Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4363/02

W15-4363-02

METHODS IN MATHEMATICS

UNIT 1: Methods (Non-Calculator)
HIGHER TIER

A.M. FRIDAY, 9 January 2015

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

ADDITIONAL MATERIALS

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

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

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **4**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**10**	
3.	**3**	
4.	**6**	
5.	**9**	
6.	**3**	
7.	**3**	
8.	**5**	
9.	**8**	
10.	**4**	
11.	**6**	
12.	**9**	
13.	**5**	
14.	**4**	
15.	**4**	
16.	**7**	
17.	**7**	
Total	**100**	

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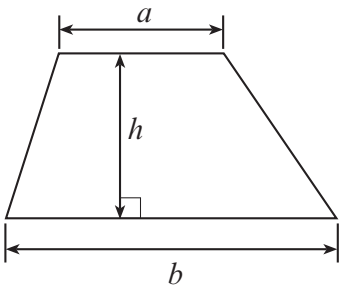
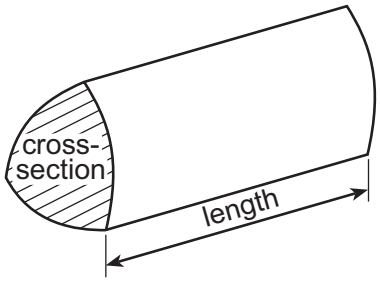
Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

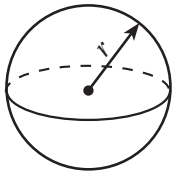


Volume of prism = area of cross-section × length



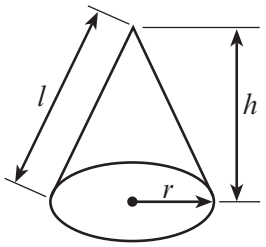
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

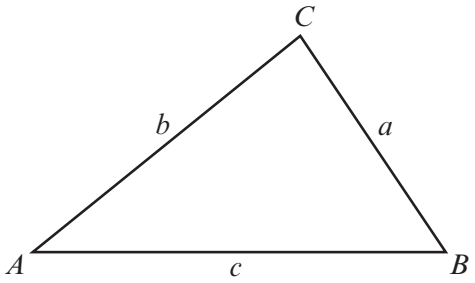


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. Sanjay has two fair dice.
One dice is coloured red and the other is coloured yellow.

The two dice are thrown.
The two outcomes are multiplied together, and then the two outcomes are added on to obtain the score.
For example, if the two outcomes are 3 and 5, then the score is $3 \times 5 + 3 + 5 = 23$.
The table shows how the scores are recorded.

		Yellow dice					
		1	**2**	**3**	**4**	**5**	**6**
Red dice	**1**	3	5	7	9	11	13
	2	5				17	20
	3	7			19	23	
	4			19			34
	5	11	17	23	29	35	41
	6	13	20	27	34	41	48

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(a) Complete the table above. [3]

(b) Write down the probability of obtaining a score that is [4]

equal to 11

.....

an even number

.....

an odd number

.....

a square number.

.....

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2. *(a)* Express $\frac{7}{8}$ as a decimal. [2]

(b) Express $\frac{1{\cdot}2 \times 0{\cdot}4}{48}$ as a fraction in its simplest form. [3]

(c) A number is divided by 3 then 7 is added. This gives an answer of 40.
Find the number. [2]

(d) Evaluate $5{\cdot}23 \times 2{\cdot}1$, giving your answer correct to 2 significant figures. [3]

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3.

