Candidate Name	Centre Number	Candidate Number
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WJEC CBAC

GCSE

185/09

MATHEMATICS

HIGHER TIER

PAPER 1

P.M. MONDAY, 7 June 2010

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

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.

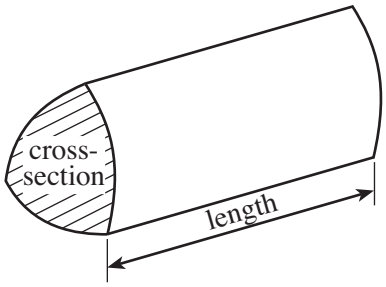
Scale drawing solutions will not be acceptable where you are asked to calculate.

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

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

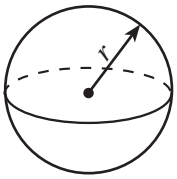
Formula List

Volume of prism = area of cross-section × length



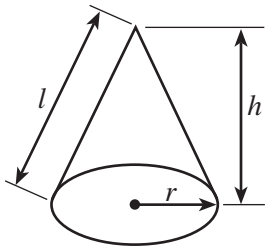
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

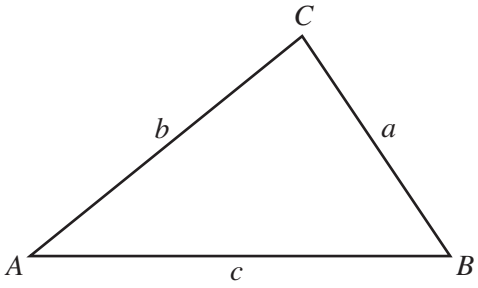


In any triangle ABC

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

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

Standard Deviation

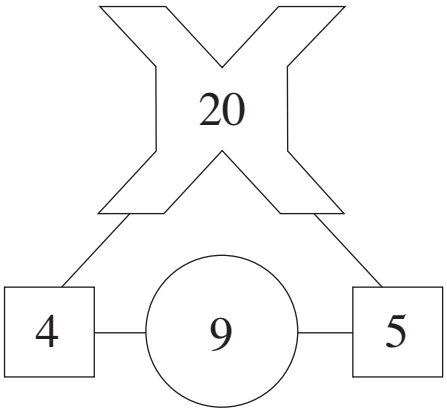
Standard deviation for a set of numbers

$x_1, x_2, \ldots, x_n$, having a mean of $\bar{x}$ is given by

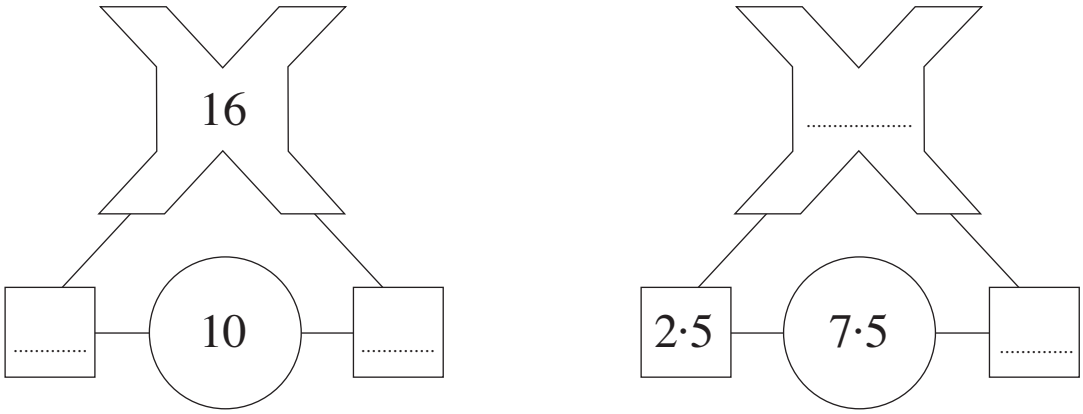
$$s = \sqrt{\frac{\sum(x-\bar{x})^2}{n}} \quad \textbf{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

Examiner only

1. The sum of the two numbers in the squares is shown in the circle.
The product of the two numbers in the squares is shown in the cross.

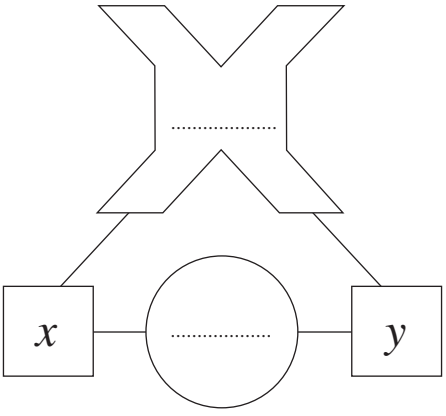


(a) Complete **each** of the following diagrams.



[2]

(b) Using the same rules, complete the diagram below in terms of x and y.



