UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

* 2 6 3 5 4 9 0 2 2 3 *

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

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

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 **16** printed pages.

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1 Last year Mukthar earned \$18 900 .
He did not pay tax on \$5500 of his earnings.
He paid 24% tax on his remaining earnings.

(a) (i) Calculate how much tax Mukthar paid last year.

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

(ii) Calculate how much Mukthar earned each month after tax had been paid.

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

(b) This year Mukthar now earns \$19 750.50 .

Calculate the percentage increase from \$18 900.

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

(c) Mukthar has \$1500 to invest in one of the following ways.

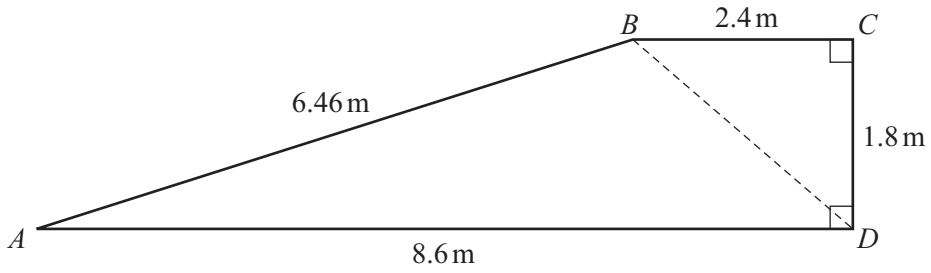
- **Account A** paying **simple** interest at a rate of 4.1% per year
- **Account B** paying **compound** interest at a rate of 3.3% per year

Which account will be worth more after **3 years** and by how much?

Answer(c) Account ..... by \$ ..... [5]

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2



NOT TO SCALE

The diagram shows the cross section, *ABCD*, of a ramp.

(a) Calculate angle *DBC*.

Answer(a) Angle *DBC* = ... [2]

(b) (i) Show that *BD* is exactly 3 m.

Answer(b)(i)

[2]

(ii) Use the cosine rule to calculate angle *ABD*.

Answer(b)(ii) Angle *ABD* = ... [4]

(c) The ramp is a prism of width 4 m.

Calculate the volume of this prism.

Answer(c) ..... m^3 [3]

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3 **(a)** Write as a single fraction in its simplest form.

$$\frac{2x-1}{2} - \frac{3x+1}{5}$$

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

(b) Expand and simplify.

$$(2x-3)^2 - 3x(x-4)$$

Answer(b) ..... [4]

(c) **(i)** Factorise.

$$2x^2 + 5x - 3$$

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

(ii) Simplify.

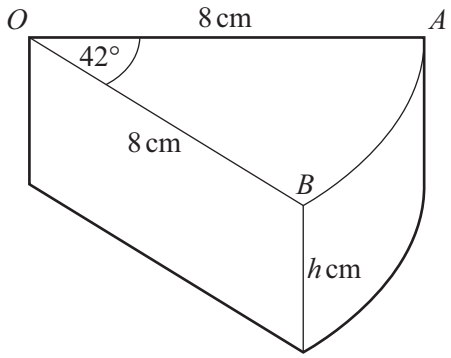
$$\frac{2x^2+5x-3}{2x^2-18}$$

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

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NOT TO SCALE

A wedge of cheese in the shape of a prism is cut from a cylinder of cheese of height h cm. The radius of the cylinder, OA, is 8 cm and the angle $AOB = 42°$.

(a) (i) The volume of the wedge of cheese is 90 cm^3.

Show that the value of h is 3.84 cm correct to 2 decimal places.

Answer(a)(i)

[4]

(ii) Calculate the **total** surface area of the wedge of cheese.

Answer(a)(ii) ..... cm^2 [5]

(b) A mathematically similar wedge of cheese has a volume of 22.5 cm^3.

Calculate the height of this wedge.

