Surname	Centre Number	Candidate Number
First name(s)		0

wjec cbac

GCSE

C300UA0-1

A20-C300UA0-1

eduqas Part of WJEC

TUESDAY, 3 NOVEMBER 2020 – MORNING

MATHEMATICS – Component 1

Non-Calculator Mathematics HIGHER TIER

2 hours 15 minutes

For Examiner's Use Only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**3**	
3.	**3**	
4.	**4**	
5.	**5**	
6.	**5**	
7.	**5**	
8.	**1**	
9.	**6**	
10.	**6**	
11.	**4**	
12.	**6**	
13.	**5**	
14.	**10**	
15.	**7**	
16.	**6**	
17.	**3**	
18.	**4**	
19.	**2**	
20.	**4**	
21.	**7**	
22.	**5**	
23.	**4**	
24.	**8**	
25.	**5**	
Total	**120**	

ADDITIONAL MATERIALS

The use of a calculator is not permitted in this examination.

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

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.

If you run out of space, use the additional pages at the back of the booklet, taking care to number the question(s) correctly.

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 of the need for good English and orderly, clear presentation in your answers.

C300UA01
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Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

Curved surface area of a cone = πrl

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

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

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

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

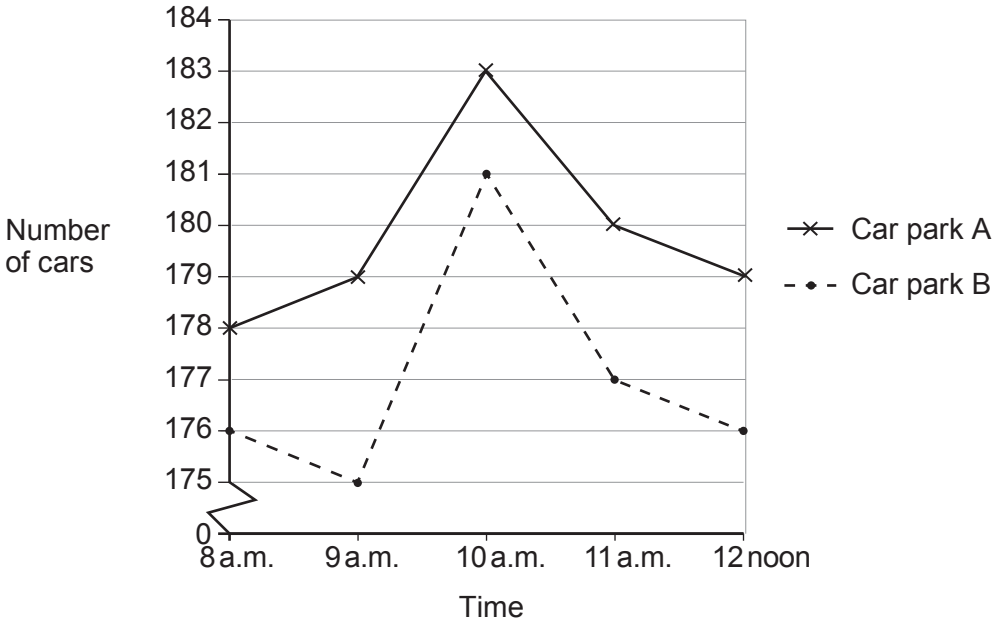
Examiner only

1. Peter and Paula record the number of cars in each of two airport car parks, A and B, between 8 a.m. and 12 noon one Saturday morning.
This was done to find out if there was a peak time for parking during that period.

The table shows the data they collected.

Time	8 a.m.	9 a.m.	10 a.m.	11 a.m.	12 noon
Number of cars in car park A	178	179	183	180	179
Number of cars in car park B	176	175	181	177	176

Paula draws this graph to represent the data.



Peter says,

"This graph is not sensible as it does not show the data fairly."

(a) What has been done in the drawing of the graph that has made Peter think this? [1]

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(b) What error might this lead to, for people who do not look carefully at the graph? [1]

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Examiner only

2. Lena makes a fruit drink by mixing orange juice, pineapple juice and sparkling water in the ratio

orange : pineapple : water = 3 : 2 : 7.

(a) What fraction of the mix is water? [1]

(b) Lena pours 300 ml of her fruit drink into a glass.

How much pineapple juice is in Lena's glass? [2]

..... ml

3. Work out $2\frac{3}{4} \div \frac{5}{8}$.

Give your answer as a mixed number in its simplest form. [3]

Examiner only

4. *(a)* Simplify $18\pi \div 9\pi$. [1]

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(b) The diagram shows two circles, one inside the other.

