CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CAMBRIDGE INTERNATIONAL MATHEMATICS　　　　　　　**0607/31**

Paper 3 (Core)　　　　　　　　　　　　　　　　　　　　**May/June 2013**

1 hour 45 minutes

Candidates answer on the Question Paper.

Additional Materials:　　Geometrical Instruments
　　　　　　　　　　　　　Graphics Calculator

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.

Do not use staples, paper clips, highlighters, glue or correction fluid.

You may use a pencil for any diagrams or graphs.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.

Unless instructed otherwise, give your answers exactly or correct to three significant figures as appropriate.

Answers in degrees should be given to one decimal place.

For π, use your calculator value.

You must show all the relevant working to gain full marks and you will be given marks for correct methods, including sketches, even if your answer is incorrect.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is 96.

This document consists of **16** printed pages.

[Turn over

Formula List

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

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

Circumference, C, of circle, 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. $\qquad$ $A = \pi rl$

Curved 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. $\qquad$ $V = \dfrac{1}{3}Ah$

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

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

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

$\qquad$

3

Answer **all** the questions.

1   Three friends go out for a meal.
    Leon orders salmon fillet at $15.00 .
    Jin orders vegetarian pasta at $10.60 .
    Callum orders the chef's speciality at $17.00 .

    (a) Calculate the total cost of the three meals.

    Answer(a) $ .... [1]

    (b) The service charge is 10% of the total cost of the three meals.
        Calculate the service charge.

    Answer(b) $ .... [2]

    (c) Find the total cost including the service charge.

    Answer(c) $ .... [1]

    (d) The three friends agree to divide the total cost equally.
        Calculate how much Leon pays.

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

    (e) Leon pays with a $20 note.
        Find how much change he receives.

    Answer(e) $ .... [1]

2 **(a)**

Q

61°

NOT TO SCALE

c° / b°   42° \ a°

R   P
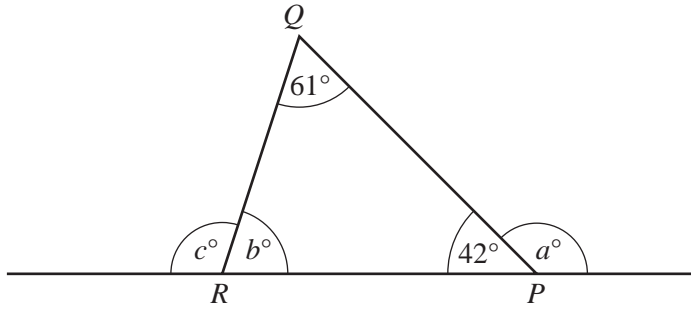
In triangle *PQR*, angle *QPR* = 42° and angle *PQR* = 61°.
Find the values of *a*, *b* and *c*.

Answer(a) a = ...

b = ...

c = ... [3]

(b)
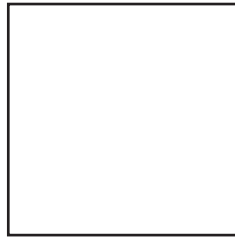
The diagram shows a square.

(i) Draw all the lines of symmetry on the square. [2]
(ii) Write down the order of rotational symmetry of the square.

Answer(b)(ii) .... [1]

3 **(a)** $s = \dfrac{pr}{q}$

Find the value of *s* when *p* = 13.2, *q* = 1.3 and *r* = 12.8 .
Give your answer correct to 3 decimal places.

Answer(a) .... [2]

(b) Write your answer to **part (a)** correct to 2 significant figures.

Answer(b) .... [1]

(c) Write your answer to **part (b)** in standard form.

Answer(c) .... [1]

4 23 girls each walked a distance of 2 kilometres.
The number of minutes, correct to the nearest minute, that each girl took is recorded below.

18	19	26	36	18	25	31	43	13	36	18	23

20	20	34	32	41	33	19	17	21	25	40

(a) Complete the **ordered** stem and leaf diagram to show this information.

```
1 |
2 |
3 |
4 |
```

Key .... | .... = ... [3]

(b) For the times given in **part (a)** work out

(i) the range,

Answer(b)(i) .... [1]

(ii) the median,

Answer(b)(ii) .... [1]

(iii) the lower quartile,

Answer(b)(iii) .... [1]

(iv) the upper quartile.

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

5 Ten children were each given a burger to eat.
The table shows the number of hours since their last meal and the time, in seconds, taken to eat their burger.