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

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[Turn over

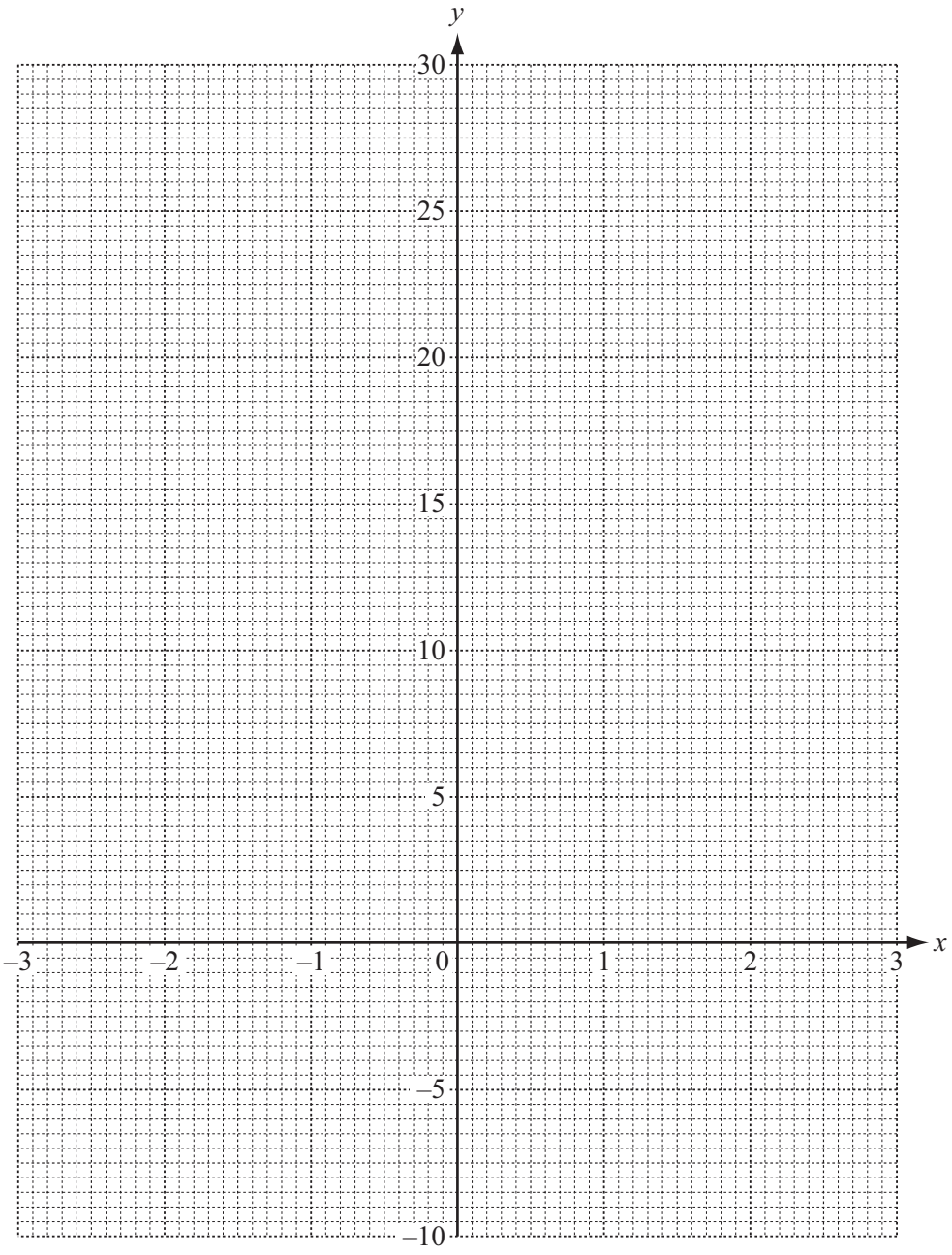
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5 **(a)** Complete the table of values for $y = \frac{2}{x^2} - \frac{1}{x} - 3x$.

x	–3	–2	–1	–0.5	–0.3		0.3	0.5	1	2	3
y	9.6		6		26.5		18.0		–2	–6	–9.1

[3]

(b) Draw the graph of $y = \frac{2}{x^2} - \frac{1}{x} - 3x$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$.