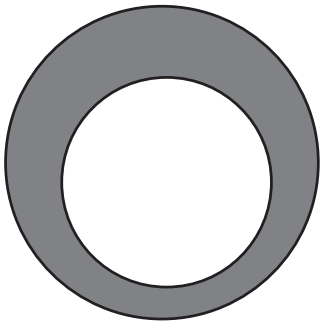

Diagram not drawn to scale

The radius of the outer circle is 6 cm.
The radius of the inner circle is 5 cm.

Work out the area of the shaded region.
Give your answer in terms of π. [3]

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Area of shaded region = ... cm^2

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5. Use:

$$\text{Pressure} = \frac{\text{Force (N)}}{\text{Area (cm}^2\text{)}}$$

A camera is attached to a tripod.
The tripod has 3 legs and stands on horizontal ground.
Each leg exerts the same pressure on the ground.

The tripod has a weight of 34 N.
The camera has a weight of 20 N.

Each foot of the tripod is a rectangle with length 3 cm and width 2 cm.

Work out the pressure exerted by the tripod and camera on the ground.
You must show all your working. [5]

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Pressure = ... N/cm^2

Examiner only

6. *(a)* Eric currently spends £36 each week playing ten pin bowling.

He wants to decrease this amount by $\frac{3}{8}$.

He writes:

New amount	:	Current amount
3	:	8
13.50	:	36

I will now spend £13.50 each week playing ten pin bowling

(i) Explain why Eric's **method** is not correct. [1]

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(ii) Describe what Eric's **answer** of £13.50 actually represents. [1]

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(b) Three integers a, b and c are in the ratios

$$a : b = 9 : 2 \quad \text{and} \quad b : c = 6 : 7.$$

It is known that $a + b + c = 200$.

Find the integers a, b and c. [3]

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a = ... b = ... c = ...

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7. Ivan is part of a team making bags of free items to give away at a college open evening.

He has:

- 140 discount vouchers,
- 56 pencils,
- 280 sweets

to share between all his bags.

He uses **all** the vouchers, **all** the pencils and **all** the sweets.
He makes as many bags as possible.
The contents of each bag are the same.

How many bags does Ivan make and what does each bag contain? [5]

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Ivan makes ..... bags containing

..... vouchers, ... pencils, ... sweets.

8. A line *L* has equation $y = 12 - 4x$.

Write down the equation of a different line that is parallel to *L*. [1]

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Examiner only

9. *(a)* (i) $xy = 1$

Explain why neither x nor y can be zero. [1]

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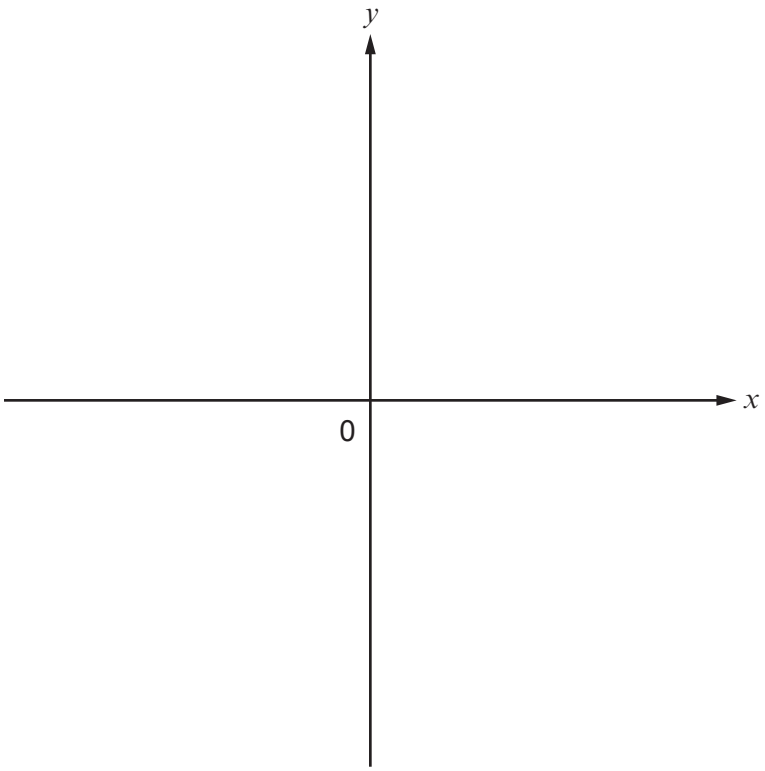
(ii) On the axes below, sketch the graph of $y = \frac{1}{x}$. [2]



(iii) Complete this sentence about the graph you have drawn. [1]

The graph shows 'y is ..... proportional to x'.

(b) The variables V and p are connected by the equation $\frac{V}{p^2} = 5$.

