

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	
TOTAL	



General Certificate of Secondary Education  
Higher Tier

# Methods in Mathematics (Linked Pair Pilot)

93651H/A

Unit 1 Higher Tier (Section A)

Specimen Paper

H

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>a calculator</li> <li>mathematical instruments.</li> </ul>	
---	--

**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.
- This paper is divided into two sections: Section A and Section B.
- After the 45 minutes allowed for Section A, you must put your calculator on the floor under your seat. You will then be given Section B.
- When you have answered Section B you may work again on Section A but you may **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 11 and 13.  
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 booklet.
- You are expected to use a calculator where appropriate.

### Advice

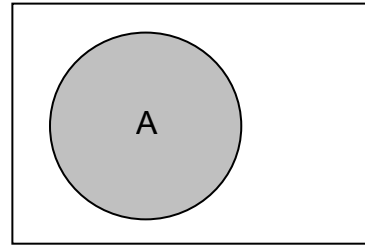
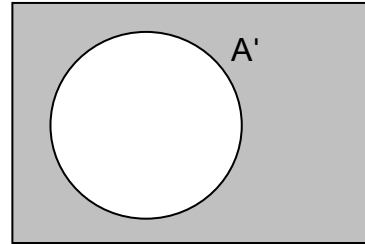
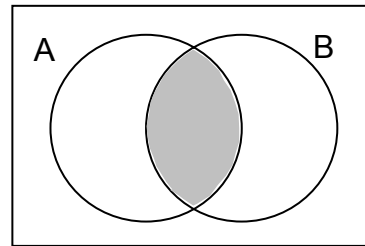
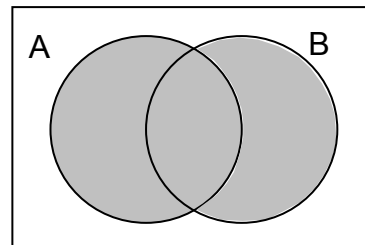
- In all calculations, show clearly how you work out your answer.

93651H/A

## Formulae Sheet: Higher Tier

## Set notation

A

 $A'$  $A \cap B$  $A \cup B$ 

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

- 1** The ratio of boys to girls in a class is 2 : 3  
Which of the following statements is True (T), False (F) or could be true (C).  
Put a tick in the appropriate box.  
The first one is done for you.

Statement	T	F	C
There are 13 boys on the class		✓	
There are 30 students in the class			
The fraction of boys in the class is $\frac{2}{3}$			
The percentage of girls in the class is 60%			
The number of girls in the class must be a multiple of 3			

(3 marks)

- 2** The sum of the two digits of the number 18 is 9 because  $1 + 8 = 9$   
How many whole numbers from 10 to 99 inclusive have the sum of their digits equal to 9?

.....

.....

.....

.....

.....

.....

