GCSE LINKED PAIR PILOT

wjec cbac

4363/02

S16-4363-02

METHODS IN MATHEMATICS
UNIT 1: Methods (Non-Calculator)
HIGHER TIER

A.M. THURSDAY, 26 May 2016

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	8	
3.	6	
4.	2	
5.	6	
6.	7	
7.	9	
8.	5	
9.	6	
10.	10	
11.	3	
12.	3	
13.	2	
14.	2	
15.	4	
16.	7	
17.	5	
18.	5	
19.	6	
Total	100	

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.

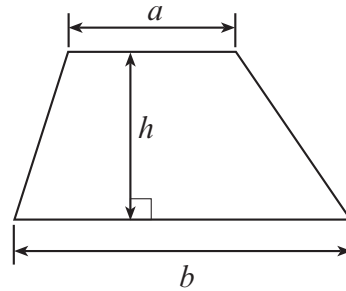Take π as 3·14.

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 **7**(b).

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Formula List

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

Volume of prism = area of cross-section × length
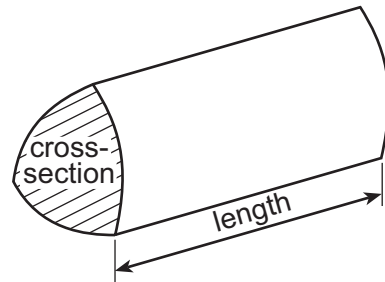
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$
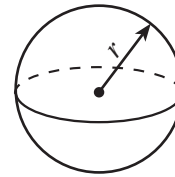
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
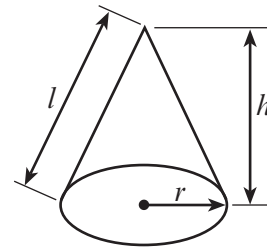
In any triangle ABC

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

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

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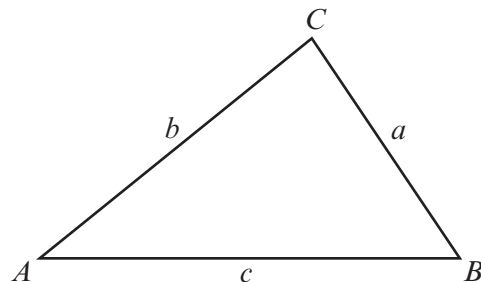
The Quadratic Equation

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

where $a \neq 0$ are given by

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

1.
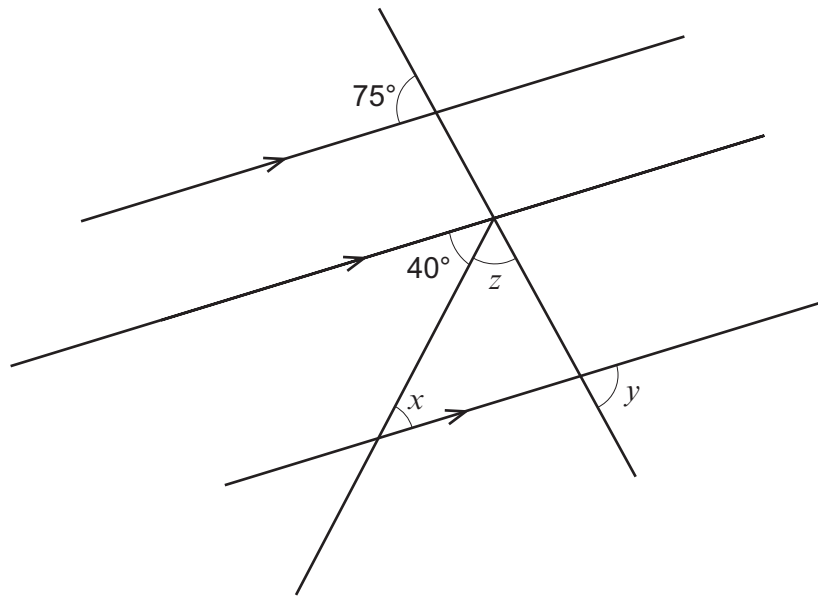
Diagram not drawn to scale

Find the sizes of angles x, y and z. [4]

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$x =$ .... ° $\qquad$ $y =$ .... ° $\qquad$ $z =$ .... °

2. *(a)* Complete the following table. [3]

Fraction	Decimal	Recurring or terminating?
$\frac{1}{3}$	$0\dot{\cdot}3$	....
$\frac{5}{8}$	....	....
$\frac{3}{11}$	....	....