Find the value of V when p = 0·1. [2]

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10. *(a)* Solve $10(x-1)-(7x+9)=x$. [3]

(b) Factorise and hence solve $x^2+3x-18=0$. [3]

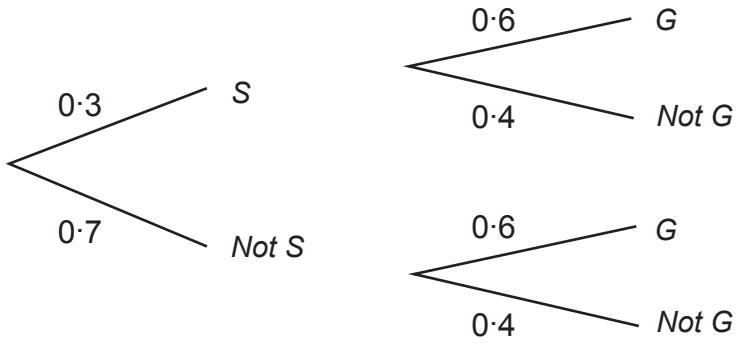
Examiner only

11. Jan's hobbies are sewing and gardening.

Each week the probability that she spends:
- Monday evening sewing (*S*) is 0·3,
- time gardening on Friday (*G*) is 0·6.

These events are independent.

The tree diagram shows this information.



Calculate the probability that, in a randomly selected week,

(a) Jan spends Monday evening sewing but does not spend time gardening on Friday, [2]

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(b) Jan does not spend Monday evening sewing but does spend time gardening on Friday. [2]

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12. *(a)* Find the next term of this sequence.

$$\frac{3}{2}, \quad -\frac{9}{4}, \quad \frac{27}{8}, \quad -\frac{81}{16}, \quad \ldots$$

[2]

(b) The nth term of a sequence is $\left(2\sqrt{3}\right)^n$.

Find and simplify the 3rd term of this sequence. [2]

(c) Find the nth term of this sequence.

1·5, 3, 5·5, 9, 13·5, ... [2]

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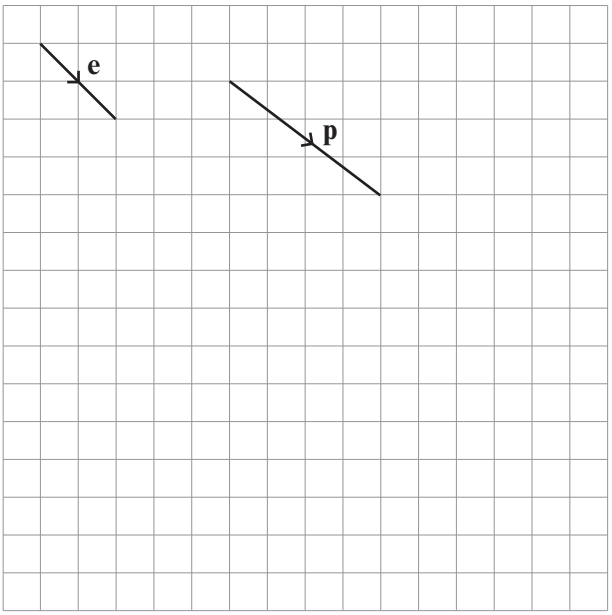
13. *(a)*



The grid shows the vector $\mathbf{e} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$ and the vector $\mathbf{p}$.

The vector $\mathbf{q} = \begin{pmatrix} -0{\cdot}5 \\ -2{\cdot}5 \end{pmatrix}$.

Draw a diagram on the grid above to represent $\mathbf{p} + 2\mathbf{q}$. [2]

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(b)

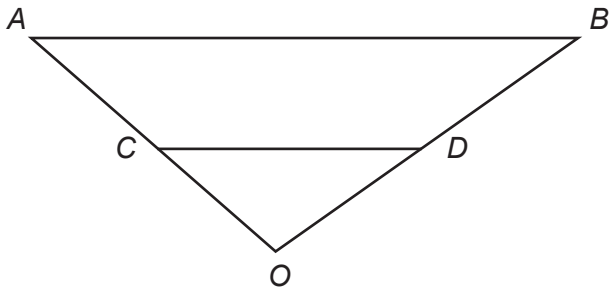

Diagram not drawn to scale

OA = $3\mathbf{a}$ and **OB** = $6\mathbf{b}$.
The sides of triangles *OAB* and *OCD* are in the ratio 3 : 1.

By writing **AB** and **CD** in terms of $\mathbf{a}$ and $\mathbf{b}$, decide whether *CD* is parallel to *AB*.

