UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

*1108636051*

**MATHEMATICS** **0580/42**

Paper 4 (Extended) **October/November 2011**

**2 hours 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For $\pi$ use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

**1** Children go to camp on holiday.

**(a)** Fatima buys bananas and apples for the camp.

**(i)** Bananas cost \$0.85 per kilogram.

Fatima buys 20kg of bananas and receives a discount of 14%.

How much does she spend on bananas?

*Answer(a)*(i) \$ ..... [3]

**(ii)** Fatima spends \$16.40 on apples after a discount of 18%.

Calculate the original price of the apples.

*Answer(a)*(ii) \$ ..... [3]

**(iii)** The ratio number of bananas : number of apples = 4 : 5.

There are 108 bananas.

Calculate the number of apples.

*Answer(a)*(iii) ..... [2]

**(b)** The cost to hire a tent consists of two parts.

| | | |
|---|---|---|
| $c | + | $d per day |

The total cost for 4 days is $27.10 and for 7 days is $34.30.

Write down two equations in $c$ and $d$ and solve them.

*Answer(b)* $c =$ .....

$d =$ ..... [4]

**(c)** The children travel 270 km to the camp, leaving at 07 43 and arriving at 15 13.

Calculate their average speed in km/h.

*Answer(c)* ..... km/h [3]

**(d)** Two years ago $540 was put in a savings account to pay for the holiday.

The account paid **compound** interest at a rate of 6% per year.

How much is in the account now?

*Answer(d)* $ ..... [2]

**2**

$$f(x) = 4x - 2$$

$$g(x) = \frac{2}{x} + 1$$

$$h(x) = x^2 + 3$$

**(a)** **(i)** Find the value of hf(2).

*Answer(a)*(i) ..... [2]

**(ii)** Write fg($x$) in its simplest form.

*Answer(a)*(ii) fg($x$) = ..... [2]

**(b)** Solve g($x$) = 0.2.

*Answer(b)* $x$ = ..... [2]

**(c)** Find the value of gg(3).

*Answer(c)* ..... [2]

**(d)** **(i)** Show that f($x$) = g($x$) can be written as $4x^2 - 3x - 2 = 0$.

*Answer (d)*(i)

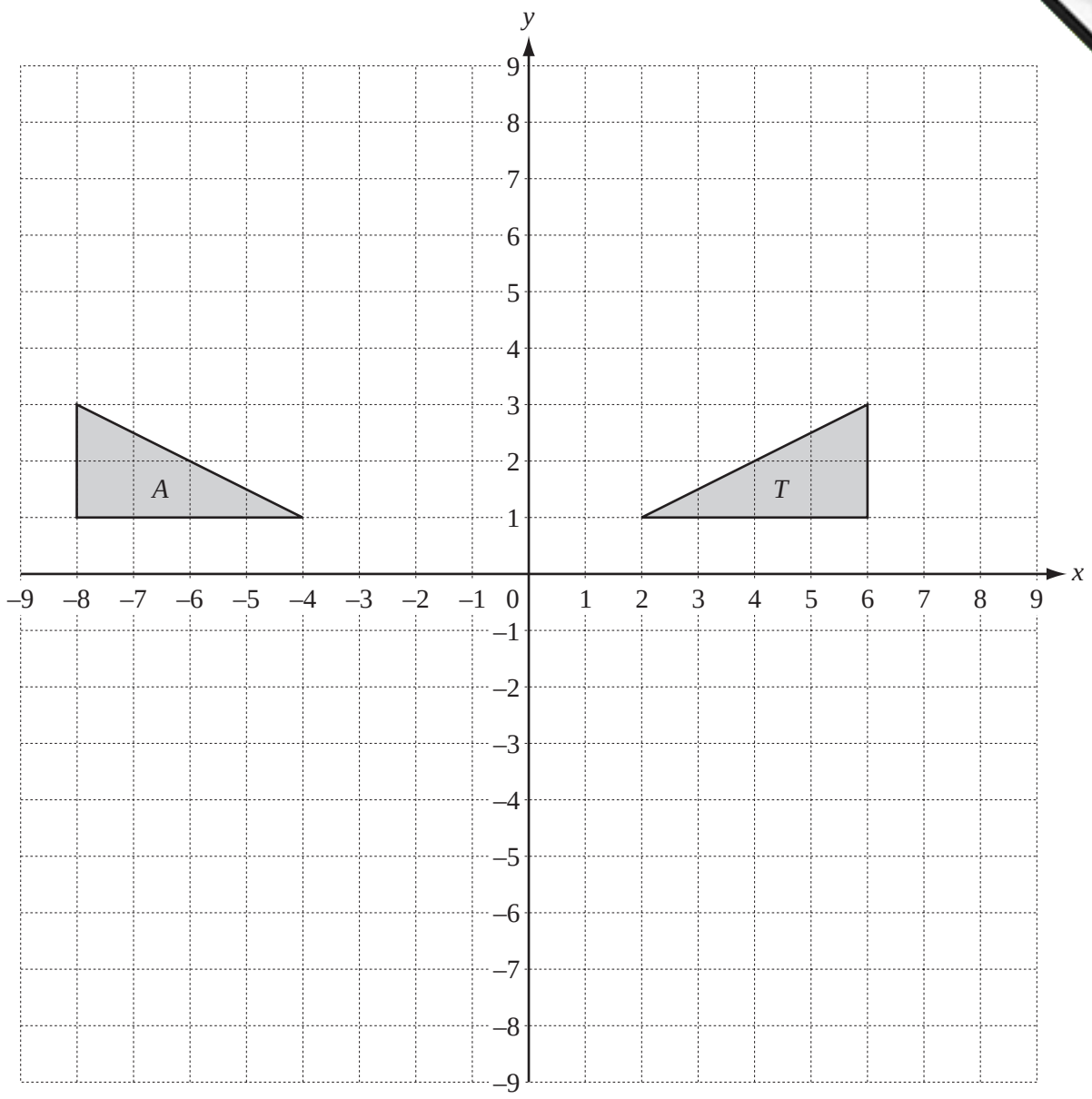
[1]

