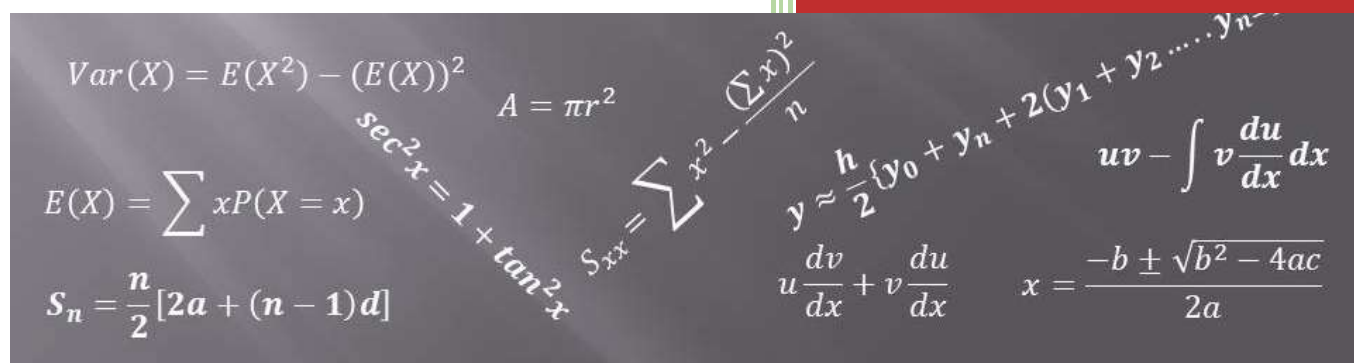


GCSE Higher Level Harder Questions Pack 1 - Questions



Question No.	Mark Scored	Mark
1		5
2		4
3		8
4		6
5		4
6		4
7		5
8		7
9		7
10		6
11		4
12		3
13		4
14		6
15		3
16		4
17		5
18		7
19		5
20		3
TOTAL		100



Calculators Allowed

Time Allowed: 2hrs

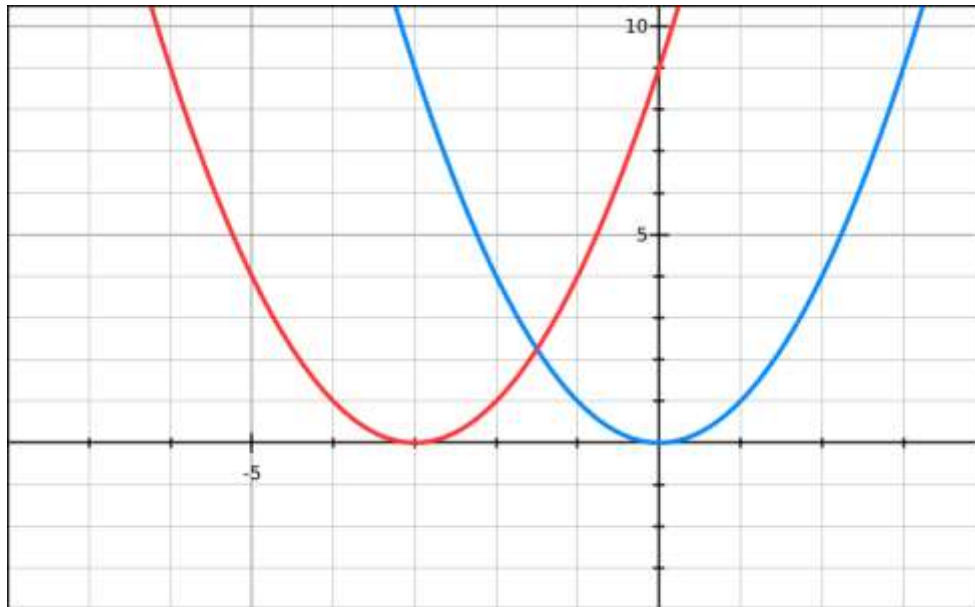
Give all answer to 3 significant figures unless otherwise stated

September 2013

MathsGeeks

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Question 1.

