Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
November 2014

Methods in Mathematics (Linked Pair) 93651H/B

H

Unit 1 Algebra and Probability
Section B Non-Calculator

Monday 10 November 2014 9.50 am to 10.35 am

For this paper you must have:
- mathematical instruments.

You may **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 spaces 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.

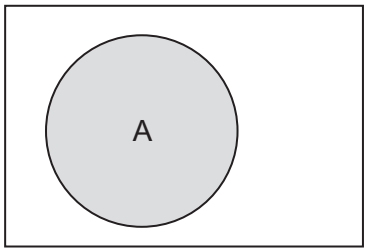
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 40.
- The quality of your written communication is specifically assessed in Questions 16 and 18.
  These questions are indicated with an asterisk (*)
- You may ask for more answer paper, graph paper and tracing paper.
  These must be tagged securely to this answer book.

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

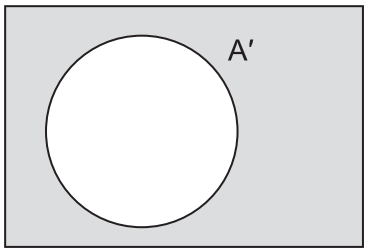
Formulae Sheet: Higher Tier

Set notation

A



A′



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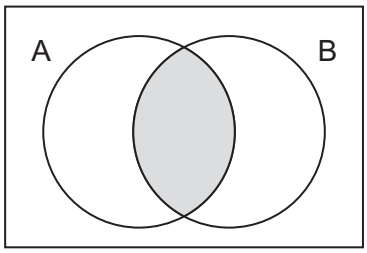
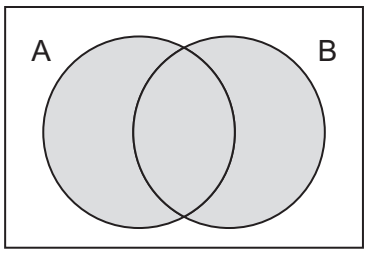


$A \cup B$



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

14 Solve $10x + 3 = 6x + 17$

[3 marks]

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$x =$ .....

Turn over for the next question

3

15 Some people are at a concert.

Half are women.

One-sixth are men.

The rest are children.

There are 40 children.

How many **men** are at the concert?

[4 marks]

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Answer .....

***16** Is 80% of $0.2 \times 4\frac{1}{2}$ greater than $\frac{3}{4}$?

You **must** show your working.

[3 marks]

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Turn over for the next question

7

17 A spinner has three sections.
One is black, one is white and one is yellow.

17 (a) Luke says the probability of the spinner landing on black is $\frac{1}{3}$

Give a reason why Luke may **not** be correct.

[1 mark]

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17 (b) Anna spins the spinner 50 times.
Here are her results.

Black	White	Yellow
20	23	7

Write down the relative frequency of the spinner landing on **black**.

[1 mark]

Answer .....

17 (c) Anna wants the results for 100 spins.

She says,

"I don't need to do another 50 spins.
I can double my results from the first 50"

Is Anna correct?
Give a reason for your answer.

[1 mark]

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17 (d) Jack, Emily and Katy spin the spinner.
They each do a different number of spins.
Here are their relative frequencies for landing on white.

	Jack	**Emily**	**Katy**
Number of spins	80	120	200
Relative frequency	0.475	0.45	0.44

Whose relative frequency gives the best estimate of the probability of landing on white?
Give a reason for your answer.

[1 mark]

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Turn over for the next question

4

18 $K = 2^n + n^2$ where n is a positive integer.

***18 (a)** Show that K is a prime number when $n = 1$

[1 mark]

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18 (b) What is the next value of n that makes K a prime number?

[1 mark]

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Answer .....

18 (c) What is the lowest value of n that makes K a square number?
You **must** show your working.

[2 marks]

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Answer .....

19 In a game, a player chooses a card at random from an ordinary pack of cards.

If the player chooses a spade, they lose.