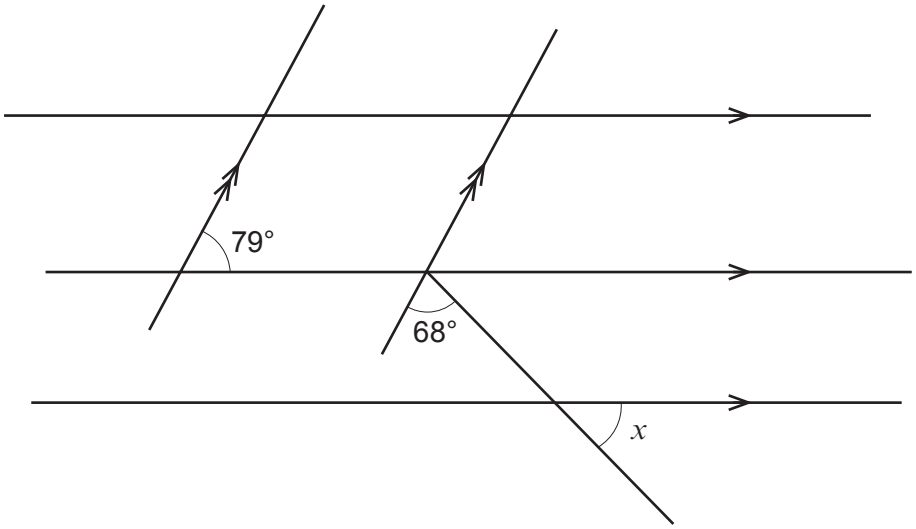

Diagram not drawn to scale

Calculate the size of the angle x.
You must show your working below or on the diagram. [3]

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x = ... °

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4. *You will be assessed on the quality of your written communication in this question.*

Four of the seven **exterior** angles of a 7-sided polygon are 34°, 46°, 53° and 77°.
The other three exterior angles are all **consecutive** multiples of 10°.
Calculate the sizes of the three remaining **exterior** angles of this 7-sided polygon.
You must show all your working. [6]

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5. *(a)* Find the highest common factor of 120 and 140. [1]

(b) Find the lowest common multiple of 14 and 22. [2]

(c) Showing all your working, write $\frac{13}{20}$, $\frac{3}{4}$ and $\frac{3}{5}$ in **descending** order. [3]

(d) Express 180 as a product of prime factors using index notation. [3]

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6. *(a)* Given that $t = 5q^2 + 8w$, calculate the value of t when $q = -3$ and $w = \frac{1}{4}$. [2]

(b) Which has the greater value, $3x^2$ or $(3x)^2$, when $x = 2$?
You must show your working. [1]

7. A length of cable is cut into three pieces in the ratio 3 : 4 : 5.
The **longest** piece of cable is 35 metres in length.
Calculate the lengths of the other two pieces of cable. [3]

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8. It is known that two of the interior angles of a kite are 155° and 45°.
This kite does not have an interior angle of 80°.
Find the **two** possibilities for the other two interior angles of this kite. [5]

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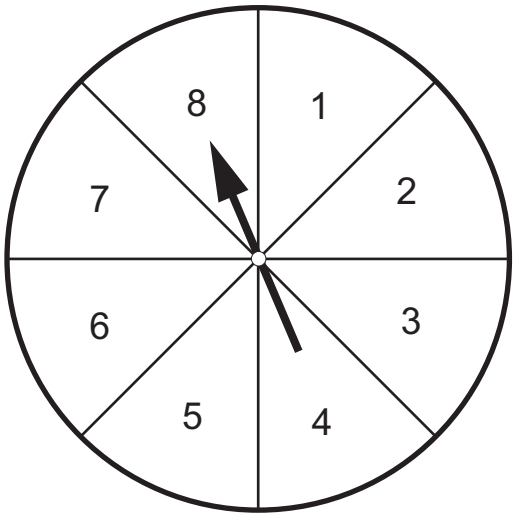
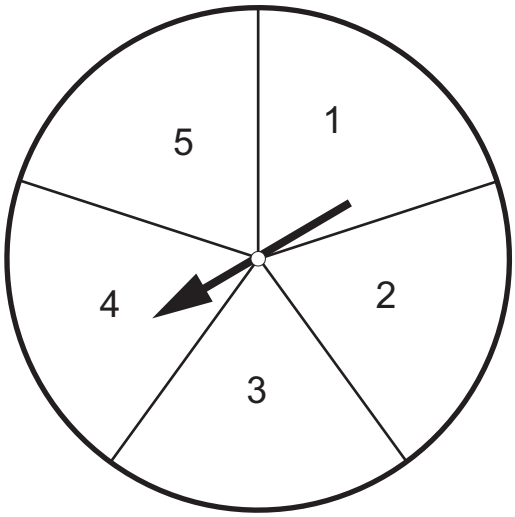
9.





