DO NOT WRITE ON THIS PAPER	**TIME** 2 hours	*Paper 3 of 5 from ZigZag Education*
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.

Planet	**Distance to sun (km)**
Earth	150×10^6
Saturn	143×10^7

a) Write down the distance of the sun from earth in standard index form.

b) How far is the total distance from the earth to the sun and then to planet Saturn. Give your answer in standard index form. 3 marks

2. Jim plots the price of 20 cars against the age of the car. All 20 cars are the same make and model and were made between 1980 and 1990. The older cars are worth less money. For each year the car was made before 1990 the value on average drops by about £100.

a) Sketch a scatter diagram which shows the likely correlation.

b) Describe the correlation.

c) Sketch a scatter diagram which shows perfect linear correlation. 3 marks

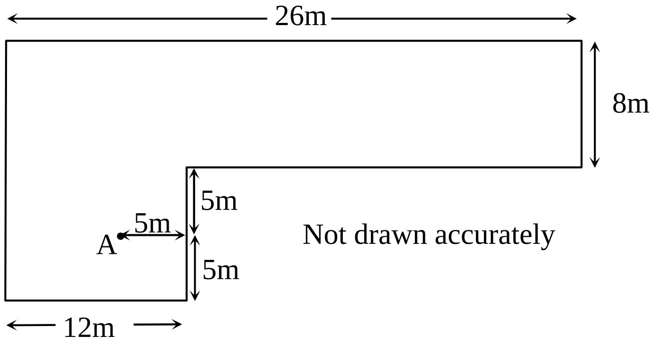
3. Calculate each of the following

a) 0.4^3 b) 0.02^3 c) $\frac{1}{4} + 1\frac{1}{5}$

d) $2\frac{1}{4} \div 3\frac{1}{5}$ e) $2.4 \times 10^{-4} \times 2.0 \times 10^6$ 5 marks

4. a) Construct using a straight edge and compasses an equilateral triangle of side 8cm.

Jim ties his goat to a post with an 8m rope in an L-shaped field. The post is marked A. The field is bounded by a tall fence and the corners of the field with tall posts. Neither the goat nor the rope can leave the field.



b) i) Using a scale of 1cm to 2m reproduce the diagram accurately. You can use square cm paper.

ii) Shade on your diagram the largest area the goat can reach inside the field. 7 marks

5. Anita thinks of a number ***y***, trebles it, adds 45 and gets the result ***x***.

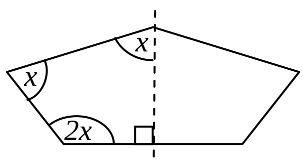
a) Work out an equation that links ***x*** and **y**.

Tom starts with Anita's answer ***x*** and subtracts 27.
He ends up with the number Anita started with.

b) i) Work out a 2nd equation linking ***x*** and **y**.

ii) Hence or otherwise calculate the number that Anita started with. 6 marks

6. The following pentagon has one line of symmetry as shown.
Calculate angle *x*. 3 marks



7. Simplify

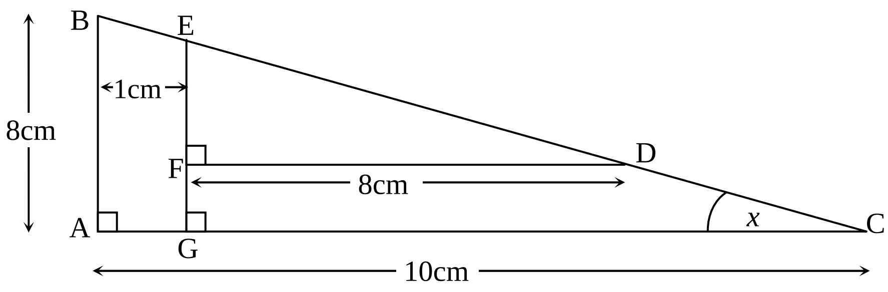
a) i) $3p^3 \times 2p^3$

ii) $\dfrac{9r^4}{6r^3}$

b) i) Rearrange the equation m = 2r + 3st, making r the subject.

ii) If in the equation m = 2r + 3st, r = –3, s = –4 and t = –5, find m. 5 marks

8. ABC, DEF and CEG are similar triangles.
AB and EG are parallel with the distance between them 1cm.



a) i) Find the length BC, leaving your answer in the form √n, where *n* an integer.

ii) Simplify your answer √n into the form p√q, with p, and q are integers.

b) Calculate the lengths EF and EG.

c) i) Which angle in the diagram is equal to ∠EDF?

ii) Given that tan $x = r$, find r. 7 marks

9. In 2002 Jim records his first 5 golf scores as 68, 70, 71, 71, 73.
Jim records his scores in date order, so the 68 was his first score, 70 his second, etc.

a) Calculate his average score.

