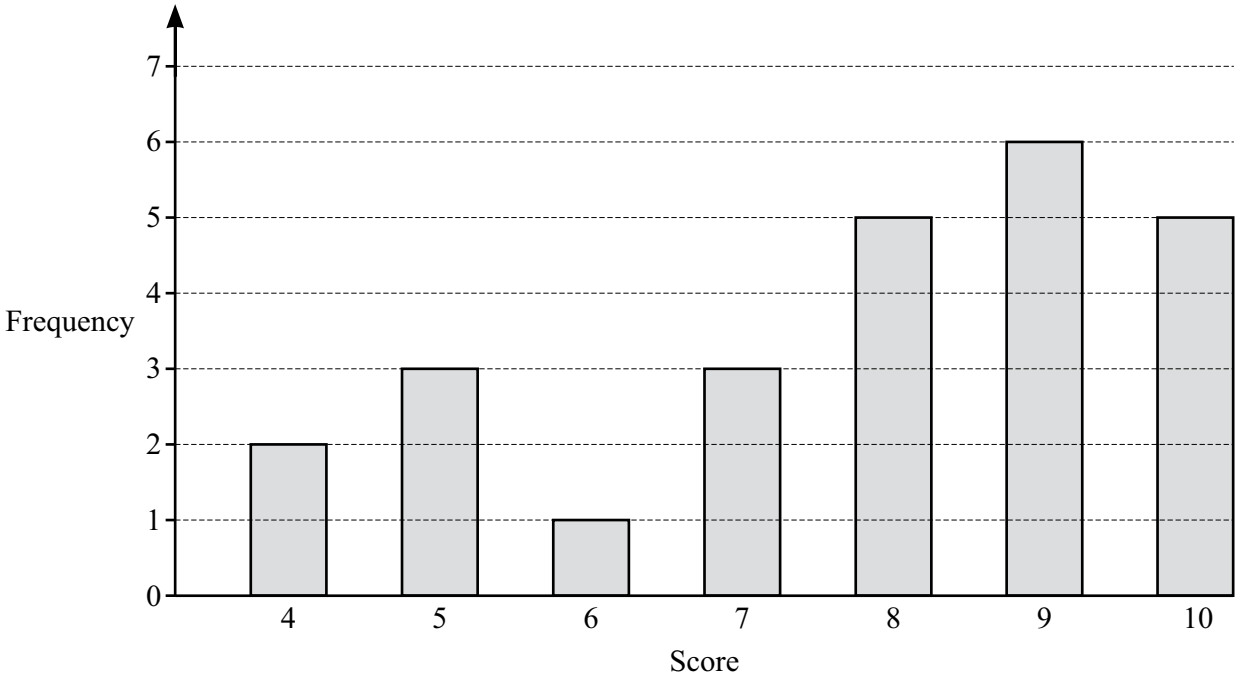
..... [1]

2 Simplify.

$10y - 2y + 5y$

..... [1]

3 The bar chart shows the marks scored by a group of students in a test.



(a) Write down the mode.

..... [1]

(b) Work out the total number of students in the group.

..... [1]

(c) Find the median score.

..... [1]

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4 The scale drawing shows the position of town A and town B.

Town B is due north of town A.
The scale of the drawing is 1 cm to 5 km.

Scale: 1 cm to 5 km

(a) Town C lies to the east of the line AB.
It is 25 km from A and 40 km from B.

Using a ruler and a pair of compasses only, construct the position of town C on the scale drawing. [3]

(b) Measure the bearing of town C from town A.

..... [1]

5 Write down the reciprocal of 9.

..... [1]

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6 Work out.

(a) 0.2×0.4

..... [1]

(b) $\frac{1}{3} + \frac{2}{3} \div \frac{7}{6}$

..... [3]

7 Factorise.

$12ab - 3a^2$

..... [2]

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8 Maya has a spinner with four sections numbered 1 to 4.

She spins the spinner 200 times.
Her results are shown in the table.

Number on spinner	1	2	3	4
Frequency	25	70	55	50

(a) (i) Write down the relative frequency of the spinner landing on 2.

..... [1]

(ii) Maya says that this relative frequency is a good estimate for the probability of the spinner landing on 2.

Explain why she is correct.

..... [1]

(b) Maya spins the spinner 500 times.

Find the number of times Maya should expect the spinner to land on 2.