The scores on the two spinners are added together.
The two spinners shown give a **total score** of 12.

(a) Assuming that both spinners are not biased, calculate the probability of getting a **total score** of 5 using these two spinners. [3]

(b) If the spinner numbered 1 to 8 is not biased, how many sixes would you expect in 200 spins? [2]

(c) After 200 spins of the spinner numbered 1 to 8, it was found that the number six occurred on 80 occasions.
Explain clearly how you know that this spinner is almost certainly biased. [1]

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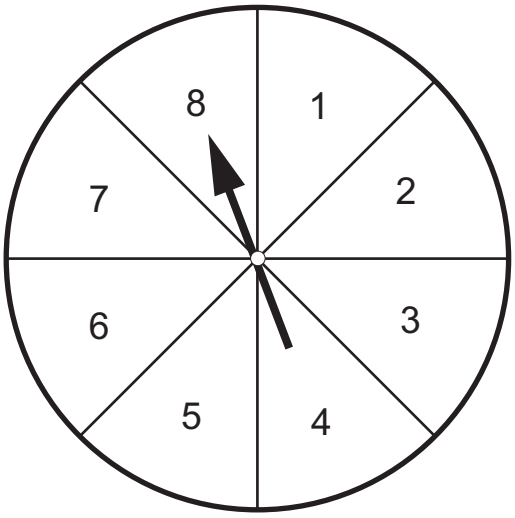
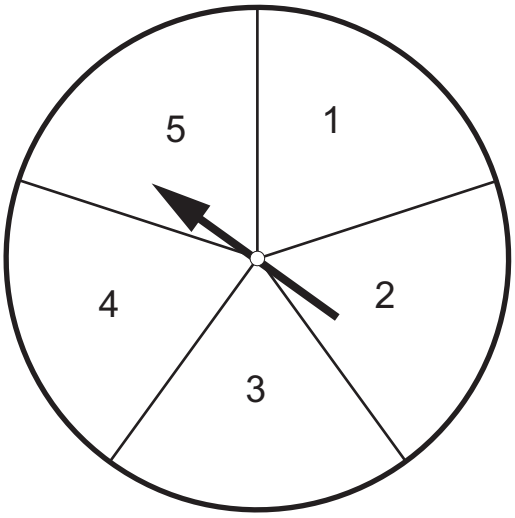
(d) The spinner numbered 1 to 8 is **biased** towards landing on six.
The other spinner is **not biased**.





In part *(a)*, you worked out the probability of getting a total score of 5 using the two spinners by assuming the spinners were not biased.
You now know that the spinner numbered 1 to 8 is biased.

Is the probability of getting a total score of 5
- the same as your answer in part *(a)*, or
- greater than your answer in part *(a)*, or
- less than your answer in part *(a)*?

You must give a reason for your answer. [2]

