Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS (SYLLABUS D)	**4024/02**
Paper 2 Calculator	**For examination from 2025**
SPECIMEN PAPER B	**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.
- You should use a scientific calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

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. Any blank pages are indicated.

[Turn over

v1

List of formulas

Area, A, of triangle, base b, height h. $\qquad A = \frac{1}{2}bh$

Area, A, of circle of radius r. $\qquad A = \pi r^2$

Circumference, C, of circle of radius r. $\qquad C = 2\pi r$

Curved surface area, A, of cylinder of radius r, height h. $\qquad A = 2\pi rh$

Curved surface area, A, of cone of radius r, sloping edge l. $\qquad A = \pi rl$

Surface area, A, of sphere of radius r. $\qquad A = 4\pi r^2$

Volume, V, of prism, cross-sectional area A, length l. $\qquad V = Al$
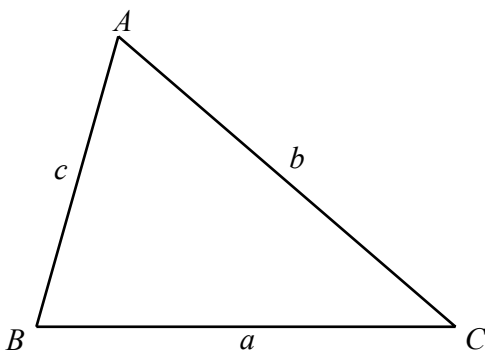
Volume, V, of pyramid, base area A, height h. $\qquad V = \frac{1}{3}Ah$

Volume, V, of cylinder of radius r, height h. $\qquad V = \pi r^2 h$

Volume, V, of cone of radius r, height h. $\qquad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\qquad V = \frac{4}{3}\pi r^3$

For the equation $ax^2 + bx + c = 0$, where $a \neq 0$, $\qquad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,

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

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

$$\text{Area} = \frac{1}{2}ab\sin C$$
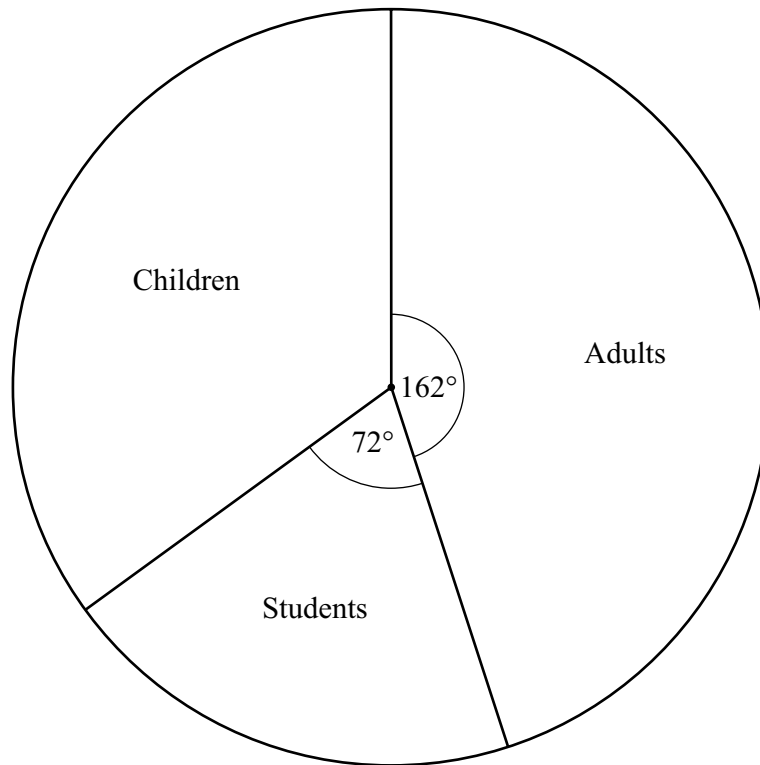
1 Find the reciprocal of 0.35 .

.... [1]

2 Calculate.

$$\frac{4^2 - 1.9}{3.2 - 2.6}$$

.... [1]

3 The pie chart shows information about visitors to a museum on one day.

Complete the table.

	Number of visitors	Pie chart sector angle
Adults	108	162°
Students		72°
Children		

[3]

4 Navin and Esther share some money in the ratio   Navin : Esther = 5 : 7.

(a) Find Navin's share as a percentage of the total money.

