UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

0866018584

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2010**

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 π 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 **18** printed pages and **2** blank pages.

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1 **(a)** Hansi and Megan go on holiday.
The costs of their holidays are in the ratio Hansi : Megan = 7 : 4.
Hansi's holiday costs \$756.
Find the cost of Megan's holiday.

Answer(a) \$ ..... [2]

(b) In 2008, Hansi earned \$7800.

(i) He earned 15% more in 2009.
Calculate how much he earned in 2009.

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

(ii) In 2010, he earns 10% more than in 2009.
Calculate the percentage increase in his earnings from 2008 to 2010.

Answer(b)(ii) ..... % [3]

(c) Megan earned \$9720 in 2009. This was 20% more than she earned in 2008.
How much did she earn in 2008?

Answer(c) \$ ..... [3]

(d) Hansi invested \$500 at a rate of 4% per year **compound** interest.
Calculate the final amount he had after three years.

Answer(d) \$ ..... [3]

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2 $f(x) = 6 + x^2$ $g(x) = 4x - 1$

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(a) Find

(i) g(3),

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

(ii) f (–4).

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

(b) Find the inverse function $g^{-1}(x)$.

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

(c) Find $fg(x)$ in its simplest form.

Answer(c) $fg(x) =$ ..... [3]

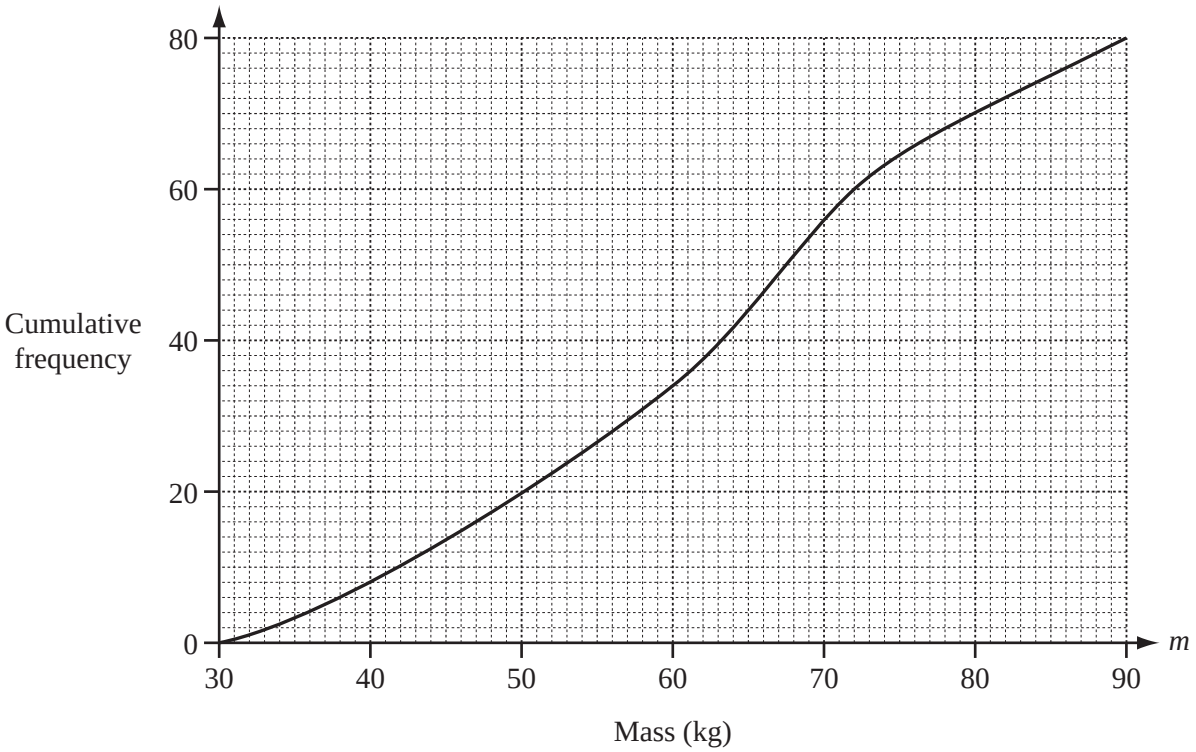
(d) Solve the equation $gg(x) = 3$.