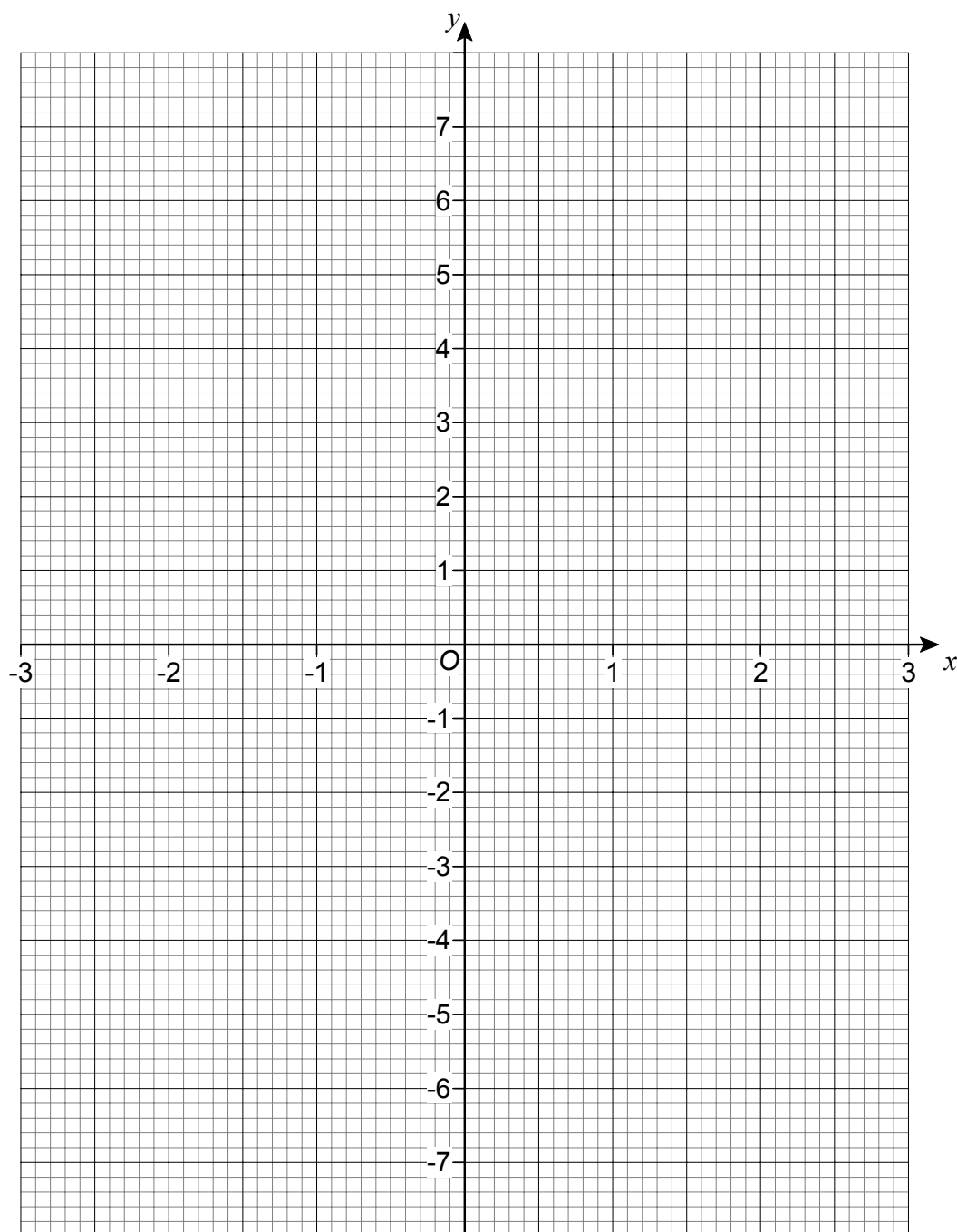
.....

Answer ..... (3 marks)

3 This is a table of values for  $y = x^2 - 3$

$x$	-3	-2	-1	0	1	2	3
$y$	6	1	-2	-3	-2	1	6

3 (a) On the grid, draw the graph of  $y = x^2 - 3$  for values of  $x$  from -3 to +3



(2 marks)

3 (b) Use your graph to write down the **positive** solution to the equation  $x^2 - 3 = 0$

.....

Answer .....

(1 mark)  
93651H/A

4 Solve the equation  $7x - 9 = 3x + 5$

.....

.....

.....

.....

.....

.....

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

5 Expand and simplify  $(x - 3)(x + 4)$

.....

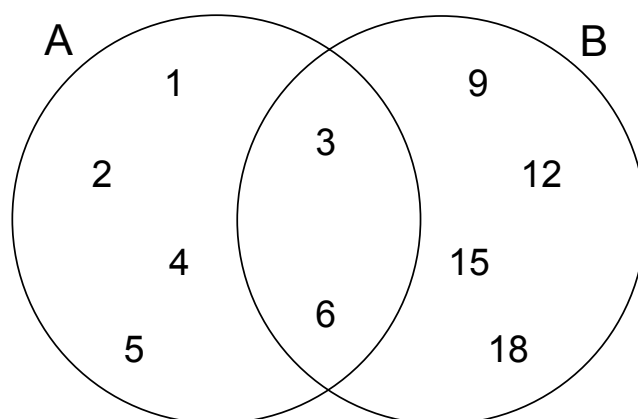
.....