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(b) Express $\dfrac{0\cdot3 \times 0\cdot9}{5\cdot4}$ as a fraction in its simplest form. [3]

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(c) A number is multiplied by 12 and then 56 is added before finally dividing by 100. This leads to an answer of 2.
What is the original number? [2]

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Original number is ....

3. *(a)* Given that $d = -2$, $e = 3$ and $f = 5$, find the value of each of the following.

(i) d^3 [1]

....

(ii) $e^2 + df$ [1]

....

....

(iii) $\frac{1}{f}(e - d)$ [1]

....

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....

(b) Simplify each of the following.

(i) $6g - 22h - 14g - 7h$ [2]

....

....

(ii) $\dfrac{(x+8)^5}{(x+8)^4}$ [1]

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....

4. Use the clues to write down the names of each of the following quadrilaterals.

(a) This quadrilateral has:

- 4 equal sides,
- diagonals of different lengths. [1]

This quadrilateral is a ....

(b) This quadrilateral has:

- diagonals that intersect at right angles,
- only one pair of opposite angles which are equal,
- 2 pairs of adjacent sides equal in length,
- no reflex angles. [1]

This quadrilateral is a ....

5. *(a)* (i) Express 600 as a product of prime factors using index form. [3]

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(ii) What is the least number 600 should be multiplied by to give an answer that is a square number? [1]

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(b) Calculate the larger amount when £440 is divided in the ratio 5 : 6. [2]

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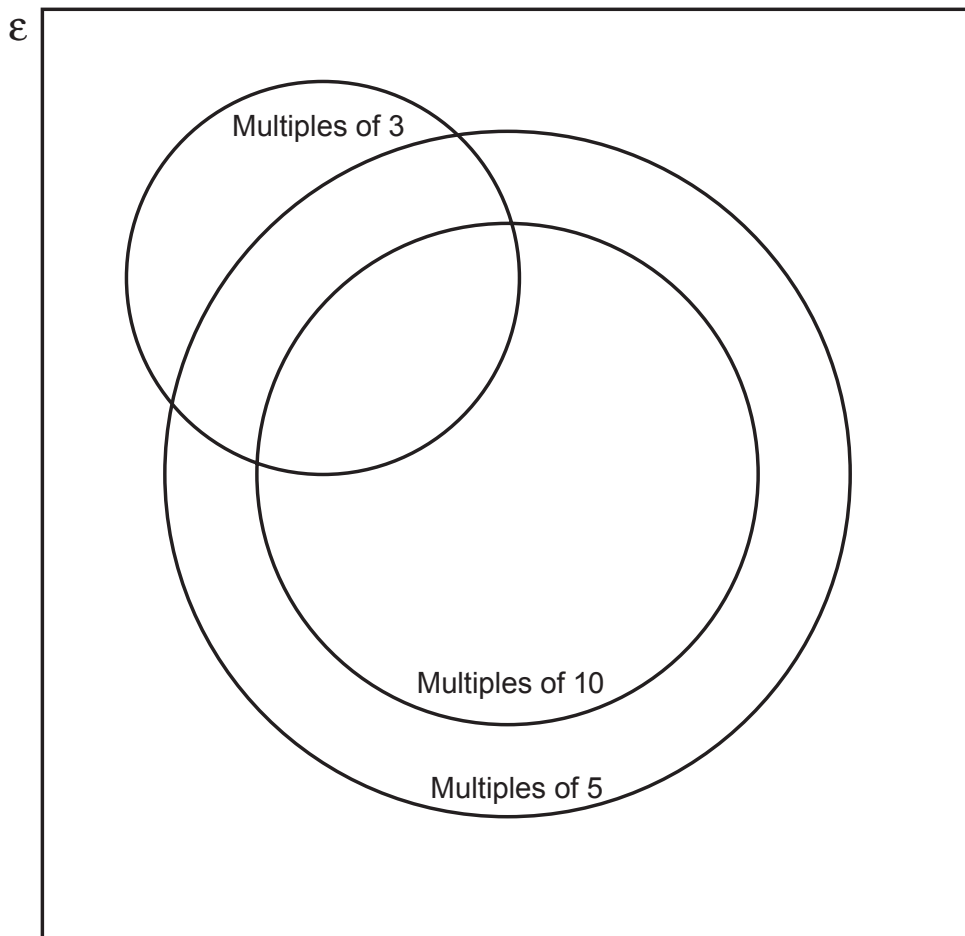
6. *(a)* A Venn diagram is shown below.
Explain why the circle to represent multiples of 10 is drawn inside the circle to represent multiples of 5. [1]