Answer(d) $x =$ ..... [3]

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3 80 boys each had their mass, m kilograms, recorded.
The cumulative frequency diagram shows the results.



(a) Find

(i) the median,

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

(ii) the lower quartile,

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

(iii) the interquartile range.

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

(b) How many boys had a mass greater than 60kg?

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

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(c) (i) Use the cumulative frequency graph to complete this frequency table.

Mass, m	Frequency
$30 < m \leqslant 40$	8
$40 < m \leqslant 50$	
$50 < m \leqslant 60$	14
$60 < m \leqslant 70$	22
$70 < m \leqslant 80$	
$80 < m \leqslant 90$	10

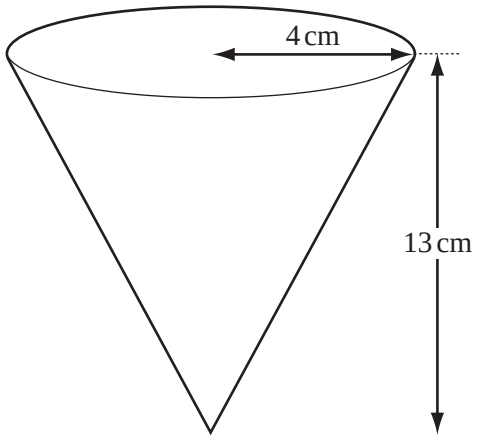
[2]

(ii) Calculate an estimate of the mean mass.

Answer(c)(ii) ..... kg [4]

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4 (a)



NOT TO SCALE

The diagram shows a cone of radius 4 cm and height 13 cm.
It is filled with soil to grow small plants.
Each cubic centimetre of soil has a mass of 2.3g.

(i) Calculate the volume of the soil inside the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(a)(i) ..... cm^3 [2]

(ii) Calculate the mass of the soil.

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

(iii) Calculate the greatest number of these cones which can be filled **completely** using 50 kg of soil.

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

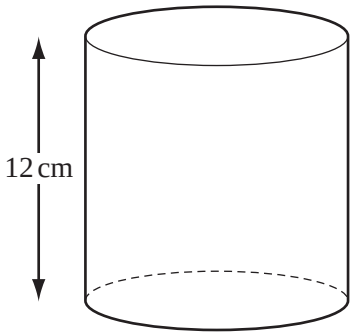
(b) A **similar** cone of height 32.5 cm is used for growing larger plants.

Calculate the volume of soil used to fill this cone.

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

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(c)



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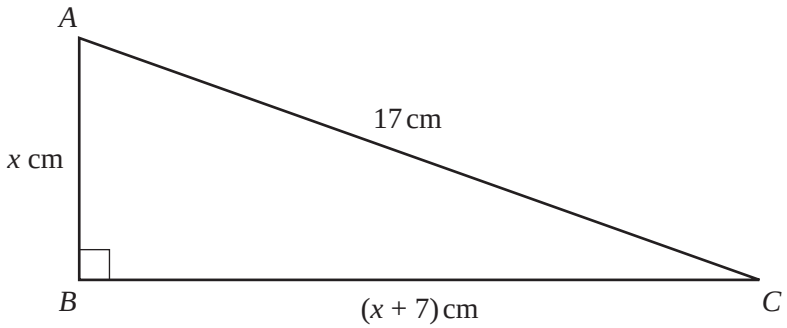
Some plants are put into a cylindrical container with height 12 cm and volume 550 cm^3.

Calculate the radius of the cylinder.

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

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5 (a)



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In the right-angled triangle ABC, $AB = x$ cm, $BC = (x + 7)$ cm and $AC = 17$ cm.

(i) Show that $x^2 + 7x - 120 = 0$.

Answer(a)(i)

[3]

(ii) Factorise $x^2 + 7x - 120$.

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

(iii) Write down the solutions of $x^2 + 7x - 120 = 0$.