.....

Answer ..... (2 marks)

**Turn over for the next question**

- 6 The Venn diagram shows two sets A and B.



- 6 (a) A number is selected at random from set A.

- 6 (a)(i) What is the probability that it is an odd number?

Answer ..... (1 mark)

- 6 (a)(ii) What is the probability that it is a factor of 12?

Answer ..... (1 mark)

- 6 (b) A number is selected at random from  $A \cup B$ .

What is the probability that it is a multiple of 3?

.....

Answer ..... (2 marks)

- 7 Ann has two brothers.

David is 3 years younger than Ann.

Ken is twice as old as Ann.

The total of all three ages is 25

Work out Ann's age.

.....

.....

.....

.....

.....

Answer ..... (4 marks)

8 A number becomes 3248 after a 16% increase.

What was the number before the increase?

.....

.....

.....

.....

.....

Answer ..... (3 marks)

9 Rearrange the formula  $y = \frac{x-5}{2}$  to make  $x$  the subject.

.....

.....

.....

.....

.....

Answer ..... (2 marks)

**Turn over for the next question**

**10(a)** Write  $4.2 \times 10^{-3}$  as an ordinary number.

.....

Answer ..... (1 mark)

**10(b)** Calculate  $\frac{9.1 \times 10^6}{3.5 \times 10^{-4}}$

Give your answer in standard form.

.....

.....

Answer ..... (2 marks)

**\* 11** These three expressions have the same value

$$xy \qquad (y + 2)(x - 3) \qquad (y - 1)(x + 3)$$

Work out the value of  $x$  and  $y$ .

You **must** show your working

.....

.....

.....

.....

.....

.....

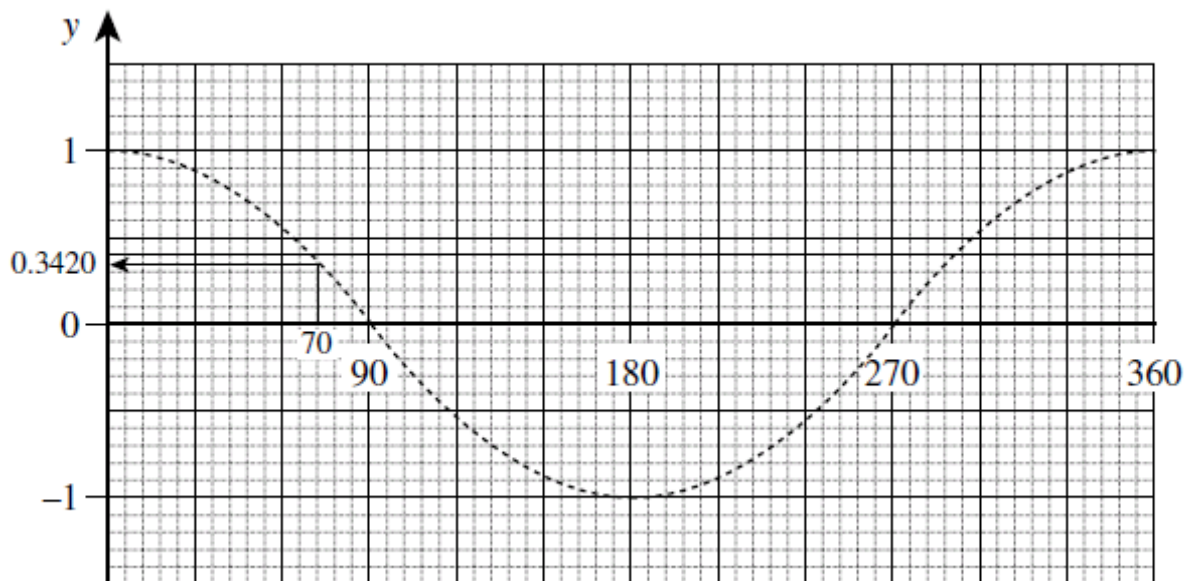
.....