Jim then records his next 4 scores, in date order, as 68 70 71 68.

b) Calculate the moving average based on 5 games at a time. 3 marks

10. a) Factorise the expression, $x^2 - x - 6$ and hence solve the equation $x^2 - x - 6 = 0$.

b) Solve the equations:

i) $2(x + 2) = x$

ii) $\dfrac{2}{3}x = 19$

c) Solve the inequality, $2 - 3x < 17$

8 marks

11. The number of hot pasties, *p*, which are sold at a rugby game is directly proportional to the square of the number of spectators, *s*, watching the game.

At the first game of the season, there were 1000 spectators, and 100 pasties were sold.

a) Find a formula for *p* in terms of *s*, evaluating any constants.

b) At the final game, there are 500 spectators. How many pasties will be sold? 6 marks

12. a) i) Write the expression $(4x + 2)(3x - 12)$ without brackets in simplified form.

ii) Hence write the $(4x + 2)(3x - 12)$ in the form $6(ax^2 - bx - c) = 0$ with a, b and c positive integers.

b) Hence or otherwise solve $2x^2 - 7x - 4 = 0$ 6 marks

13. Evaluate

a) $125^{1/3}$

b) $64^{-2/3}$

c) 4^0

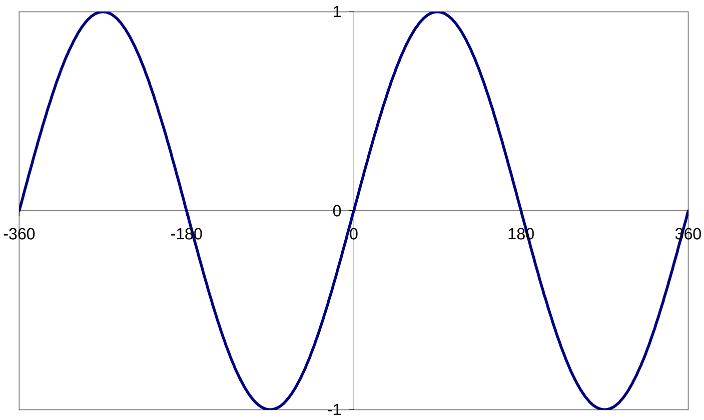
d) $32^{3/5}$

4 marks

14. To the right is the graph of

$y = \sin x$

for values of x between –360° and 360°.



a) One solution of the equation $\sin x = -0.574$ is $x = 215°$. Find all other solutions for x in the range –360° to 360°.

b) Sketch, with x ranging between 0 and 360°–

i) $y = 2 \sin x$

ii) $y = \sin (x + 45)$

7 marks

15. a) Simplify the fraction $\frac{1}{2\sqrt{5}}$ by removing the square root from the denominator.

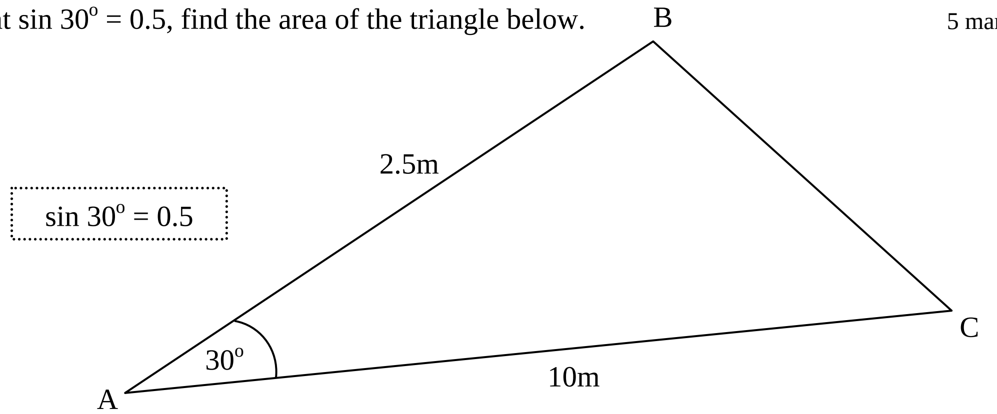
b) Simplify the following. Give your answer in the form $a + b\sqrt{3}$