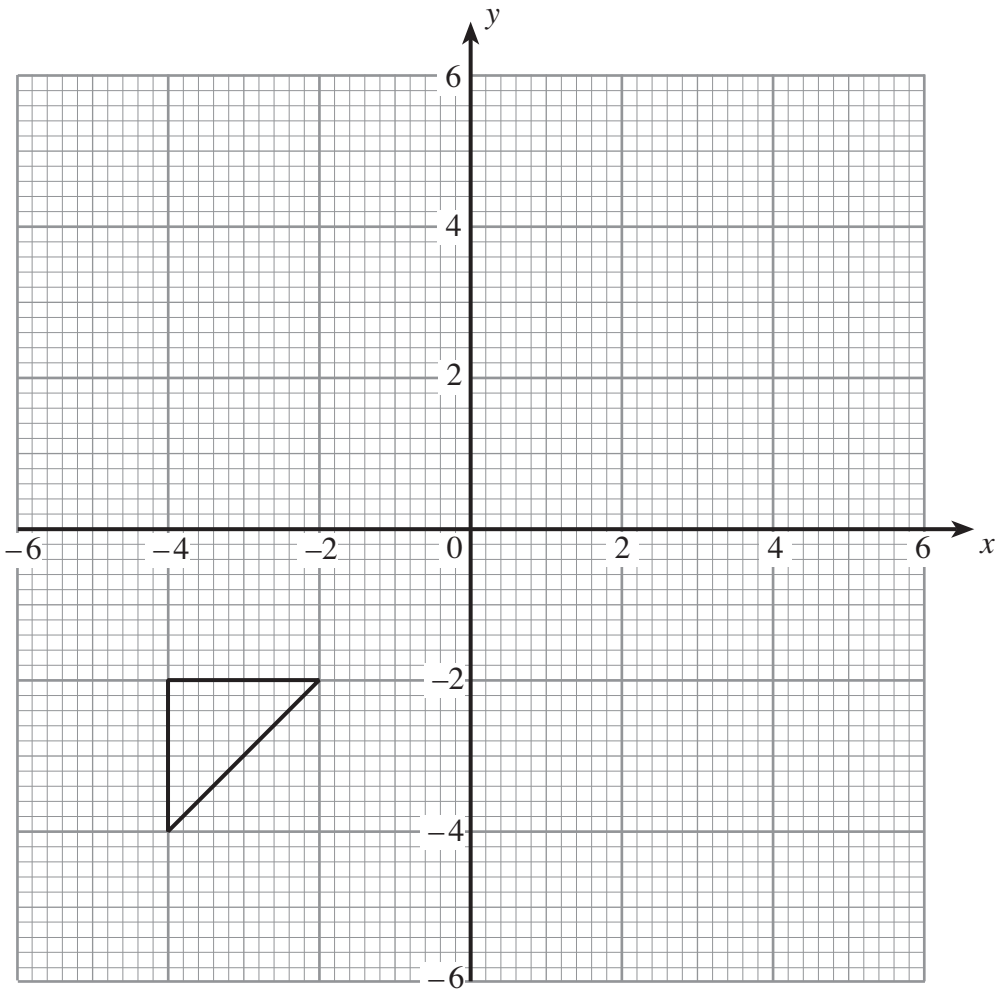
[2]

S10 0185 09 3

Examiner only

2. *(a)* Reflect the triangle in the line $x = -2$.

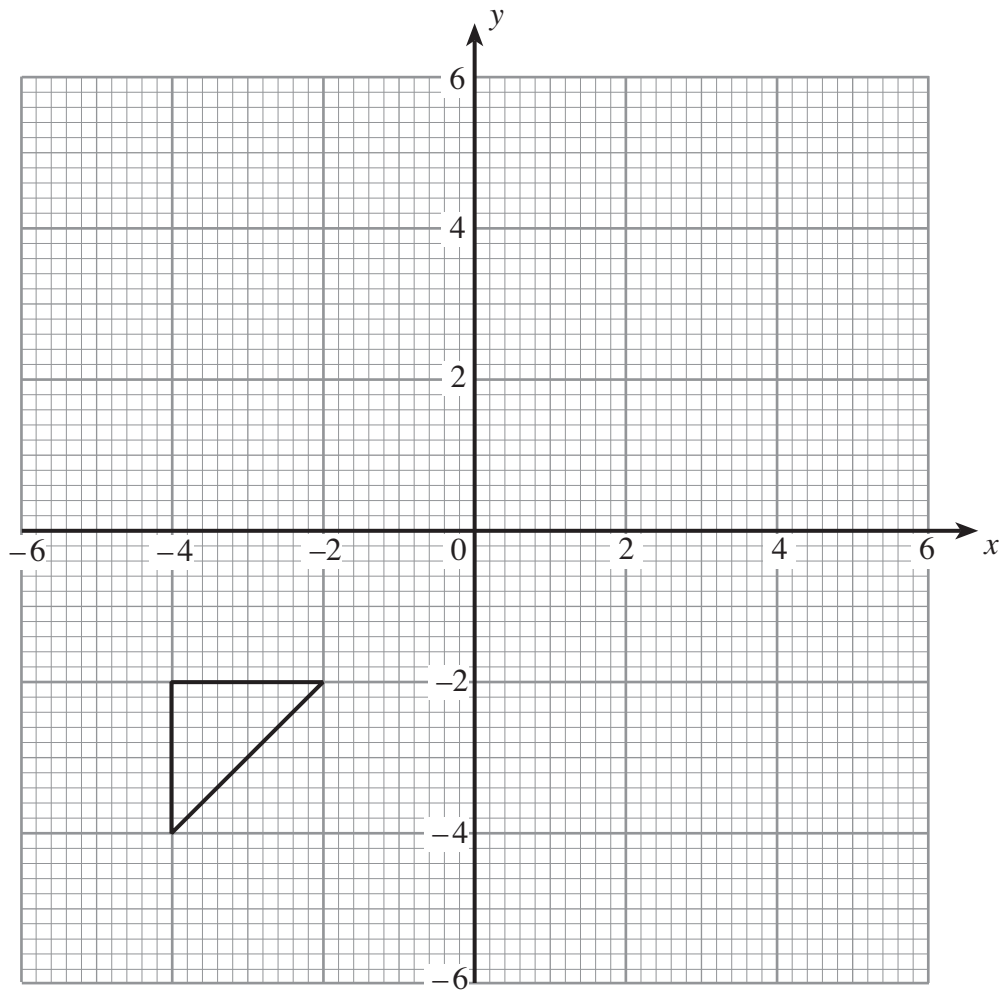
[2]



Examiner only

(b) Translate the triangle shown 2 to the right and 3 up.