Parallel ☐ Not Parallel ☐

Show how you decide. [3]

C300UA01
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Examiner only

14. *(a)* Simplify $\frac{x^2 \times x^7}{x^3}$. [2]

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(b) (i) Find the positive value of $16^{\frac{1}{4}}$. [1]

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(ii) Find the value of $27^{\frac{4}{3}}$. [2]

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Examiner only

(c) **Estimate** the value of $\left(3{\cdot}9\times10^{6}\right)^{3}$.
Give your answer in standard form. [3]

Estimate .....

(d) Write $\frac{42}{\sqrt{6}}$ in the form $a\sqrt{6}$ where a is an integer. [2]

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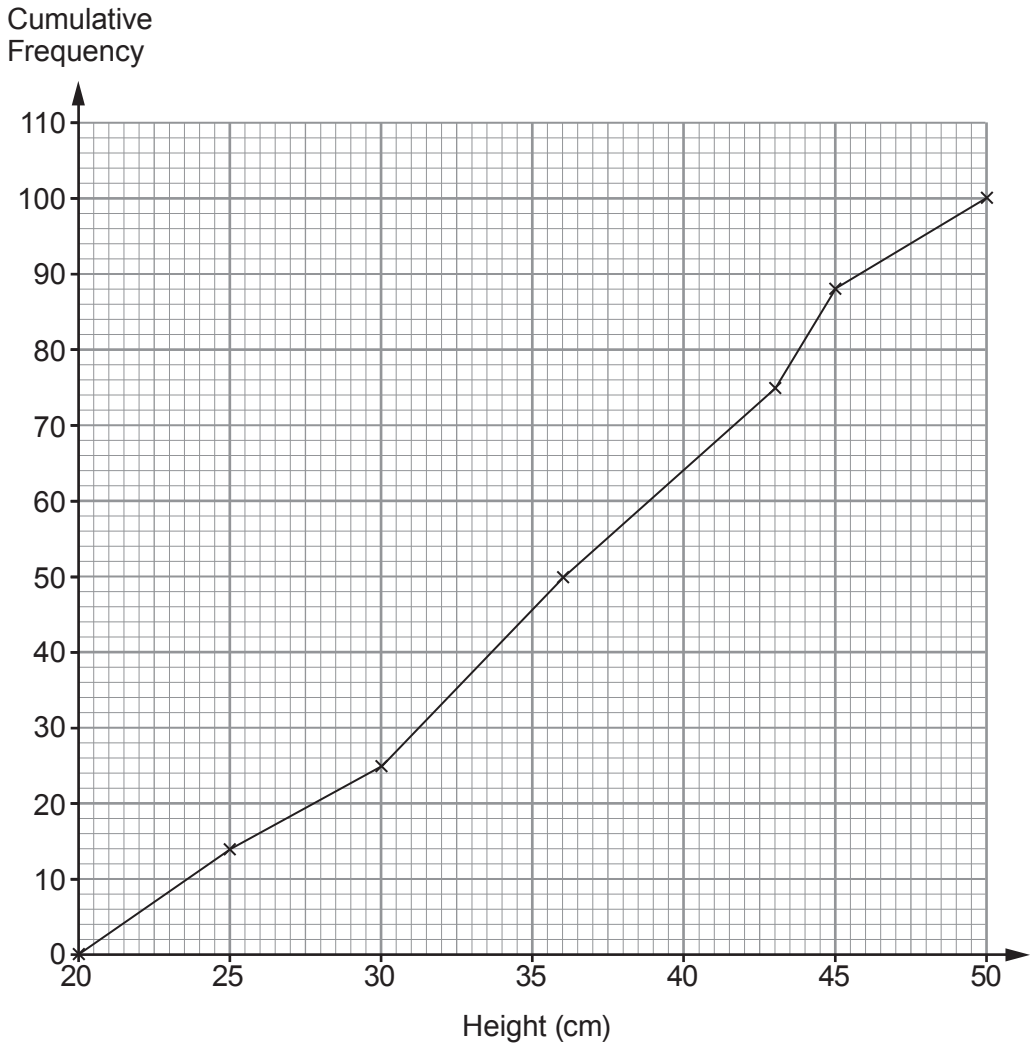
15. *(a)* The diagram shows the distribution of the heights, in cm, of 100 *Firebird Marigold* plants.