**(ii)** Solve the equation $4x^2 - 3x - 2 = 0$.

Show all your working and give your answers correct to 2 decimal places.

*Answer(d)*(ii) $x$ = ..... or $x$ = ..... [4]

3




Triangles $T$ and $A$ are drawn on the grid above.

**(a)** Describe fully the **single** transformation that maps triangle $T$ onto triangle $A$.

*Answer(a)* ..... [2]

**(b)** **(i)** Draw the image of triangle $T$ after a rotation of 90° anticlockwise about the point (0,0).

Label the image $B$. [2]

**(ii)** Draw the image of triangle $T$ after a reflection in the line $x + y = 0$.

Label the image $C$. [2]

**(iii)** Draw the image of triangle $T$ after an enlargement with centre (4, 5) and scale factor 1.5.

Label the image $D$. [2]

**(c)** **(i)** Triangle $T$ has its vertices at co-ordinates (2, 1), (6, 1) and (6, 3).

Transform triangle $T$ by the matrix $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$.

Draw this image on the grid and label it $E$.

[3]

**(ii)** Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$.

*Answer(c)*(ii) ..... [3]

**(d)** Write down the matrix that transforms triangle $B$ onto triangle $T$.

*Answer(d)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

**4** Boris has a recipe which makes 16 biscuits.

The ingredients are

160 g flour,

160 g sugar,

240 g butter,

200 g oatmeal.

**(a)** Boris has only 350 grams of oatmeal but plenty of the other ingredients.

**(i)** How many biscuits can he make?

*Answer(a)*(i) ..... [2]

**(ii)** How many grams of butter does he need to make this number of biscuits?

*Answer(a)*(ii) ..... g [2]

**(b)** The ingredients are mixed together to make dough.

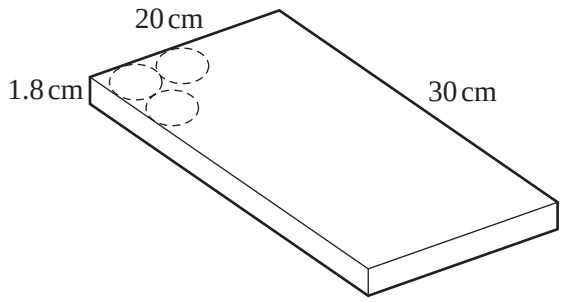
This dough is made into a sphere of volume 1080 $cm^3$.

Calculate the radius of this sphere.

[The volume, $V$, of a sphere of radius $r$ is $V = \frac{4}{3}\pi r^3$.]

*Answer(b)* ..... cm [3]

**(c)**




NOT TO SCALE

The 1080 $cm^3$ of dough is then rolled out to form a cuboid 20 cm × 30 cm × 1.8 cm.

