Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

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0123456789

MATHEMATICS **0580/04**

Paper 4 Calculator (Extended) **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.
- 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

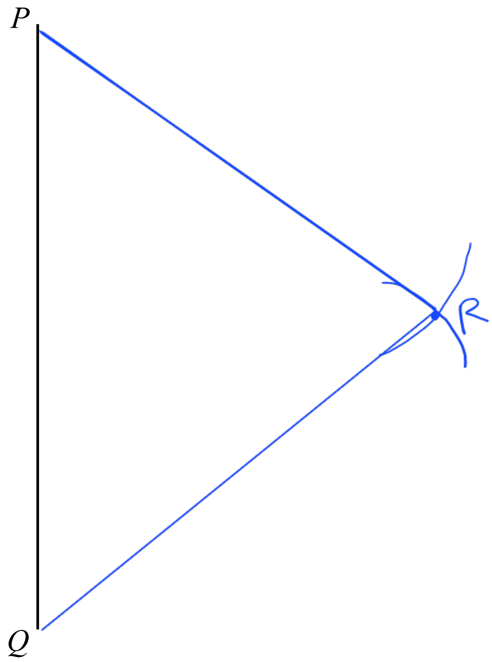
- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

1 Write down the integer values of x that satisfy the inequality $-2 \leqslant x < 2$.

$-2, -1, 0, 1$ .... [2]

2



In triangle PQR, $QR = 10$ cm and $PR = 11$ cm.

Using a ruler and compasses only, construct triangle PQR.
The line PQ has been drawn for you. [2]

3 Simplify.

$$(x^8y^7) \div (x^{-1}y^3)$$

x^9y^4 .... [2]

4

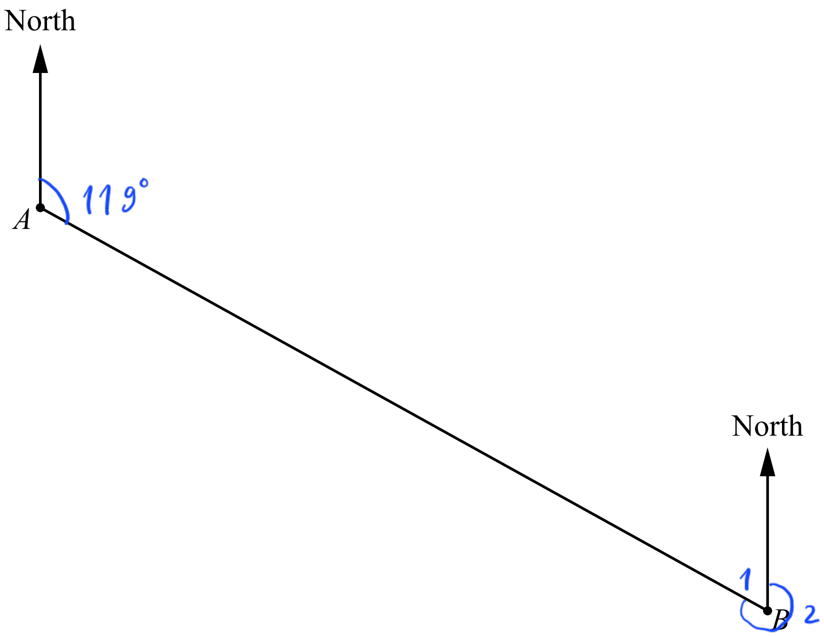
$$f(x) = 3x - 5$$

The domain of $f(x)$ is $\{-3, 0, 2\}$.

Find the range of $f(x)$.

{ $-14, -5, 1$ .... } [2]

5



Two towns, A and B, are shown on a map.
The scale of the map is 1 cm to 3 km.

(a) Find the actual distance between A and B.

10.8×3

..........32.4.......... km [1]

(b) Measure the bearing of B from A.

..........$119°$.......... [1]

(c) Calculate the bearing of A from B.
You must show all your working.

