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**MATHEMATICS****0580/41**

Paper 4 Calculator (Extended)

**October/November 2025****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  $\pi$ , 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.

## 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  $h$ .

$$V = \frac{1}{3}\pi r^2 h$$

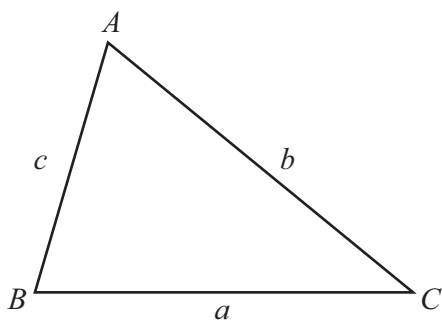
Volume,  $V$ , of sphere of radius  $r$ .

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

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,



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

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

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



1 A quadrilateral has

- rotational symmetry of order 2
- two diagonals that are the only lines of symmetry.

Write down the geometrical name of this quadrilateral.

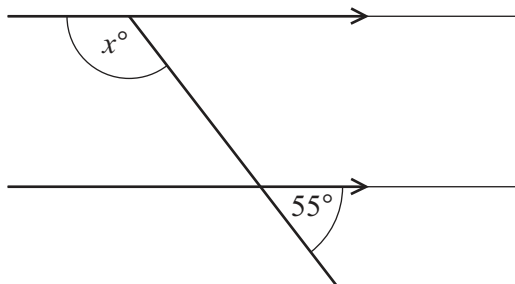
..... [1]

2 Solve.

$$11 - 2x = 4$$

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

3



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The diagram shows two parallel lines and a straight line.

Find the value of  $x$ .

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

4 A train journey starts at 22 16.  
The journey takes 5 hours 52 minutes.

Find the time the train journey finishes.

..... [1]





$A$  —————  $B$

- (a) In triangle  $ABC$ ,  $AB = 8$  cm,  $AC = 7$  cm and  $BC = 5$  cm.

**Using a ruler and compasses only**, construct triangle  $ABC$ .  
The side  $AB$  has been drawn for you.

[2]

- (b) Measure angle  $ACB$ .

..... [1]

- (c) Triangle  $ABC$  is a scale drawing of a field.

- (i) The scale is 1 : 10 000.

Find the actual distance from  $A$  to  $B$ .  
Give your answer in kilometres.

..... km [1]

- (ii)  $B$  is due east of  $A$ .  
Find the bearing of  $A$  from  $B$ .

..... [1]

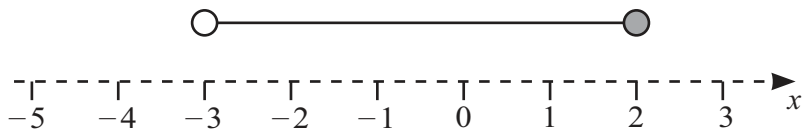
- 6 Expand.

$$g(3 - 2g)$$

..... [1]



7 (a)



Write down the inequality represented in the diagram.

..... [2]

(b) Write down the integer values of  $x$  that satisfy the inequality  $-4 < 2x \leq 8$ .

..... [2]

8 Calculate.

$$(3.5^2 - 2.2^3)^{\frac{1}{4}}$$

..... [1]

9 An athlete runs at a speed of 9.5 m/s.

Convert this speed into km/h.

..... km/h [2]



- 10  $A$  is the point  $(2, 1)$ .

$$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

Find the coordinates of  $B$ .

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

- 11 In a sale, the prices of coats are reduced by 15%.

- (a) The original price of a coat is \$60.

Calculate the sale price of the coat.

\$ ..... [2]

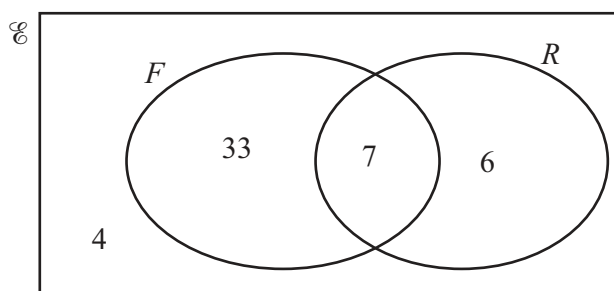
- (b) The sale price of a different coat is \$58.14 .