(i) How many of these *Firebird Marigold* plants had a height of less than 25 cm? [1]

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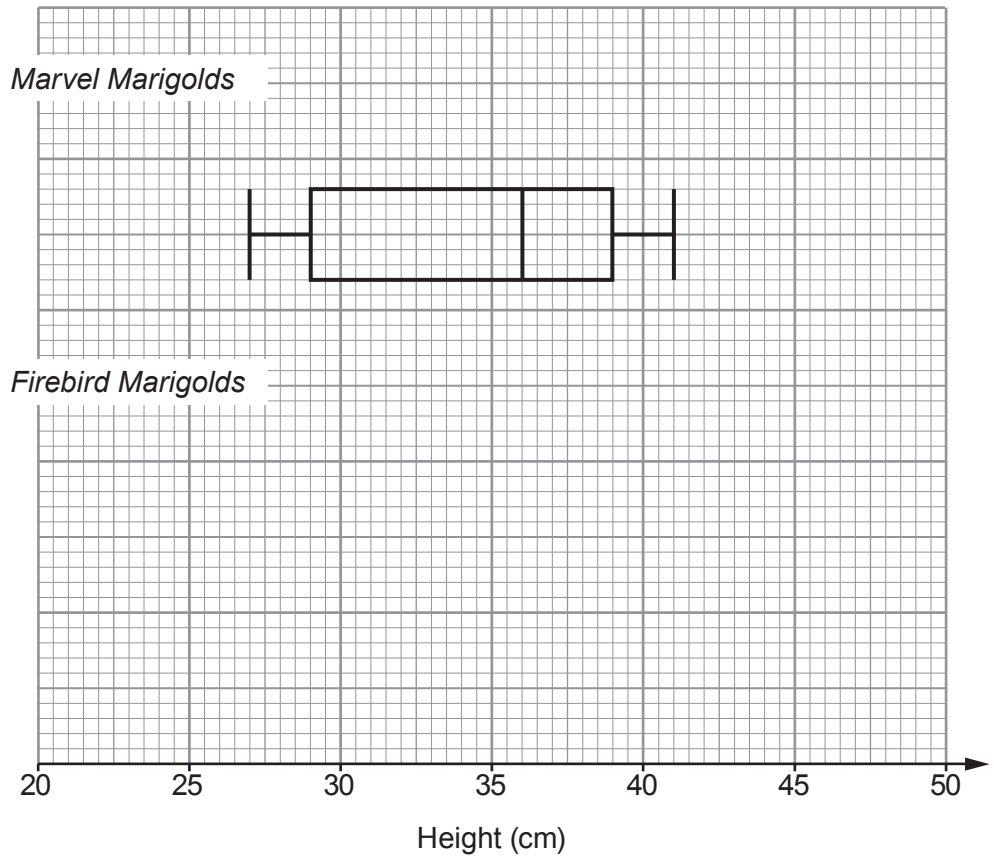
(ii) Use the diagram to complete the table for these *Firebird Marigold* plants. [3]

Median	Lower Quartile	Upper Quartile	Inter-quartile Range

Examiner only

(b) This box plot shows the distribution of the heights, in cm, of 100 *Marvel Marigold* plants.



(i) The tallest *Firebird Marigold* plant had a height of 49 cm.
The range of the heights of the *Firebird Marigold* plants was exactly 27 cm.

Use this information and the information from part *(a)* to draw the box plot for the *Firebird Marigold* plants on the grid above. [2]

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(ii) Jules wants to buy one of these types of Marigold for her garden.
She wants as many as possible of her plants to be at least 30 cm tall.

Should Jules buy *Marvel Marigold* or *Firebird Marigold* plants?

Marvel Marigold ☐ *Firebird Marigold* ☐

Give a reason for your decision. [1]

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Examiner only

16. A tennis club has 240 members.
They each played a senior, main or junior event in one of three competitions, *A*, *B* or *C*.

Of the club members:

- 110 played in *A*,
- 30 played in a junior event,
- 25 played in the senior event in *B*,
- no junior played in *C*,
- 40 of those who played in *C* were in the main event.

The number of members who played in a senior event was 150% more than those who played in a junior event.
The ratio of members who played in *B* and *C* was $B : C = 6 : 7$.
The probability that a member played in the junior event in *A* was 0·1.

A member is selected at random from the club.

Use the table to help you to find the probability that this member played in a Main event or played in *B* but not both.
You must show all your working. [6]

	Senior	Main	Junior	Totals
A				
B				
C				
Totals				

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Probability = ...

