Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4363/02

S15-4363-02

METHODS IN MATHEMATICS

UNIT 1: Methods (Non-Calculator)
HIGHER TIER

A.M. THURSDAY, 21 May 2015

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

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 **8**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**3**	
3.	**4**	
4.	**7**	
5.	**3**	
6.	**4**	
7.	**5**	
8.	**5**	
9.	**7**	
10.	**3**	
11.	**6**	
12.	**5**	
13.	**5**	
14.	**3**	
15.	**4**	
16.	**5**	
17.	**9**	
18.	**5**	
19.	**5**	
20.	**6**	
Total	**100**	

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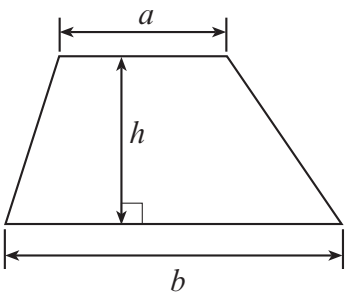
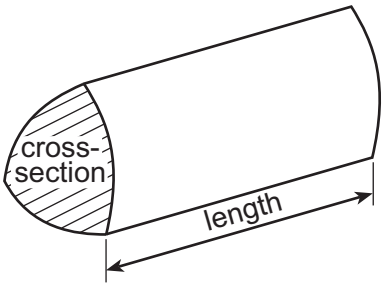
Formula List

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

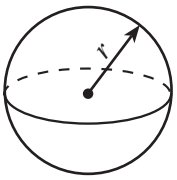


Volume of prism = area of cross-section × length



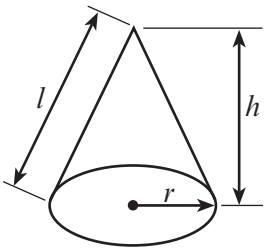
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

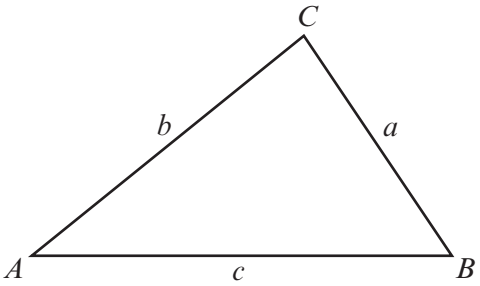


In any triangle ABC

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

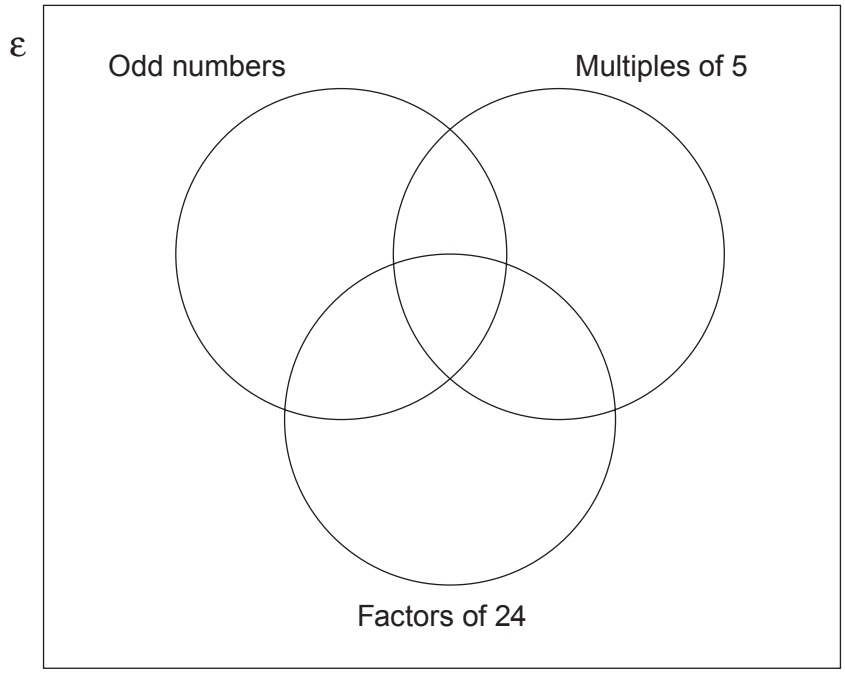
The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Examiner only

1. *(a)* Place the whole numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 in the correct positions in the Venn diagram. [3]



(b) A whole number is selected at random from the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}.