Calculate the original price of this coat .

\$ ..... [2]



- 12 Some students are asked if they like football ( $F$ ) or rugby ( $R$ ).  
The Venn diagram shows the results.



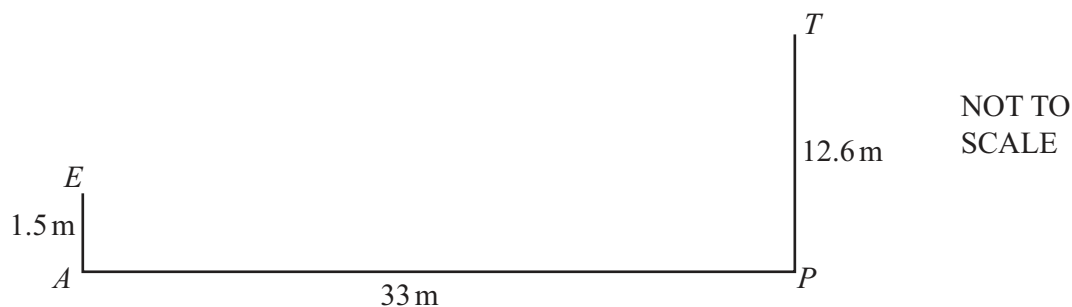
- (a) Find the number of students who do not like rugby.

..... [1]

- (b) Use set notation to describe the region containing students who like rugby but not football.

..... [1]

13



The diagram shows two vertical poles,  $AE$  and  $PT$ , standing on horizontal ground,  $AP$ .

Calculate the angle of elevation of the point  $T$  from the point  $E$ .

..... [3]



- 14 A cube contains a solid metal sphere.  
The sphere touches all the faces of the cube.  
The side length of the cube is 8 cm.

(a) Show that the volume of the sphere is  $\frac{256}{3}\pi \text{ cm}^3$ .

[1]

(b) Calculate the percentage of the cube that is **not** occupied by the sphere.

..... % [3]

(c) The density of the metal of the sphere is  $7.86 \text{ g/cm}^3$ .

Calculate the mass of the sphere.

Give your answer in kilograms.

[Density = mass  $\div$  volume]

..... kg [2]

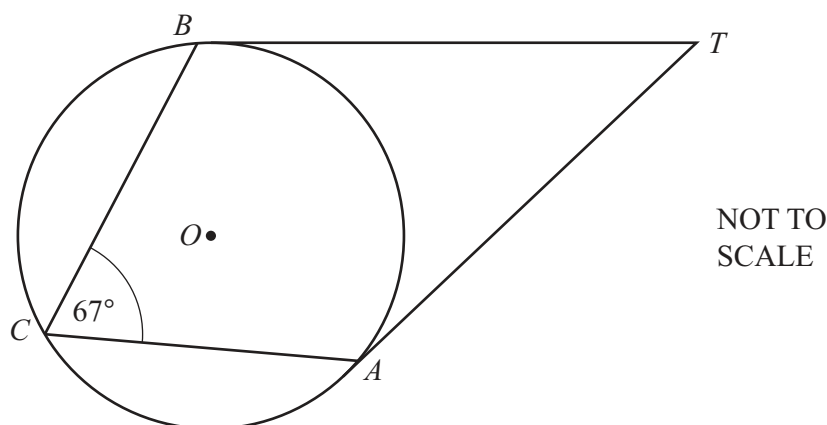


(d) The sphere is melted down and made into a solid cylinder with radius 3.1 cm.

Calculate the **total** surface area of the cylinder.

..... cm<sup>2</sup> [4]

15



$A$ ,  $B$  and  $C$  lie on a circle, centre  $O$ .  
 $TA$  and  $TB$  are tangents to the circle at  $A$  and  $B$ .

Calculate angle  $ATB$ .