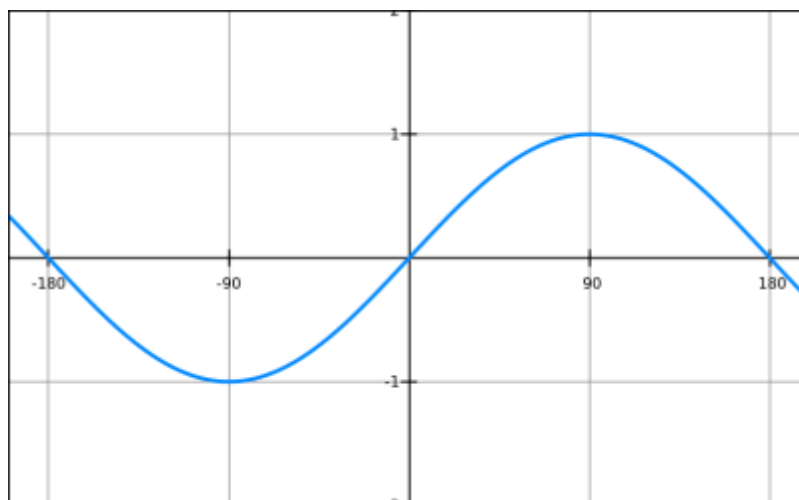


The curve with equation $y = f(x)$ (shown in red) is translated such that the point $(-3, 0)$ is mapped onto the point $(0, 0)$ (shown in blue).

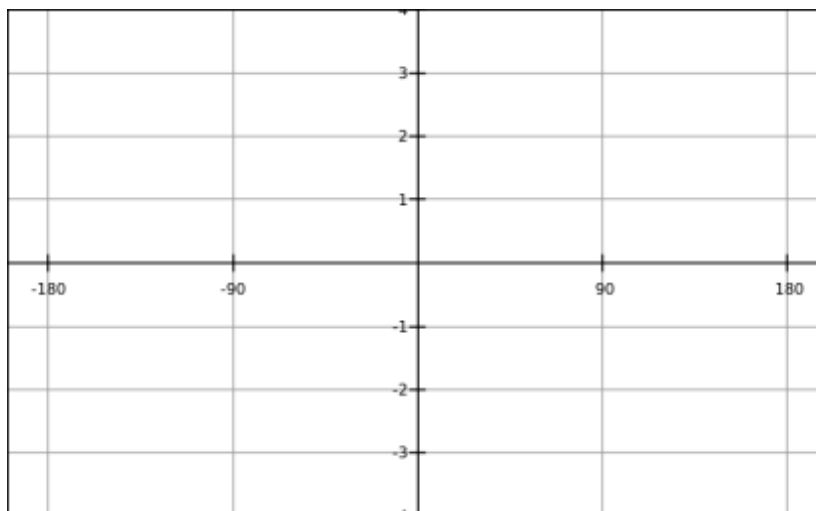
a) Find the equation of the translated curve.

(2)

b) The graph shows $y = \sin(x)$ for values of x between -180° and 180° .

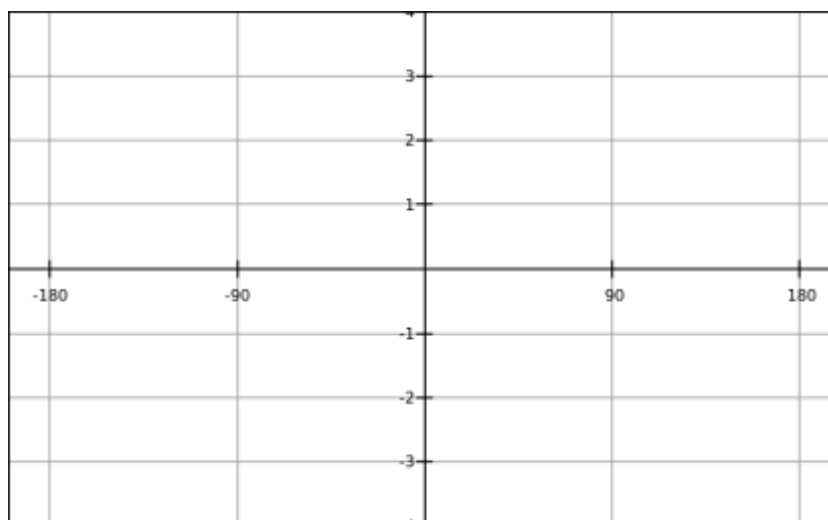


- (i) Sketch the graph $y=\sin(2x)$ between -180° and 180°



(2)

- (ii) Sketch the graph $y=3\sin(2x)$ between -180° and 180°



(1)