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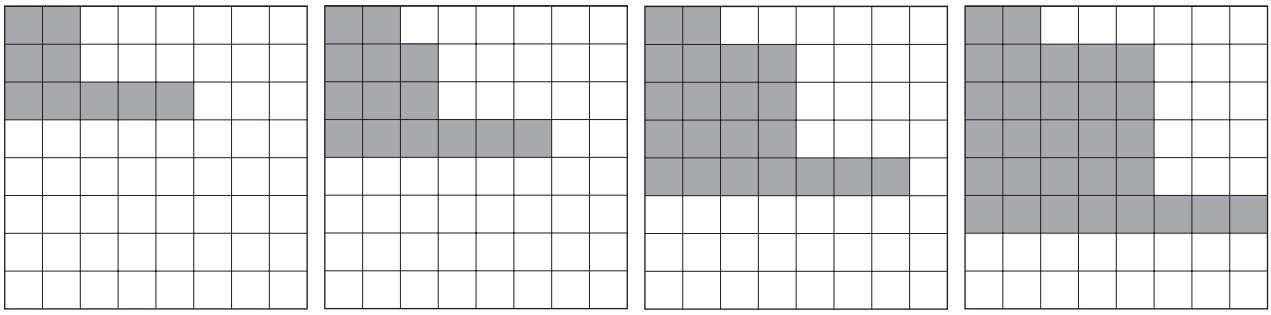
10.



Pattern 2 Pattern 3 Pattern 4 Pattern 5

(a) There are 9 shaded squares in Pattern 2.
How many shaded squares would there be in Pattern 1? [1]

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(b) Find an expression, in terms of n, for the number of shaded squares in Pattern n. [3]

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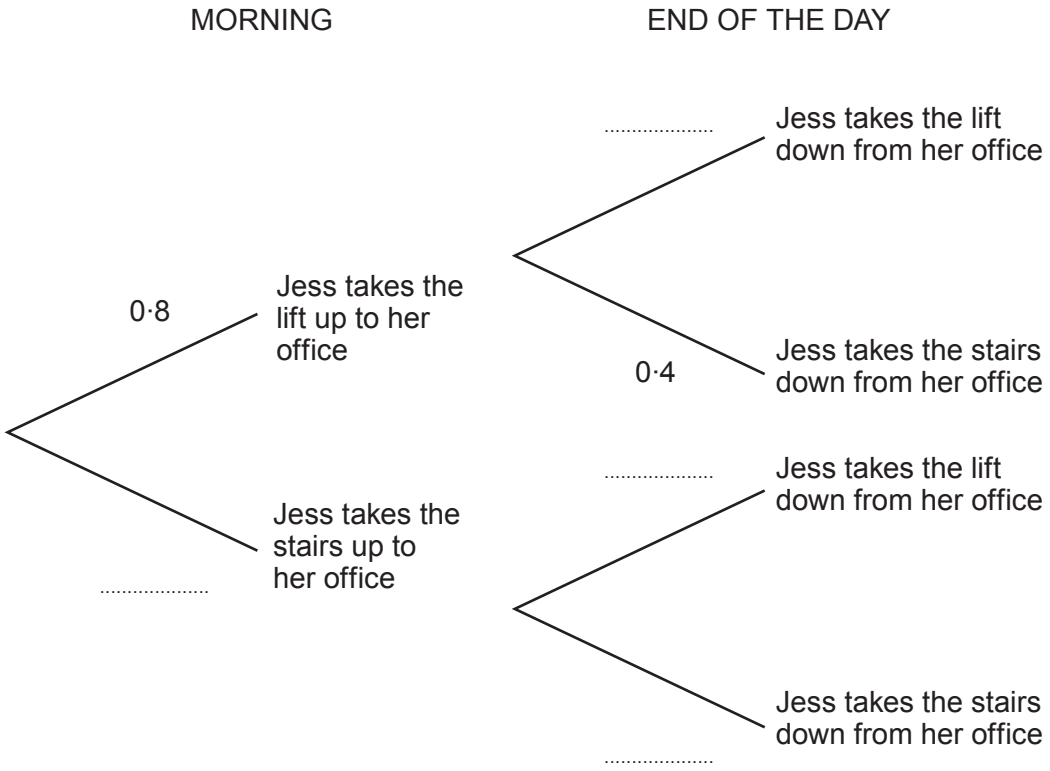
11. Jess works on the 8th floor of an office block.
To get up to her office in the morning and down from her office at the end of the day, she uses either the lift or the stairs.