Find the probability that the number selected is:

an odd number .....

an odd number that is a factor of 24 .....

not a multiple of 5 and not a factor of 24. .....

[3]

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Turn over.

Examiner only

2.

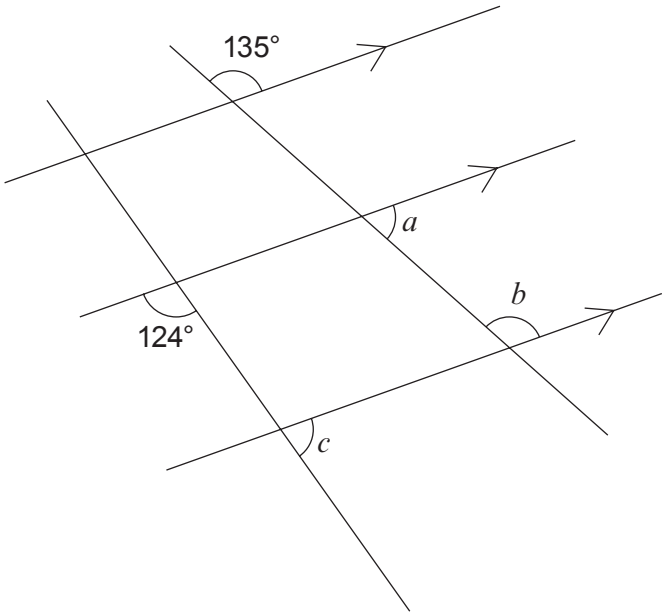

Diagram not drawn to scale

Find the size of each of the angles a, b and c. [3]

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a = ... °

b = ... °

c = ... °

Examiner only

3. *(a)* Use the formula below to find the value of g when $e = 8$ and $h = -2$. [3]

$$g = \frac{e(5 - h)}{4}$$

(b) Find the value of $k^2 - 10$ when $k = -5$. [1]

4. *(a)* Expand $5(x + 8)$. [1]

(b) Expand $x(x^2 + 7)$. [2]

(c) Simplify $\frac{1}{2}f + 5f - 17f - 1{\cdot}5f + 6f$. [1]

(d) Factorise $7p + 28$. [1]

(e) Factorise $3x^2 + 27x$. [2]

Examiner only

5. Write 800 as a product of prime factors using index notation. [3]

Examiner only

6. A spinner shows 5 colours.
The spinner was spun 50 times.
Some of the outcomes were recorded in a table.

Colour	Purple	Black	White	Red	Yellow
Number of times	7	8	20	.....	.....

(a) Red occurred twice as many times as yellow.
Complete the table above. [1]

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(b) Write down the best estimate for the following probabilities on a single spin.
You must express each of your answers as a **decimal**.

(i) The probability of obtaining black. [1]

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(ii) The probability of **not** obtaining white. [2]

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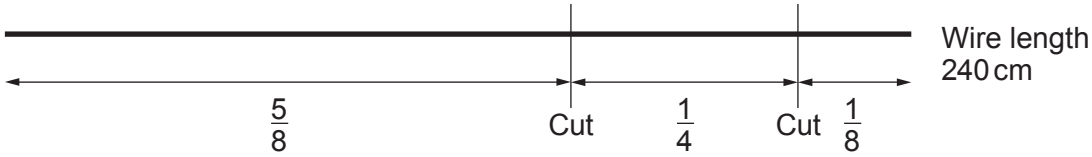
Examiner only

7. *(a)* A length of wire measuring 240 cm is to be cut into 3 pieces as shown in the diagram.