.....

Answer  $x = \dots\dots\dots$   $y = \dots\dots\dots$  (5 marks)



- 12 The sketch shows the graph of  $y = \cos x$  for  $0^\circ \leq x \leq 360^\circ$ .



- 12 (a) You are given that  $\cos 70^\circ = 0.3420$  to 4 decimal places.

Work out another value of  $x$ , where  $0^\circ \leq x \leq 360^\circ$  for which,  $\cos x = 0.3420$  to 4 decimal places.

.....  
 .....

Answer  $x = \dots\dots\dots$  degrees (1 mark)

- 12 (b) You are given that  $\cos 110^\circ = -0.3420$  to 4 decimal places.

Work out another value of  $x$ , where  $0^\circ \leq x < 360^\circ$  for which,  $\cos x = -0.3420$  to 4 decimal places.

.....  
 .....

Answer  $x = \dots\dots\dots$  degrees (1 mark)

\* 13 Prove that  $(n + 5)^2 - (n + 3)^2 \equiv 4(n + 4)$

.....

.....

.....

.....

.....

.....

.....

.....

.....

(3 marks)

**END OF SECTION A**

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**

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	
TOTAL	



General Certificate of Secondary Education  
Higher Tier

# Methods in Mathematics (Linked Pair Pilot)

**93651H/B**

Unit 1 Higher Tier (Section B)

**H**

Specimen Paper

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>mathematical instruments.</li> </ul> <p>You may <b>not</b> use a calculator.</p>	
---	--

**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 may **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 may **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 19, 21 and 23.  
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 booklet.

### Advice

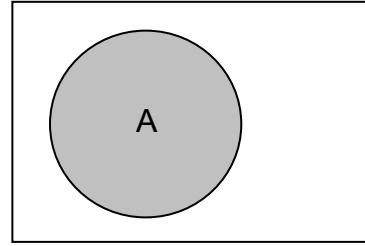
- In all calculations, show clearly how you work out your answer.

**93651H/B**

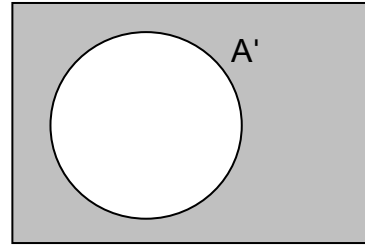
# Formulae Sheet: Higher Tier

## Set notation

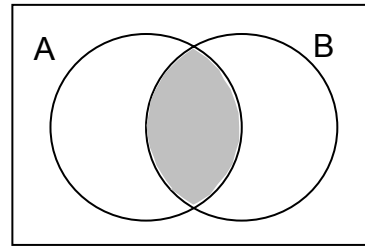
A



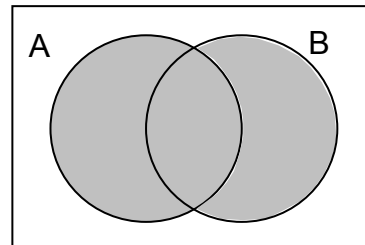
A'



$A \cap B$



$A \cup B$



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

**14** There are 600 marbles of five different colours in a bag.

One marble is chosen at random.

The probabilities of choosing some of the colours are shown in the table.

<b>Colour</b>	Red	Yellow	Blue	Black	White
<b>Probability</b>	0.3		0.25	0.15	0.1

Work out the number of yellow marbles in the bag.

.....

.....

.....

.....

.....

Answer ..... (3 marks)

**Turn over for the next question**

- 15** In the following calculations each letter represents a different digit.

$$A \times A = BC$$

$$BC \times BC = DEC$$

Which digit does each letter represent?

.....

.....

.....

.....

.....

.....

A = .....

B = .....

C = .....

D = .....

E = .....

*(3 marks)*

- 16** Work out  $3\frac{3}{4} - 1\frac{2}{3}$

.....