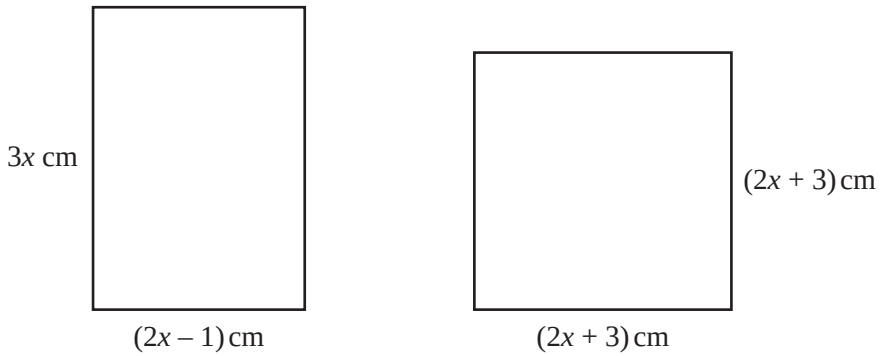
Answer(a)(iii) $x =$ ..... or $x =$ ..... [1]

(iv) Write down the length of BC.

Answer(a)(iv) $BC =$ ..... cm [1]

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(b)



The rectangle and the square shown in the diagram above have the same area.

(i) Show that $2x^2 - 15x - 9 = 0$.

Answer(b)(i)

[3]

(ii) Solve the equation $2x^2 - 15x - 9 = 0$.
Show all your working and give your answers correct to 2 decimal places.

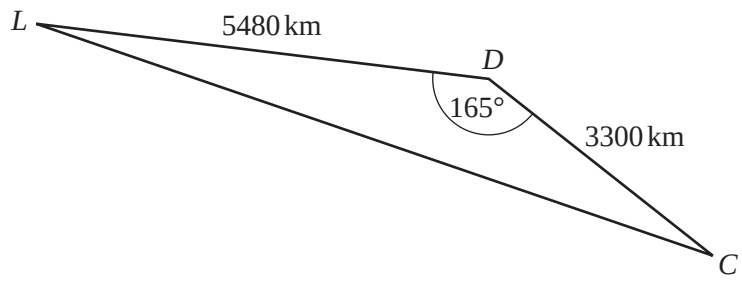
Answer(b)(ii) $x =$ ..... or $x =$ ..... [4]

(iii) Calculate the perimeter of the square.

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

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6



NOT TO SCALE

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The diagram shows the positions of London (L), Dubai (D) and Colombo (C).

(a) (i) Show that LC is 8710 km correct to the nearest kilometre.

Answer(a)(i)

[4]

(ii) Calculate the angle CLD.

Answer(a)(ii) Angle CLD = ... [3]

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(b) A plane flies from London to Dubai and then to Colombo.
It leaves London at 01 50 and the total journey takes 13 hours and 45 minutes.
The local time in Colombo is 7 hours ahead of London.
Find the arrival time in Colombo.

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

(c) Another plane flies the 8710 km directly from London to Colombo at an average speed of 800 km/h.
How much longer did the plane in **part (b)** take to travel from London to Colombo?
Give your answer in hours and minutes, correct to the nearest minute.

Answer(c) ..... h ..... min [4]