Calculate the length of each of the 3 pieces of wire. [2]

(b) A different piece of wire of length 308 cm is cut in the ratio 2 : 4 : 5.
Calculate the length of each of the 3 pieces of wire. [3]

Examiner only

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

Each interior angle of a regular polygon is 160°.
How many sides does this regular polygon have? [5]

Examiner only

9. *(a)* The diagram below shows dark and light triangular tiles.
The tiles are all identical isosceles triangles.

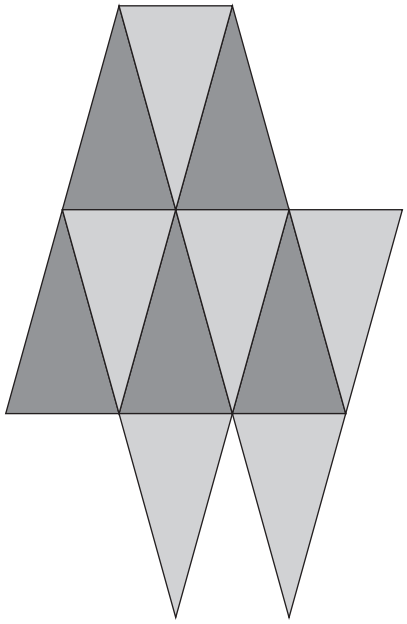


Diagram not drawn to scale

Explain why the tiles tessellate.
You must give a reason, based on angle facts, for your answer. [2]

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Examiner only

(b) Labels have been inserted on the diagram showing the tiles.

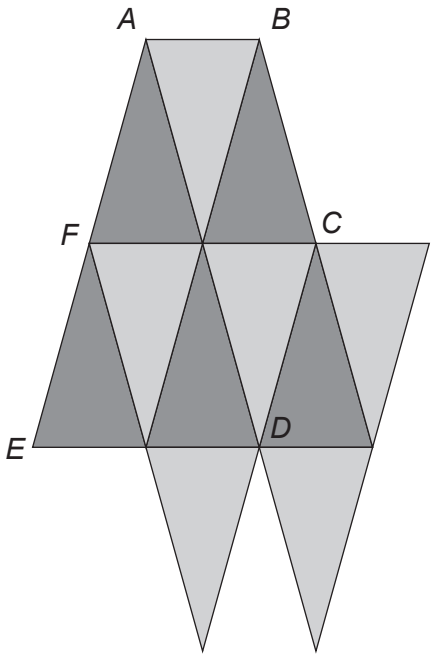

Diagram not drawn to scale

The smallest angle in each of the isosceles triangular tiles is 26°.

(i) Use angle facts to show that *AB* is parallel to *FC*.
You must show your calculations. [3]

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(ii) Use angle facts to show that *FCDE* is a parallelogram.
You must show your calculations. [2]

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Turn over.

Examiner only

10. The length of one side of a quadrilateral is x cm.
The length of one of the other sides of this quadrilateral is $(x + 7)$ cm.
The length of each of the other sides is double the length of the shortest side of the quadrilateral.
The sum of all the lengths of the sides of the quadrilateral is F cm.

Write a formula that could be used to find the sum of the lengths of all the sides of this quadrilateral.
Give your answer in its simplest form. [3]