Examiner only

17. The diagram shows a sketch of a letter L.

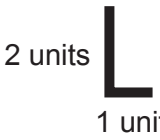
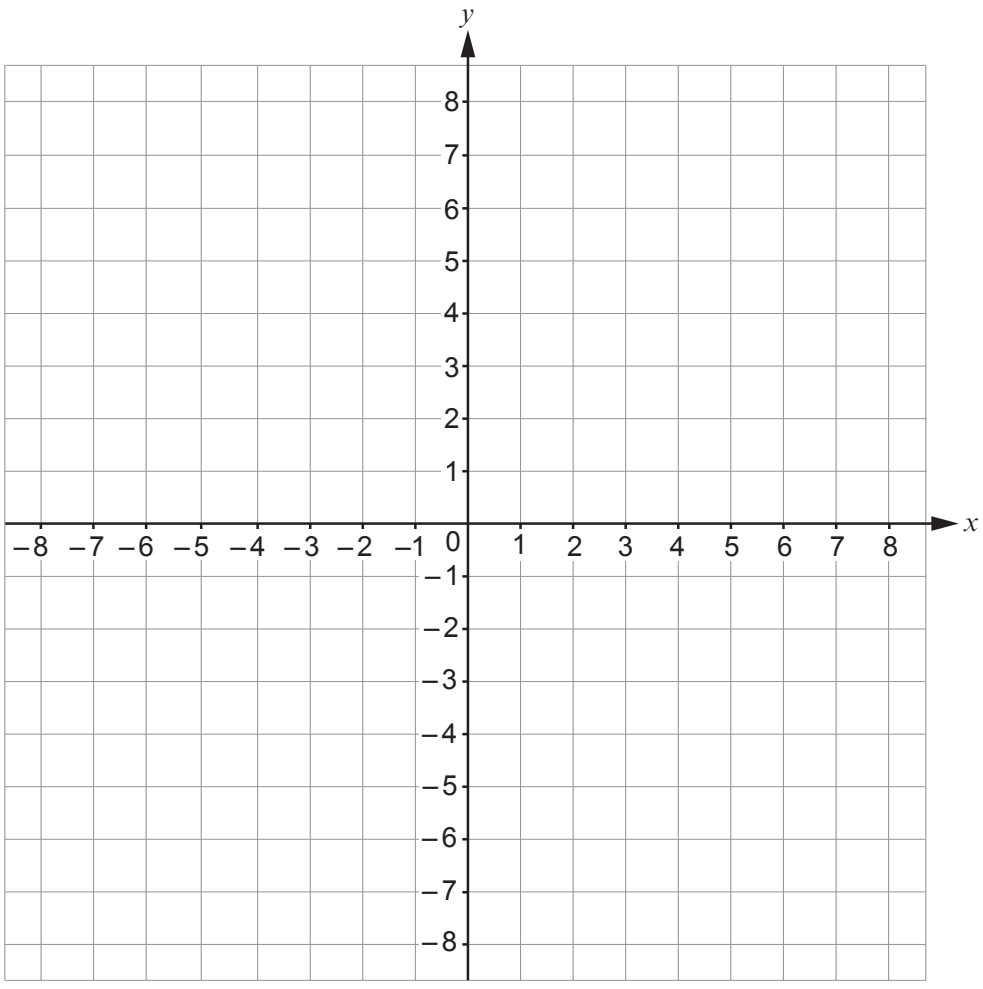


Diagram not drawn to scale

This letter is first, reflected in the line $x = 4$, then reflected in the x-axis and finally translated through $\begin{pmatrix} -4 \\ -2 \end{pmatrix}$.

Describe the **single** transformation that is equivalent to these 3 transformations. [3]

You may use this grid to help you.



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18. *(a)*

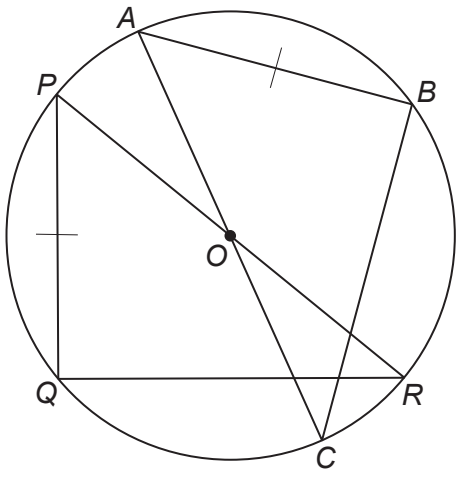

Diagram not drawn to scale

Points *A*, *B*, *C*, *P*, *Q* and *R* lie on the circumference of the circle, centre *O*.

Show that triangle *ABC* is congruent to triangle *PQR*.
Give a reason for each step of your answer. [3]

Examiner only

(b) William says,

"It is possible to draw one circle through the four vertices of any kite that has two opposite angles that are right angles."

Is William correct?

Yes ☐ No ☐

Show how you decide. [1]

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Examiner only

19. Write $7.\dot{3}4\dot{1}$ as a fraction. [2]

Examiner only

20. Alys has 10 different-coloured tokens.
Each day, she chooses 3 of her tokens at random and places them in a row on her desk.

(a) Find the number of different ways in which this can be done. [2]

(b) One of her tokens is pink and another is green.

Find the number of arrangements where the middle token is pink or green. [2]

Examiner only

21. *(a)* $f(x) = \sqrt{x-1}$ for $x \geqslant 1$.

Show that $f^{-1}(x) < 1$ has no solutions. [3]

Examiner only

(b) $g(x) = 5^x$

$h(x) = x + 3$

Solve $gh(x) = \frac{1}{25}$. [4]

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22.

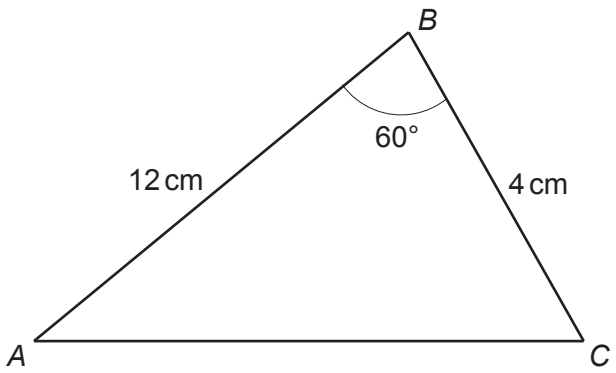

Diagram not drawn to scale

Calculate the length of *AC*.
Give your answer as a surd in its simplest form. [5]

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23. In this question, all lengths are in centimetres.

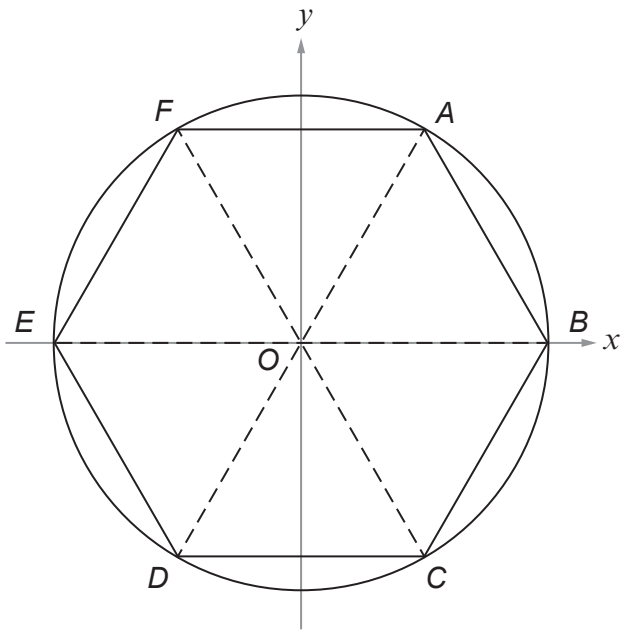

Diagram not drawn to scale

The diagram shows a sketch of a circle, centre *O*.
Points *A*, *B*, *C*, *D*, *E* and *F* lie on the circumference of the circle.
Triangles *AOB*, *BOC*, *COD*, *DOE*, *EOF* and *FOA* are congruent.

The circle has equation $x^2 + y^2 = \frac{25}{4}$.

Calculate the perimeter of the hexagon *ABCDEF*.
You must justify any decisions that you make. [4]

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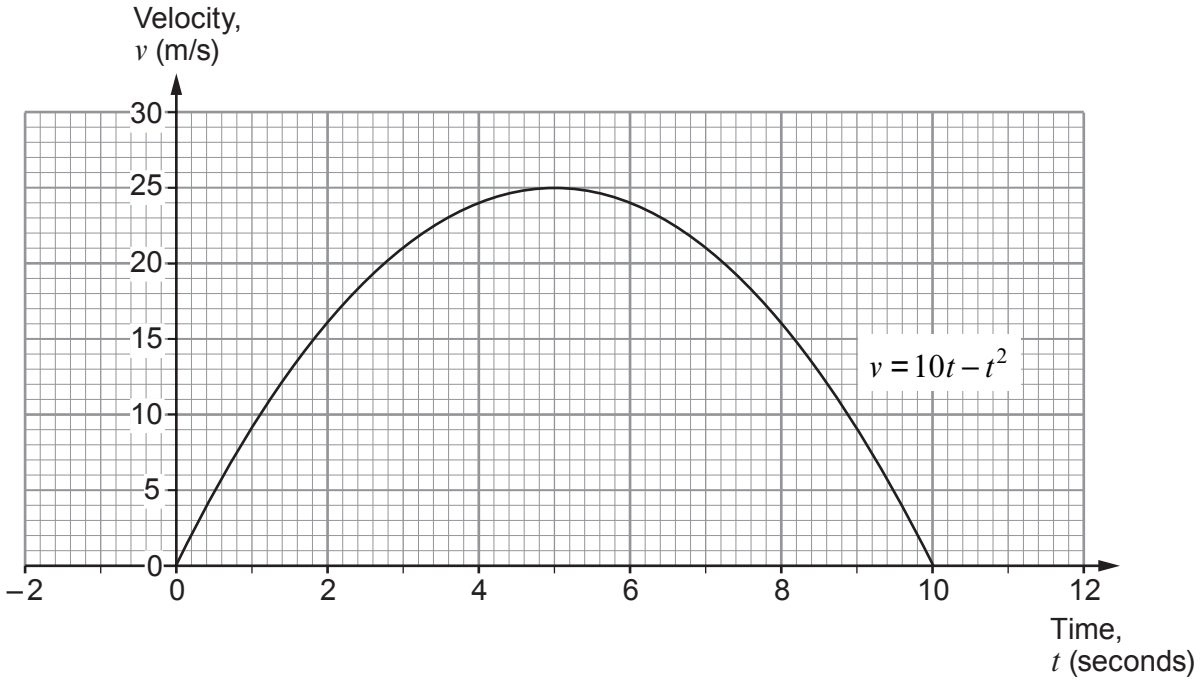
Examiner only