Angle  $ATB$  = ..... [3]



- 16 The table shows some information about the heights of 50 plants.

|                  |                 |                  |                  |
|------------------|-----------------|------------------|------------------|
| Height ( $h$ cm) | $5 < h \leq 10$ | $10 < h \leq 12$ | $12 < h \leq 20$ |
| Frequency        | 3               | 24               | 23               |

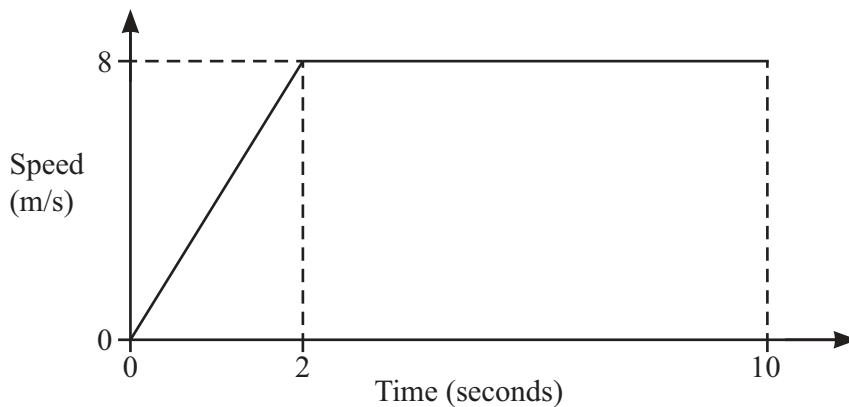
Calculate an estimate of the mean height.

..... cm [4]

- 17 Find the equation of the straight line that passes through the points (2, 0) and (0, 4).  
Give your answer in the form  $y = mx + c$ .

$y =$  ..... [3]





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The diagram shows part of the speed–time graph for an athlete in a race.

- (a) Calculate the distance the athlete runs in the first 10 seconds.

..... m [2]

- (b) The length of the race is 100 m.  
After 10 seconds, the athlete continues to run at a speed of 8 m/s until the end of the race.

Calculate the **total** time the athlete takes to complete the 100 m race.

..... s [2]



- 19 The mass of a radioactive substance decays exponentially at a rate of 10% per day. The initial mass of the substance is 20 g.

Find the number of whole days it takes for the mass of the substance to first be less than 1 g.

..... days [3]

- 20 These are the first five terms of a sequence.

48                      24                      12                      6                      3

- (a) Find the next term.

..... [1]

- (b) Find the  $n$ th term.

..... [2]

- 21 In triangle  $STU$ ,  $ST = 8$  cm,  $SU = 9$  cm and angle  $TSU = 50^\circ$ .

Calculate the area of triangle  $STU$ .

.....  $\text{cm}^2$  [2]



- 22 Alex invests \$200 at a rate of  $r\%$  per year compound interest.  
At the end of 25 years the value of this investment is \$301.10 .

Find the value of  $r$ .

$$r = \dots\dots\dots [3]$$

23  $y \propto \frac{1}{\sqrt{x+1}}$

When  $x = 8, y = 3$ .

Find  $y$  in terms of  $x$ .

$$y = \dots\dots\dots [2]$$



- 24 Martha walks a distance of 10 km at a speed of  $x$  km/h.  
She then runs a distance of 5 km at a speed of  $(x + 4)$  km/h.  
The total time taken for the whole journey is 3.5 hours.

(a) Write down an expression in terms of  $x$  for the time Martha is walking.

..... h [1]

(b) Show that  $7x^2 - 2x - 80 = 0$ .

[4]

(c) Solve  $7x^2 - 2x - 80 = 0$ , giving your answers correct to 2 decimal places.  
You must show all your working.

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [3]

(d) Calculate the difference between the time Martha is walking and the time she is running.  
Give your answer in hours and minutes correct to the nearest minute.

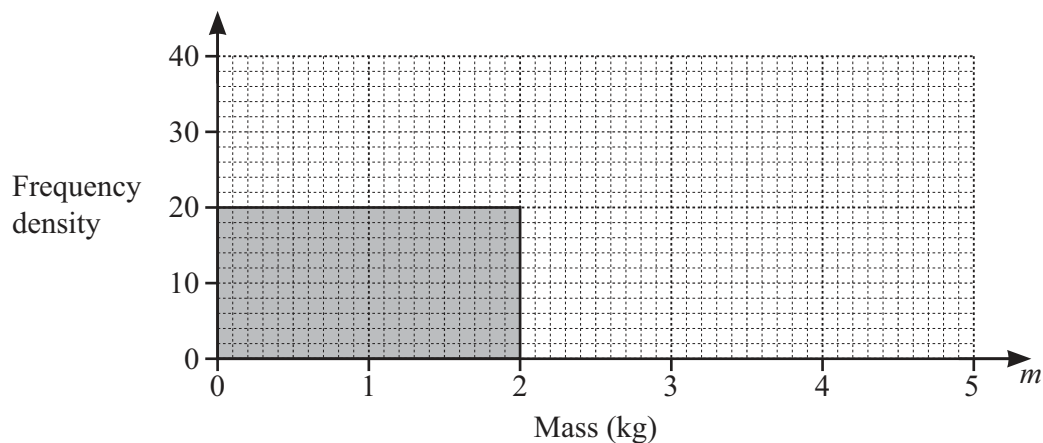
..... h ..... min [3]