Time since last meal, x hours	1.5	1.9	2.3	3.0	3.2	3.5	3.8	4.1	4.7	5.2
Time to eat burger, y seconds	90	86	70	72	63	55	60	45	38	25

(a) Complete the scatter diagram.
The first six points have been plotted for you.

[2]
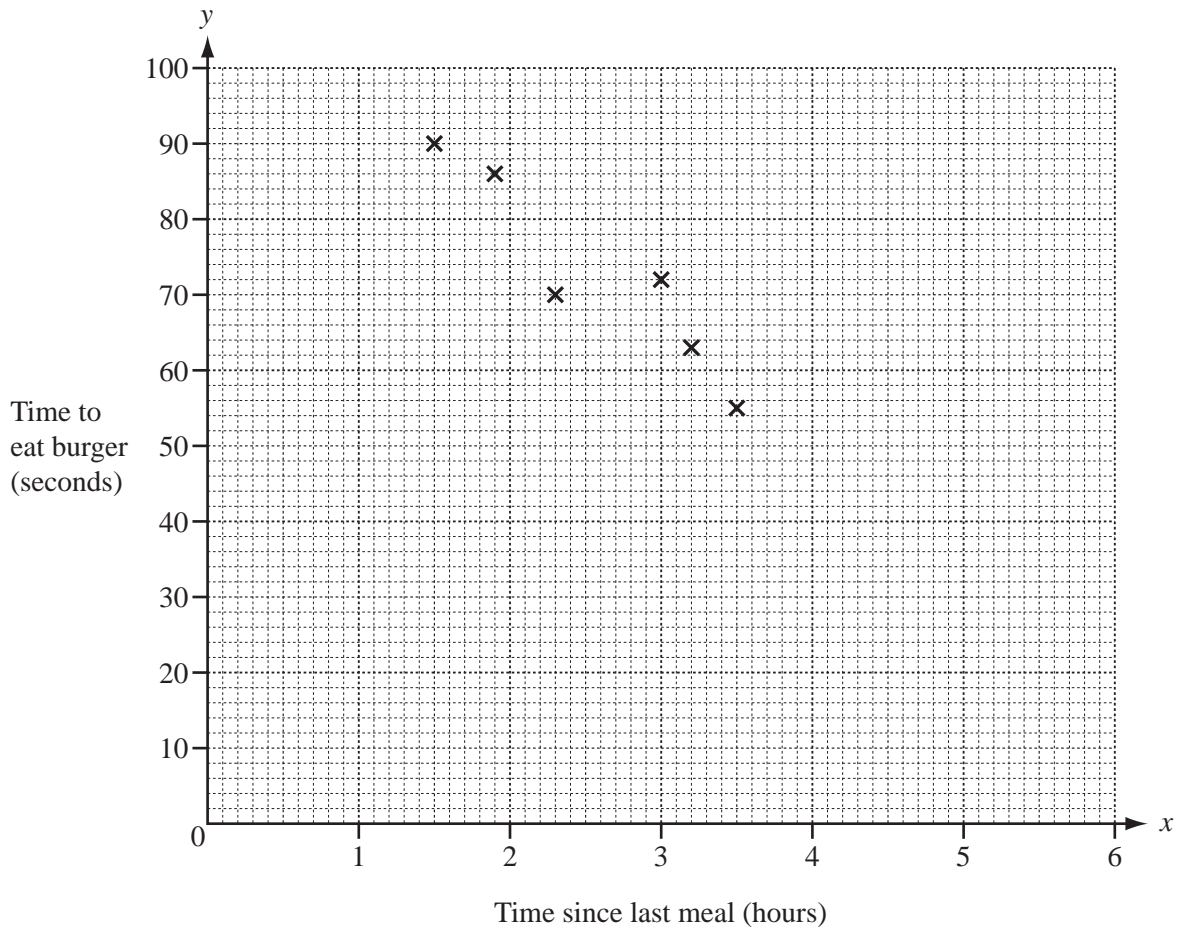
(b) Describe the type of correlation.

Answer(b) .... [1]

(c) (i) Find the mean number of hours since the children's last meal.

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

(ii) Find the mean number of seconds taken to eat a burger.