..... [1]

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9 The equation of line P is $5x + 2y = 13$.
The equation of line Q is $y = 2x - 7$.

(a) Find the gradient of line P.

..... [2]

(b) Find the coordinates of the point of intersection of line Q with the x-axis.

(..... , ...) [2]

(c) Find the coordinates of the point of intersection of line P and line Q.

(..... , ...) [3]

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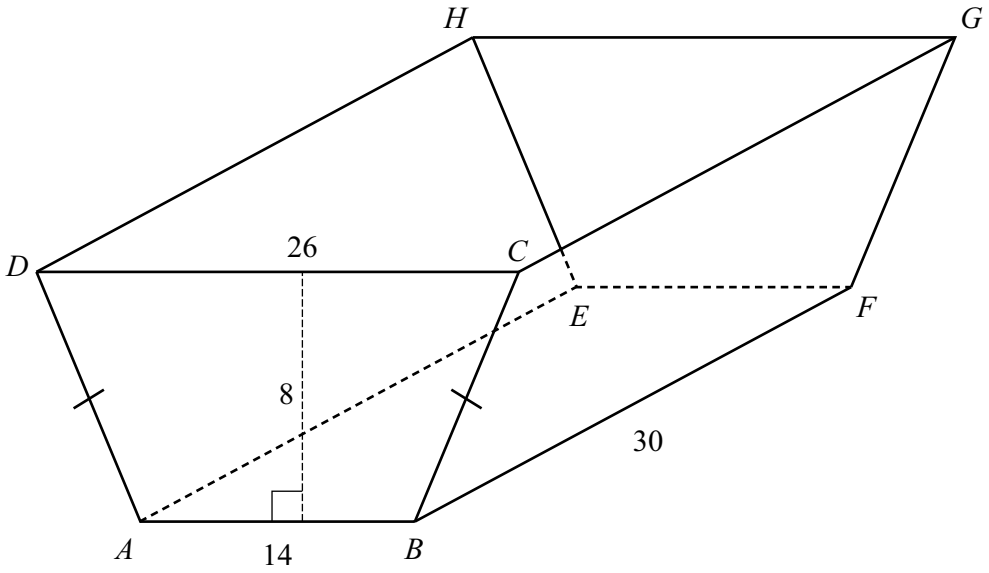
10



The diagram shows a container in the shape of a prism with an open top.
The cross-section of the prism, *ABCD*, is a trapezium.
AB = 14 cm, *CD* = 26 cm and *BF* = 30 cm.
The height of the container is 8 cm.

(a) Calculate the area of trapezium *ABCD*.

..... cm^2 [2]

(b) Calculate the capacity of the container in litres.

..... litres [2]

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(c) Calculate the total surface area of the inside of the container.

..... cm^2 [6]

(d) A mathematically similar container has a height of 16 cm.

Calculate the total surface area of the inside of the container with height 16 cm.

..... cm^2 [2]

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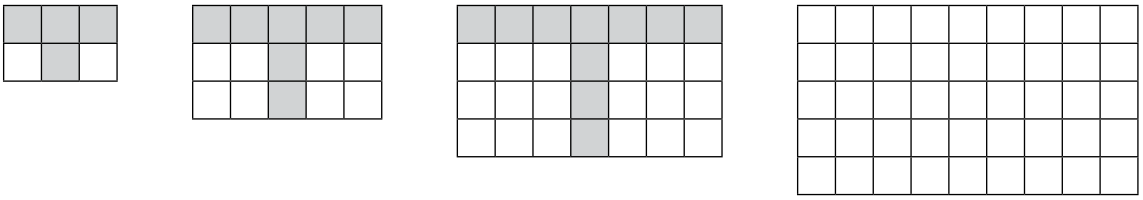
11 Grey squares and white squares are used to make patterns in a sequence.
The first three patterns in the sequence are shown.
Pattern 4 is incomplete.

Pattern 1 Pattern 2 Pattern 3 Pattern 4



(a) Shade squares in Pattern 4 to continue the sequence. [1]

(b) Complete the table for the patterns in the sequence.

Pattern number	1	2	3	4	5
Number of grey squares	4	7	10		
Number of white squares	2	8	18		

[2]

(c) **(i)** Write an expression, in terms of n, for the number of grey squares in Pattern n.

..... [2]

(ii) Write an expression, in terms of n, for the number of white squares in Pattern n.