Boris cuts out circular biscuits of diameter 5 cm.

**(i)** How many whole biscuits can he cut from this cuboid?

*Answer(c)*(i) ..... [1]

**(ii)** Calculate the volume of dough left over.

*Answer(c)*(ii) ..... $cm^3$ [3]

**5** **(a)** The times, $t$ seconds, for 200 people to solve a problem are shown in the table.

| Time ($t$ seconds) | Frequency |
|---|---|
| $0 < t \leqslant 20$ | 6 |
| $20 < t \leqslant 40$ | 12 |
| $40 < t \leqslant 50$ | 20 |
| $50 < t \leqslant 60$ | 37 |
| $60 < t \leqslant 70$ | 42 |
| $70 < t \leqslant 80$ | 50 |
| $80 < t \leqslant 90$ | 28 |
| $90 < t \leqslant 100$ | 5 |

Calculate an estimate of the mean time.

*Answer(a)* ..... s [4]

**(b)** **(i)** Complete the cumulative frequency table for this data.

| Time ($t$ seconds) | $t \leqslant 20$ | $t \leqslant 40$ | $t \leqslant 50$ | $t \leqslant 60$ | $t \leqslant 70$ | $t \leqslant 80$ | $t \leqslant 90$ | $t \leqslant 100$ |
|---|---|---|---|---|---|---|---|---|
| Cumulative Frequency | 6 | 18 | 38 | | | 167 | | |

[2]

**(ii)** Draw the cumulative frequency graph on the grid opposite to show this data. [4]

**(c)** Use your cumulative frequency graph to find

**(i)** the median time,

*Answer(c)*(i) ..... s [1]

**(ii)** the lower quartile,

*Answer(c)*(ii) ..... s [1]

**(iii)** the inter-quartile range,

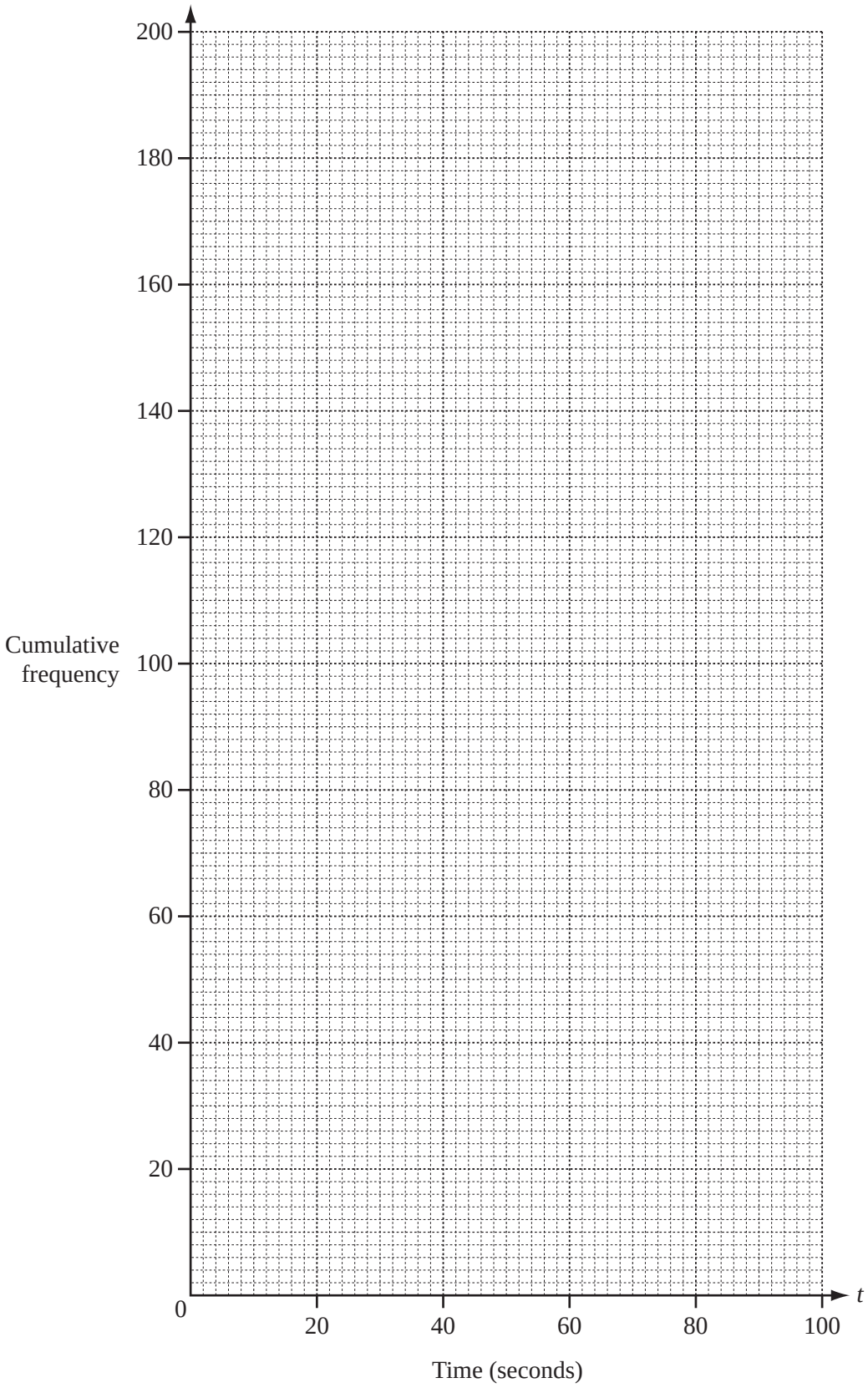
*Answer(c)*(iii) ..... s [1]