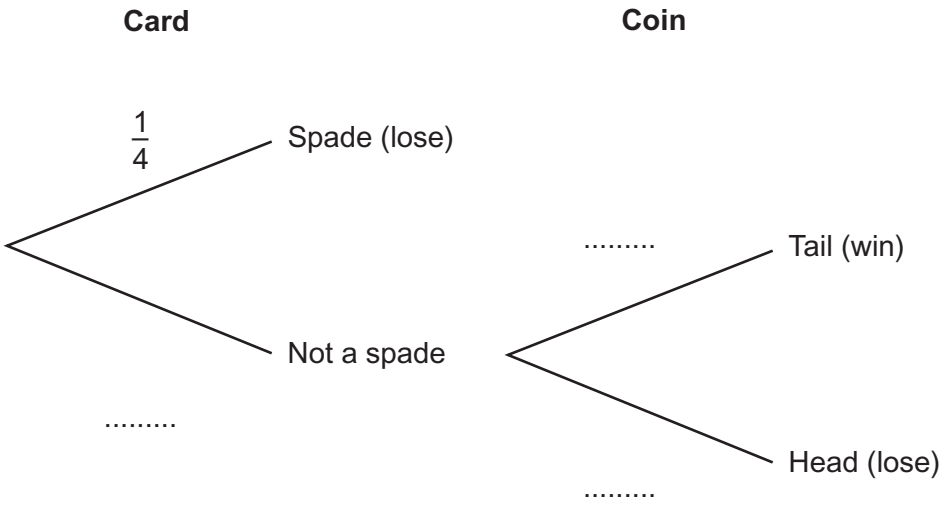
If they do **not** choose a spade, they throw a fair coin.

If they throw a tail, they win.

If they throw a head, they lose.

19 (a) Complete the tree diagram to show this information.

[1 mark]



19 (b) Work out the probability that the player **loses** the game.

[3 marks]

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Answer .....

8

20 $x^2 = a$ where a is a positive number.

Circle the correct ending to each sentence.

20 (a) The **sum** of the two possible values of x is

-1 0 a $2\sqrt{a}$ $-a$

[1 mark]

20 (b) The **product** of the two possible values of x is

-1 0 a $2\sqrt{a}$ $-a$

[1 mark]

21 (a) Factorise $x^2 - 16$

[1 mark]

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Answer .....

21 (b) Factorise $x^2 + 2x - 24$

[2 marks]

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Answer .....

21 (c) Hence, simplify $\dfrac{x^2 - 16}{x^2 + 2x - 24}$

[1 mark]

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Answer .....

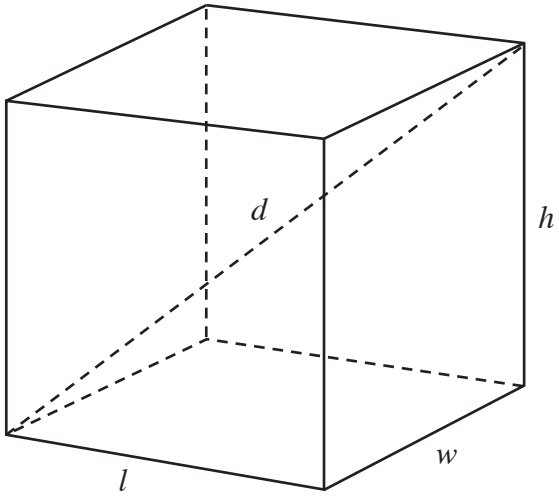
Turn over for the next question

6

22 The formula for the length, d, of a diagonal of a cuboid is

$$d = \sqrt{l^2 + w^2 + h^2}$$

where l, w and h are the dimensions of the cuboid.



A cuboid has dimensions 7 cm by 10 cm by 11 cm

Work out the length of a diagonal of this cuboid.
Give your answer in the form $a\sqrt{b}$, where a and b are integers and $a > 1$

[3 marks]

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Answer ..... cm

23 y is directly proportional to the cube of x.

$y = 12$ when $x = 2$

Work out the value of y when $x = 10$

[3 marks]

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Answer .....

Turn over for the next question

6

24 $W = \dfrac{5 \times 10^{-3}}{2 \times 10^{6}}$

Work out the value of W^{-1}
Give your answer in standard form.

[3 marks]

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Answer .....

25 Simplify $\dfrac{6\sqrt{5}}{\sqrt{15}}$

Give your answer in the form $a\sqrt{3}$ where a is an integer.
You **must** show your working.

[3 marks]

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Answer .....

END OF QUESTIONS

6

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED