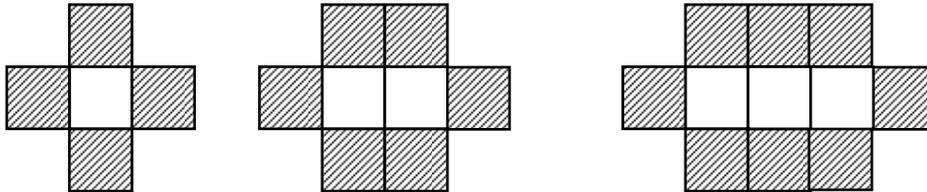


<i>DO NOT WRITE ON THIS PAPER</i>	TIME 2 hours	<i>Paper 1 of 5 from ZigZag Education</i>
Sample GCSE Examination Paper Higher tier non-calculator paper	Standard Equipment: lined or squared paper, pen, pencil, ruler. Additional Equipment: pair of compasses, plain paper.	

1. a) Solve the inequality $3x + 2 \leq 5$
Solve the following equations:
- b) $x^2 = 9$ c) $\frac{x}{2} + \frac{x}{3} = 2$ d) $\frac{x+1}{2} + \frac{x}{3} = 1$ 7 marks

2. a) Write down the next 2 numbers in the sequences
- i) 1, 5, 9, 13, ...
ii) 2, 5, 10, 17, 26, ...
- b) Determine a formula for the n^{th} term of each of the above sequences?

Consider the following pattern:



- c) How many dark squares will there be when there are 100 white squares?
d) How many dark squares will there be when there are n white squares? 6 marks

3. X and Y are lengths.
 $J = X^2 + Y^2$
 $K = 2X + Y$
- a) State whether J represents i) a length ii) an area iii) a volume iv) none of the previous
b) State whether K represents i) a length ii) an area iii) a volume iv) none of the previous 2 marks

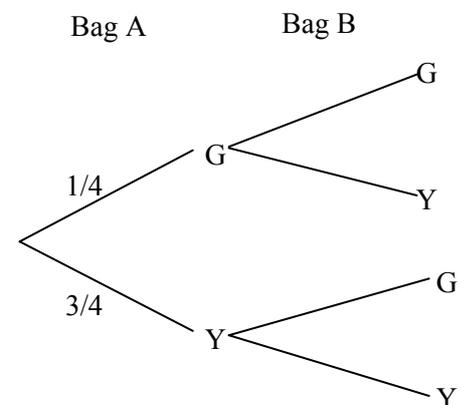
4. a) Write 120 as the product of primes.
b) Write 1.234×10^{-5} as an ordinary number.
c) Estimate: $\frac{13.8 \times 0.022}{133}$ 4 marks

5. a) Construct a triangle ABC such that $AB = 10\text{cm}$ $BC = 9\text{cm}$ and $AC = 8\text{cm}$. 4 marks
b) Shade all the points inside the triangle that are within 3cm of AB and are nearer to AB than BC.

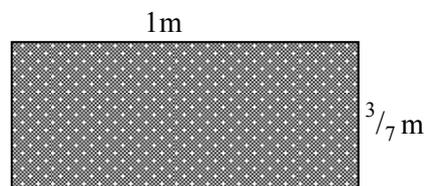
6. Bag A, and bag B both have green and yellow balls in.
The ratio of green to yellow balls in bag A is 1:3.
The ratio of green to yellow balls in bag B is 1:4.
The number of balls in each bag is the same.
a) Calculate the smallest number of balls that can be in bag A.

A ball is selected at random from each bag.

- b) Copy and complete the tree diagram.
c) Calculate the probability that both balls are of the same colour. 6 marks



7. I have enough paint for 100m^2 .
I am painting the front of these panels.
How many complete panels do I have enough paint for?



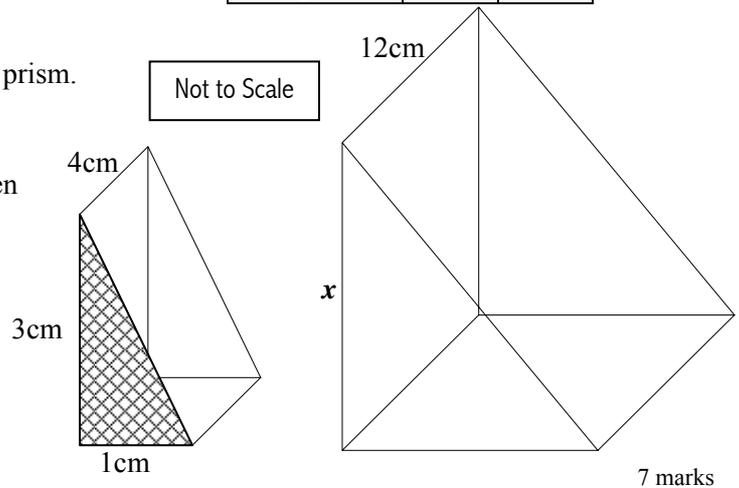
2 marks

8. The share price of a company was recorded every quarter for two years. The results are shown in the table below.
- Find a four point moving average for the data.
 - Comment on the trend of the moving average.

	1998	1999
1 st quarter	£1.80	£2.00
2 nd quarter	£2.00	£2.20
3 rd quarter	£2.10	£2.30
4 th quarter	£2.10	£2.30

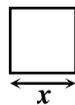
4 marks

9.
 - Calculate the area shaded.
 - Calculate the volume of the smaller prism.
 The two prisms are similar.
 - Calculate the missing length x .
 The surface area of the smaller prism is given by: $a + b\sqrt{c}$ where a , b and c are integers
 - Find a , b and c .



7 marks

10. Here are two squares.



Not drawn accurately

The perimeter of the bigger square is 4cm more than the smaller one.

- Work out an expression in terms of x for the difference in the areas of the 2 squares, and simplify your answer.

The difference between the area of the small square above and an even smaller square is given by the expression: $6x - 9$.

- Find an expression for the perimeter of the smallest square in terms of x .

8 marks

11. Evaluate:

- $(1 - 4)^{-2}$
- $8^{4/3}$
- $100^{-1/2}$

4 marks

12. Write $0.\dot{9}\dot{3}$ as a fraction in simplified form $\frac{a}{b}$, with a and b integers.

3 marks

13. A quadrilateral $OABC$ is such that $\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$, and $\vec{OC} = \mathbf{c}$.

- Write \vec{BC} in terms of \mathbf{a} and/or \mathbf{b} and/or \mathbf{c} .
The midpoint of OA is X . The midpoint of BC is Y .
- Write \vec{XY} in terms of \mathbf{a} , \mathbf{b} and \mathbf{c} .

3 marks

14. I roll 3 fair dice.

- What is the probability that all of the dice land on a 5 or 6?
- What is the probability **none** of the dice lands on a 5 or 6?



3 marks

15.
 - Write the expression, $x^2 + 4x - 5$ in the form $(x + b)^2 - c$, where b and c are integers.
 - Use the method of completing the square to solve the equation, $x^2 + 4x - 5 = 0$.
Leave your answer in surd form. *To obtain any marks for b) you must show your working.*

- Describe the transformation that maps the curve $y = x^2 + 4x - 5$ to the curve $y = x^2 + 4x$.
- Describe the transformation that maps the curve $y = x^2 + 4x - 5$ to the curve $y = 2x^2 + 8x - 10$.