$\hat{B}_1 = 180° - 119° = 61°$

$B_2 = 360° - 61° = 299°$

..........$299°$.......... [2]

6 A solid metal cuboid has a volume of $600\,cm^3$.

(a) The base of the cuboid is 10 cm by 12 cm.

Calculate the height of the cuboid.

$$\frac{600}{10 \times 12} = 5$$

.......................5....................... cm [2]

(b) The solid metal cuboid is melted and made into 1120 spheres, each with radius 0.45 cm.

Find the volume of metal **not** used in making these spheres.

$$600 - 1120 \times \frac{4}{3} \pi\, 0.45^3 \simeq 172$$

.......................172....................... cm^3 [2]

7 On any day the probability that it rains is $\frac{1}{3}$.

When it rains the probability that Amira goes fishing is $\frac{3}{5}$.

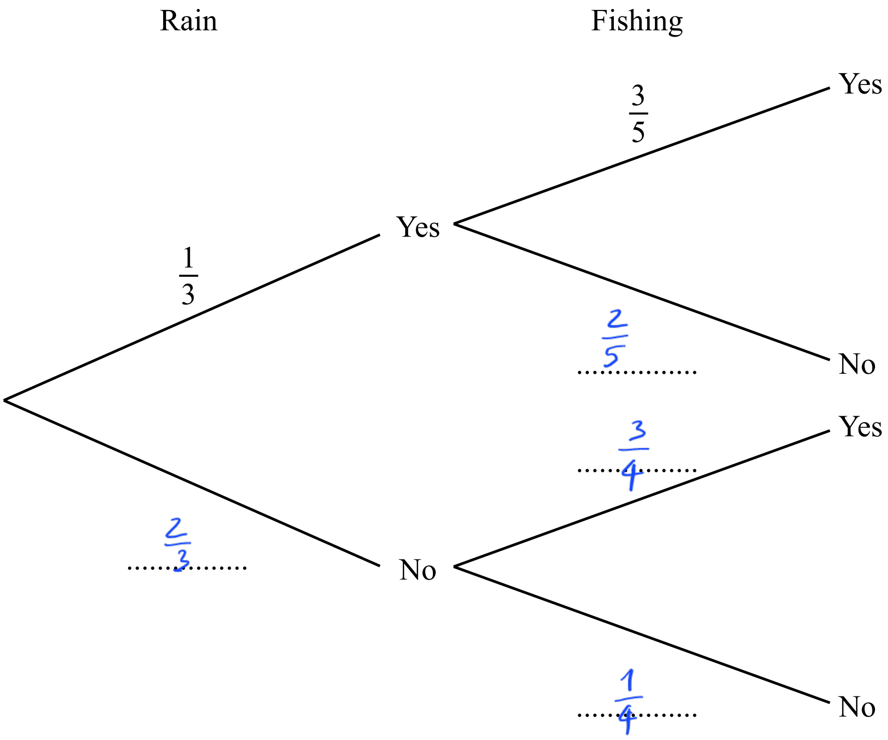
When it does not rain the probability that Amira goes fishing is $\frac{3}{4}$.

(a) In a period of 60 days on how many days is it expected to rain?

$60 \times \frac{1}{3}$

........................20........................ [1]

(b) Complete the tree diagram.



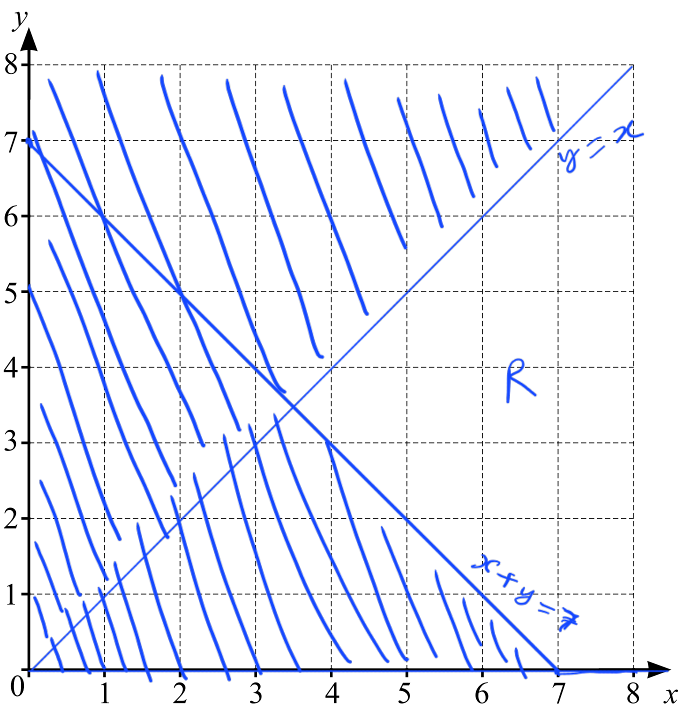
[2]