..... [2]

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(d) Pattern 10 and Pattern 11 in the sequence are made from grey squares and white squares.

Find the difference between the total number of squares needed to make Pattern 10 and the total number of squares needed to make Pattern 11.

..... [3]

(e) Pattern k in the sequence needs 61 grey squares.

Find the number of white squares needed for Pattern k.

..... [4]

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12 The position vector of point A is $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$.

$\overrightarrow{AB} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$ and $\overrightarrow{AB} = \overrightarrow{BC}$.

Find the position vector of point C.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

13 Write $0.2\dot{3}$ as a fraction in its simplest form.

..... [3]

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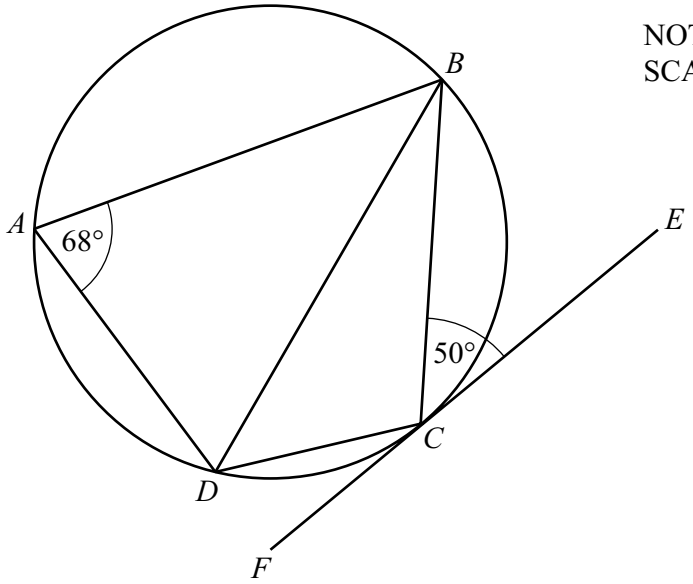
14



A, *B*, *C* and *D* are points on the circumference of a circle.
EF is a tangent to the circle at *C*.
Angle *BAD* = 68° and angle *BCE* = 50°.

Find angle *CBD*.
Give a geometrical property to explain each step of your working.

.....

.....

.....

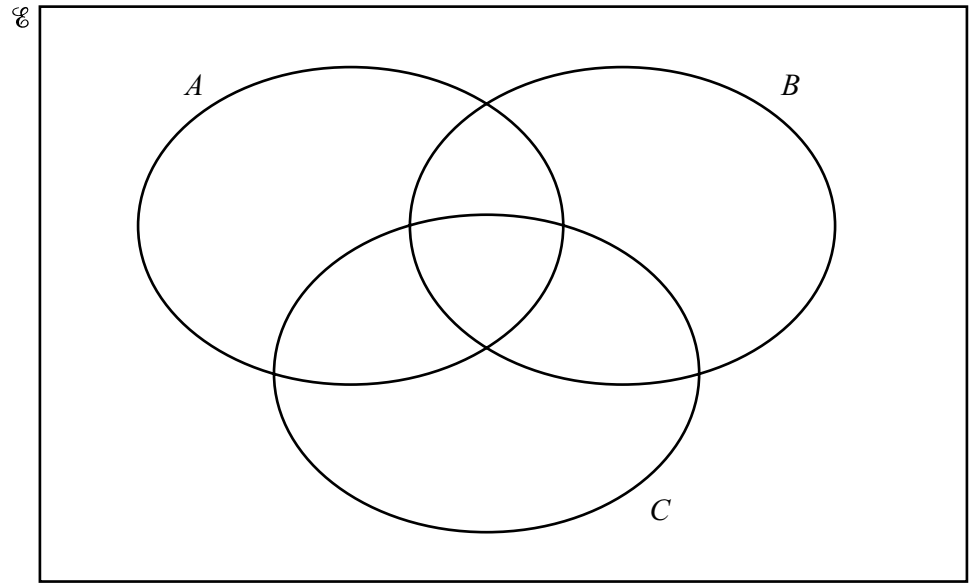
Angle *CBD* = ... [5]

15 Write $25^{-\frac{3}{2}}$ as a fraction in its simplest form.

..... [2]

16 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$
$A = \{x : 6 \leqslant x \leqslant 10\}$
$B = \{x: x \text{ is a factor of } 18\}$
$C = \{x: x \text{ is a square number}\}$

(a) Complete the Venn diagram.