....% [1]

(b) Find Esther's share as a percentage of Navin's share.

....% [1]

(c) Navin's share is $160.

Work out Esther's share.

$ .... [2]

5 Solve.

$$5(3 - 2x) = 17$$

$x =$ .... [3]

6
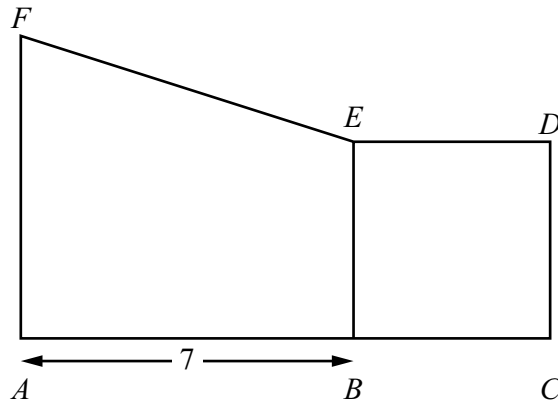
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The diagram shows a trapezium *ABEF* joined to a square *BCDE*.
ABC is a straight line and *AB* = 7 cm.
AF : *BE* = 3 : 2.
The area of the square is 32 cm².

Calculate the area of the trapezium *ABEF*.

....cm² [4]

7 The table shows the relative frequency of a bus arriving at Milltown early and arriving at Milltown on time.

Time of arrival	Early	On time	Late
Relative frequency	0.1	0.55	

(a) Complete the table.

[2]

(b) During one week, 200 buses arrive at Milltown.

Calculate the number of buses expected to arrive early.

.... [1]

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8 **(a)** Calculate the exterior angle of a regular hexagon.

.... [2]

(b) The diagram shows part of a regular hexagon and part of a regular polygon.
The regular hexagon and the regular polygon are joined by a common side.

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Regular polygon

100°

Regular hexagon
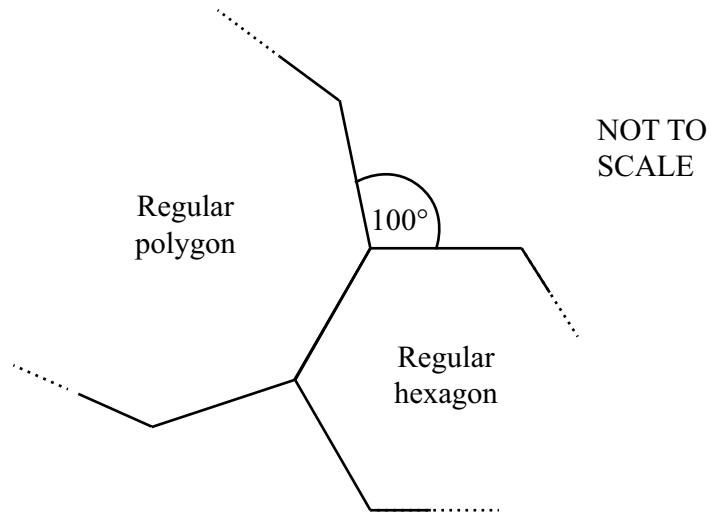
Calculate the number of sides of the regular polygon.

.... [2]

9 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

$A = \{x: x \text{ is an odd number}\}$

$B = \{x: x \text{ is a multiple of 3}\}$

(a) List the elements of $A \cap B$.

.... [1]

(b) Use set notation to describe the set $\{2, 4, 8, 10\}$.

.... [1]

10 (a) Write 0.0473 in standard form.

.... [1]

(b) The numbers in the calculation are written in standard form.

$$\frac{2.7 \times 10^4}{c \times 10^d} = 2.25 \times 10^{-4}$$

Find the value of c and the value of d.

$c = $ ....

$d = $ ....

[2]

11 **(a)** Talia invests $1500 in a savings account for 4 years.

The account pays simple interest at a rate of $2\frac{1}{6}\%$ per year.

Calculate the total interest she receives at the end of 4 years.

$ .... [2]

(b) Kylian also invests $1500 in a savings account.
The account pays compound interest at a rate of $r\%$ per year.

At the end of 5 years, the value of the investment is $1825.

Calculate the value of r.