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ε

Multiples of 3

Multiples of 10

Multiples of 5

(b) (i) Place each of the six numbers 30, 32, 33, 35, 40, 45 in the correct position in the Venn diagram. [3]

(ii) A number is selected at random from the set {30, 32, 33, 35, 40, 45}.

Find the probability that the number selected is

a prime number, ...

a multiple of 10 that is also a multiple of 3, ...

neither a multiple of 3 nor 10. .... [3]

7. *(a)* Each **exterior** angle of a regular polygon is 18°.
How many sides does this regular polygon have? [2]

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.... sides

(b) *You will be assessed on the quality of written communication in this part of the question.*

Three of the **interior** angles of a pentagon are 125°, 130° and 135°.
The other two angles are equal.
Find the size of the other two angles. [7]

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(4363-02) **Turn over.**

8. A game is played in which these two spinners are spun at the same time.
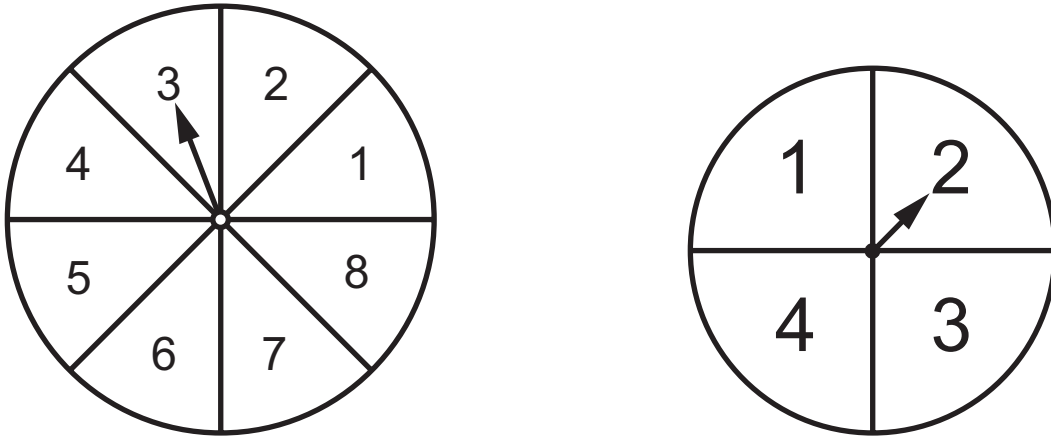
The score is the **product** of the 2 numbers shown on the spinners.
In this example the score is 6, as 3 × 2 = 6.

(a) If the game were to be played 96 times, how many times would you expect to score 6? [3]

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(b) Explain why even number scores are more likely than odd number scores. [2]

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9. Rowena sometimes wears a hat and sometimes wears gloves.

The probability that she wears a hat on a given day is 0·6.
The probability that she **does not** wear gloves on a given day is 0·2.
Wearing a hat and wearing gloves are independent.