[2]



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Examiner only

3. *(a)*

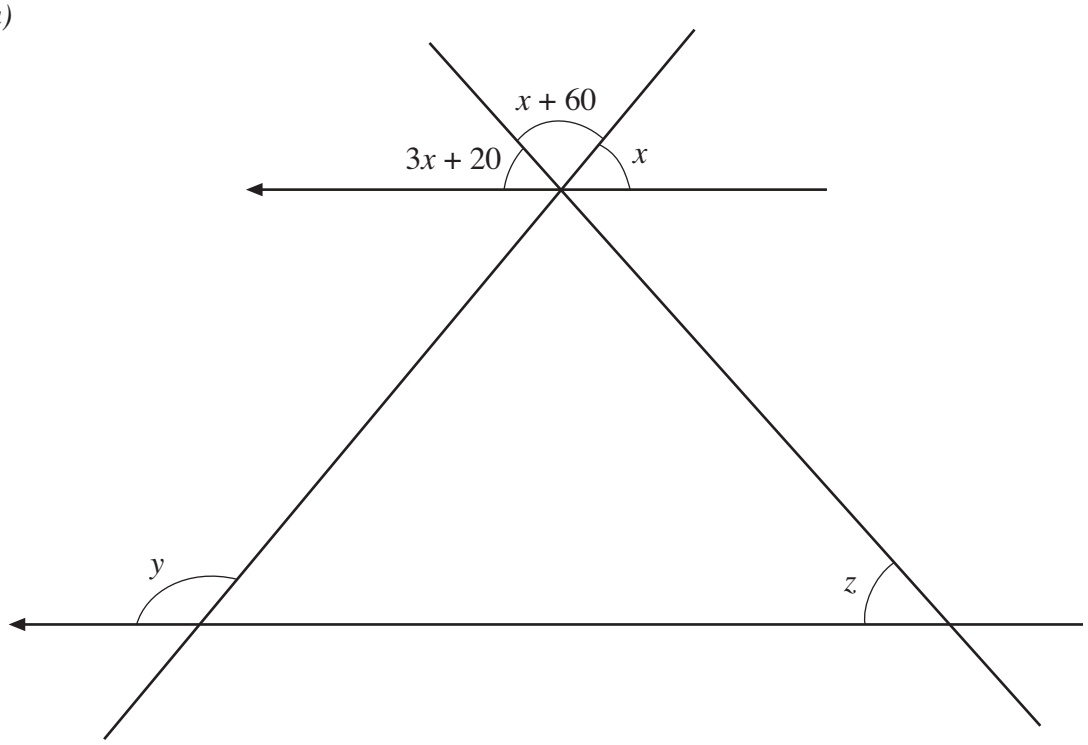

Diagram not drawn to scale.

All angles are measured in degrees.
Find the size of angles x, y and z.

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x = ... , y = ... , z = ...

[5]

Examiner only

(b)

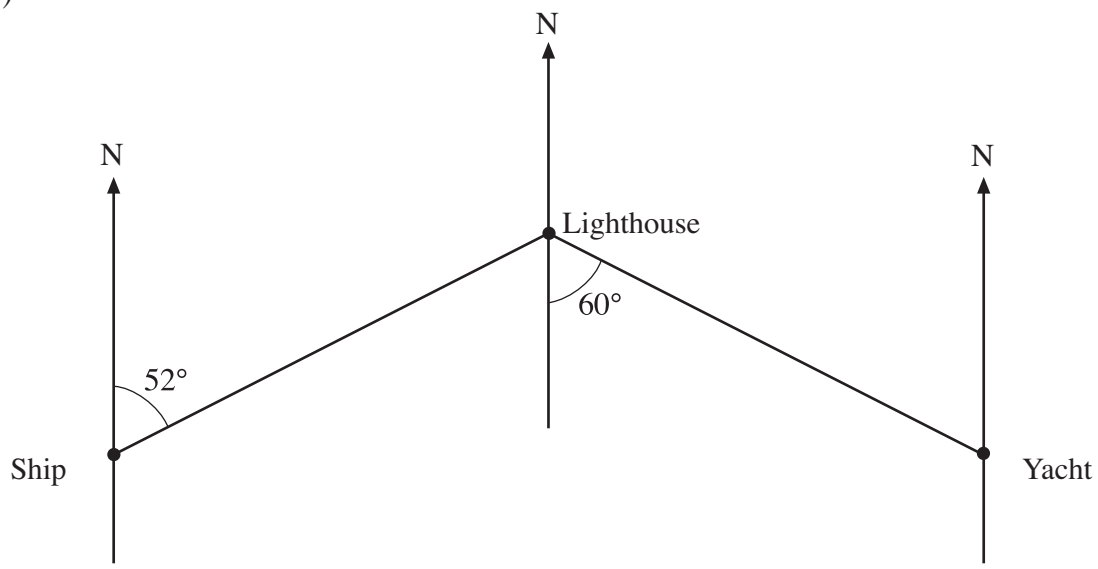

Diagram not drawn to scale.

Write down the bearing of:

(i) the yacht from the lighthouse.

.....

(ii) the ship from the lighthouse.

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[3]

S10 0185 09 7

Examiner only

4. *(a)* Calculate the circumference of a circle with a radius of 5 cm, using 3·14 as the value of π.

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[2]

(b)

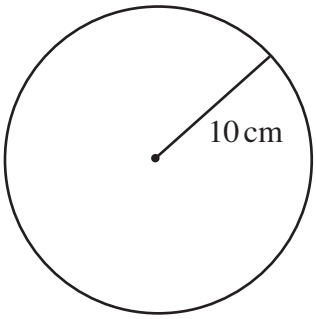

Diagram not drawn to scale.

Calculate the area of the circle shown in the diagram above, using 3·14 as the value of π.

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[2]

(c)

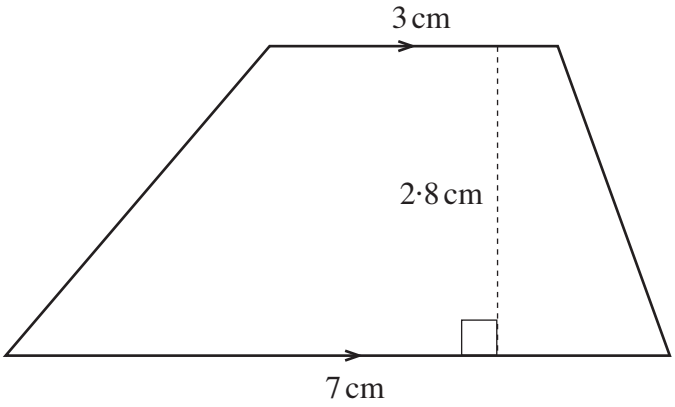

Diagram not drawn to scale.

Calculate the area of the trapezium shown in the diagram.

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[2]

Examiner only

5. *(a)* A sequence starts with 8.
Equal amounts are added each time to get the next term.
Write down the three missing terms of the sequence.

[3]

8				26

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(b) The nth term of a sequence is $n^2 - 3$. Write down the first three terms of this sequence.

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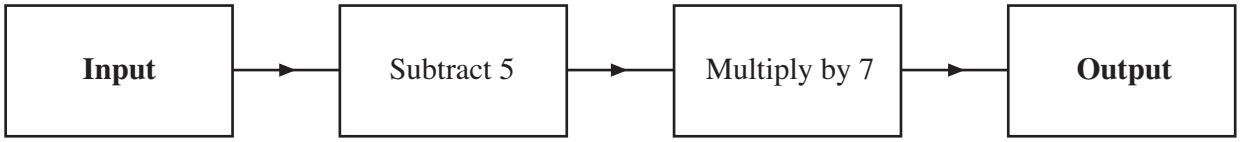
[2]

(c) The diagram shows a number machine.



(i) Find the **Input** to the number machine when the **Output** is -49.

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(ii) Write down the **Output** from the number machine when the **Input** is n.

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[3]

(d) Write down the nth term of the sequence 8, 13, 18, 23, 28, ...

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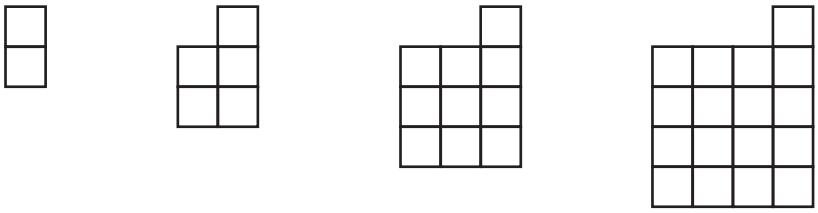
[2]

(e) The diagrams show tile patterns.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

Find an expression for the number of tiles in Pattern n.

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[2]

Examiner only

6. *(a)* Express 792 as a product of prime numbers in index form.

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[3]

(b) Explain why 18 is not a perfect square.

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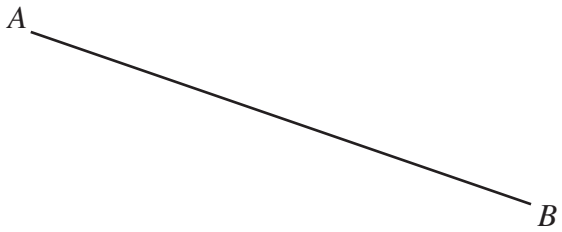
[1]

Examiner only

7. Shade the region that satisfies both of the following conditions.

(i) The points are less than 4·5 cm from A.
(ii) The points are nearer to B than to A.

[3]



8. *(a)* Solve $\dfrac{20+x}{3} = 7$.

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[3]

(b) Solve $6x < 2x + 24$.

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[2]

Examiner only

9. The table shows some of the values of $y = 4x^3 + 3$ for values of x from -2 to 2.

(a) Complete the table by finding the value of y for $x = -1$.

x	-2	-1	0	1	2
$y = 4x^3 + 3$	-29		3	7	35

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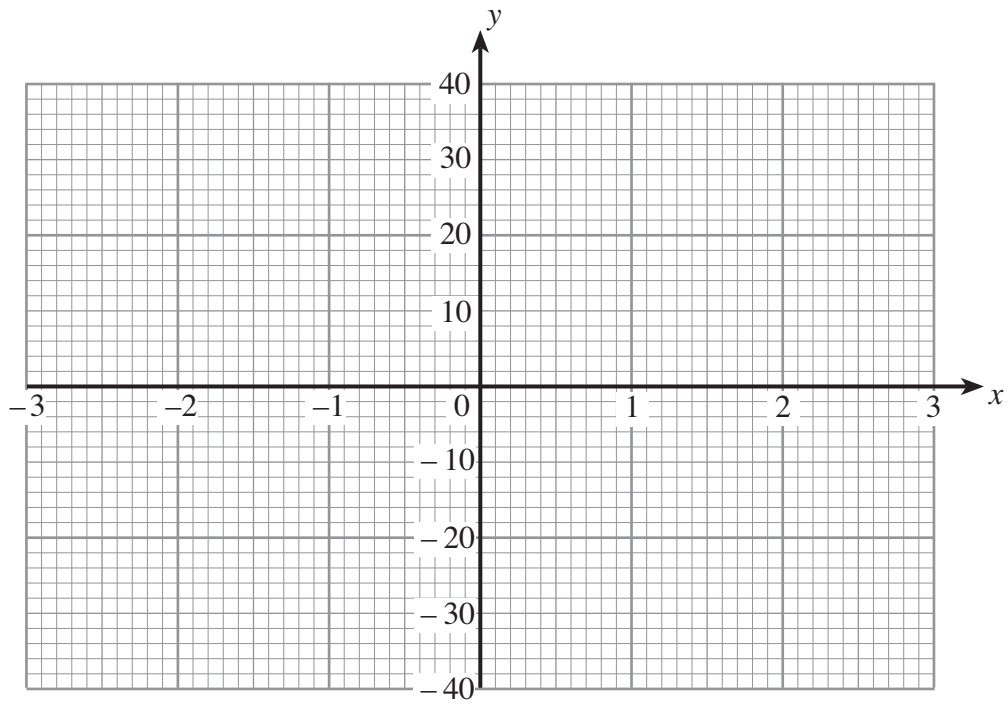
[1]

(b) On the graph paper below, draw the graph of $y = 4x^3 + 3$ for values of x from -2 to 2.

[2]



(c) Use your graph of $y = 4x^3 + 3$ to find the value of x for which $4x^3 + 3 = -20$.

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[2]

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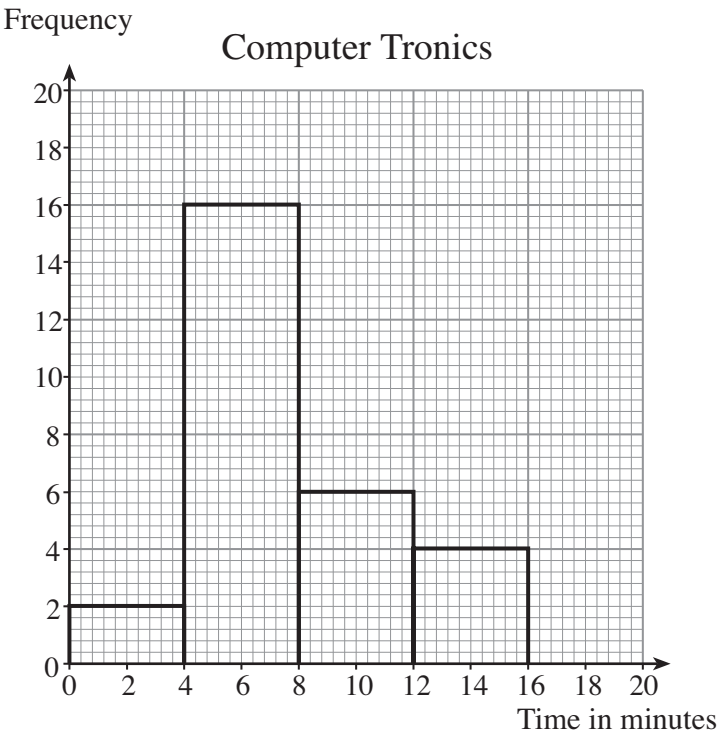
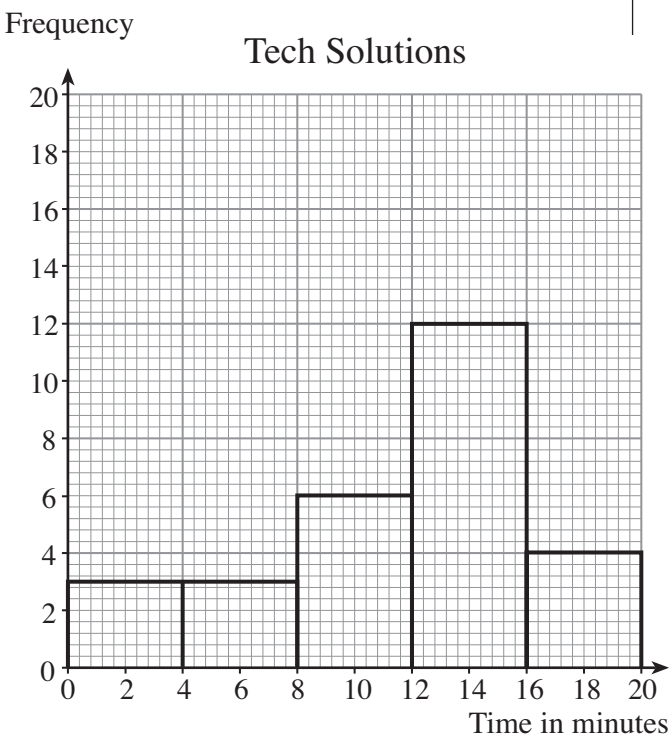
Examiner only

10. The frequency diagrams show the time taken by two computer company helplines to deal with customer problems.





(a) How many calls to Computer Tronics lasted between 4 minutes and 12 minutes?

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.....

[1]

(b) One of the helplines won an award for their speedy response to customer questions. Which company do you think won the award? Give a reason for your answer.

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[2]

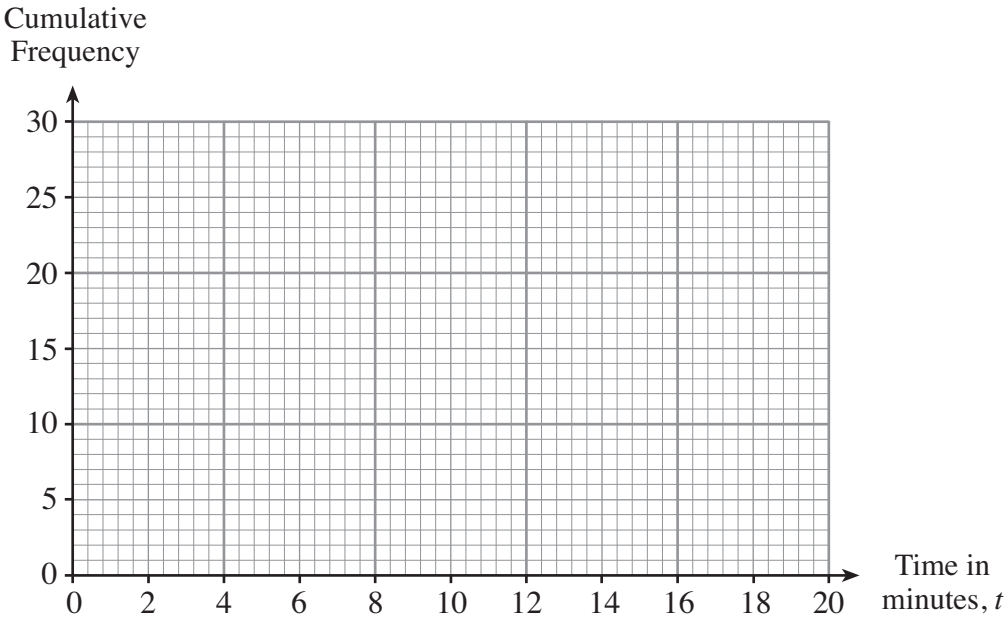
(c) Complete the cumulative frequency table for Computer Tronics helpline times.

Time in minutes, t	$t \leqslant 4$	$t \leqslant 8$	$t \leqslant 12$	$t \leqslant 16$
Cumulative frequency				

[1]

(d) Use the graph paper below to draw a cumulative frequency diagram for the Computer Tronics information.

[3]



(e) Use your cumulative frequency diagram to find

(i) an estimate for the median helpline time for Computer Tronics,

.....

(ii) an estimate for the inter-quartile range of the helpline times for Computer Tronics.

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[3]

Examiner only

11. Sara calculates that five times her age and three times her brother's age gives a total of 100.
The sum of Sara's age and her brother's age is 22.
Find Sara's age and her brother's age.

[4]

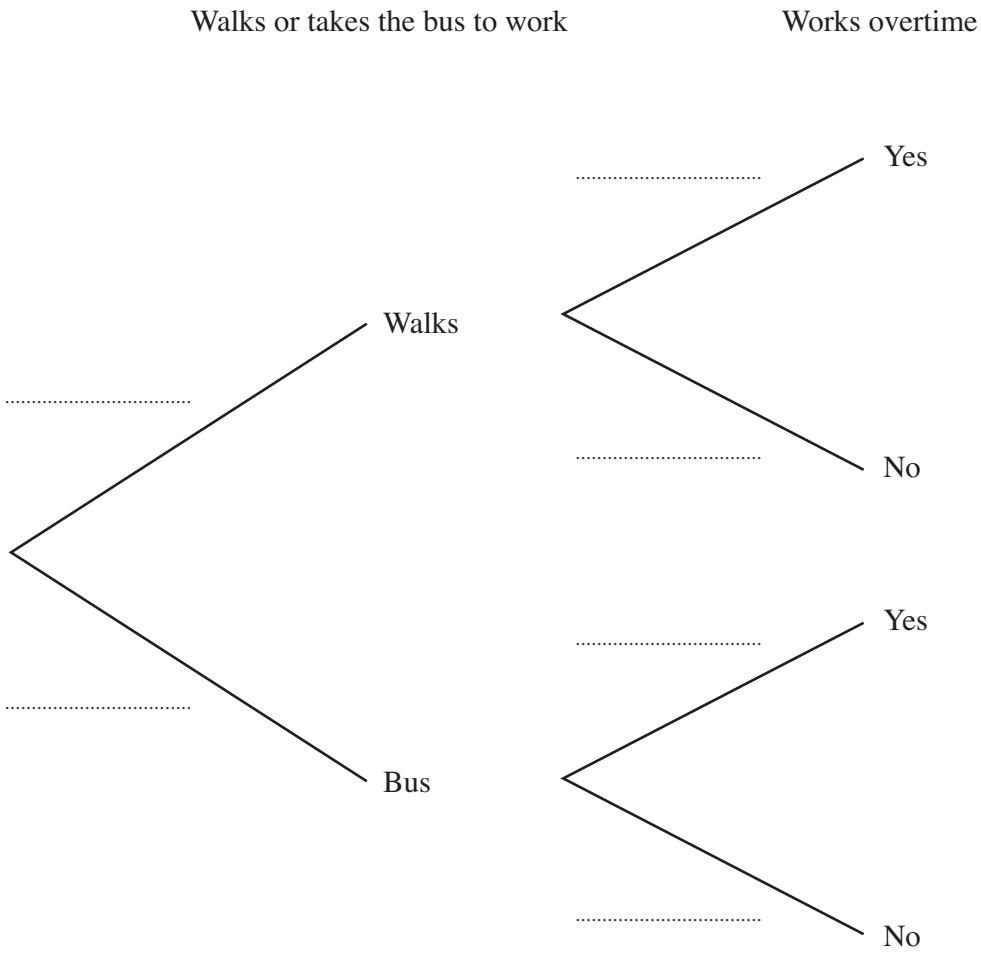
12. There is a positive value of x which satisfies $x^2 = 6{\cdot}5$.
Find this value of x correct to the nearest whole number.
You must justify your answer.

[4]

Examiner only

13. Carly can either walk or take the bus to work.
The probability that she walks to work is 0·4.
The probability that she works overtime is 0·3.
These events are independent.

(a) Complete the following tree diagram.



[3]

(b) Calculate the probability that Carly walks to work and works overtime.

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[2]

Turn over.

Examiner only

14. Alan and Clive each take part in 10 sports quiz competitions. The actual results have been lost but their mean score and standard deviations are given in the table below.