**(iv)** how many people took between 65 and 75 seconds to solve the problem,

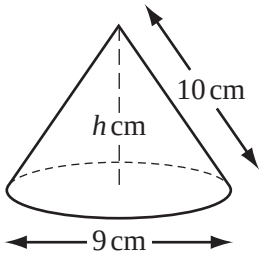
*Answer(c)*(iv) ..... [1]

**(v)** how many people took longer than 45 seconds to solve the problem.

*Answer(c)*(v) ..... [2]



**6**




NOT TO SCALE

A solid cone has diameter 9 cm, slant height 10 cm and vertical height $h$ cm.

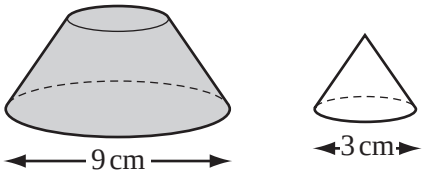
**(a)** **(i)** Calculate the curved surface area of the cone.
[The curved surface area, $A$, of a cone, radius $r$ and slant height $l$ is $A = \pi rl$.]

*Answer(a)*(i) ..... $cm^2$ [2]

**(ii)** Calculate the value of $h$, the vertical height of the cone.

*Answer(a)*(ii) $h$ = ..... [3]

**(b)**




NOT TO SCALE

Sasha cuts off the top of the cone, making a smaller cone with diameter 3 cm.
This cone is **similar** to the original cone.

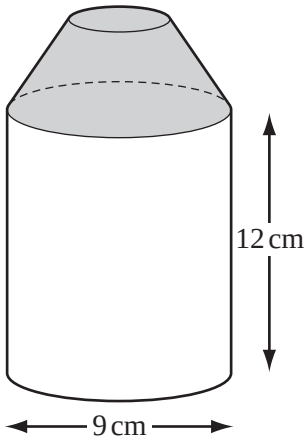
**(i)** Calculate the **vertical** height of this small cone.

*Answer(b)*(i) ..... cm [2]

**(ii)** Calculate the curved surface area of this small cone.

*Answer(b)*(ii) ..... $cm^2$ [2]