Answer(c)(ii) .... seconds [1]
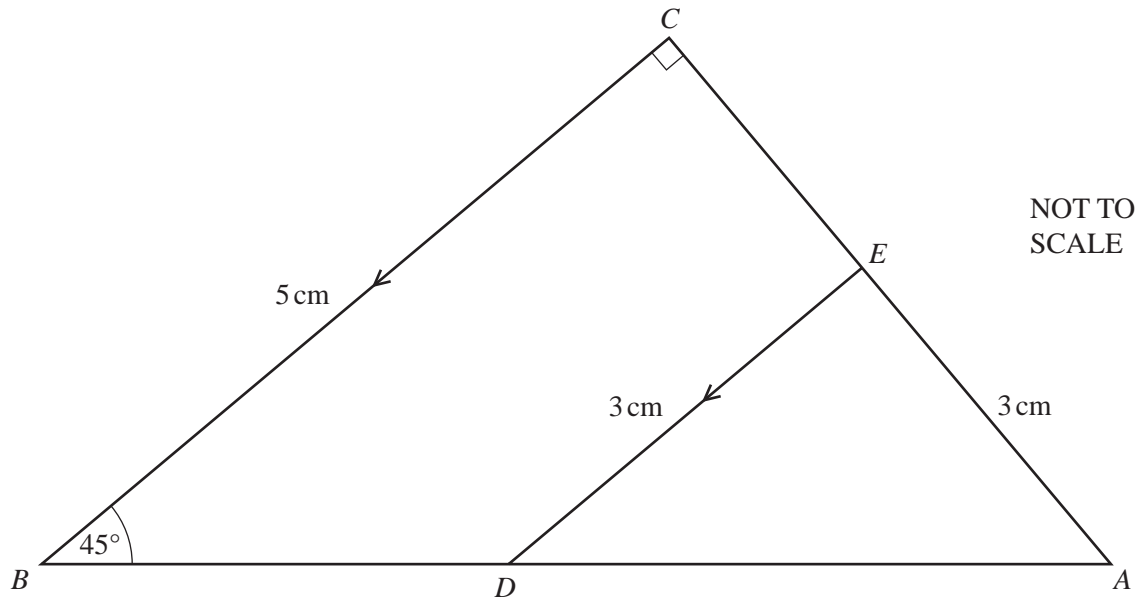
(iii) On the diagram, plot the mean point. [1]

(d) On the diagram, draw the line of best fit by eye. [2]

(e) Jordi's last meal was 4.5 hours ago.

Use your line of best fit to estimate the time taken for Jordi to eat a burger.

Answer(e) .... seconds [1]

6

NOT TO SCALE

5 cm

3 cm

3 cm

45°

B *D* *A* *C* *E*

The diagram shows a right-angled triangle, *ABC*.
BC is parallel to *DE*, *AE* = *DE* = 3 cm, *BC* = 5 cm and angle *CBA* = 45°.

(a) Use the letters of this diagram to write down

(i) an angle that is acute,

Answer(a)(i) .... [1]

(ii) an angle that is obtuse,

Answer(a)(ii) .... [1]

(iii) two lines that are perpendicular.

Answer(a)(iii) .... and .... [1]

(b) Write down the size of the following angles.

(i) Angle *DEA*

Answer(b)(i) .... [1]

(ii) Angle *DAE*

Answer(b)(ii) .... [1]

7 A zoo has three hippopotamuses (hippos), a male, a female and a baby.
The hippos eat a total of 87.5 kg of food each day.

(a) The hippos eat the food in proportion to their weight.
The male weighs 1600 kg, the female weighs 1400 kg and the baby weighs 500 kg.

(i) Show that the male eats 40 kg of food each day.

[2]

(ii) Calculate the amount of food that the female eats each day.

Answer(a)(ii) .... kg [2]

(b) One kilogram of food costs 0.50 euros (€).

Calculate how much it costs to feed the three hippos for one year (365 days).

Answer(b) € .... [2]

(c) The entrance fee to the zoo is 15 euros per person.

What is the minimum number of people that need to visit the zoo to pay for feeding the three hippos for one year?

Answer(c) .... [2]

8 (a) Piotr is making patterns with sticks.

Pattern 1   Pattern 2   Pattern 3

(i) In Pattern 1 there are 3 sticks.

Write down the number of sticks that Piotr uses to make Pattern 2 and Pattern 3.
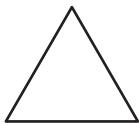
Answer(a)(i) Pattern 2 ....

Pattern 3 .... [2]

(ii) Find an expression, in terms of *n*, for the number of sticks used to make Pattern *n*.

Answer(a)(ii) .... [1]

(iii) Find the number of sticks used to make Pattern 10.