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

```
                                        ................  Rowena
                                       /                  wears gloves
                                      /
                        Rowena       /
              0·6      wears a hat  /    0·2
                \     /             \
                 \   /               \
                  \ /                 ................  Rowena does not
                   X                                    wear gloves
                  / \
                 /   \
    ............/     \  Rowena
                       \ does not      ................  Rowena
                         wear a hat   /                  wears gloves
                                     /
                                    /
                                    \
                                     \
                                      ................  Rowena does not
                                                        wear gloves
```
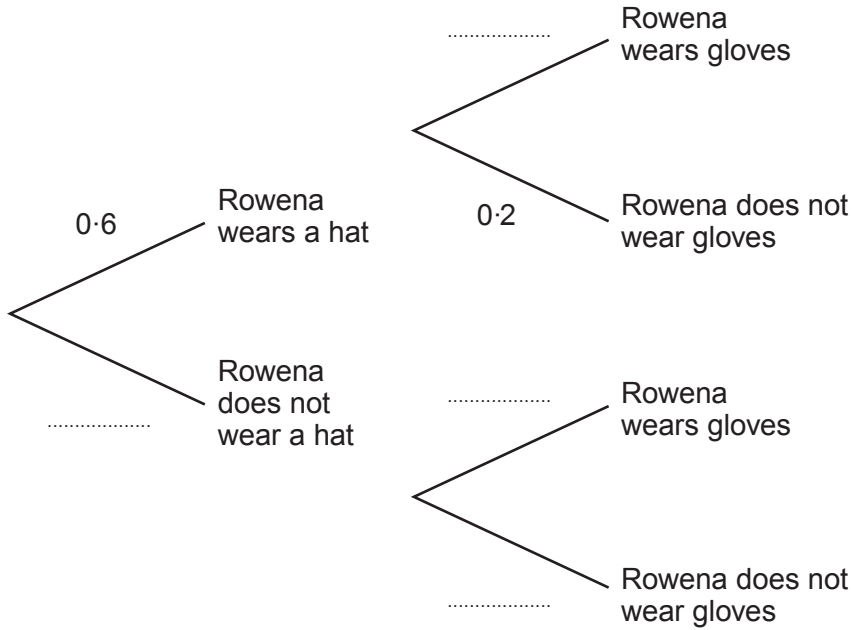
(b) Calculate the probability that, on a given day, Rowena wears a hat but does not wear gloves. [2]

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....

(c) Calculate the probability that, on a given day, Rowena **does not** wear a hat or gloves. [2]

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10. *(a)* Evaluate $\dfrac{8 \times \sqrt{5} \times \sqrt{3} \times \sqrt{3}}{2 \times \sqrt{5}}$. [2]

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(b) Evaluate $\dfrac{25^{\frac{1}{2}} \times 18}{\sqrt{9^2}}$. [3]

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(c) Write 0·00006 in standard form. [1]

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(d) Evaluate $\dfrac{3 \cdot 6 \times 10^8}{1 \cdot 2 \times 10^{-4}}$, giving your answer in standard form. [2]

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(e) Simplify $\dfrac{5\pi}{2} + \dfrac{7\pi}{4}$.

Give your answer in terms of π. [2]

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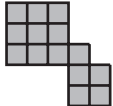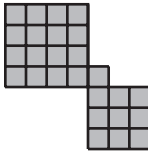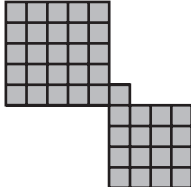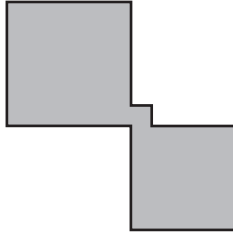
11. Use the table below to find an expression for the number of small squares in pattern number n.

[3]

Pattern number	Shape	Number of small squares
1		6
2		14
3		26
4		
n		....

Turn over.