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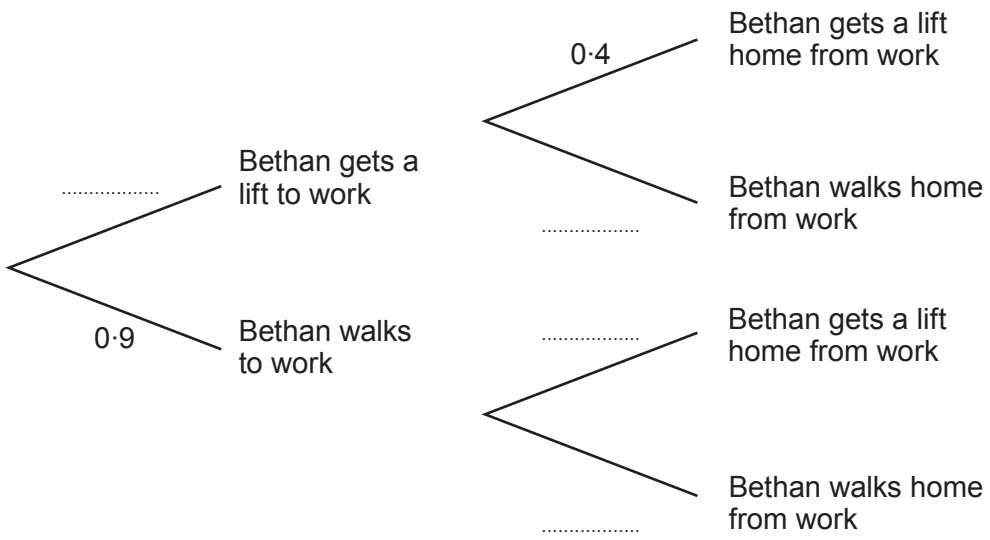
Examiner only

11. Bethan sometimes gets a lift to and from work.
When she does not get a lift, she walks.
The probability that she walks to work is 0·9.
The probability that she gets a lift home from work is 0·4.
Getting to work and getting home from work are independent.

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



(b) Calculate the probability that Bethan walks to work and gets a lift home from work. [2]

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(c) Calculate the probability that Bethan gets a lift to work but **does not** get a lift home from work. [2]

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Examiner only

12. *(a)* Make g the subject of the following formula. [2]

$$tg^2 = m$$

(b) Make q the subject of the following formula. [3]

$$hq - c = yq + f$$

Examiner only

13. The nth term of a sequence is $\frac{n(n+1)}{4}$.

(a) Calculate the value of the 20th term of the sequence. [2]

(b) Which term in the sequence has a value of 33? [3]

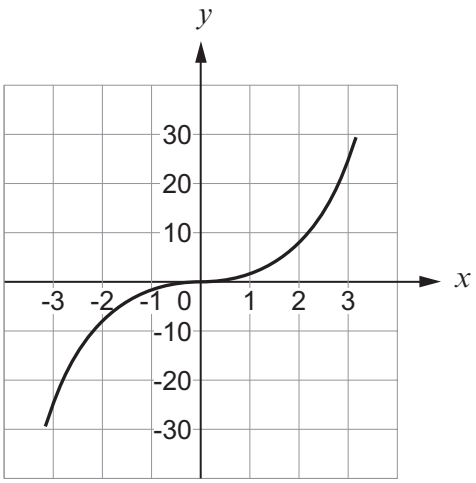
Examiner only

14. Match each of the given graphs with one of the possible equations shown below.

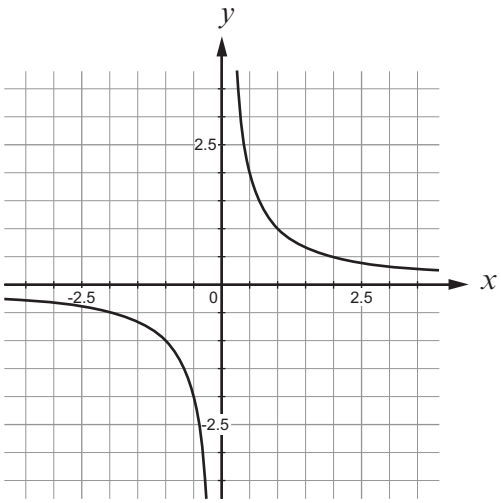
Possible equations:

$y = x$	$y = x^2$	$y = x^3$	$y = \frac{1}{x}$	$y = -x$	$y = -x^2$

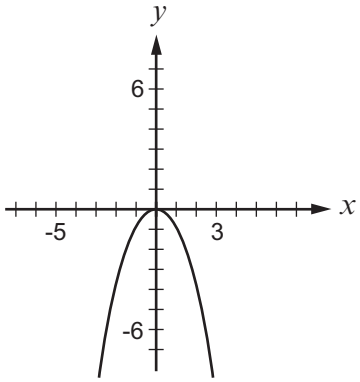
Graphs



Equation: ..... [1]



Equation: ..... [1]



Equation: ..... [1]

Examiner only

15. *(a)* Express $\sqrt{75}$ in the form $a\sqrt{b}$, where a and b are whole numbers. [2]

(b) Evaluate the following, giving your answer in standard form. [2]

$$\frac{2{\cdot}1\times 10^{23} + 7{\cdot}5\times 10^{23}}{4\times 10^{-6}}$$

Examiner only

16. *(a)* The diagram shows a circle with centre *O* and a tangent *TAP.*
The points *A*, *B* and *C* lie on the circumference of the circle.