The probability that she takes the lift up to her office is 0·8.
The probability that she takes the stairs down from her office is 0·4.
Going up to her office and coming down from her office are independent events.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that Jess takes the lift up to her office in the morning and takes the stairs down from her office at the end of the day. [2]

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(c) Calculate the probability that Jess **does not** use the lift when she goes up to her office in the morning or when she comes down at the end of the day. [2]

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12. *(a)* Express 0·000007 in standard form. [1]

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(b) Make x the subject of the formula $7x - h = 3x + m$. [2]

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(c) Factorise $x^2 - 49$. [1]

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(d) (i) Expand and simplify $(x + 3)(2x + 1)$. [2]

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(ii) **Hence**, solve $(x + 3)(2x + 1) = 7$. [3]

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13. *(a)* Calculate the length a. [2]

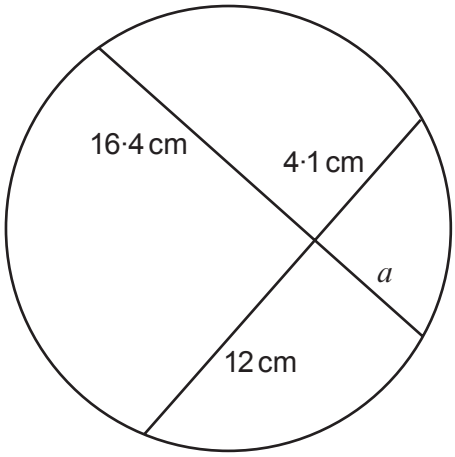

Diagram not drawn to scale

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a = ... cm

(b) *PT* is a tangent to the circle.

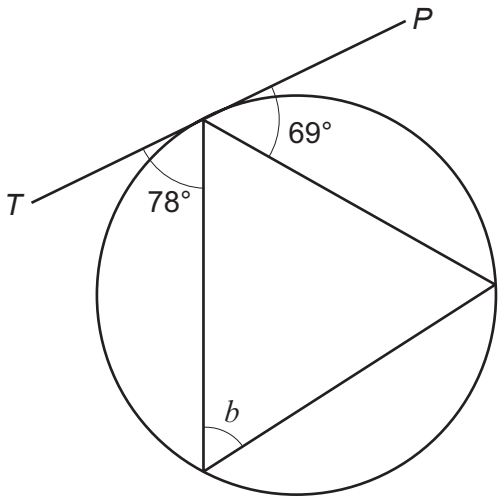

Diagram not drawn to scale

Find the size of the angle b. [1]

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b = ... °

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(c) The point *O* is the centre of the circle.

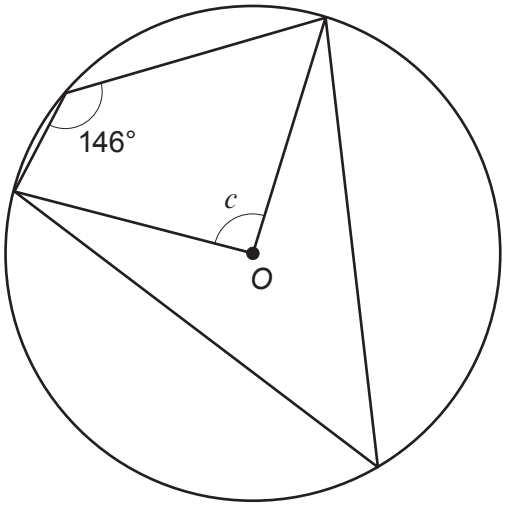

Diagram not drawn to scale

Find the size of angle c.
You must show your working. [2]