Answer(a)(iii) .... [1]

(b) Pawel is also making patterns with sticks.
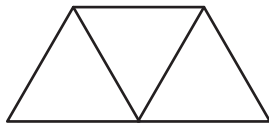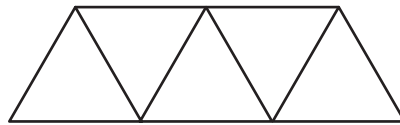
Pattern 1   Pattern 2   Pattern 3

The number of triangles in each Pattern forms the sequence 1, 3, 5, ….

(i) Write down the next two terms in this sequence.

Answer(b)(i) .... , ... [2]

(ii) Find the number of triangles in Pattern 10.

Answer(b)(ii) .... [1]

(iii) Find an expression, in terms of *n*, for the number of triangles used to make Pattern *n*.

Answer(b)(iii) .... [2]

9 A polygon, *Q*, has been drawn on the diagram.
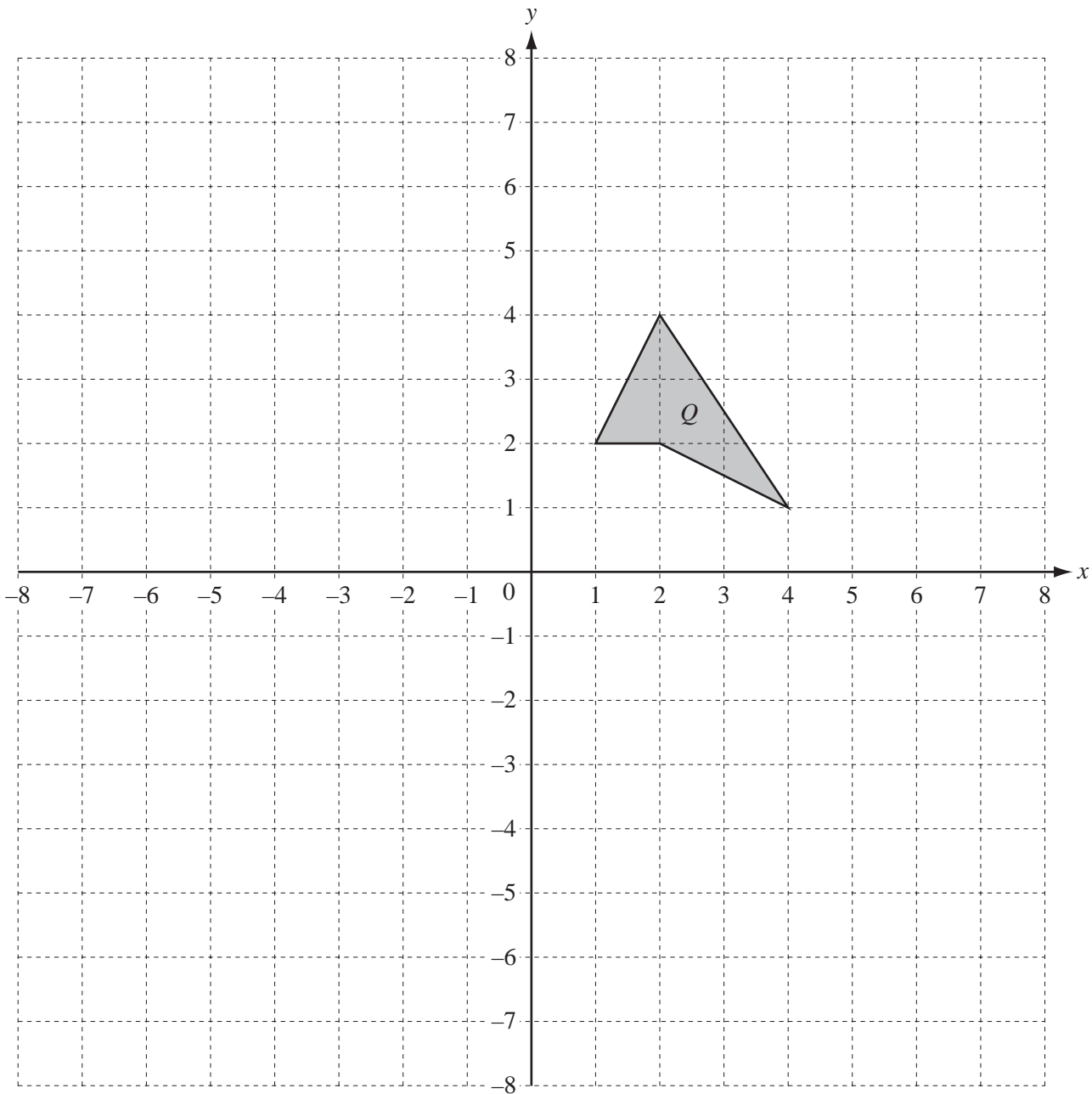
(a) Draw the reflection of shape *Q* in the *y*-axis. [2]