12. Match each of the graphs shown below with an equation from the following list. [3]

$y = x^2 + 1$ $\qquad\qquad$ $y = x^2 - 1$ $\qquad\qquad$ $y = x^3 + 1$ $\qquad\qquad$ $y = x^3 - 1$

$y = -x^3$ $\qquad\qquad$ $y = -x^2$ $\qquad\qquad$ $y = -x^2 + 1$ $\qquad\qquad$ $y = -x^3 + 1$

$y = \dfrac{1}{x}$ $\qquad\qquad$ $y = \dfrac{-1}{x}$ $\qquad\qquad$ $y = x$ $\qquad\qquad$ $y = -x$

$y = $ ....

$y = $ ....

$y = $ ....

13.
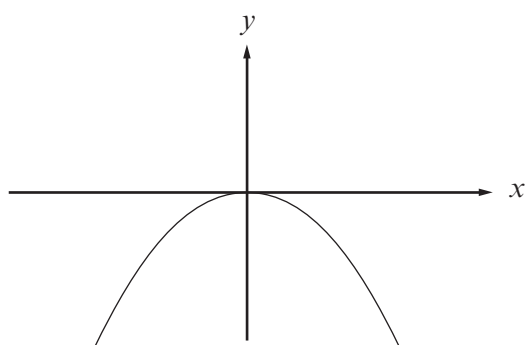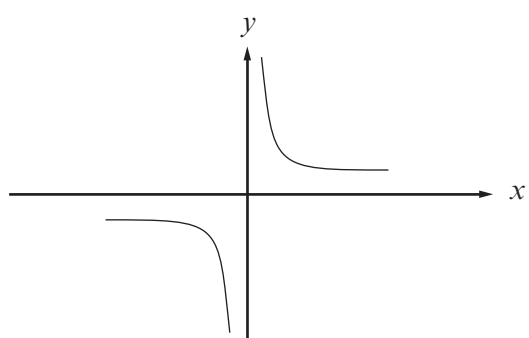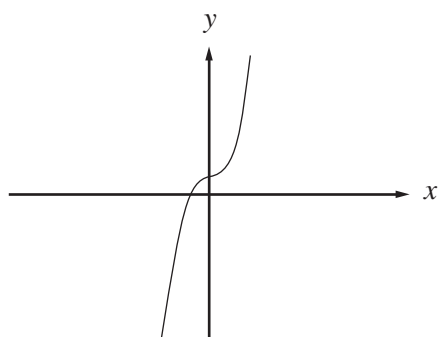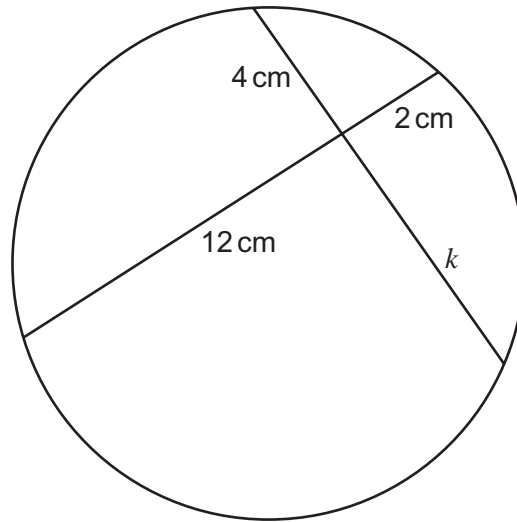
Diagram not drawn to scale

Find the length of the line marked k. [2]

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14. On each Venn diagram, shade the appropriate region.

(a) A∪B [1]

(b) (A∩B)′ [1]

(4363-02) **Turn over.**

15.