10 marks

16. The following heights were recorded after one week of an experiment concerning plant growth.



Height in cm	Frequency
$10 < h \leq 30$	10
$30 < h \leq 50$	20
$50 < h \leq 60$	10
$60 < h \leq 80$	10
$80 < h \leq 100$	50



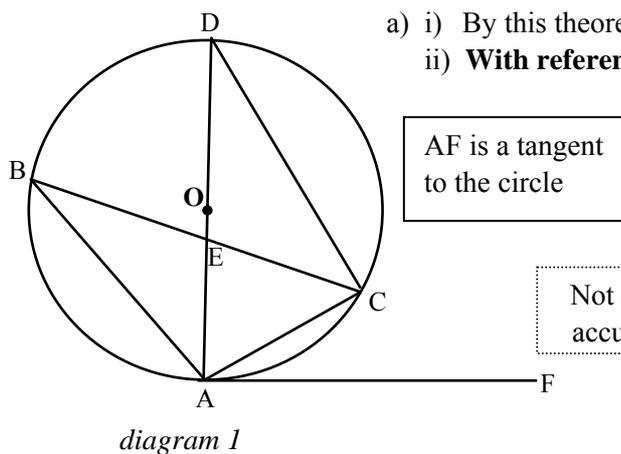
The mean height after this first week of the 100 plants was 65.1cm. A week later the heights of all the plants are re-measured. A table to show the increase in height of each plant is summarised by the table.

Increase in Height in cm	Frequency
$0 < h \leq 2$	10
$2 < h \leq 4$	20
$4 < h \leq 6$	10
$6 < h \leq 8$	10
$8 < h \leq 10$	50

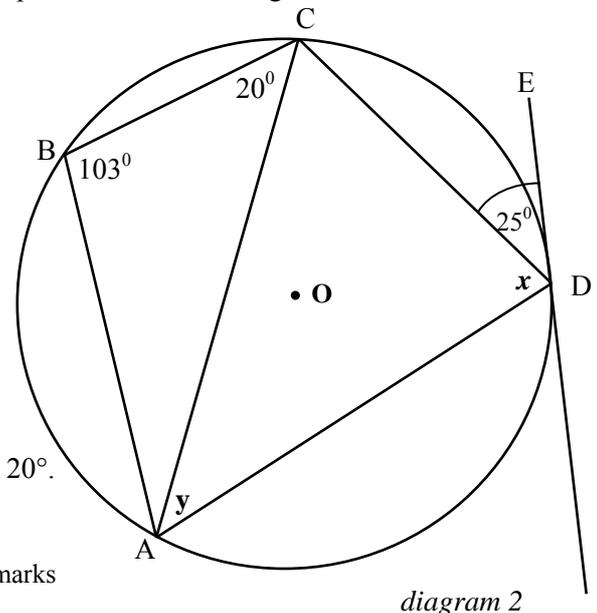
Estimate the mean height of the 100 plants after the second week.

3 marks

17. The alternate segment theorem states 'the angle between a tangent and its chord is equal to the angle in the alternate segment'.



- a) i) By this theorem state two angles in *diagram 1* that are equal.
 ii) **With reference to diagram 1** prove the alternate segment theorem.



In diagram 2 angle $\angle CDE = 25^\circ$, $\angle ABC = 103^\circ$, $\angle ACB = 20^\circ$.

- b) i) Calculate angles x and y .
 ii) Calculate the obtuse angle AOC , where O is the centre of the circle.

9 marks

18. The force of attraction, f N, between a steel mass and a magnet is inversely proportional to the cube of the distance, d m between them. When the steel mass is $2m$ away from the magnet, it experiences an attractive force of 4 N.

- a) What will be the attractive force when the steel mass is $4m$ away from the magnet? 7 marks
 b) What distance of separation is required for an attractive force of 16 N? Leave your answer in surd form.

19. The equation of a curve is $y = f(x)$ where $f(x) = x^2 - 14x + 16$.

- a) Complete the square for $f(x)$. 5 marks
 b) Hence or otherwise state the transformation that maps the curve $y = x^2 - 14x + 16$ to the curve $y = x^2$.

20. Make L the subject of the formula $V = 2\pi\sqrt{3L}$. 3 marks