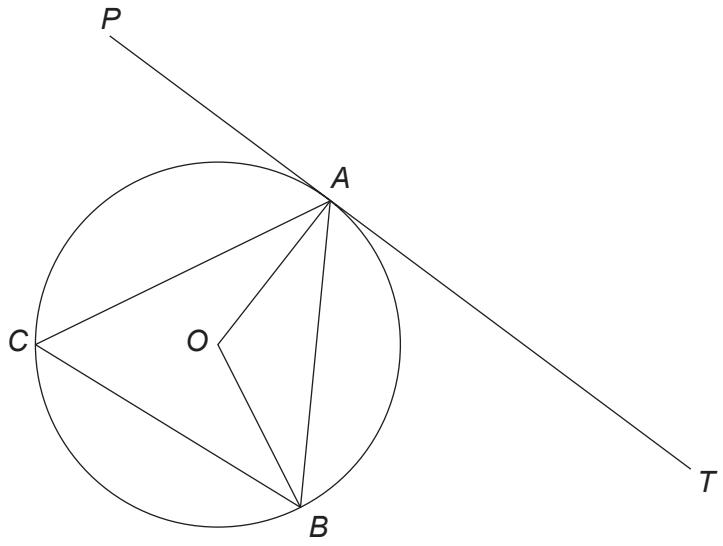


Diagram not drawn to scale

Given that $\hat{TAB} = 50°$, calculate the **reflex** angle $\hat{AOB}$.
You must show all your working. [3]

Examiner only

(b) The points *B*, *C*, *D* and *E* lie on the circumference of another circle.
The point *A* lies outside the circle.
ABE and *ACD* are straight lines.

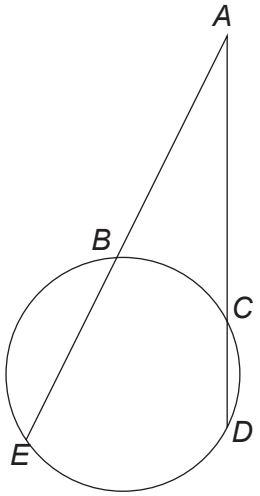


Diagram not drawn to scale

Given that *AB* = 9 cm, *AC* = 10 cm and *CD* = 8 cm, calculate the length of *BE*. [2]

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Examiner only

17. *(a)* Given that x is a whole number, explain why $2x + 1$ is an odd number. [1]

(b) Write down an expression for the next **odd** number after $2x + 1$. [1]

(c) Expand and simplify $(2x + 1)^2$. [2]

(d) Expand and simplify the square of the expression you found in **part *(b)***. [2]

(e) Using your answers from **part *(c)*** and **part *(d)***, explain why the difference between the squares of two consecutive odd numbers is always a multiple of 8. [3]

Examiner only

18. A box contains 2 mango yogurts, 4 vanilla yogurts and 6 cherry yogurts.
Three yogurts are selected at random from the box without replacement.