[3]

(b) Find $n(A \cap C \cap B')$.

..... [1]

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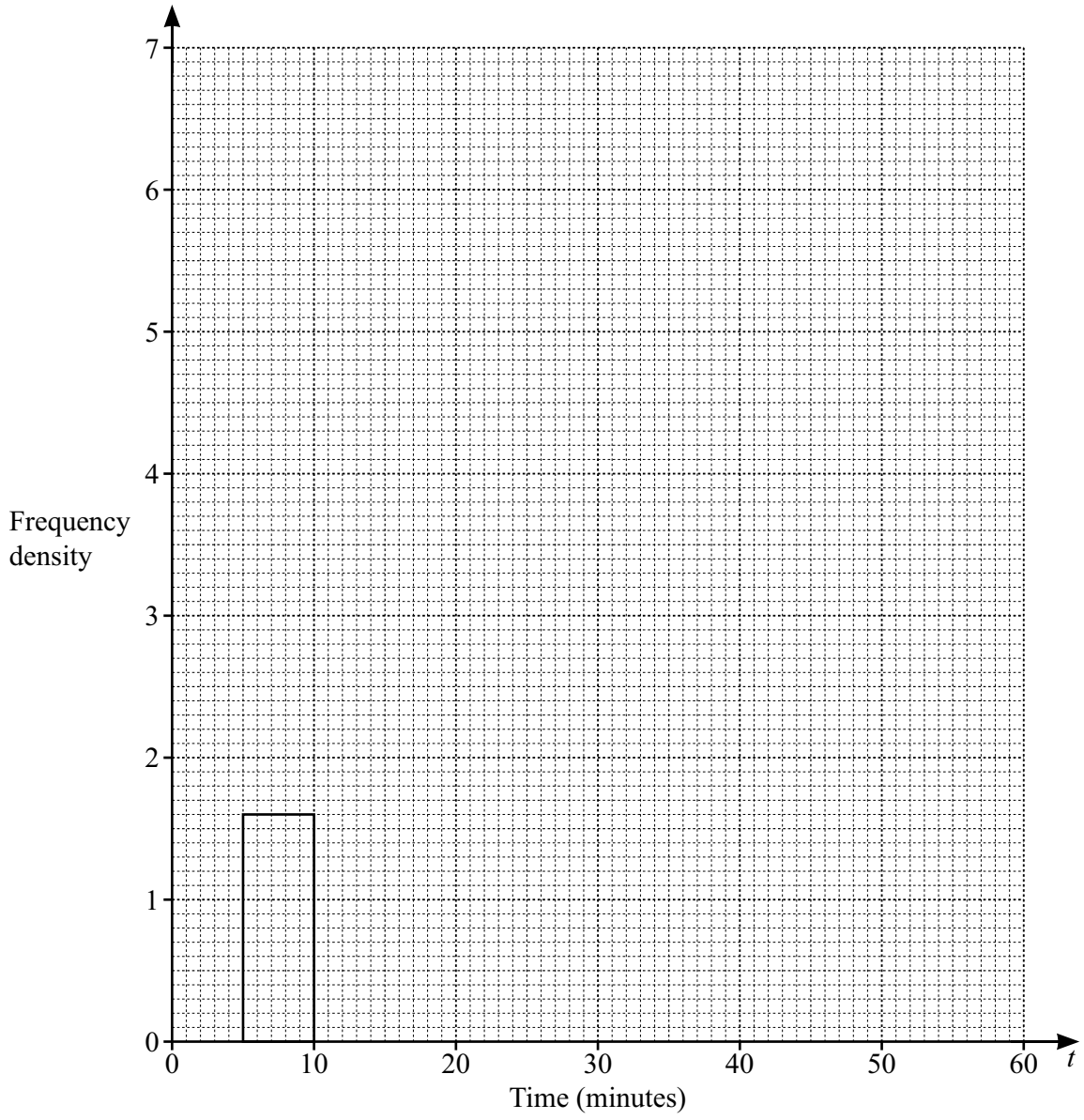
17 The times some students take to travel to school one morning are shown in the table.
The time is recorded in minutes.

Time (t minutes)	$5 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 60$
Frequency	x	16	29	20	15

(a) On the grid, complete the histogram to represent this information.