$r = $ .... [3]

12 Simplify.

(a) $5x^2 - 7x + 6x - x^2$

.... [2]

(b) $\dfrac{4x}{3y} \div \dfrac{2a}{9y}$

.... [2]

13 In June, fuel for a bus costs $0.32 per kilometre.

(a) In June, a bus travels 1800 km.

Calculate the total cost of the fuel in June.

$ .... [1]

(b) In July, fuel for the bus costs 7.5% more per kilometre than in June.
In July, the bus travels 1850 km.

Calculate the difference in the total cost of the fuel between June and July.

$ .... [4]

14 (a) On a map, the distance between two cities is 7.3 cm.

The actual distance between the two cities is 365 km.
The scale of this map is $1 : n$.

Find the value of n.

$n =$ .... [2]

(b) The diagram shows the positions of towns A, B and C.
The towns are joined by straight roads.
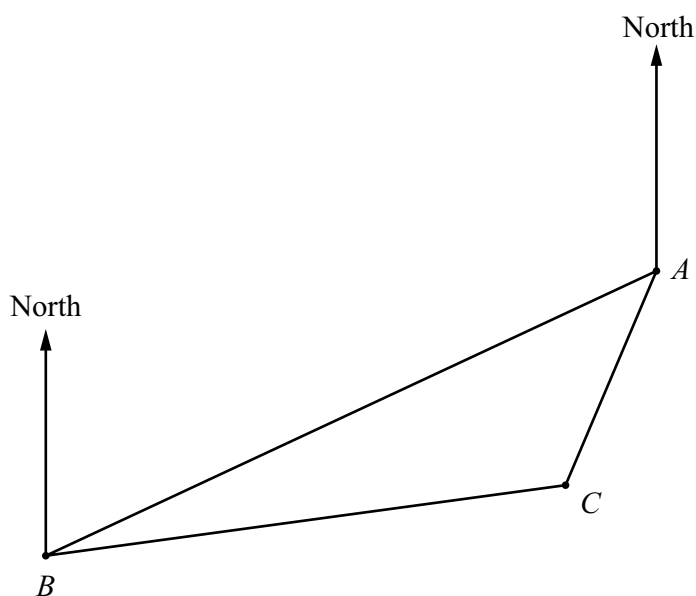
(i) The bearing of A from B is 070°.

Find the bearing of B from A.

.... [2]

(ii) The bearing of C from A is 195° and angle $BCA = 113°$.

Find the bearing of C from B.

.... [3]

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18
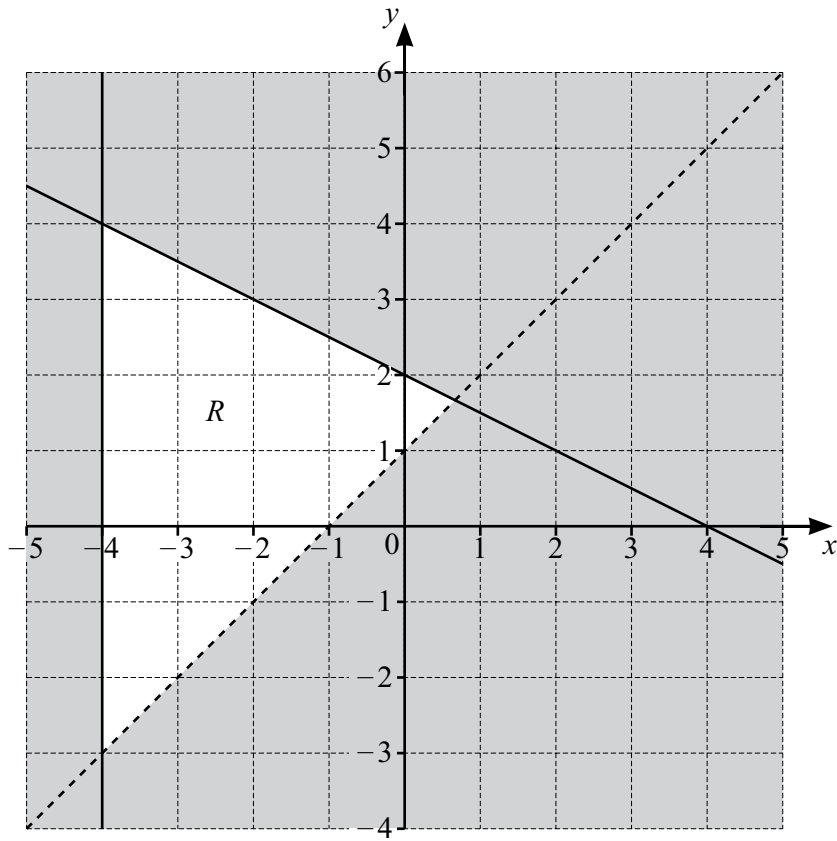
Find the three inequalities that define the unshaded region, *R*.