[5]

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(c) Use your graph to solve these equations.

(i) $\frac{2}{x^2} - \frac{1}{x} - 3x = 0$

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

(ii) $\frac{2}{x^2} - \frac{1}{x} - 3x - 7.5 = 0$

Answer(c)(ii) x = ... or x = ... or x = ... [3]

(d) (i) By drawing a suitable straight line on the graph, solve the equation $\frac{2}{x^2} - \frac{1}{x} - 3x = 10 - 3x$.

Answer(d)(i) x = ... or x = ... [4]

(ii) The equation $\frac{2}{x^2} - \frac{1}{x} - 3x = 10 - 3x$ can be written in the form $ax^2 + bx + c = 0$ where a, b and c are integers.

Find the values of a, b and c.

Answer(d)(ii) a = ... , b = ... , c = ... [3]

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E	N	L	A	R	G	E	M	E	N	T

Prettie picks a card at random from the 11 cards above and does not replace it.
She then picks a second card at random and does not replace it.

(a) Find the probability that she picks

(i) the letter L and then the letter G,

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

(ii) the letter E twice,

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

(iii) two letters that are the same.

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

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(b) Prettie now picks a third card at random.

Find the probability that the three letters

(i) are all the same,

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

(ii) **do not** include a letter E,

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

(iii) include exactly two letters that are the same.

Answer(b)(iii) ..... [5]

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7 Noma flies from Johannesburg to Hong Kong.
Her plane leaves Johannesburg at 1845 and arrives in Hong Kong 13 hours and 25 minutes later.
The local time in Hong Kong is 6 hours ahead of the time in Johannesburg.

(a) At what time does Noma arrive in Hong Kong?

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

(b) Noma sleeps for part of the journey.
The time that she spends sleeping is given by the ratio

$$\text{sleeping} : \text{awake} = 3 : 4 .$$

Calculate how long Noma sleeps during the journey.
Give your answer in hours and minutes.

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

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(c) **(i)** The distance from Hong Kong to Johannesburg is 10 712 km.
The time taken for the journey is 13 hours and 25 minutes.

Calculate the average speed of the plane for this journey.

Answer(c)(i) ..... km/h [2]

(ii) The plane uses fuel at the rate of 1 litre for every 59 metres travelled.

Calculate the number of litres of fuel used for the journey from Johannesburg to Hong Kong.
Give your answer in standard form.

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

(d) The cost of Noma's journey is 10 148 South African Rand (R).
This is an increase of 18% on the cost of the journey one year ago.

Calculate the cost of the same journey one year ago.

Answer(d) R ..... [3]

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8 $f(x) = 4x + 3$ $\quad g(x) = \dfrac{7}{x+1}$ $(x \neq -1)$ $\quad h(x) = x^2 + 5x$

(a) Work out

(i) h(–3),

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

(ii) hg(13).

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

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

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

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(c) (i) Solve the equation $f(x) = 23$.

Answer(c)(i) $x =$ ..... [2]