$$(4 - 5\sqrt{3})(1 + \sqrt{3})$$

5 marks

16. Using the fact that $\sin 30° = 0.5$, find the area of the triangle below.

5 marks



17. Make p the subject of the formula below.

$$V = \frac{pQ + 4}{2p}$$

5 marks

18. Given that **a** and **b** are vectors such that–

$$\mathbf{a} = \begin{bmatrix} 2 \\ 4 \end{bmatrix} \text{ and } \mathbf{b} = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$$

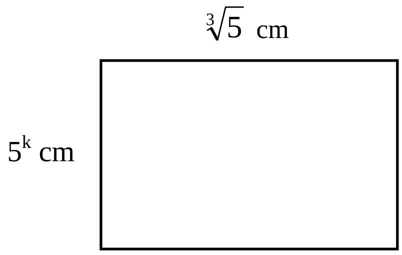
Find–

a) $2\mathbf{a} + \mathbf{b}$

b) $\mathbf{b} - \mathbf{a}$

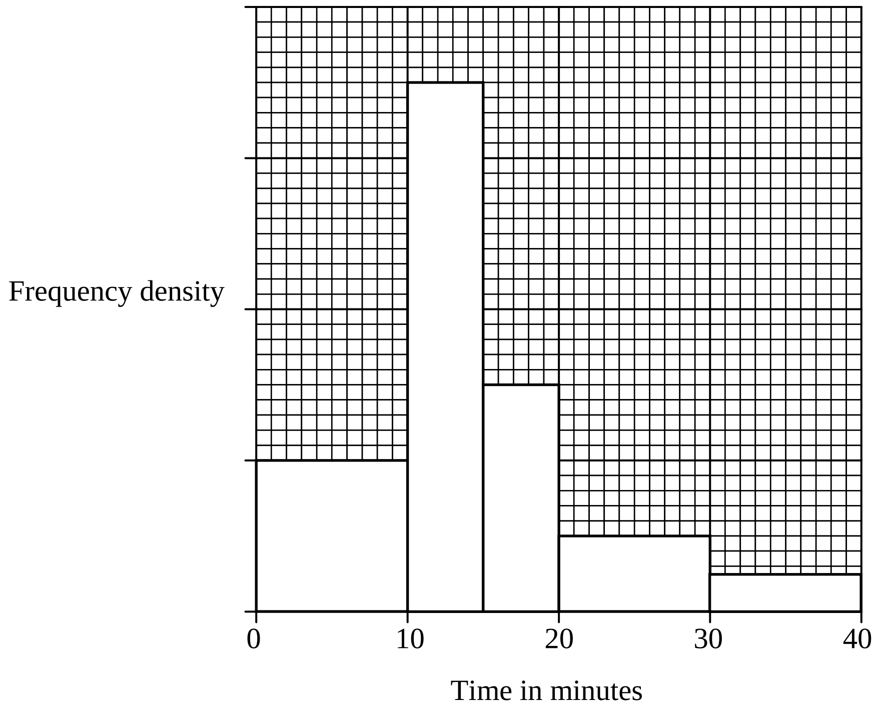
4 marks

19. The area of the rectangle below is $125cm^2$. Find the value of k. 5 marks



20. Jenny is investigating how long it takes members of her year to travel in to school each day. Her results for a particular day are shown in the histogram below - the y-axis scale is not shown. There were 5 people whose journey had length from 30 minutes up to, but not including, 40 minutes.

a) Use the histogram to copy and complete the table below.



Length in minutes (t)	Frequency
$0 \le t < 10$	
$10 \le t < 15$	
$15 \le t < 20$	
$20 \le t < 30$	
$30 \le t < 40$	5

b) Jenny repeated the study the following week. She constructs a table of the data prior to making the histogram, shown below. Express x in terms of y.

Length in minutes (t)	Frequency	Frequency Density
$0 \le t < 30$	69	2.3
$30 \le t < 40$	x	y

5 marks