....

....

....

[4]

19 $f(x) = 2x^2 - 3x$ $g(x) = 7 + 2x$

(a) Find

(i) g(–8)

.... [1]

(ii) gf(5)

.... [2]

(iii) $g^{-1}(x)$.

$g^{-1}(x) =$ .... [2]

(b) Find f(x – 6).
Give your answer in the form $ax^2 + bx + c$.

.... [4]

(c) Use the quadratic formula to solve $f(x) - 6 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

20 In this question, all lengths are given in metres.
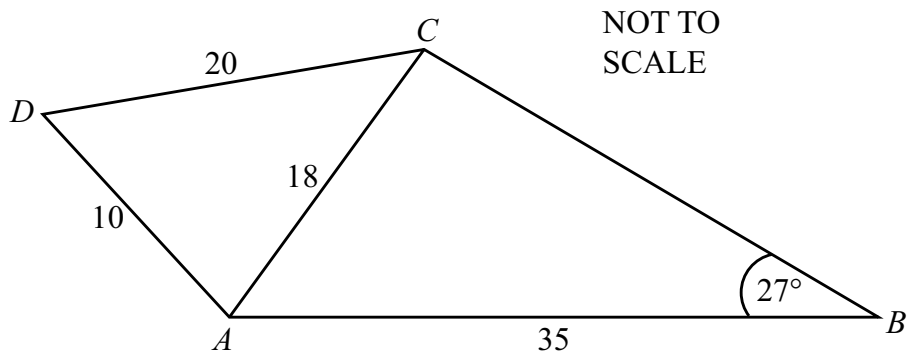
The diagram shows the positions *A*, *B*, *C* and *D* on a football pitch.

(a) Show that angle *CAD* = 86.2°, correct to 1 decimal place.

[4]

(b) Calculate **obtuse** angle *ACB*.

.... [4]

(c) A player runs directly from *B* to *D* in a time of 5.3 seconds.

Calculate the average speed of the player.

.... m/s [5]

21 *f* is inversely proportional to the cube of *g*.
When *f* = 0.5, *g* = 3.

(a) Find *f* in terms of *g*.

$f =$ .... [2]

(b) *g* is increased by 100%.

Find the percentage change in *f*.

....% [3]

22 The area of a triangle is $12\,\text{m}^2$, correct to the nearest square metre.
The base of the triangle is $5.7\,\text{m}$, correct to the nearest $0.1\,\text{m}$.

Calculate the smallest possible height of the triangle.

.... m [3]

23

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1.44

0.48

←0.6→
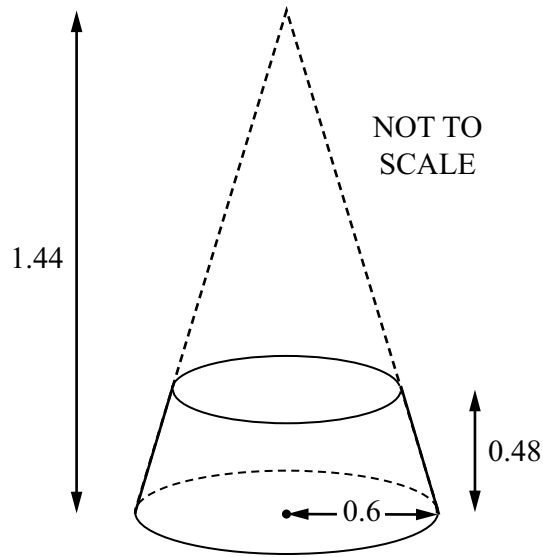
The diagram shows the frustum of a cone.
The frustum has base radius 0.6 m and vertical height 0.48 m.
The vertical height of the original cone is 1.44 m.

Calculate the total surface area of the frustum.

.... m^2 [6]

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