| 1 | 2 | 3 | 5 | 7 |
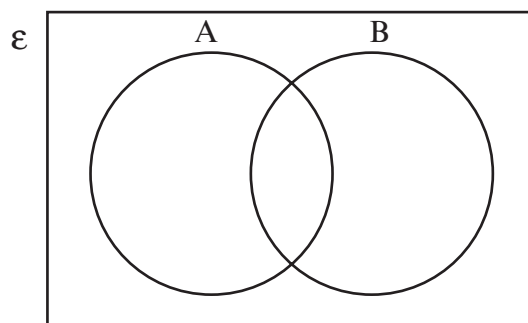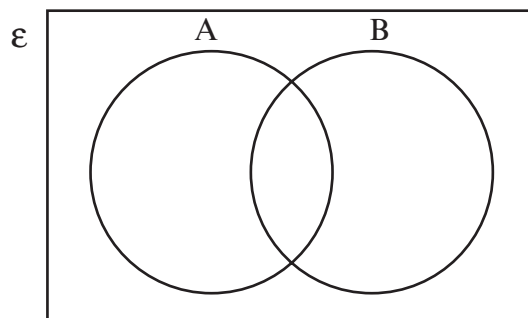
Five cards are numbered 1, 2, 3, 5 and 7 respectively.
The cards are shuffled and **two** cards are chosen at random.

(a) Write down the probability that at least one of the chosen cards shows an odd number.

[1]

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(b) Calculate the probability that the **difference** between the numbers on the chosen cards
is odd.
You must show your working. [3]

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16. *(a)* Show that the following identity is true. [4]

$$(x + 2)(2x - 5) + (1 - x)(3 + 2x) + 1 \equiv -2(x + 3)$$

(b) Simplify $\dfrac{x^2 + 7x + 12}{x^2 - 9}$. [3]

17. The diagram shows two circles of equal radii with centres *A* and *B* joined with a straight line.
The line *TSP* is a tangent to both circles.
S lies on the circumference of both circles.
E and *F* lie on the circumference of one of the circles.
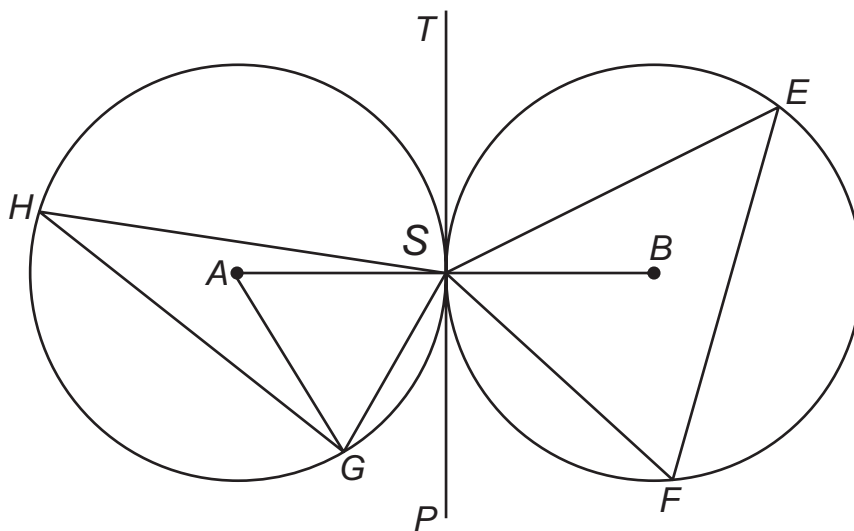*G* and *H* lie on the circumference of the other circle.

Diagram not drawn to scale

You are given that $S\hat{E}F = 2x°$ and $G\hat{S}P = x°$.

(a) State the size of each of the following angles in terms of x.

(i) $G\hat{S}F$. [1]

....

....

(ii) $A\hat{S}G$. [1]

....

....

(iii) $S\hat{A}G$. [1]

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....

(b) *J* is the mid-point on the minor arc of the circle between *S* and *F*.
State the size of $S\hat{J}F$ in terms of x.
Give the reason for your answer. [2]

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18. *(a)* Express the following as a single fraction in its simplest terms. [3]

$$\frac{2x-3}{3} - \frac{x+5}{4}$$

(b) Express $x^2 + 18x + 100$ in the form $(x + a)^2 + b$ where a and b are values to be found. [2]