(c) Find the probability that on any day Amira goes fishing.

$\frac{1}{3} \times \frac{3}{5} + \frac{2}{3} \times \frac{3}{4} = \frac{1}{5} + \frac{2}{4}$

........................$\frac{7}{10}$........................ [3]

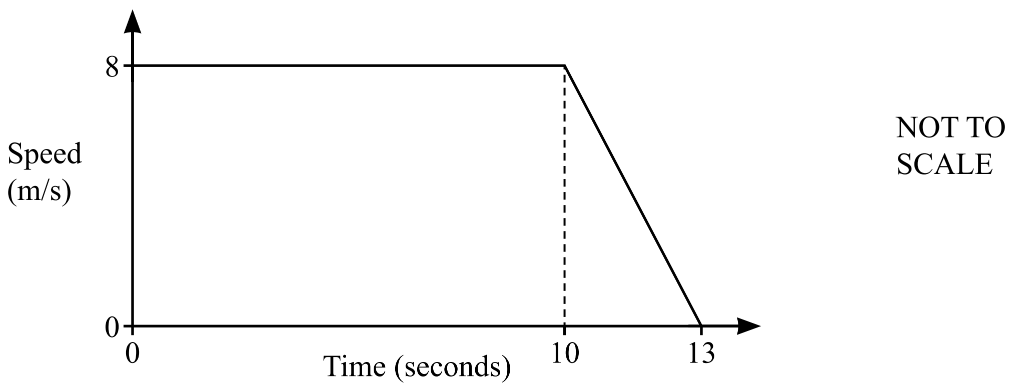
8



(a) On the grid, draw the lines $y = x$ and $x + y = 7$. [3]

(b) Region R satisfies the three inequalities $y \geqslant 0$, $y \leqslant x$ and $x + y \geqslant 7$.
On the grid, label the region R. [1]

9



The diagram shows the speed–time graph of part of a car journey.

(a) Find the deceleration of the car between 10 and 13 seconds.

$\frac{8-0}{13-10}$

$\frac{8}{3}$ m/s^2 [1]

(b) Calculate the total distance travelled during the 13 seconds.

$\frac{10+13}{2} \times 8$

92 m [2]

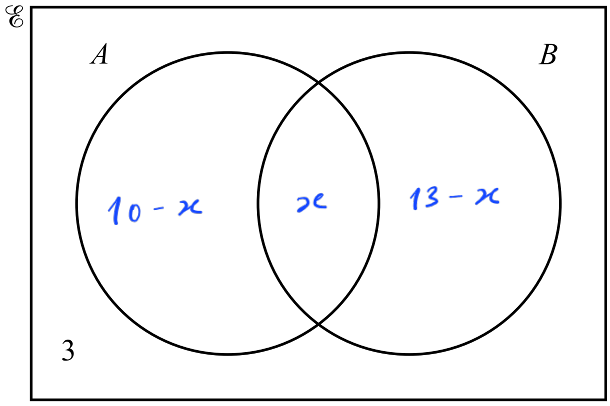
10 Factorise.

$$2x + 6 - 3xy - 9y$$

$2(x+3) - 3y(x+3)$

$(2-3y)(x+3)$ .... [2]

11



n(ℰ) = 20, n$(A \cup B)'$ = 3, n(A) = 10 and n(B) = 13.
The Venn diagram shows some of this information.