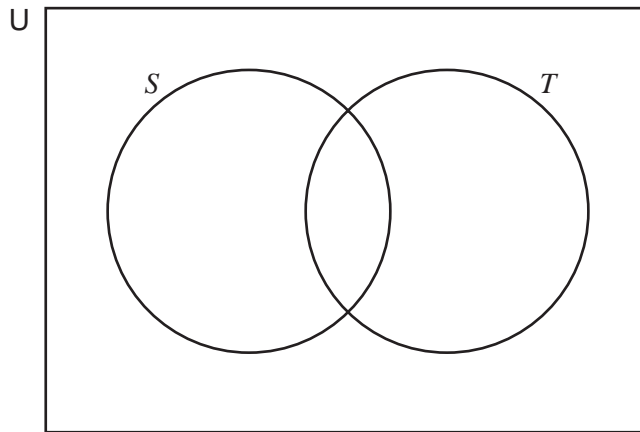(b) Draw the enlargement of shape *Q* with centre (0, 0), scale factor 2. [2]

10 $U = \{c, a, m, b, r, i, d, g, e\}$
$S = \{m, a, g, i, c\}$
$T = \{b, r, i, d, g, e\}$

(a) Write down the letters in the set $S \cap T$.

Answer(a) .... [1]

(b) Complete the Venn diagram.

[2]

(c) A letter is chosen at random from U.
Find the probability that the letter is in the set

(i) S,

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

(ii) $S \cup T$,

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

(iii) T'.

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

(d) A letter is chosen at random from the set S.
Find the probability that the letter is also in the set T.

Answer(d) .... [2]

11 Faaiz competes in a three-part race.
    He runs 10 km, cycles 20 km and rollerblades 10 km.

(a) Faaiz takes 40 minutes to run the 10 km.
     Find his average speed in kilometres per hour.

                            Answer(a) .... km/h [2]

(b) He cycles at 25 km/h.
     Find the time, in minutes, he takes to cycle 20 km.

                            Answer(b) .... minutes [2]

(c) He takes 32 minutes to rollerblade 10 km.
     Find his average speed, in km/h, for the **whole race**.

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

12 **(a)** Heyon is orienteering.
She starts at point F and walks 500 m on a bearing of 050° to the point G.
From G she walks 1000 m on a bearing of 140° to the point H.

(i) Draw a **sketch** to show Heyon's walk.
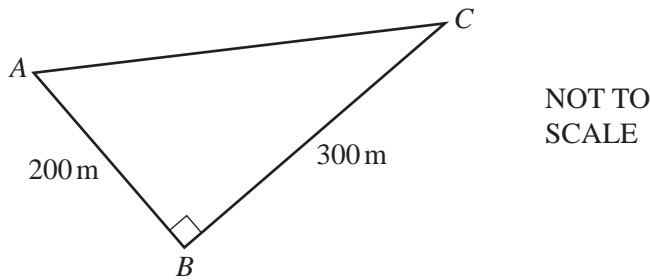Mark the points G and H.

North

F

[2]

(ii) On your sketch, draw a North line through the point G.

On your sketch, write the values of the angles at G which show that angle $FGH = 90º$. [2]
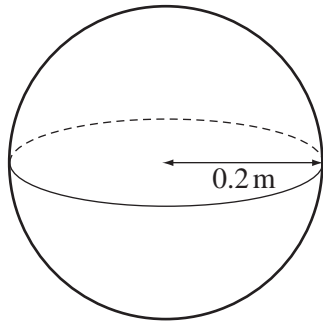
(b) Sean walks from A to B to C.

C

A

200 m   300 m

NOT TO
SCALE

B

(i) Calculate the distance AC.

Answer(b)(i) .... m   [2]

(ii) Use trigonometry to calculate angle BAC.

Answer(b)(ii) Angle $BAC =$ ....   [2]

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13 (a)

NOT TO
SCALE

0.2 m

The diagram shows a sphere of radius 0.2 m.

