Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4–5	
6–7	
8	
TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2011

Methods in Mathematics (Linked Pair Pilot) 93651H/B

Unit 1 Algebra and Probability
Section B Non-calculator

H

Monday 13 June 2011 9.50 am to 10.35 am

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- You must **not** use your calculator in Section B. Your calculator must remain on the floor under your seat.
- When you have answered Section B you may work again on Section A but you must **not** use your calculator. It must remain on the floor under your seat.
- At the end of the examination tag Section A and Section B together with Section A on top.

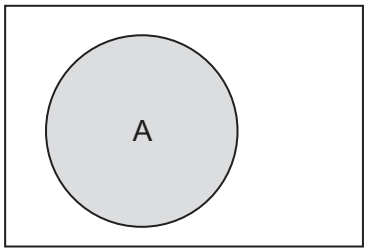
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 40.
- The quality of your written communication is specifically assessed in Question 10.
  This question is indicated with an asterisk (*)
- You may ask for more answer paper, graph paper and tracing paper.
  These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

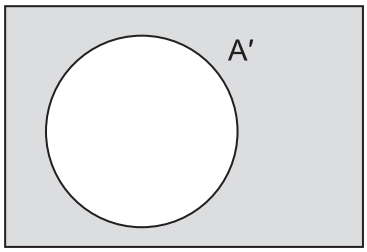
Formulae Sheet: Higher Tier

Set notation

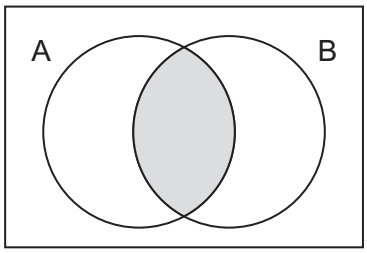
A



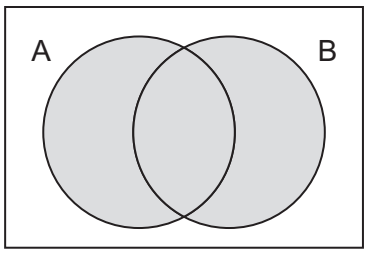
A′



$A \cap B$



$A \cup B$



Answer **all** questions in the spaces provided.

***10** The expression $4(x + 6) - x$ can be simplified to the form $3(x + a)$

What is the value of a?

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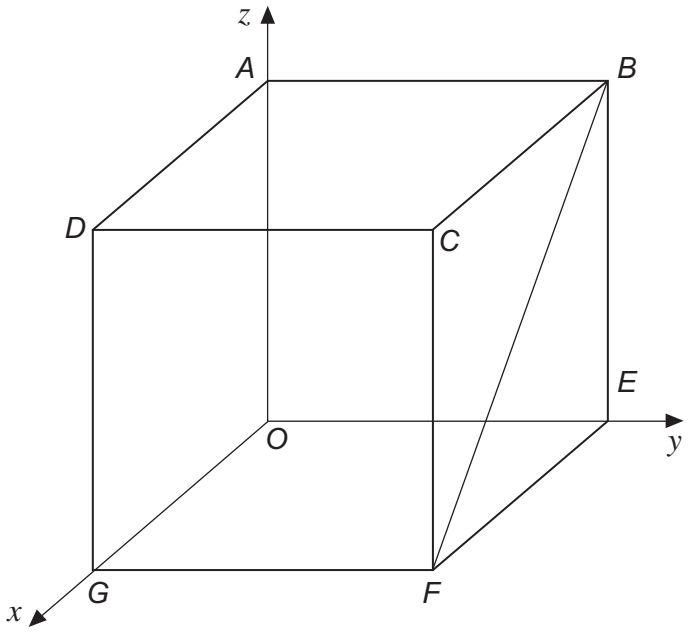
Answer ..... *(3 marks)*

11 The diagram shows a cube on a 3-D coordinate grid.



Not drawn accurately

The length of each side of the cube is 8 units.

G has the coordinates (8, 0, 0).

Write down the coordinates of the midpoint of the line *BF*.

Answer (....., ..., ...) *(2 marks)*

5

Turn over ▶

12 Work out $\left(\frac{3}{5} \times 4\right) - \left(\frac{3}{5} \div 4\right)$

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Answer ..... *(4 marks)*

13 (a) Solve $8x - 1 = 5x + 5$

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.....

Answer x = ... *(3 marks)*

13 (b) $x = 4$ is the solution to the equation $a(2x - 3) = 5x - b$

a and b are integers.

Find **two** possible pairs of values for a and b.

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Answer a = ... b = ...

a = ... b = ... *(3 marks)*

13 (c) Solve $\frac{7x - 2}{4} + \frac{5x + 8}{3} = 9$

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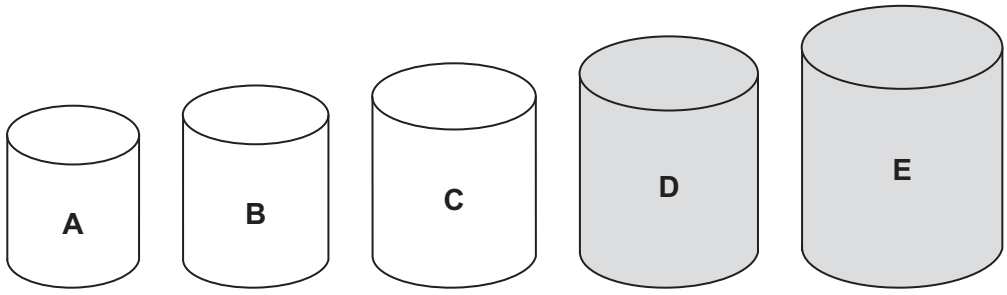
Answer x = ... *(4 marks)*

14 Five containers have volumes in the ratio 1 : 2 : 3 : 4 : 5



D and E are full of water.
A, B and C are empty.