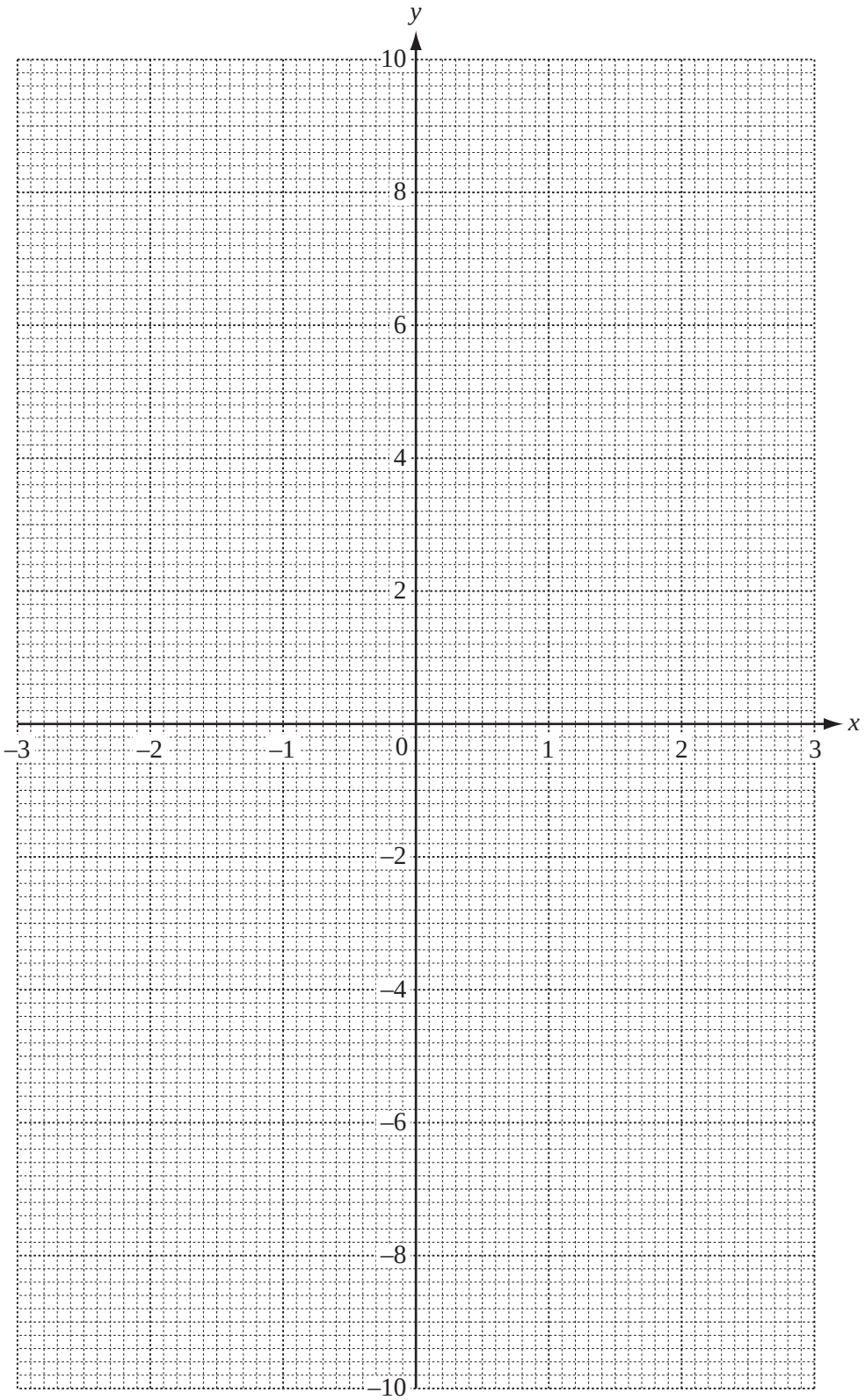
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7 **(a)** Complete the table for the function $f(x) = \frac{2}{x} - x^2$.

x	–3	–2	–1	–0.5	–0.2		0.2	0.5	1	2	3
f(x)	–9.7	–5			–10.0		10.0	3.75	1		–8.3

[3]

(b) On the grid draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.



[5]

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(c) Use your graph to

(i) solve f(x) = 2,

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

(ii) find a value for k so that f(x) = k has 3 solutions.

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

(d) Draw a suitable line on the grid and use your graphs to solve the equation $\frac{2}{x} - x^2 = 5x$.

Answer(d) x = ... or x = ... [3]