Player	Mean score	Standard deviation
Alan	55·9	2·6
Clive	79·4	5·3

(a) Which one of the two players is more consistent in the competitions?
You must state a reason for your choice.

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[1]

(b) Which one of the two players would you say is better at the competitions?
You must state a reason for your choice.

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[1]

(c) Some of the sports quiz questions refer to the 1980s. Alan is much younger than the other competitors and it was decided that 3 points should be added to his score in each of the 10 competitions. Complete the table to show Alan's data following this adjustment.

Player	Mean score	Standard deviation
Alan	.....	.....
Clive	79·4	5·3

[1]

Examiner only

15. The three points A, B and C lie on the circumference of a circle centre O.
The tangent RBT touches the circle at B, $\hat{ABR} = 44°$ and $\hat{ACO} = 21°$.

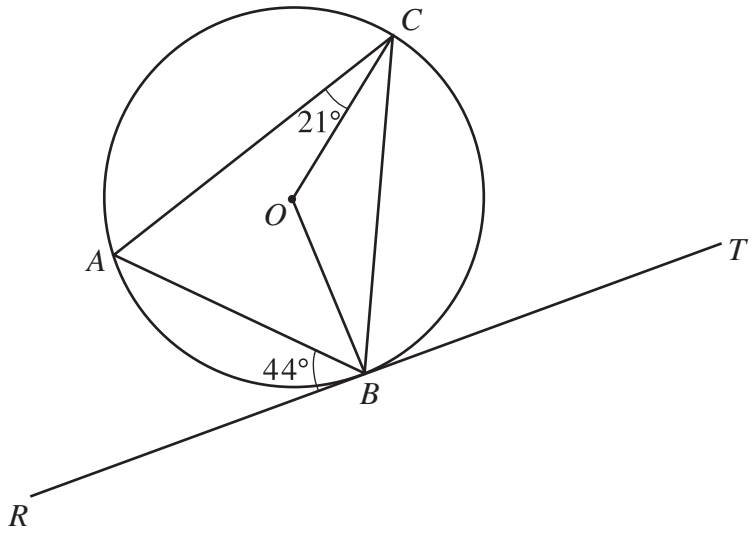

Diagram not drawn to scale.

Find **each** of the following angles, giving reasons for your answers.

(a) $\hat{OCB}$

.....

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[2]

(b) $\hat{BAC}$

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[2]

Examiner only

16. The diagram shows two **similar** shapes.

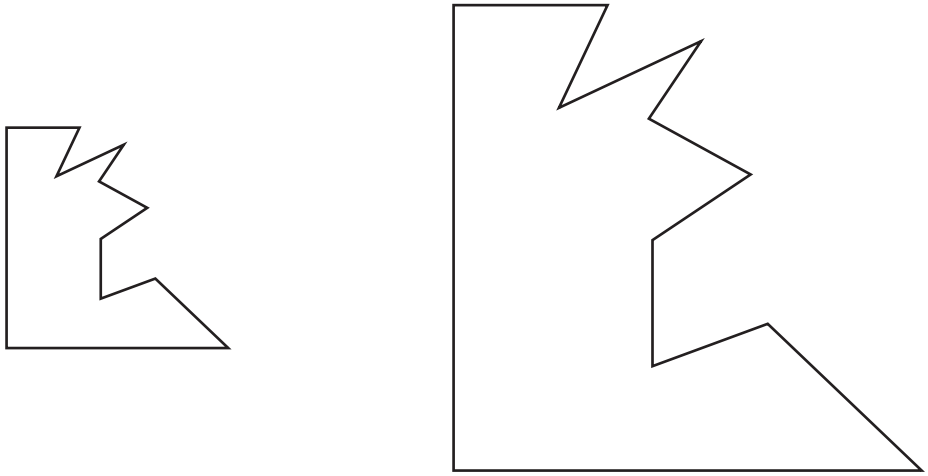

Diagram not drawn to scale.

Each length on the larger shape is three times the corresponding length on the smaller shape. The area of the larger shape is 90 cm^2. Find the area of the smaller shape.

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[3]

Examiner only

17. *(a)* Factorise the expression $14w^2 + 23w + 3$ and hence solve the equation $14w^2 + 23w + 3 = 0$.

[3]

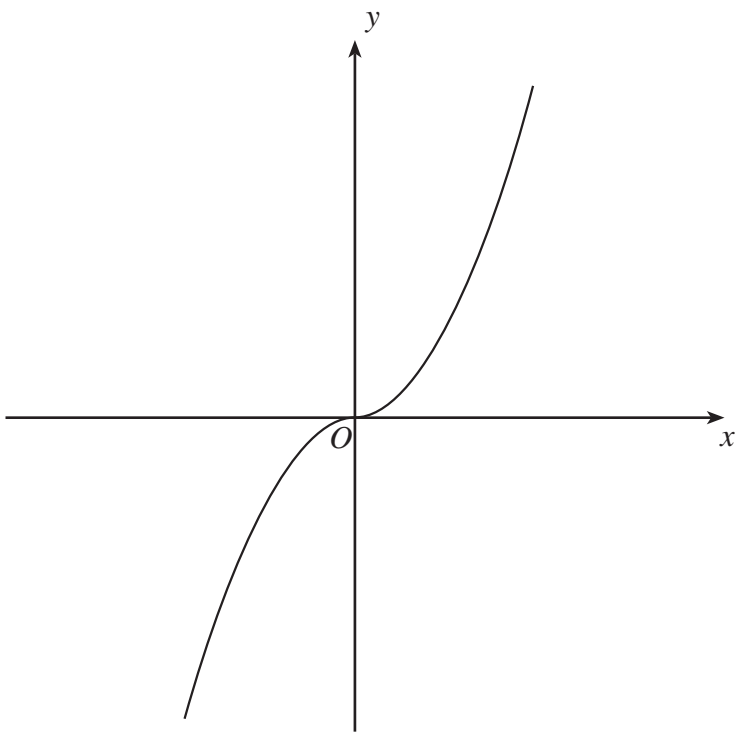
(b) Factorise the expression $9e^2 - 49$.