.....

.....

.....

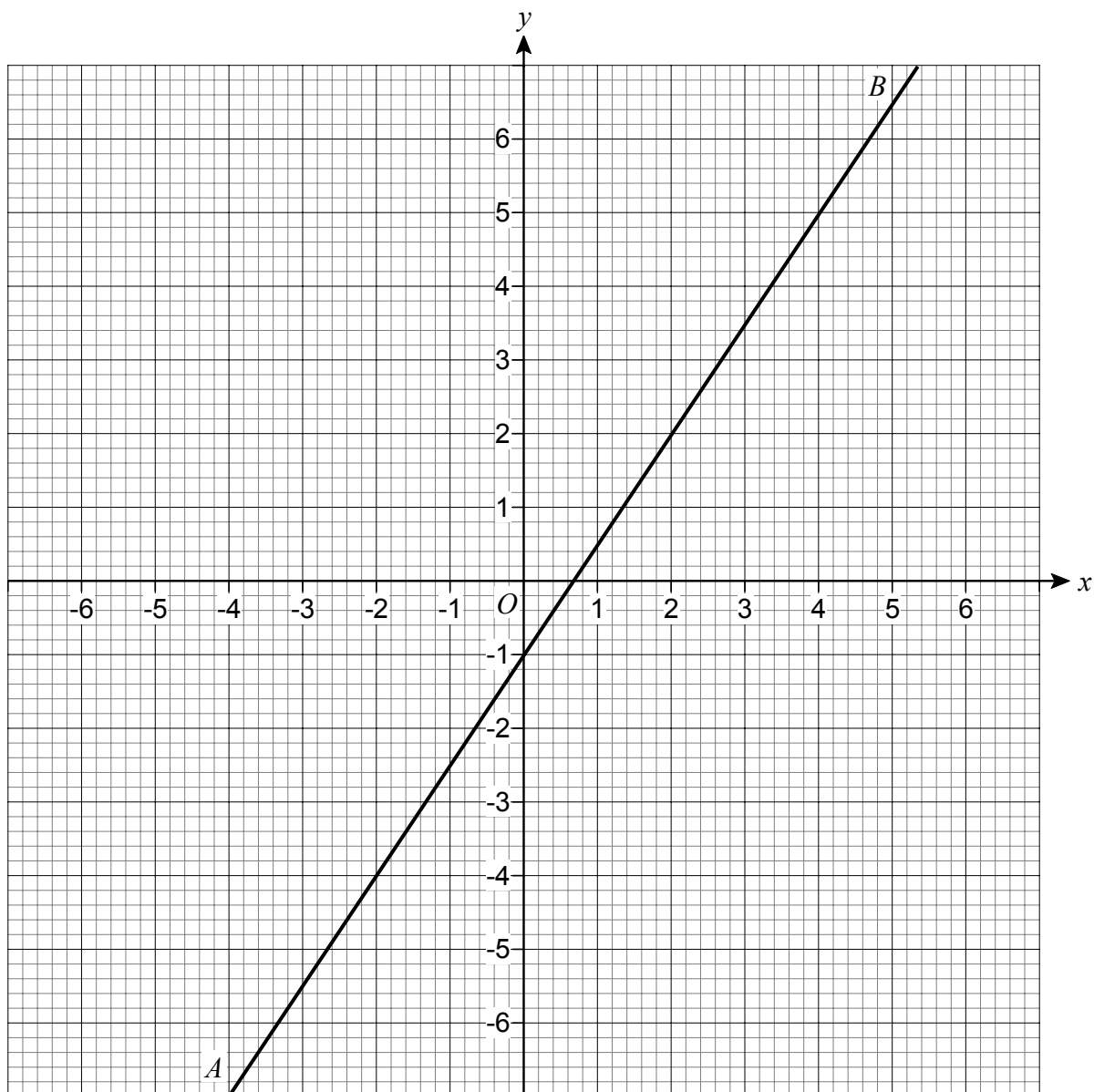
.....