(i) Calculate the curved surface area of this sphere.
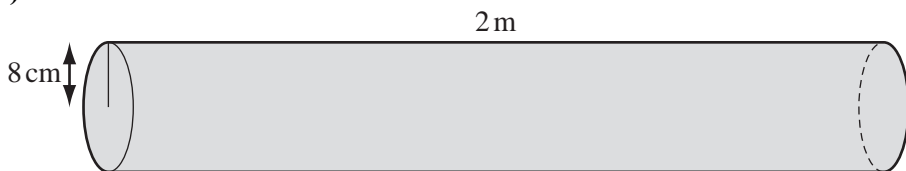
Answer(a)(i) .... m² [2]

(ii) The sphere is painted.
One tin of paint covers an area of 50 m².

Calculate the greatest number of these spheres that can be painted using one tin of paint.

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

(b)

2 m

8 cm

NOT TO
SCALE

The diagram shows a cylinder of radius 8 cm and length 2 m.

(i) Calculate the curved surface area of this cylinder.
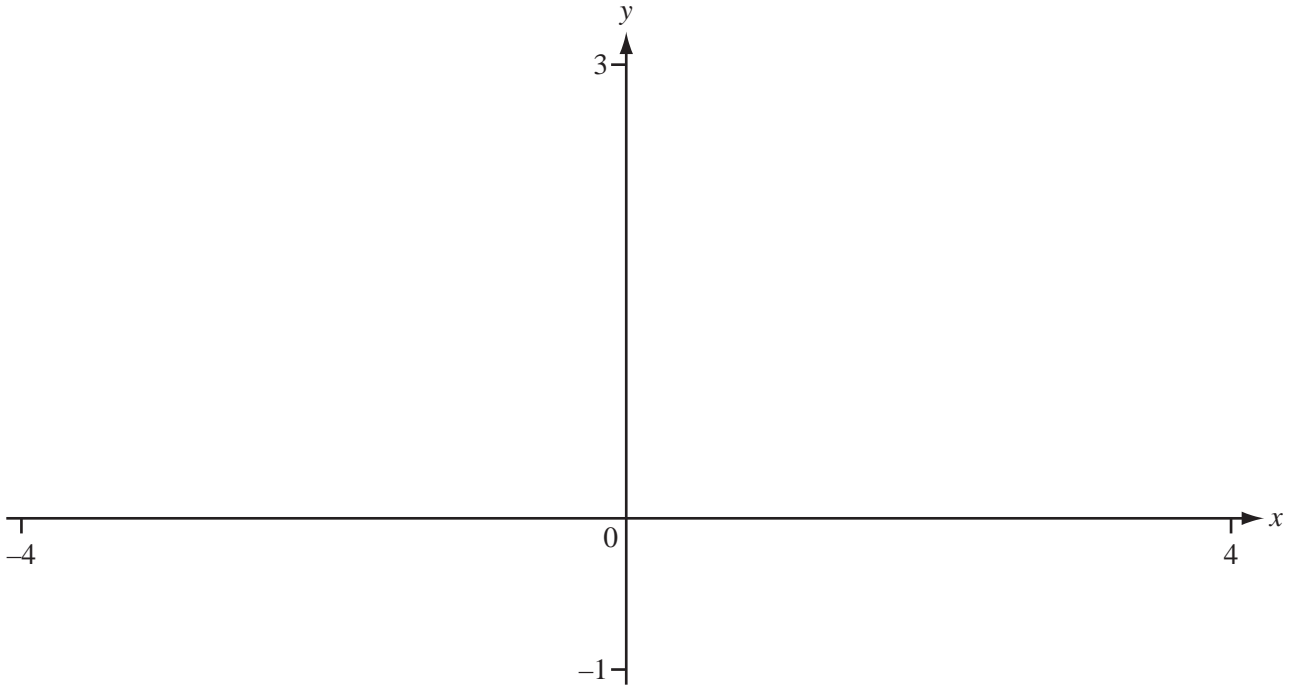Give your answer in **square centimetres**.

Answer(b)(i) .... cm² [2]

(ii) Calculate the volume of this cylinder.
Give your answer in **cubic centimetres**.

Answer(b)(ii) .... cm³ [2]

Question 14 is printed on the next page.

14

(a) On the diagram, sketch the graph $y = \dfrac{2}{(x^2+1)}$ for $-4 \leqslant x \leqslant 4$. [2]

(b) Write down the co-ordinates of the maximum point.

Answer(b) (................. , ...) [1]

(c) Write down the equation of the asymptote.

Answer(c) .... [1]

(d) Write down the range of $y = \dfrac{2}{(x^2+1)}$.

Answer(d) .... [3]

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