**(c)**

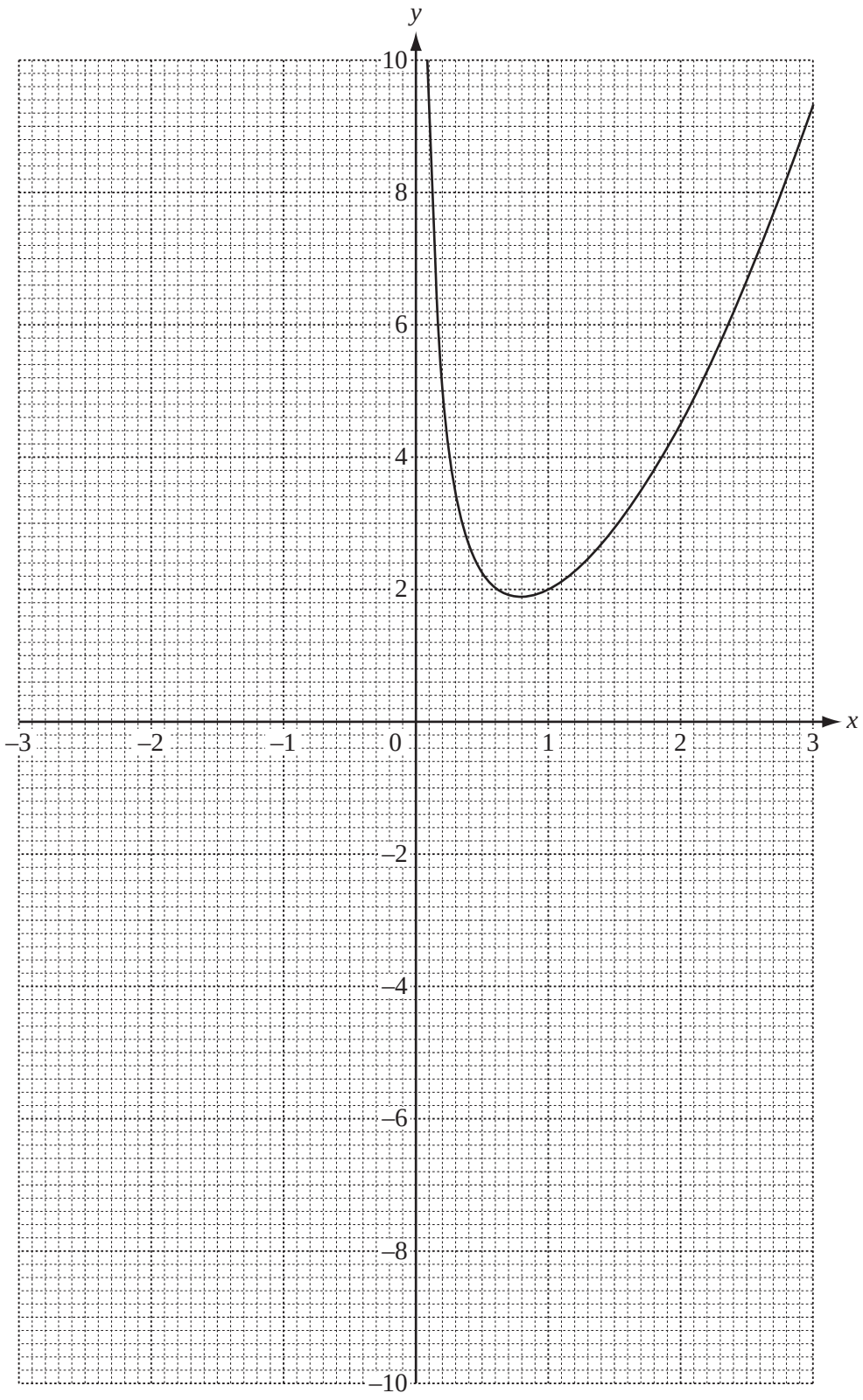



NOT TO SCALE

The shaded solid from **part (b)** is joined to a solid cylinder with diameter 9 cm and height 12 cm.
Calculate the **total** surface area of the whole solid.

*Answer(c)* ..... $cm^2$ [5]

**7** The diagram shows the accurate graph of $y = f(x)$ where $f(x) = \frac{1}{x} + x^2$ for $0 < x \leqslant 3$.



**(a)** Complete the table for $f(x) = \frac{1}{x} + x^2$.

| $x$ | $-3$ | $-2$ | $-1$ | $-0.5$ | $-0.3$ | $-0.1$ |
|---|---|---|---|---|---|---|
| $f(x)$ | | 3.5 | 0 | $-1.8$ | | |

[3]

**(b)** On the grid, draw the graph of $y = f(x)$ for $-3 \leqslant x < 0$. [3]

**(c)** By drawing a tangent, work out an estimate of the gradient of the graph where $x = 2$.

*Answer(c)* ..... [3]

**(d)** Write down the inequality satisfied by $k$ when $f(x) = k$ has three answers.

*Answer(d)* ..... [1]

**(e)** **(i)** Draw the line $y = 1 - x$ on the grid for $-3 \leqslant x \leqslant 3$. [2]

**(ii)** Use your graphs to solve the equation $1 - x = \frac{1}{x} + x^2$.

*Answer(e)*(ii) $x =$ ..... [1]

**(f)** **(i)** Rearrange $x^3 - x^2 - 2x + 1 = 0$ into the form $\frac{1}{x} + x^2 = ax + b$, where $a$ and $b$ are integers.