24. The velocity, v m/s of a particle, t seconds after it begins to move is given by

$$v = 10t - t^2 \text{ for } 0 \leqslant t \leqslant 10.$$

(a) The diagram shows the graph of the velocity of this particle.



Find an estimate for the acceleration of the particle at $t = 6$. [3]

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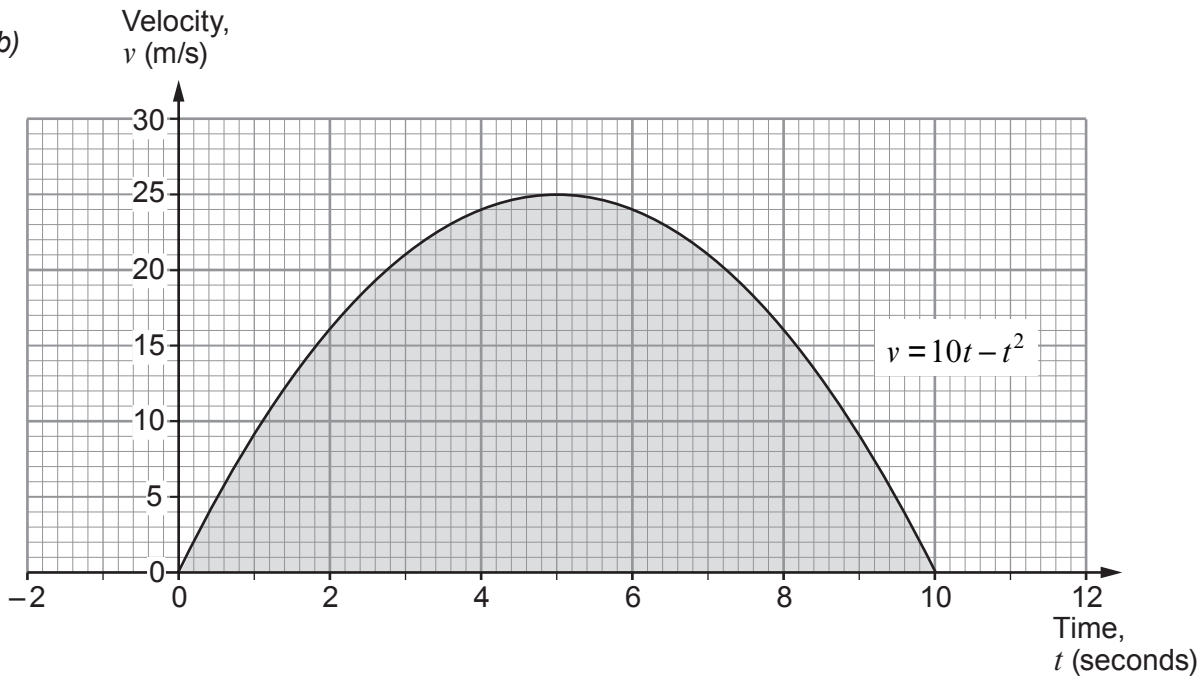
(b)



(i) Use five vertical strips of equal width to calculate an estimate of the area of the shaded region. [4]

(ii) What does this area represent? [1]

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25. *(a)* Write the expression $x^2 + 8x + 18$ in the form $(x + a)^2 + b$, where a and b are integers. [3]

(b) Write down the coordinates of the turning point of the curve $y = x^2 + 8x$. [2]

Turning point = (..... , ...)

END OF PAPER

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