Find

(a) n$(A \cap B)$

$10 - x + x + 13 - x + 3 = 20$

$-x + 26 = 20$

6 .... [2]

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

$13 - x = 13 - 6 = 7$

7 .... [1]

12 The height, h cm, of each of 100 students is measured.
The table shows the results.

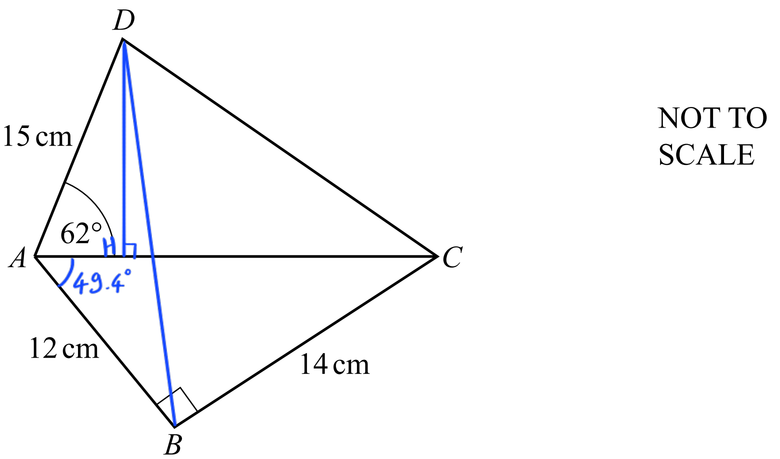
Mid value	125	155	162.5	175
Height (h cm)	$100 < h \leqslant 150$	$150 < h \leqslant 160$	$160 < h \leqslant 165$	$165 < h \leqslant 185$
Frequency	7	30	41	22

Calculate an estimate of the mean.

$$\frac{125 \times 7 + 155 \times 30 + 162.5 \times 41 + 175 \times 22}{100}$$

160.375 .... cm [4]

13



The diagram shows a quadrilateral, *ABCD*, formed from two triangles, *ABC* and *ACD*.
ABC is a right-angled triangle.

(a) Calculate angle *BAC*.

$\tan \widehat{BAC} = \frac{14}{12}$

Angle *BAC* = ...49.4°...... [2]

(b) Calculate *BD*.

$BD^2 = AB^2 + AD^2 - 2 AB.AD \cos \widehat{BAD}$

$= 12^2 + 15^2 - 2 \times 12 \times 15 \cos(49.399° + 62°)$

$BD \approx 22.4$

BD = ...22.4...... cm [4]

(c) Calculate the shortest distance from *D* to *AC*.

$DH \perp AC$

$\sin 62° = \frac{DH}{AD}$

$\Rightarrow DH = 15 \sin 62°$

......13.2...... cm [3]

[Turn over

14 **(a)** Hong has $4000 to invest.
She invests $2000 at a rate of 2.5% per year **simple** interest.
She also invests $2000 at a rate of 2% per year **compound** interest.

(i) Find the value of each investment at the end of 8 years.

$$\text{Total}_{\text{simple}} = 2000 + 2000 \times \frac{2.5}{100} \times 8 = 2400$$

$$\text{Total}_{\text{compound}} = 2000\left(1 + \frac{2}{100}\right)^8$$

$$= 2343.32$$

Simple interest investment $ 2400

Compound interest investment $ 2343.32

[5]

(ii) Find the overall percentage increase in the $4000 investment at the end of 8 years.

$$\frac{2400 + 2343.32 - 4000}{4000} \times 100\%$$

18.583 % [2]

(iii) Find the number of complete years it takes for the compound interest investment of \$2000 to become greater than \$2500.

$2000\left(1+\frac{2}{100}\right)^{r}$

$r = 11 \rightarrow 2486$

$r = 12 \rightarrow 2536$

.......................12....................... [3]

(b) Alain invests \$5000 at a rate of r% per year compound interest.
At the end of 15 years, the value of the investment is \$7566.