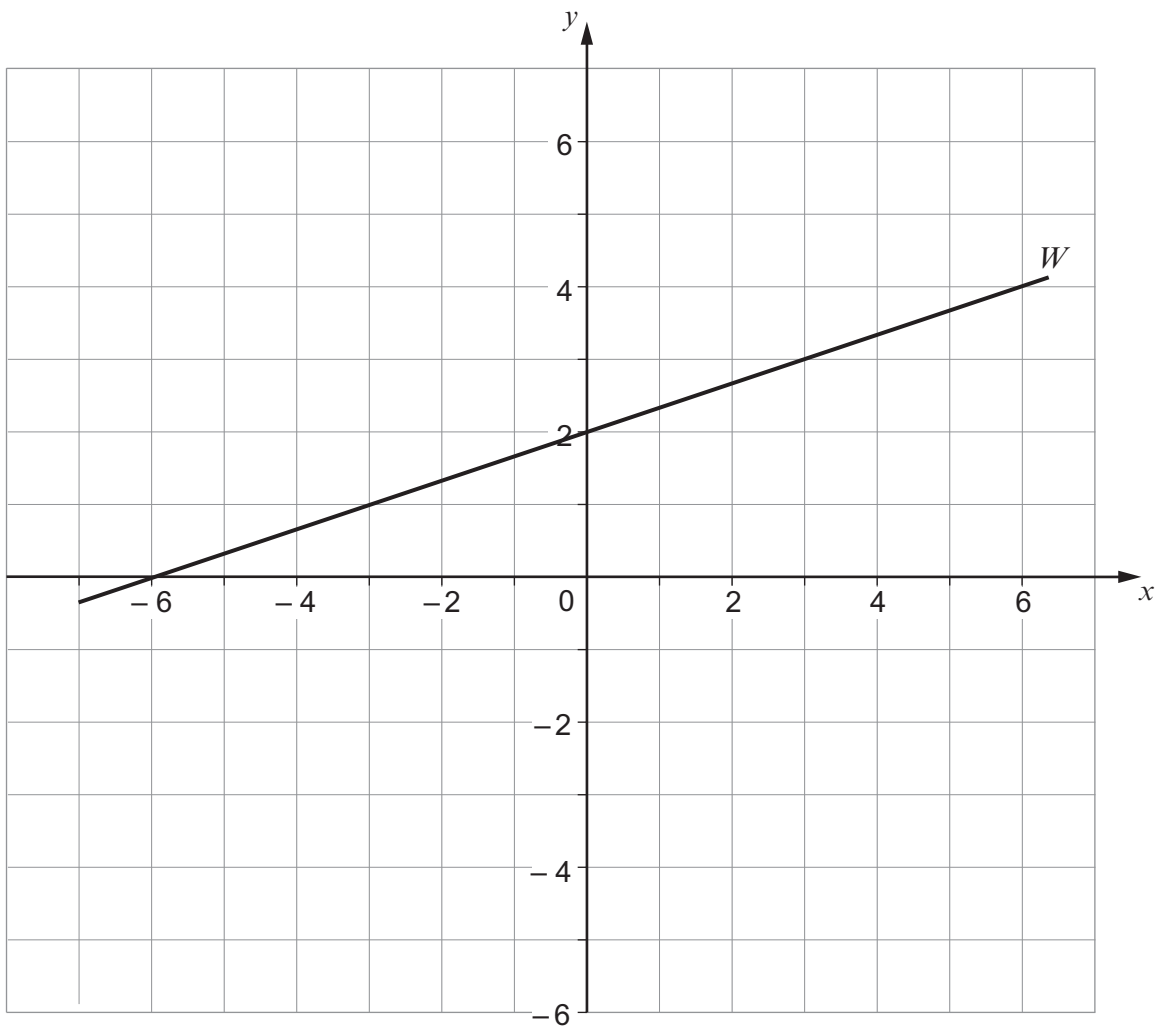**19.** A straight line, W, is shown on the axes below.

(a) The straight line, V, is parallel to W and passes through (0, –5).
Find the equation of V.
Write your answer in the form $y = mx + c$. [2]

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(b) The straight line, Z, is

- perpendicular to the straight line W, and
- passes through the mid-point of (6, 5) and (−2, −5).

Find the equation of Z.
Write your answer in the form $y = mx + c$. [4]

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