.....

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



17



17 (a) Work out the gradient of line  $AB$ .

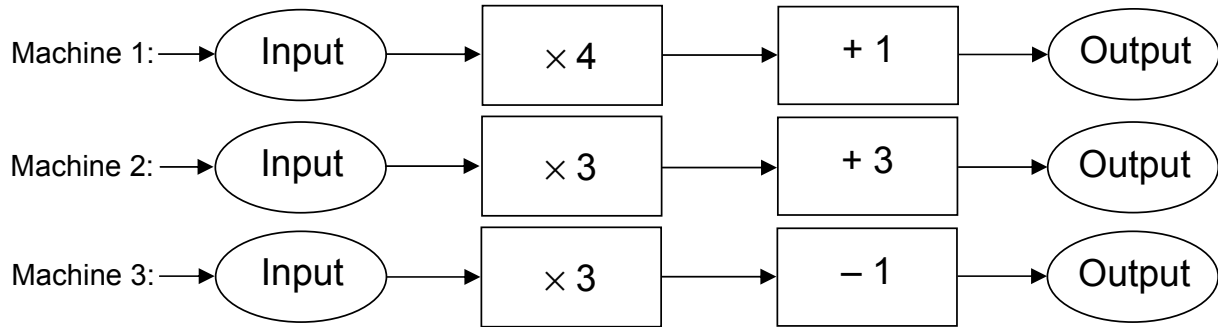
.....  
 .....

Answer ..... (2 marks)

17 (b) Write down the equation of line  $AB$ .

Answer ..... (1 mark)

**18 (a)** Here are three number machines.



For each machine state whether the outputs for each machine are

- A Always multiples of 3  
S Sometimes multiples of 3  
N Never multiples of 3

.....

.....

.....

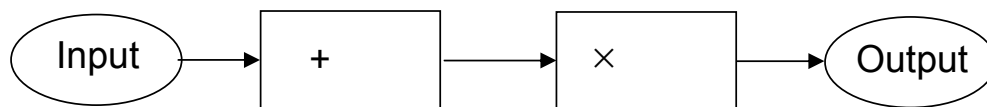
.....

Answer      Machine 1 .....

                  Machine 2 .....

                  Machine 3 ..... (3 marks)

**18 (b)** Fill in whole number values in this number machine so that when the input is an even number the output is an odd number.



.....

.....

(1 mark)

\* 19 Solve the equation  $\frac{x+3}{2} - \frac{x-2}{3} = 3$

.....

.....

.....

.....

.....

.....

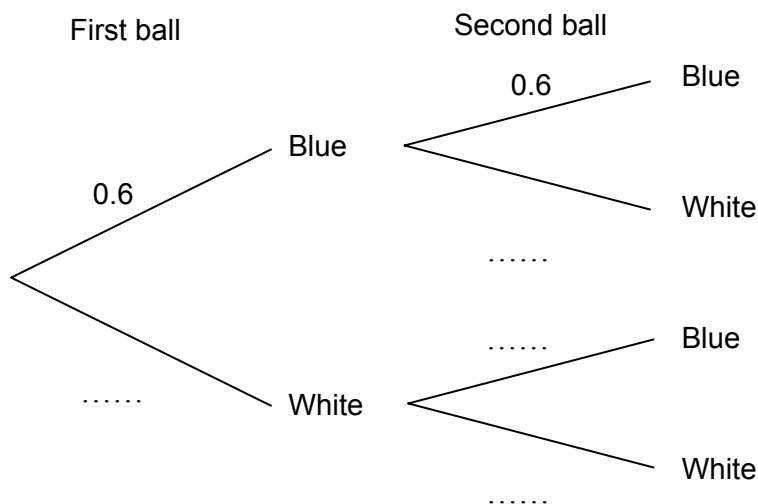
.....

.....

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

- 20 A bag contains 6 blue and 4 white balls.  
A ball is taken from the bag at random and replaced.  
Another ball is then taken from the bag at random.

20 (a) Complete the tree diagram.