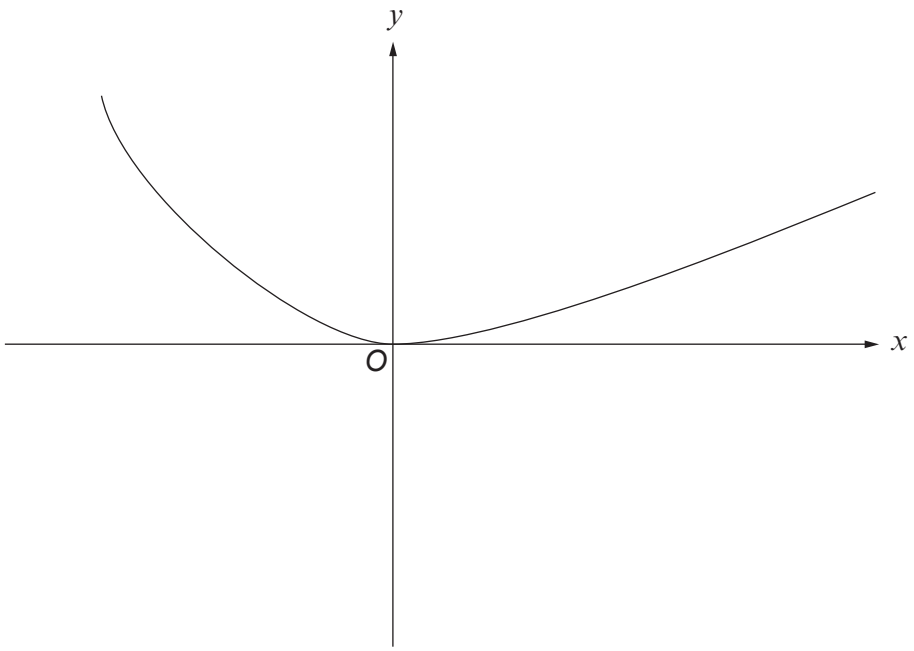
(a) Calculate the probability that all three selected yogurts are vanilla. [2]

(b) Calculate the probability that at least one of the selected yogurts is a cherry yogurt. [3]

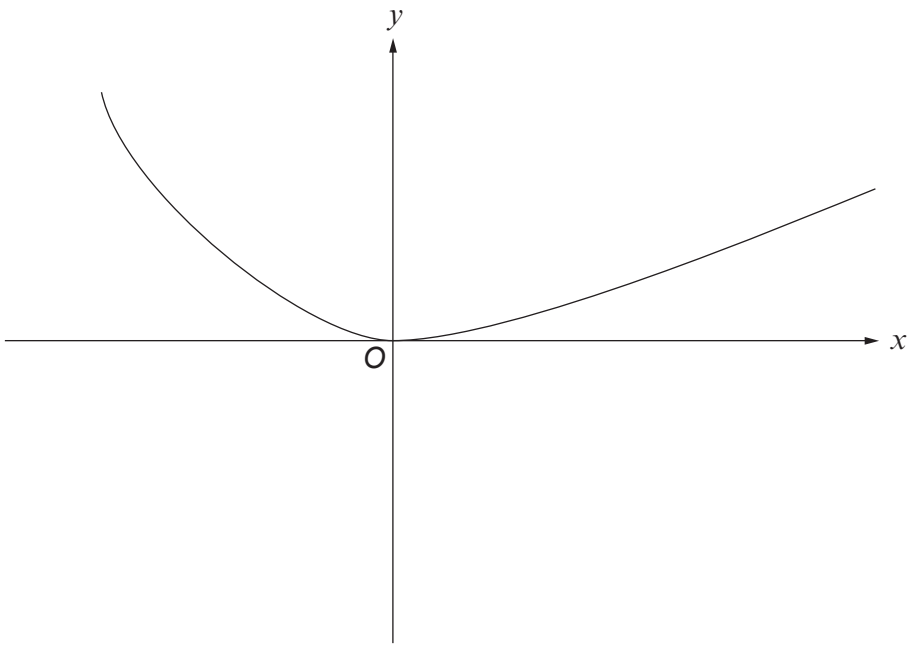
Turn over.

Examiner only

19. *(a)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x - 4)$.
Mark clearly the coordinates of the point where this curve touches an axis. [2]



(b) The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = -f(x) + 2$.
Mark clearly the coordinates of the point where this curve meets the y-axis. [3]



Examiner only

20. A straight-line graph is to be drawn using the following information.

- It is perpendicular to the line with equation $2y = 4x + 3$.
- It intersects the line $x + 3y = 12$ at the point where $x = 0$.