Find the value of r.

$7566 = 5000\left(1+\frac{r}{100}\right)^{15}$

$\sqrt[15]{\frac{7566}{5000}} = 1 + \frac{r}{100}$

$\frac{r}{100} = 0.0280$

r = ...2.80......................... [3]

15 $y = \sqrt{u^2 x}$

(a) Find the value of y when $u = 7$ and $x = 25$.

$y = \sqrt{7^2 \times 25}$

$y =$ ......35...... [2]

(b) Rearrange the formula to write x in terms of u and y.

$y^2 = u^2 x$

$x = \dfrac{y^2}{u^2}$

$x =$ ......$\dfrac{y^2}{u^2}$...... [2]

16 A is the point (7, 2) and B is the point (−5, 8).

(a) Calculate the length of AB.

$AB = \sqrt{(-5-7)^2 + (8-2)^2}$

$= 6\sqrt{5}$

......13.4...... [3]

(b) Find the equation of the line that is perpendicular to AB and that passes through the point (−1, 3). Give your answer in the form $y = mx + c$.

ℓ

$m_{AB} = \dfrac{8-2}{-5-7} = -0.5$

$m_\ell = -1 \div (-0.5) = 2$

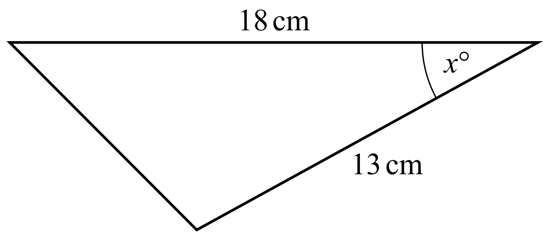
Equation of ℓ: $y - 3 = 2(x+1)$

$y - 3 = 2x + 2$

$y = 2x + 5$

$y =$ ......$2x + 5$...... [4]

17



NOT TO SCALE

The area of the triangle is $50\,\text{cm}^2$.

Calculate the value of $\sin x$.

$\frac{1}{2} \times 13 \times 18 \sin x = 50$

$\sin x = \frac{50}{117}$

$\sin x =$ ....$\frac{50}{117}$.... [2]

18 Solve.

$$\frac{3y}{2y-1} = \frac{3}{4}$$

$4 \times 3y = 3(2y-1)$

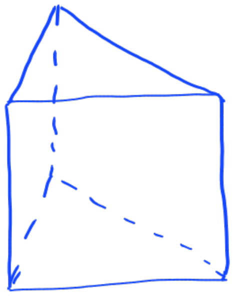
$12y = 6y - 3$

$6y = -3$

$y =$ ....-0.5.... [3]

19 The cross-section of a prism is an equilateral triangle of side 6 cm.
The length of the prism is 20 cm.

Calculate the total surface area of the prism.



$\underbrace{2 \times \frac{1}{2} \times 6 \times 6 \times \sin 60°}_{\text{2 bases}} + \underbrace{3 \times 6 \times 20}_{\text{3 surrounding faces}}$

≈ 391

..........391.......... cm^2 [4]

20 $y = 2x^k + ux^7$ and $\frac{dy}{dx} = 18x^{k-1} + 21x^6$

Find the value of k and the value of u.

$\frac{dy}{dx} = 2k\,x^{k-1} + 7u\,x^6$

$= 18x^{k-1} + 21x^6$

$\Rightarrow \begin{cases} 2k = 18 \\ 7u = 21 \end{cases}$

$k =$ ......9......