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c = ... °

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14. Express the following as a single fraction in its simplest form. [4]

$$\frac{7}{x-3} - \frac{4}{3x+5}$$

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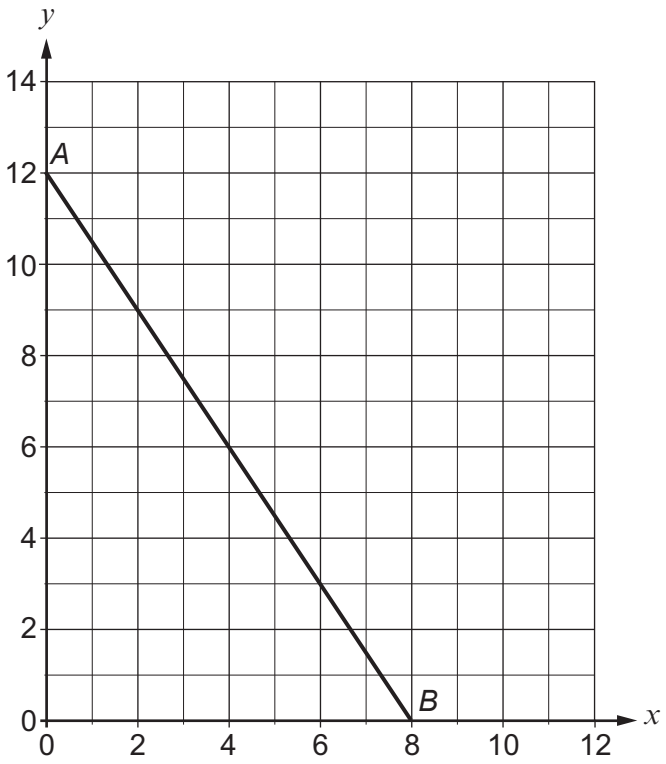
15. Select **two** of the following lines which are **perpendicular** to the straight line, *AB*, shown on the grid.
You must write a reason for your selections.

$y = \frac{3}{2}x + 8$ $\quad 2x + 3y = 8$ $\quad 2y = 3x + 6$

$y = \frac{-2x + 8}{3}$ $\quad 3y = 2x + 5$ $\quad 2x - 3y = 8$



Reason for selections: [4]

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16. *(a)* Express $x^2 + 10x + 14$ in the form $(x + a)^2 + b$, where a and b are whole numbers to be found. [3]

(b) **Hence** solve $x^2 + 10x + 14 = 0$, leaving your answers in surd form. [4]

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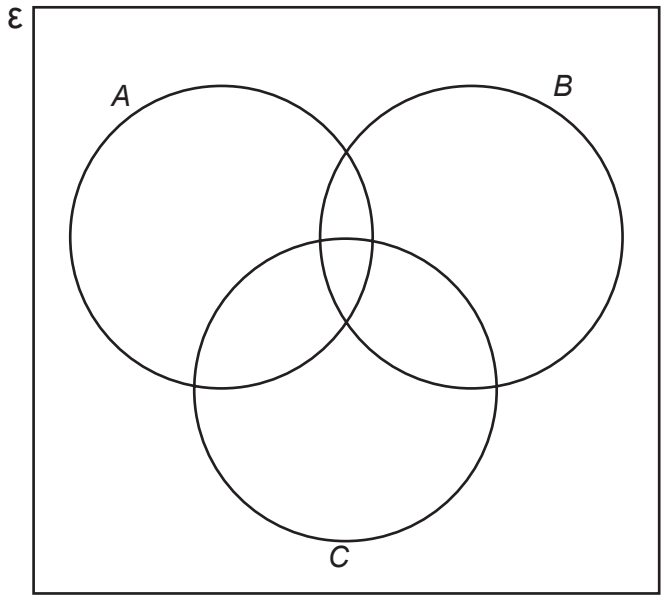
17.



An outline of a Venn diagram is shown above.
You are given the following information.

- $P(A \cup B \cup C)' = 0{\cdot}01$
- $P(A \cap B \cap C) = 0{\cdot}2$
- $P(B \cap C) = 0{\cdot}5$
- $P(A \cap B) = 0{\cdot}3$
- $P(A \cup C) = 0{\cdot}65$

Calculate $P(B)$. [7]

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