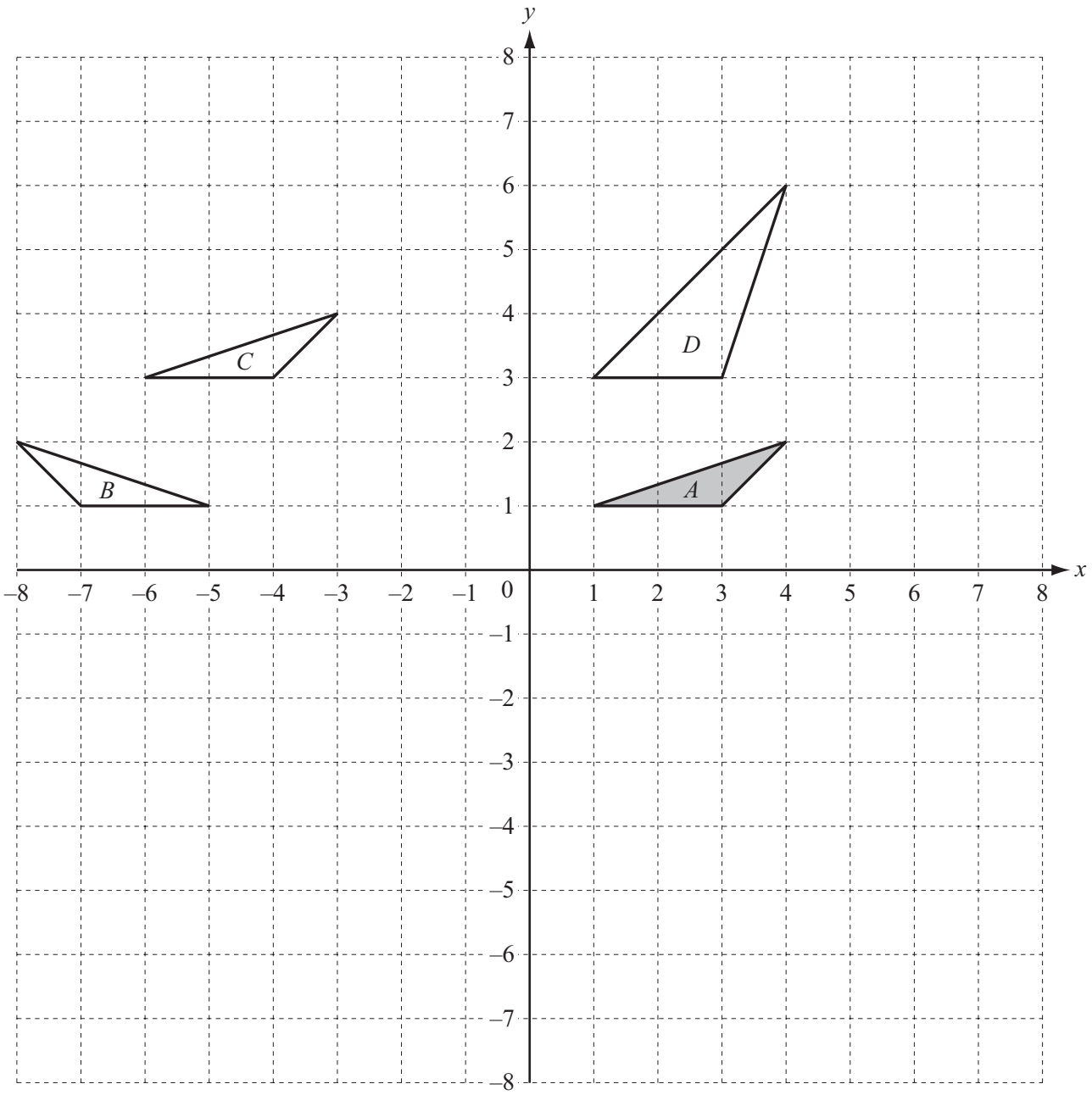
(ii) Solve the equation $h(x) = 7$.

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

Answer(c)(ii) $x =$ ..... or $x =$ ..... [5]

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

(i) triangle *B*,

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

(ii) triangle *C*,

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

(iii) triangle *D*.

Answer(a)(iii) ..... [3]

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(b) On the grid, draw

(i) the rotation of triangle A about (6, 0) through 90° clockwise, [2]

(ii) the enlargement of triangle A by scale factor –2 with centre (0, –1), [2]

(iii) the shear of triangle A by shear factor –2 with the y-axis invariant. [2]

(c) Find the matrix that represents the transformation in **part (b)(iii)**.

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

Question 10 is printed on the next page.

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10 Complete the table for the following sequences.
The first row has been completed for you.

	Sequence				Next two terms		*n*th term	
	1	5	9	13	17	21	$4n - 3$	
(a)	12	21	30	39				[3]
(b)	80	74	68	62				[3]
(c)	1	8	27	64				[2]
(d)	2	10	30	68				[2]

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