

Grade Grabber 6

Marks Available : 40

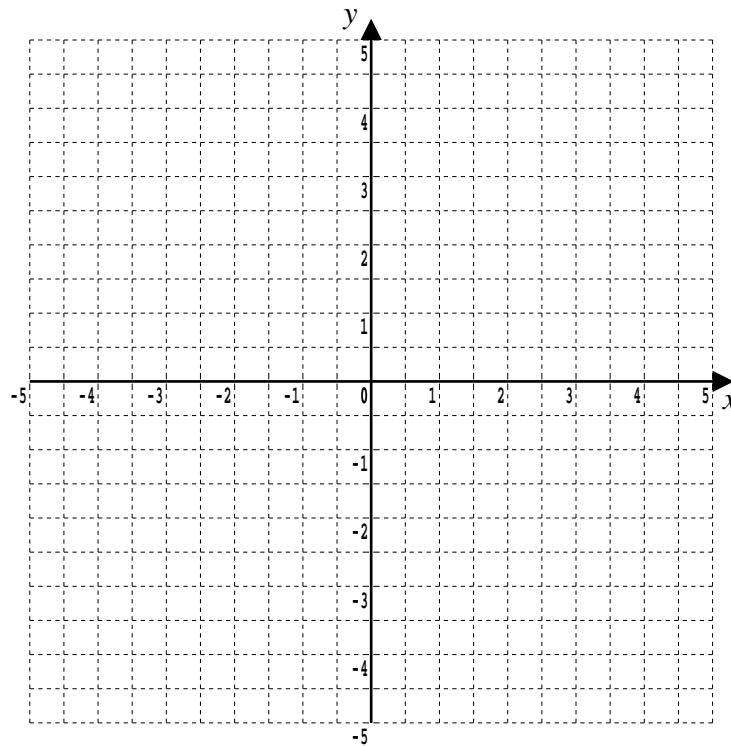
Question 1

(a) On the grid draw the three lines with equations;

(i) $y = 2x - 3$

(ii) $x + y = 3$

(iii) $x = -1$



(b) Shade in the triangle formed

[3 marks]

(c) Determine the area of the triangle that you have shaded

[1 mark]

[1 mark]

Question 2

To the nearest million, how many seconds are there in a year ?

[1 marks]

Question 3

A standard six sided dice is rolled 150 times.

- (i) How many times would you expect a “5” to be rolled ?

[1 mark]

- (ii) What is the probability that the first time a “5” is rolled is on the third roll ?
Give your answer as a decimal, correct to three significant figures.

[2 marks]

Question 4

A *square free number* is an integer that cannot be divided exactly by any square number greater than 1.

- (a) Which **one** of the following numbers is square free ?

(i) 49 (ii) 50 (iii) 51 (iv) 52

For each numbers that is not square free state the square it is divisible by.

[2 marks]

- (b) Express $\sqrt{162}$ in the form $a\sqrt{b}$
where a and b are integers and b is square free.

[1 mark]

Question 5

An arithmetic progression is a sequence of the form

$$a, a + d, a + 2d, a + 3d, \dots, a + (n - 1) d$$

- (i) If such a sequence has third term 16 and fourth term 21 list the first six terms of the sequence.

[2 marks]

- (ii) Will 2021 be in the sequence ?
Give a reason for your answer.

[2 marks]

Question 6

The kinetic energy, KE , of an object is directly proportional to the square of its velocity, v .

In symbols, this can be written,

$$KE \propto v^2$$

When my car is moving at 25 km h^{-1} , I estimate its kinetic energy to be 125000 joules.

- (i) Write down a formula of the form

$$KE = k v^2$$

that relates the kinetic energy and the velocity of my car,
where k is a constant, the value of which you have determined.