25 Kai sorts parcels into two types, light and heavy.

| Type of parcel | Mass ( $m$ kg) |
|----------------|----------------|
| Light          | $0 < m \leq 2$ |
| Heavy          | $2 < m \leq 5$ |

The histogram shows some information about the number of parcels Kai sorts in one day.



(a) Find the number of light parcels.

..... [1]

(b) There are 102 heavy parcels.

Complete the histogram. [2]





- 26 Solve the simultaneous equations.  
You must show all your working.

$$y = 2x^2 - 3x - 7$$

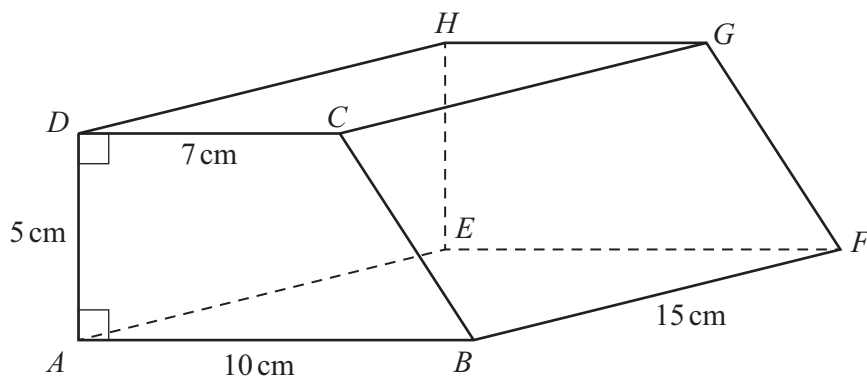
$$y = 2x - 7$$

$$x = \dots\dots\dots, y = \dots\dots\dots$$

$$x = \dots\dots\dots, y = \dots\dots\dots$$

[4]





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The diagram shows a prism of length 15 cm.  
The cross-section of the prism is a trapezium.

Angle  $DAB = 90^\circ$  and angle  $ADC = 90^\circ$ .  
 $AB = 10$  cm,  $AD = 5$  cm and  $DC = 7$  cm.

Calculate the angle the diagonal  $AG$  makes with the base  $ABFE$ .

..... [4]



28

$$f(x) = 7^{x-4}$$

Find the value of  $x$  when

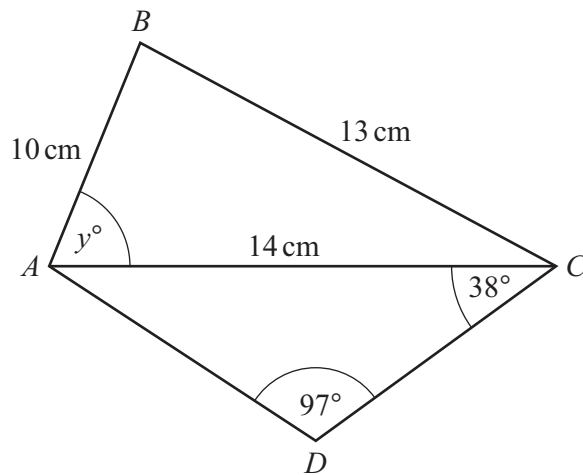
(a)  $f(x) = 1$

$$x = \dots\dots\dots [1]$$

(b)  $f^{-1}(x) = 1.$

$$x = \dots\dots\dots [2]$$





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SCALE

(a) Calculate the value of  $y$ .

$y = \dots\dots\dots$  [3]

(b) Calculate  $BD$ .

$BD = \dots\dots\dots\text{ cm}$  [5]





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