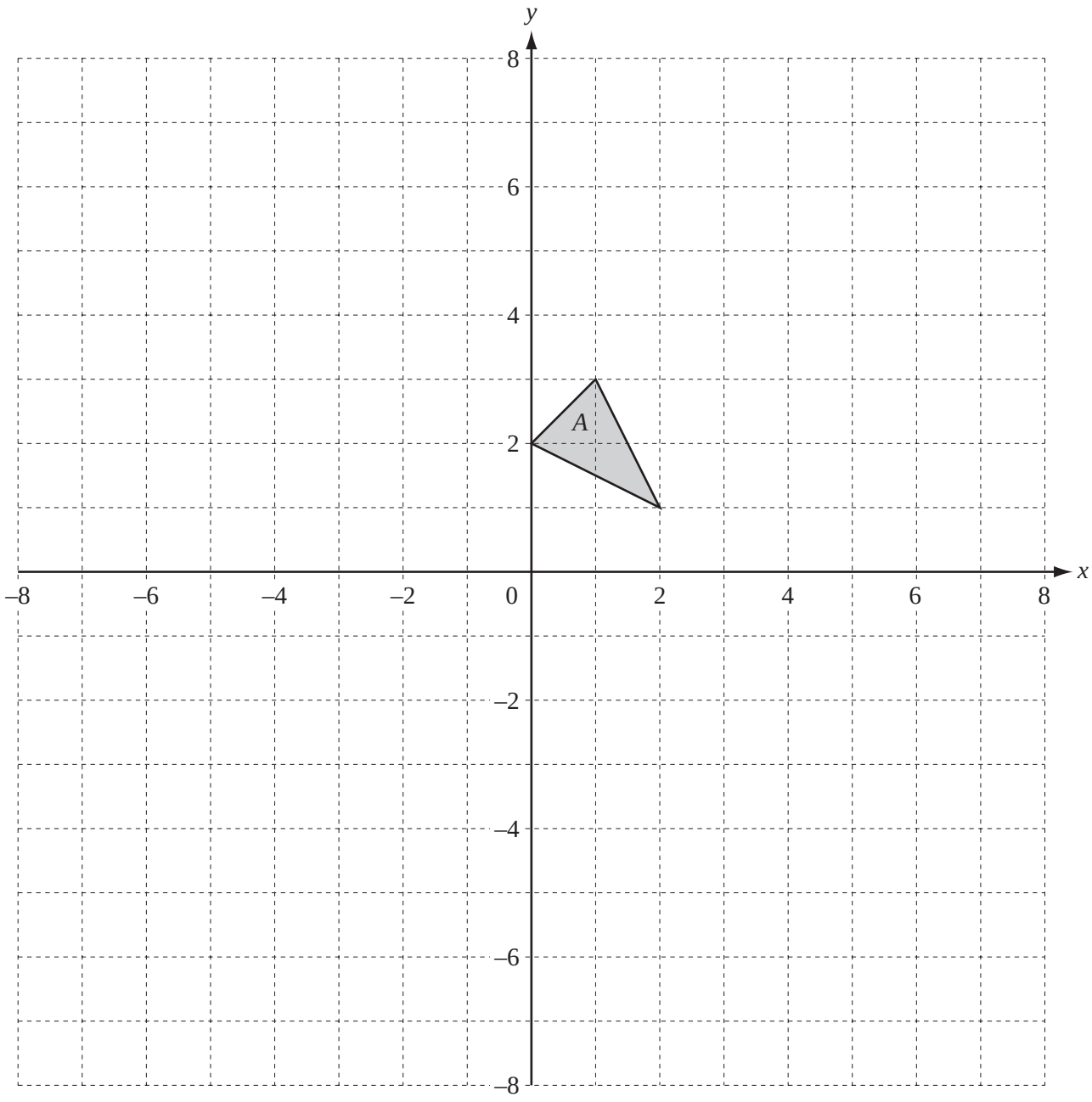
(e) Draw the tangent to the graph of y = f(x) at the point where $x = -2$.

Use it to calculate an estimate of the gradient of y = f(x) when $x = -2$.

Answer(e) ..... [3]

8 (a)

For Examiner's Use



Draw the images of the following transformations on the grid above.

(i) Translation of triangle A by the vector $\begin{pmatrix} 3 \\ -7 \end{pmatrix}$. Label the image B. [2]

(ii) Reflection of triangle A in the line $x = 3$. Label the image C. [2]

(iii) Rotation of triangle A through 90° anticlockwise around the point (0, 0). Label the image D. [2]

(iv) Enlargement of triangle A by scale factor –4, with centre (0, 1). Label the image E. [2]