Write down the equation of the straight-line that is to be drawn.
Then use the graph paper below to draw the graph of this straight line. [6]

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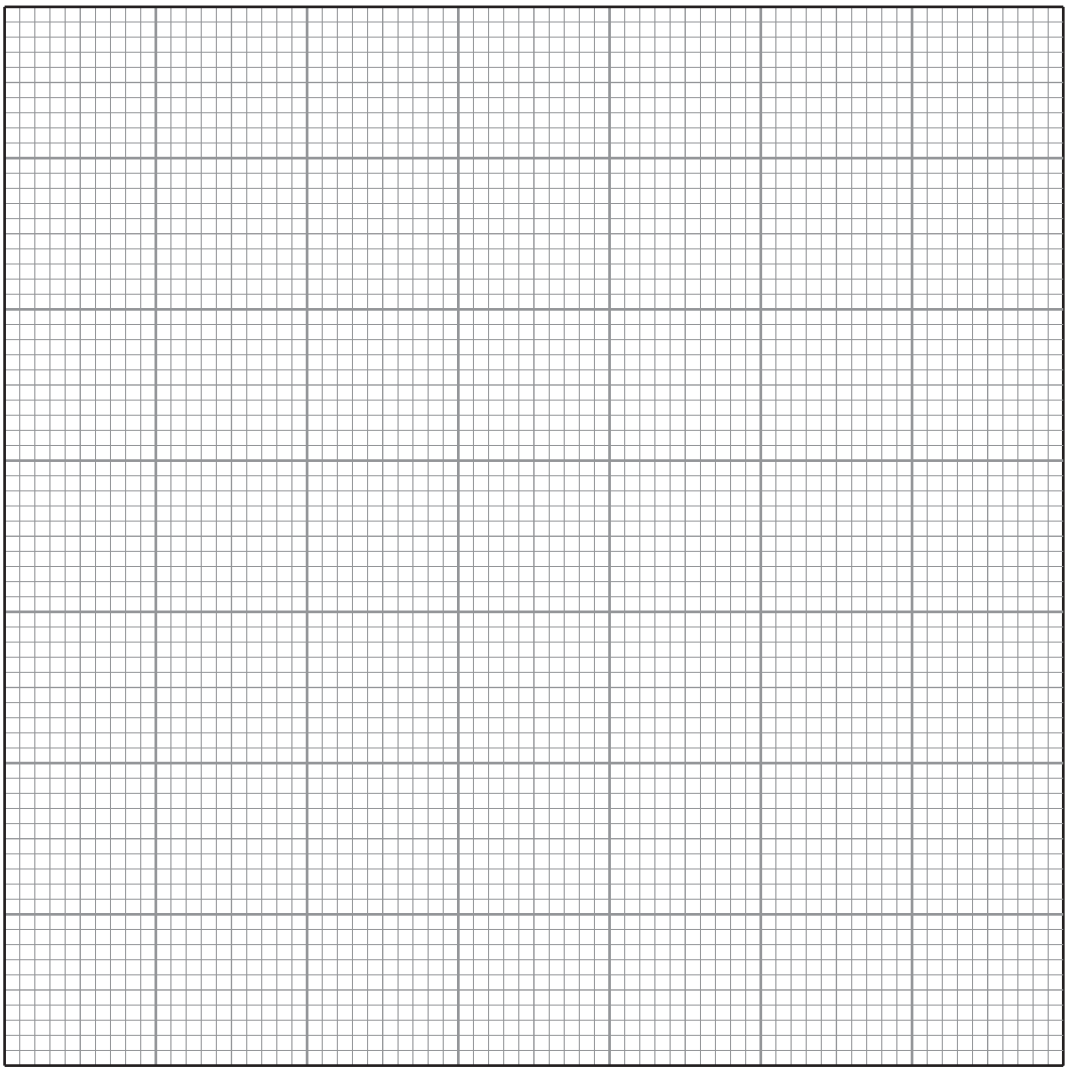
Equation of the straight-line: .....



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