[2]

Examiner only

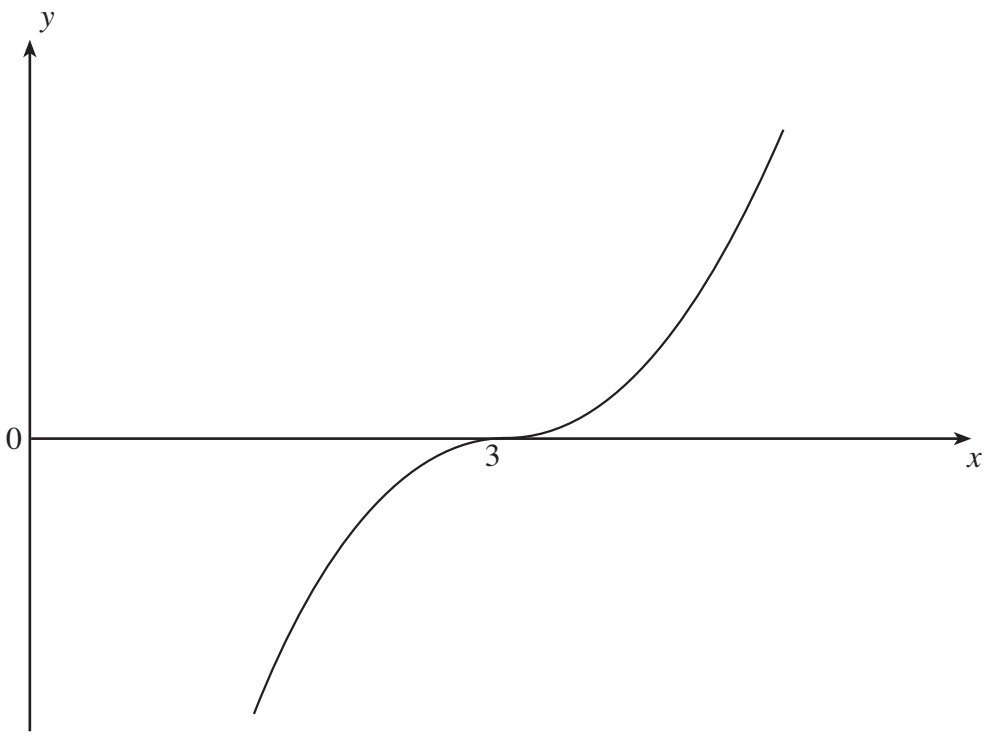
18. *(a)* The diagram shows the sketch of $y = 5x^3$. On the same diagram, sketch the curve $y = -5x^3$.

[1]

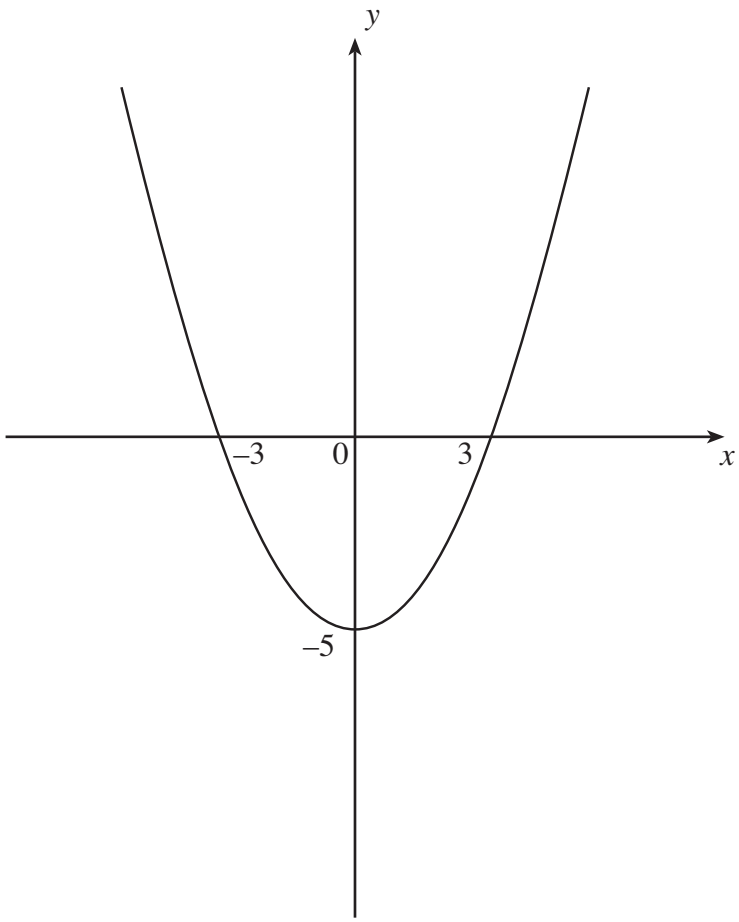


(b) The diagram shows a sketch of $y = f(x)$.
On the same diagram sketch the curve $y = f(x - 2)$.
Mark clearly the coordinates of the point where the curve crosses the x-axis.

[2]



(c) The diagram shows a sketch of $y = f(x)$.
On the same diagram sketch the curve $y = f(x) - 1$.



Write down the minimum value of $f(x) - 1$.

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[2]

Examiner only

19. Solve $\frac{x+3}{x+1} + \frac{3}{x-3} = 2$.

[6]