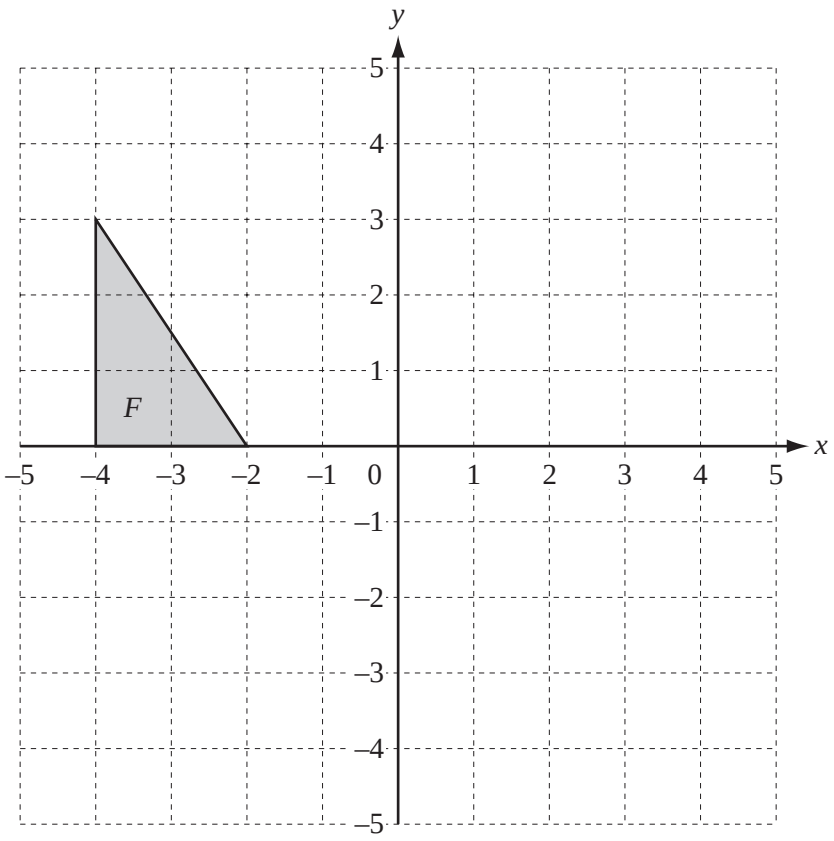
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(b) The area of triangle E is $k \times$ area of triangle A.
Write down the value of k.

Answer(b) $k =$ ..... [1]

(c)



(i) Draw the image of triangle F under the transformation represented by the matrix $\mathbf{M} = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$. [3]

(ii) Describe fully this single transformation.

Answer(c)(ii) .....

..... [3]

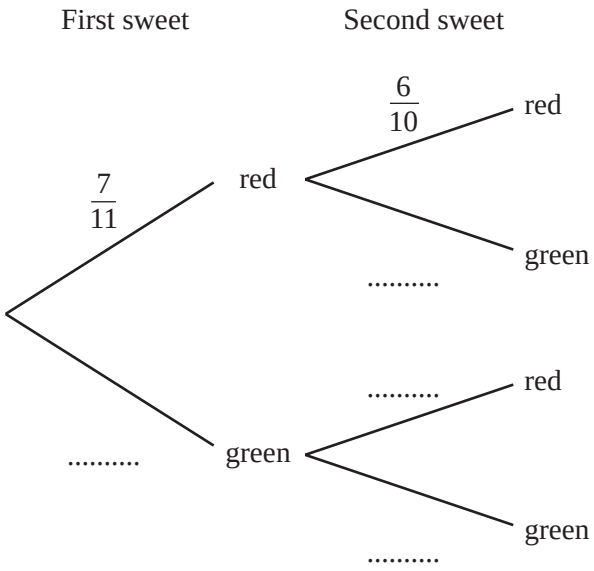
(iii) Find $\mathbf{M}^{-1}$, the inverse of the matrix $\mathbf{M}$.

Answer(c)(iii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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9 A bag contains 7 red sweets and 4 green sweets.
Aimee takes out a sweet at random and eats it.
She then takes out a second sweet at random and eats it.

(a) Complete the tree diagram.



[3]

(b) Calculate the probability that Aimee has taken

(i) two red sweets,

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

(ii) one sweet of each colour.

Answer(b)(ii) ..... [3]

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(c) Aimee takes a third sweet at random.
Calculate the probability that she has taken

(i) three red sweets,

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

(ii) at least one red sweet.

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

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10 In all the following sequences, after the first two terms, the rule is to add the previous two terms to find the next term.

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

1 1 2 3 5 8 13 .... [1]

(b) Write down the first two terms of this sequence.

.... 3 11 14 [2]

(c) **(i)** Find the value of d and the value of e.

2 d e 10

Answer(c)(i) d = ...

e = ... [3]

(ii) Find the value of x, the value of y and the value of z.

-33 x y z 18

Answer(c)(ii) x = ...

y = ...

z = ... [5]

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