Question 1: TOTAL: /5

Question 2

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

- a) Find f when $v = 4\frac{2}{3}$ and $u = 2\frac{1}{3}$

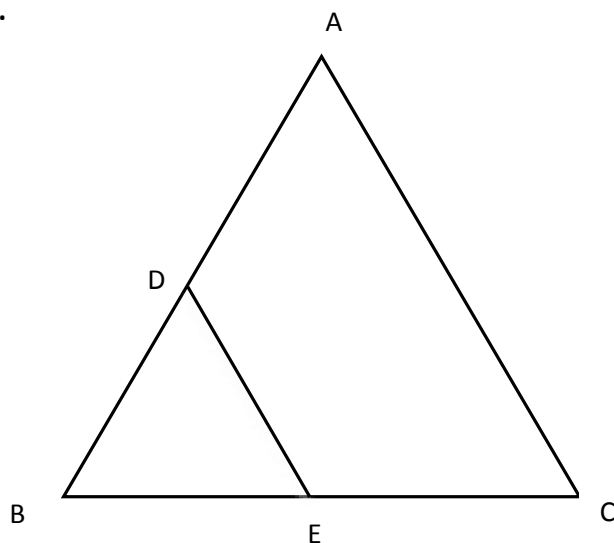
(2)

- b) Rearrange $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$ to make f the subject of the formula.

(2)

Question 2: TOTAL: /4

Question 3.



Not Drawn to
Scale

Triangle BAC is an equilateral triangle.

D lies on AB such that $AD = DB$.

E lies on BC such that $BE = EC$.

a) Prove that triangle BDE and triangle BAC are similar.

(3)

b) If $BC = 8\text{cm}$ find the area of triangle BAC.

(3)

b) What is the area of BDE?

(2)

Question 3: TOTAL: /8

.....

Question 4.

Sam either goes to school by car or he walks. If it rains the probability that he goes to school by car is 0.6 and if it doesn't rain the probability he goes by car is 0.1.

On a particular Tuesday the probability that it will rain is 0.2.

a) Draw a tree diagram to represent this information.

(4)

b) Work out the probability that he will walk to school.

(2)

Question 4: TOTAL: /6

Question 5

A farmer plants strawberry plants and records their growth a year later. He records the following data:

Growth (x) cm	Frequency
$0 < x \leq 5$	4
$5 < x \leq 10$	8
$10 < x \leq 20$	24
$20 < x \leq 40$	16
$40 < x \leq 45$	8

Draw a histogram of this information.

(4)

Question 5: TOTAL: /4

Question 6.

X is inversely proportional to Y^2 .

When $X = 4$, $Y = 2$.

a) Find a formula that relates X and Y.

(2)

b) Find X when $Y=12$.

(2)

Question 6: TOTAL: /4

Question 7.

a) Solve the inequality

$$8x + 3 < 5x + 21$$

(3)

b) x is whole number.

Write down the highest possible value that x can take.

(2)