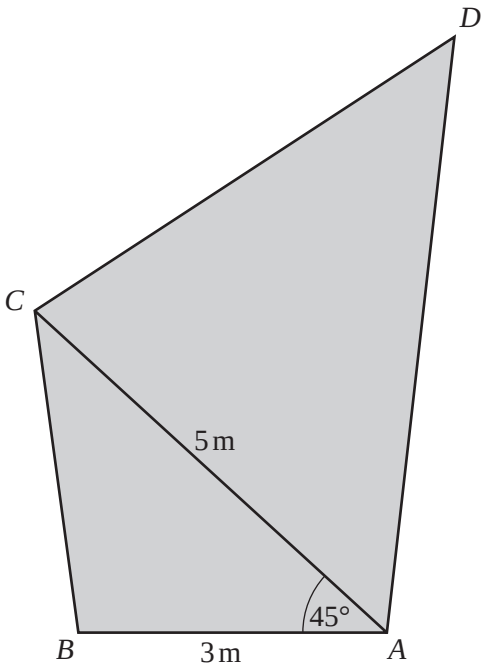
*Answer(f)*(i)

[2]

**(ii)** Write down the equation of the line that could be drawn on the graph to solve $x^3 - x^2 - 2x + 1 = 0$.

*Answer(f)*(ii) $y =$ ..... [1]

**8**




NOT TO SCALE

Parvatti has a piece of canvas *ABCD* in the shape of an irregular quadrilateral.

*AB* = 3 m, *AC* = 5 m and angle *BAC* = 45°.

**(a) (i)** Calculate the length of *BC* and show that it rounds to 3.58 m, correct to 2 decimal places.

You must show all your working.

*Answer(a)*(i)

[4]

**(ii)** Calculate angle *BCA*.

*Answer(a)*(ii) Angle *BCA* = ..... [3]

**(b)** $AC = CD$ and angle $CDA = 52°$.

**(i)** Find angle $DCA$.

*Answer(b)*(i) Angle $DCA$ = ..... [1]

**(ii)** Calculate the area of the canvas.

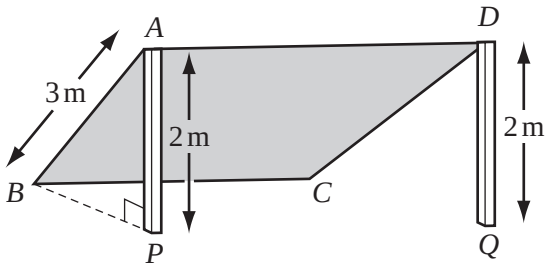
*Answer(b)*(ii) ..... $m^2$ [3]

**(c)** Parvatti uses the canvas to give some shade.

She attaches corners $A$ and $D$ to the top of vertical poles, $AP$ and $DQ$, each of height 2 m.

Corners $B$ and $C$ are pegged to the horizontal ground.

$AB$ is a straight line and angle $BPA = 90°$.




NOT TO SCALE

Calculate angle $PAB$.

*Answer(c)* Angle $PAB$ = ..... [2]

**9** **(a)** Emile lost 2 blue buttons from his shirt.

A bag of spare buttons contains 6 white buttons and 2 blue buttons.

Emile takes 3 buttons out of the bag at random **without replacement**.

Calculate the probability that

**(i)** all 3 buttons are white,

*Answer(a)*(i) ..... [3]

**(ii)** exactly one of the 3 buttons is blue.

*Answer(a)*(ii) ..... [3]

**(b)** There are 25 buttons in another bag.

This bag contains $x$ blue buttons.

Two buttons are taken at random **without replacement**.

The probability that they are both blue is $\frac{7}{100}$.

**(i)** Show that $x^2 - x - 42 = 0$.

*Answer (b)*(i)

[4]

**(ii)** Factorise $x^2 - x - 42$.

*Answer(b)*(ii) ..... [2]

**(iii)** Solve the equation $x^2 - x - 42 = 0$.

*Answer(b)*(iii) $x =$ ..... or $x =$ ..... [1]

**(iv)** Write down the number of buttons in the bag which are **not** blue.

*Answer(b)*(iv) ..... [1]

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