You can pour water from one container into another one.
You can fill one container from another one.
You need the water in the containers A, B, C, D and E to be in the ratio 1 : 1 : 3 : 2 : 2

Show how this can be done with the least number of pours.

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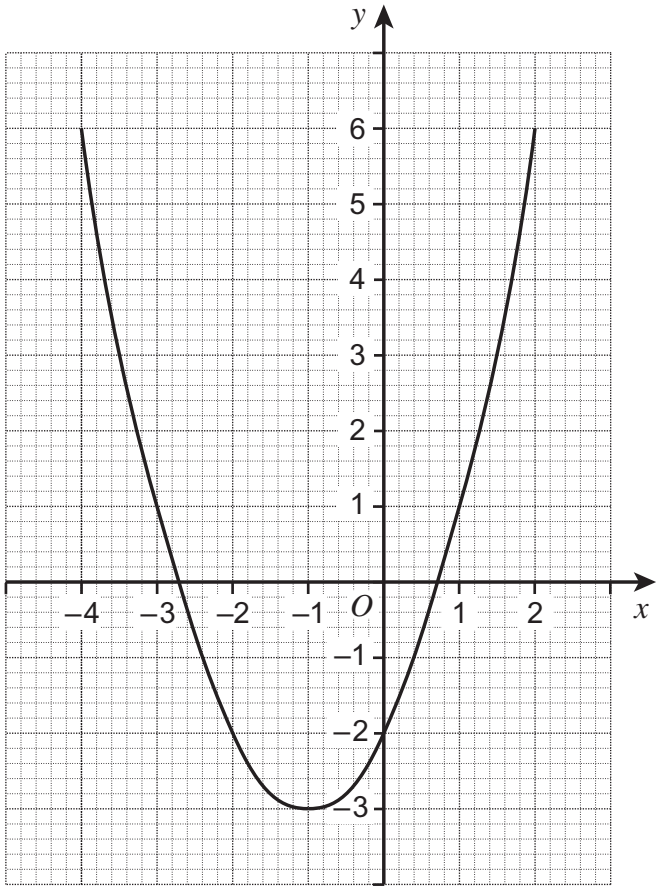
From container	Into container	New ratio				
		A :	B :	C :	D :	E
-	-	0	0	0	4	5

(3 marks)

17

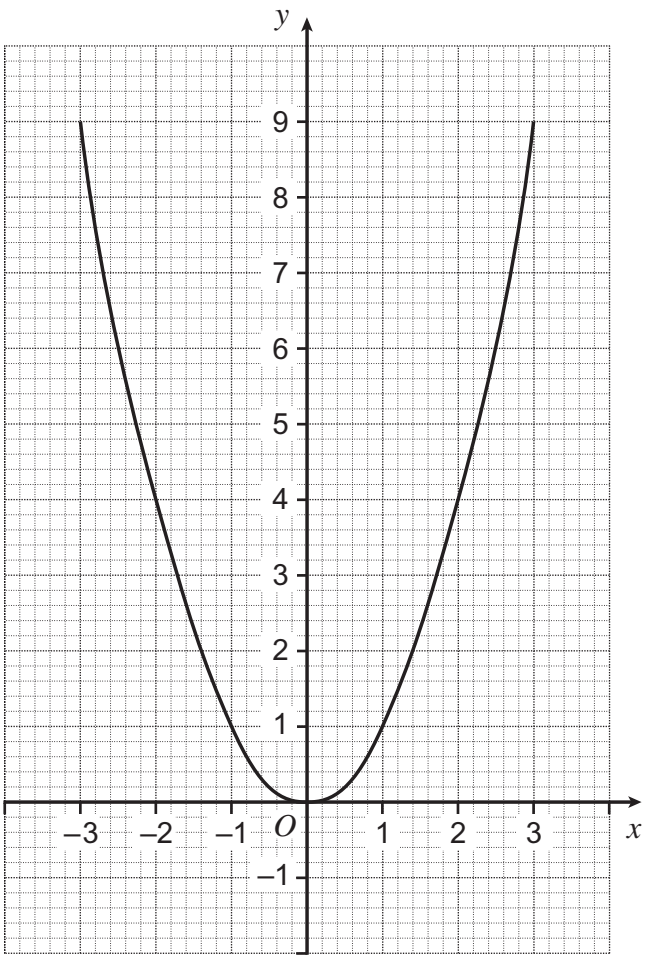
15 (a) The graph of $y = x^2 + 2x - 2$ is shown for values of x from –4 to 2.



Use the graph to find the approximate solutions to the equation $x^2 + 2x - 2 = 0$

Answer ..... *(2 marks)*

15 (b) The graph of $y = x^2$ is shown for values of x from –3 to 3.



Use the graph to estimate the value of $\sqrt{7} - \sqrt{3}$

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Answer ..... *(2 marks)*

16 Rearrange $4(x + t) = 9t + 2$ to make x the subject.

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Answer ..... *(3 marks)*

Turn over for the next question

7

17 G is inversely proportional to H.

When $G = 8$, $H = 7$.

Obtain an equation connecting G and H.

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Answer ..... *(3 marks)*

18 Four consecutive integers, p, q, r and s can be expressed as p, $p + 1$, $p + 2$ and $p + 3$.

Prove that $ps + 2 = qr$

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(3 marks)

19 Simplify fully $\dfrac{(\sqrt{12} + \sqrt{3})(\sqrt{12} - \sqrt{3})}{(\sqrt{2} + \sqrt{8})^2}$

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Answer ..... *(5 marks)*

END OF QUESTIONS

11