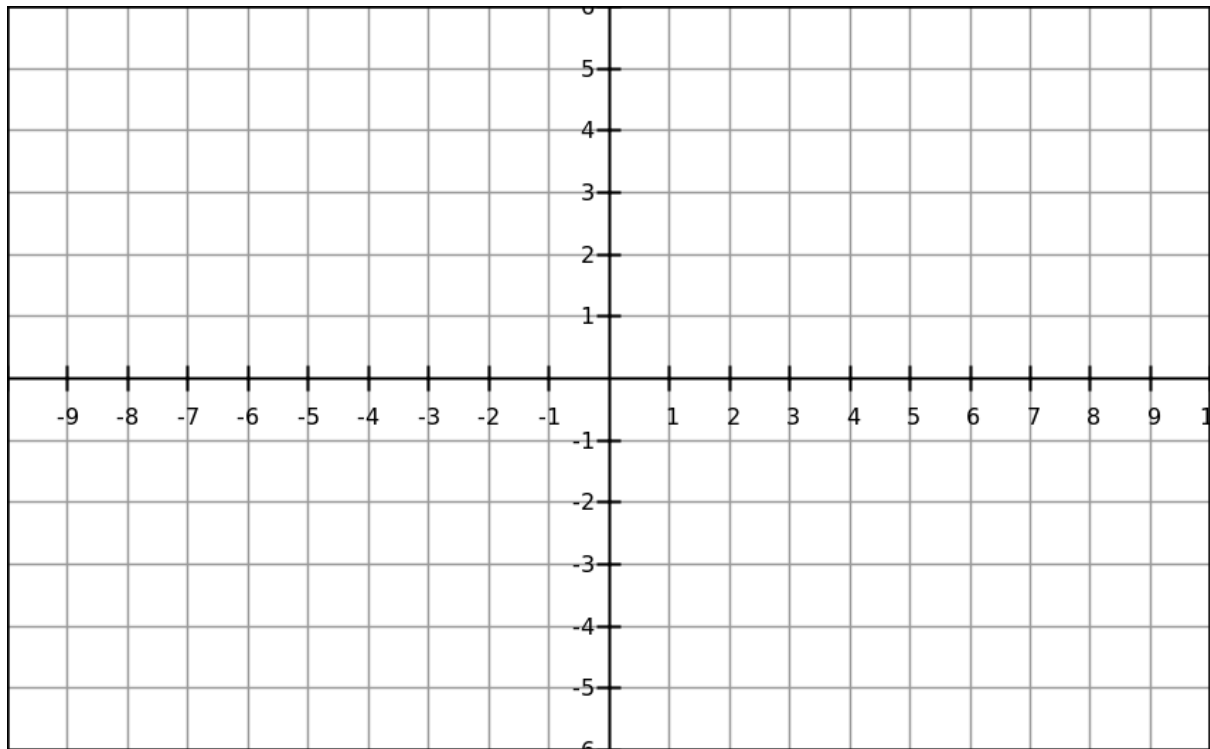
Question 7: TOTAL: /5

Question 8.

a) Plot, on the axes below, the lines:

$$3x + 4y = 12$$

$$y = \frac{x}{3} + 3$$



(4)

b) Using the graphs solve the simultaneous equations:

$$3x + 4y = 12$$

$$y = \frac{x}{3} + 3$$

$x = \dots\dots\dots$, $y = \dots\dots\dots$ (1)

c) Find an equation of the straight line which is parallel to the line $y = \frac{x}{3} + 3$ and passes through the point (0,5).

(2)

Question 8: TOTAL: **/7**

Question 9.

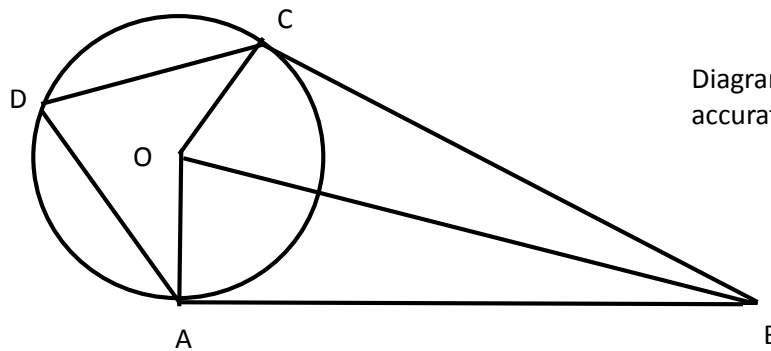


Diagram **NOT**
accurately drawn

The diagram shows a circle with centre O .

A, D and C are points on the circumference.

AB and CB are tangents to the circle.

The radius of the circle is 6cm.

The length of AB = 20cm.

- a) Work out the size of the angle \widehat{AOC} .

(2)

- b) Calculate the length of OB.

(2)

- c) (i) Work out the size of the angle \widehat{ADC}

(2)

(ii) Give a reason for your answer.

(1)

Question 9: TOTAL: /7

Question 10.

Radka did a survey of the speeds of 96 cars driving along a particular road from 9am on a Friday morning.

The cumulative frequency table gives some information about the speeds of the 96 cars.

Speed (S mph)	Cumulative Frequency
$0 \leq S < 10$	6
$10 \leq S < 20$	13
$20 \leq S < 30$	50
$30 \leq S < 40$	72
$40 \leq S < 50$	83
$50 \leq S < 60$	91
$60 \leq S < 70$	96

a) Draw a cumulative frequency diagram.

(3)

b) Use your cumulative frequency diagram to estimate the median of the data.

(1)

Radka then carried out a similar survey at 9am on the following Sunday morning and found that the median was 56 mph.

c) Compare the speeds of the cars on a Friday and Sunday and justify this difference.

(2)

Question 10: TOTAL: /6

Question 11.

Karim has 30 counters in a bag.

7 of the counters are black

10 of the counters are white

13 of the counters are red

Karim takes two counters from the bag.

Work out the probability that the counters will not be the same colour.