[3 marks]

- (ii) Use your part (i) formula to estimate the kinetic energy of my car when it is travelling at 80 km h^{-1}

[1 mark]

Question 7

A curve has the equation, $y = x^2 - 8x + 15$

- (a) For this curve find,

(i) $\frac{dy}{dx}$

[2 marks]

- (ii) The coordinates of the stationary point.

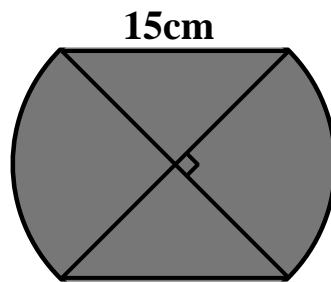
[3 marks]

- (b) State, with a reason, whether the turning point is a minimum or a maximum.

[2 marks]

Question 8

Find the perimeter of the following shape ;



The shape may be thought of as being constructed from two quarter circles and two isosceles, right angled triangles, each with hypotenuse 15 cm.

[3 marks]

Question 9

In $\triangle ABC$, two of the angles are, $A = 68^\circ$, and $C = 34^\circ$

Opposite the angle B , is a side of length $b = 9.4$ cm

- (i) Use a well known fact about the sum of the angles in a triangle to determine the size of angle B .

[1 mark]

- (ii) Sketch the triangle, not to scale, and mark on all known lengths and angles.

[1 mark]

- (iii) Find the length of each missing side, stating which is a and which is c .

[3 marks]

Question 10

In a government survey, a questionnaire is emailed to 15000 people who have previously agreed to take part.

The time taken, in hours, to return the questionnaire is logged.

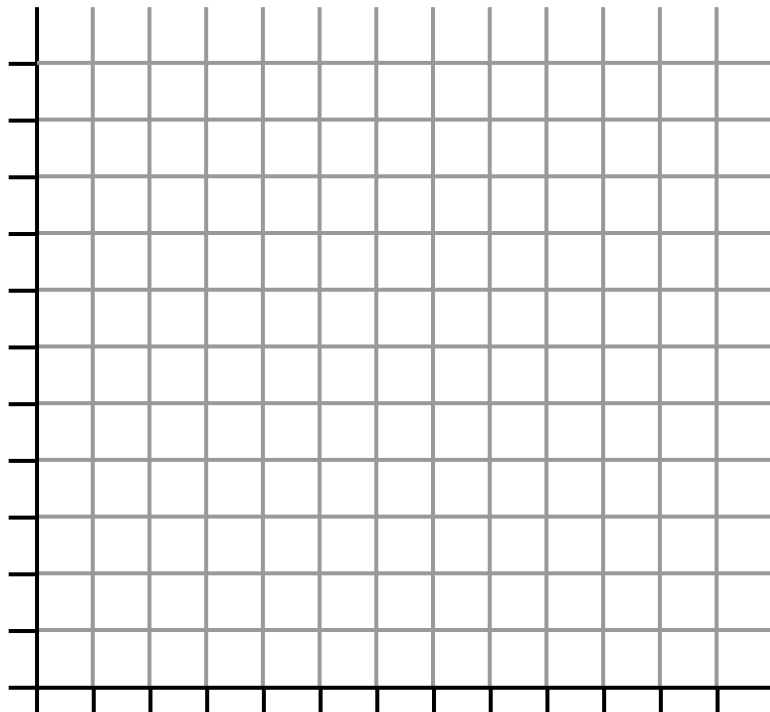
The following table presents a summary.

Response time (hours)	Number of questionnaires Frequency = Area	Width	Height
$0 \leq h < 2$	700		
$2 \leq h < 4$	1100		
$4 \leq h < 6$	2200		
$6 \leq h < 8$	1700		
$8 \leq h < 14$	3500		
$14 \leq h < 24$	2700		

(i) How many questionnaires have not generated a response ?

[1 mark]

(ii) Plot a histogram to show the distribution of the times taken in responding to the questionnaire. Complete the columns headed Width and Height in the table above, to help you do this.



[4 marks]