[3]

(b) Jamila says the histogram shows that there are the same number of students in the $5 < t \leqslant 10$ group as in the $10 < t \leqslant 20$ group.

Explain why she is wrong.

.....

..... [1]

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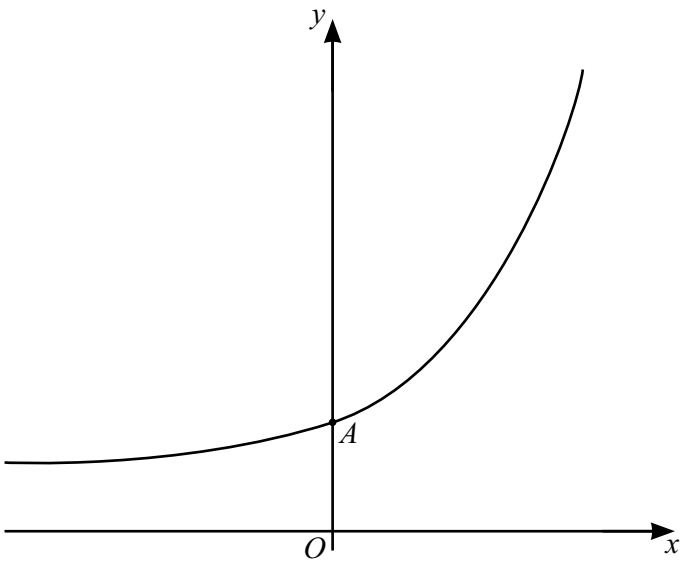
18



The diagram shows a sketch of the graph of $y = 3 \times 2^x + 5$.

(a) The graph crosses the y-axis at point A.

Find the coordinates of point A.

(..... , ...) [2]

(b) Write down the equation of the asymptote to the graph of $y = 3 \times 2^x + 5$.

..... [1]

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19 $f(x) = 5x + 2$ $g(x) = x^2 - 5$ $h(x) = 7 - x$.

(a) Find f(3).

..... [1]

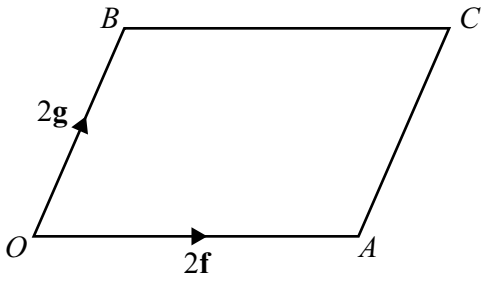
(b) Find gf(x).
Give your answer in the form $ax^2 + bx + c$.

..... [3]

(c) Solve $\frac{3}{\text{hf}(x)} = -1$.

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

20



NOT TO SCALE

$OACB$ is a parallelogram.
$\overrightarrow{OA} = 2\mathbf{f}$ and $\overrightarrow{OB} = 2\mathbf{g}$.

X is a point on AB such that $AX : XB = 3 : 1$.

Find, as simply as possible, in terms of **f** and **g**

(a) $\overrightarrow{AB}$

$\overrightarrow{AB}$ = ... [1]

(b) $\overrightarrow{XC}$.

$\overrightarrow{XC}$ = ... [3]

21 Write as a single fraction in its simplest form.

$$\frac{4}{3x-1} - \frac{5}{x+2}$$

..... [3]

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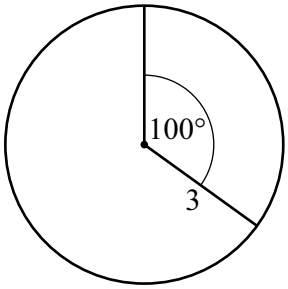
22



NOT TO SCALE

The diagram shows a circle of radius 3 cm.
The minor sector angle is 100°.

Calculate the area of the major sector.
Give your answer in terms of π.

..... cm^2 [3]

23 **(a)** Write $x^2 - 6x - 19$ in the form $(x - a)^2 + b$.

..... [2]

(b) Using your answer to **part (a)**, write down the coordinates of the turning point of the graph of $y = x^2 - 6x - 19$.

(..... , ...) [1]

Question 24 is printed on the next page.

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24 **(a)** Simplify.

$$\sqrt{75} + \sqrt{27}$$

..... [2]

(b) Rationalise the denominator.

$$\frac{3}{2 + \sqrt{5}}$$

Give your answer in its simplest form.

..... [3]

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