$u =$ ......3......
[2]

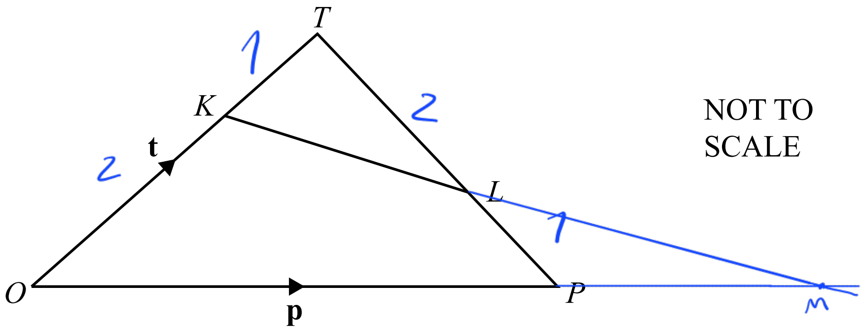
21 Simplify.

$$\frac{5p^2 - 20p}{2p^2 - 32}$$

$\frac{5p(p-4)}{2(p^2-16)} = \frac{5p(p-4)}{2(p-4)(p+4)}$

......$\frac{5p}{2(p+4)}$...... [3]

22 The diagram shows triangle OPT.



In the diagram $\overrightarrow{OT} = \mathbf{t}$ and $\overrightarrow{OP} = \mathbf{p}$.
$OK : KT = 2 : 1$ and $TL : LP = 2 : 1$.

(a) Find, in terms of **t** and **p**, in its simplest form

(i) $\overrightarrow{PL}$

$\overrightarrow{PT} = \overrightarrow{PO} + \overrightarrow{OT} = -p + t$

$\overrightarrow{PL} = \frac{1}{3}\overrightarrow{PT} = \frac{1}{3}(-p + t)$

$-\frac{1}{3}p + \frac{1}{3}t$ .... [2]

(ii) $\overrightarrow{KL}$.

$\overrightarrow{KL} = \overrightarrow{KT} + \overrightarrow{TL}$

$= \frac{1}{3}\overrightarrow{OT} + \frac{2}{3}\overrightarrow{TP}$

$= \frac{1}{3}t + \frac{2}{3}(p - t)$

$\frac{2}{3}p - \frac{1}{3}t$ .... [2]

(b) KL is extended to the point M.
$\overrightarrow{KM} = -\frac{2}{3}\mathbf{t} + \frac{4}{3}\mathbf{p}$.

Show that M lies on OP extended.

$\overrightarrow{OM} = \overrightarrow{OK} + \overrightarrow{KM}$

$= \frac{2}{3}t - \frac{2}{3}t + \frac{4}{3}p$

$= \frac{4}{3}p$

$\Rightarrow \overrightarrow{OM} = \frac{4}{3}\overrightarrow{OP}$

$\Rightarrow$ O, P, M are collinear

[2]

0.1 km

23 Serge walks 7.9 km, correct to the nearest 100 metres.
The walk takes 133 minutes, correct to the nearest minute.

$\frac{133}{60}$ h $\frac{1}{60}$ h

Calculate the maximum possible average speed of Serge's walk.
Give your answer in kilometres/hour.

$$\text{Average speed (max)} = \frac{\text{distance (max)}}{\text{time (min)}}$$

$$= \frac{7.9 + \frac{0.1}{2}}{\frac{133}{60} - \frac{1}{60} : 2} = 3.6$$

..........3.6.......... km/h [3]

24 The straight line $y = 2x + 1$ intersects the curve $y = x^2 + 3x - 4$ at the points A and B.

Find the coordinates of A and B.
Give your answers correct to 2 decimal places.

$$2x + 1 = x^2 + 3x - 4$$

$$x^2 + x - 5 = 0$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \times 1 \times (-5)}}{2 \times 1} = \frac{-1 \pm \sqrt{21}}{2} \approx \begin{cases} 1.79 \\ -2.79 \end{cases}$$

When $x = \frac{-1 + \sqrt{21}}{2}$: $y = \frac{2(-1 + \sqrt{21})}{2} + 1 \approx 4.58$

When $x = \frac{-1 - \sqrt{21}}{2}$: $y = \frac{2(-1 - \sqrt{21})}{2} + 1 \approx -4.58$

A (....−2.79.... , ...−4.58....)

B (....1.79.... , ...4.58....)
[6]