(1 mark)

20 (b) What is the probability that both balls are the same colour?

.....

.....

.....

.....

Answer ..... (3 marks)

\* 21 Two variables  $x$  and  $y$  are connected by the relationship

' $y$  is directly proportional to the square root of  $x$ .'

21 (a) When  $x = 25$ ,  $y = 15$

Express  $y$  in terms of  $x$ .

.....

.....

.....

.....

.....

.....

Answer ..... (3 marks)

21 (b) Explain what happens to the value of  $x$  when the value of  $y$  doubles.

.....

.....

.....

.....

(2 marks)



\* 23

Simplify fully

$$\frac{x^2 - 9}{2x^2 - 5x - 3}$$

.....

.....

.....

.....

.....

.....

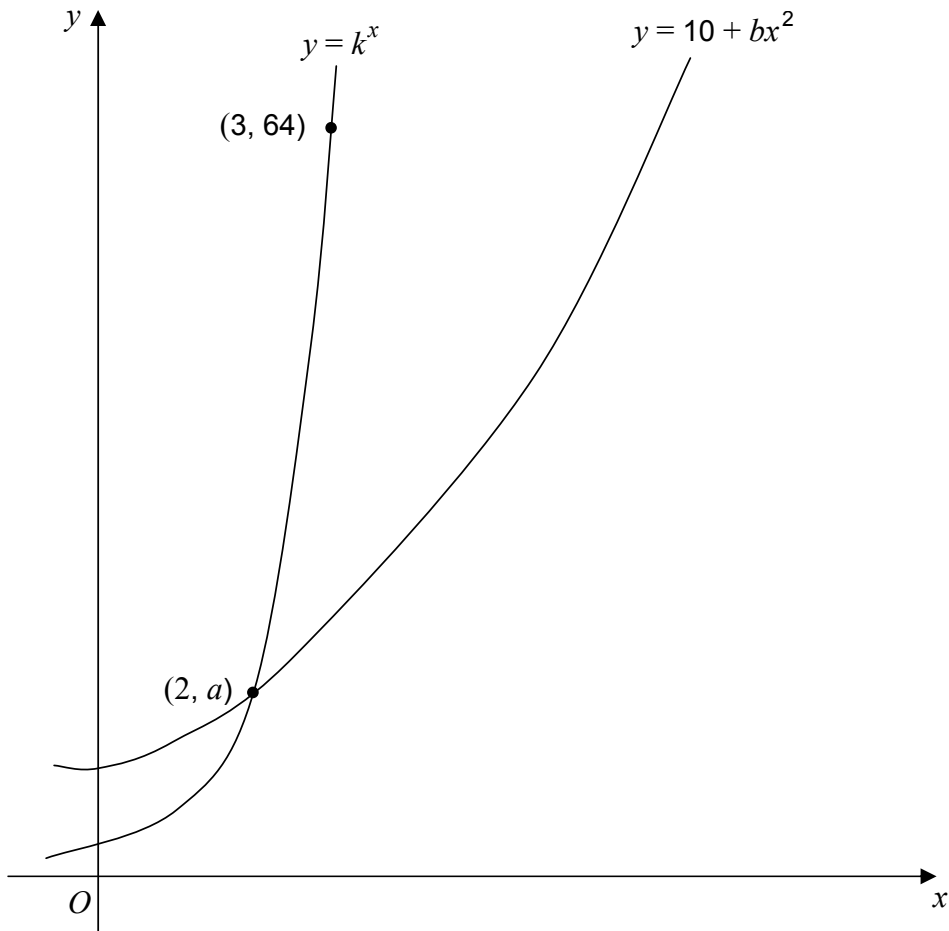
.....

.....

Answer ..... (3 marks)

24

The diagram shows a sketch of the graphs of  $y = 10 + bx^2$  and  $y = k^x$



Work out the value of  $b$ .

.....

.....

.....

.....

.....

.....

.....

.....

Answer  $b = \dots\dots\dots$  (4 marks)

**END OF QUESTIONS**

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**