(4)

Question 11: TOTAL: /4

Question 12.

Simplify fully

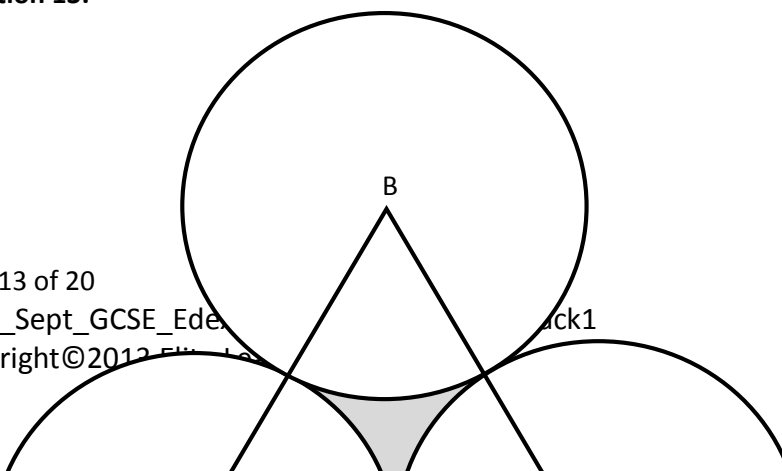
$$\frac{x^2 - x - 12}{2x^2 + 5x - 3}$$

(3)

Question 12: TOTAL: /3

Question 13.

Diagram **NOT**
accurately drawn



ABC is an equilateral triangle, where A, B and C are the centres of three circles of radius 4cm.

AB is length 8cm.

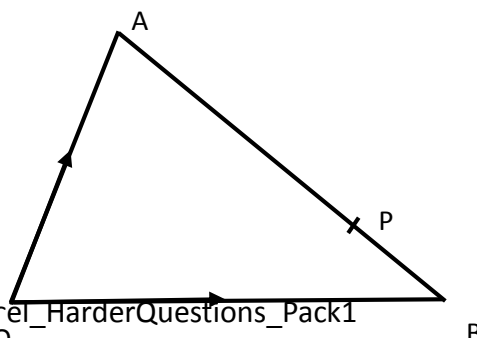
Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

(4)

Question 13: TOTAL: /4

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Question 14.



OAB is a triangle.

$$\overrightarrow{OA} = \mathbf{a}$$

$$\overrightarrow{OB} = 2\mathbf{b}$$

- a) Find the vector \overrightarrow{AB} in terms of \mathbf{a} and \mathbf{b} .

(2)

P is the point on \overrightarrow{AB} such that AP : PB = 4:1

- b) Show that \overrightarrow{OP} is

$$\overrightarrow{OP} = \frac{1}{5}(\mathbf{a} + 8\mathbf{b})$$

(4)

Question 14: TOTAL: /6

.....

Question 15.

Prove that $(5n + 2)^2 - (5n - 2)^2$ is a multiple of 8, for all positive integer values of n.

(3)

Question 15: TOTAL: /3

Question 16.

366 students each study one of these science subjects at University.

The table shows the numbers of Males and Female students that studied each science subject.

	Science subject studied		
	Physics	Chemistry	Biology
Male	80	62	70
Female	42	50	62

In a survey a sample of 50 of the 366 students is taken.

- a) Work out the number of female students studying Biology in the sample.

(2)

- b) Work out the number of female students in the sample.

(2)

Question 16: TOTAL: /4

Question 17.

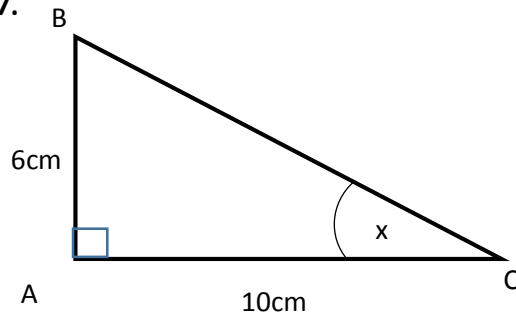


Diagram **NOT**
accurately drawn

Triangle ABC is a right angled triangle.

(a) Calculate the size of the angle marked x.

Give your answer correct to 1 decimal place.

x =° (3)

(b) Calculate the length BC.

(2)

Question 17: TOTAL: /5

Question 18.

a) Simplify

$$\frac{a \times a \times a}{a \times b}$$

(1)

(b) Expand

$$7(4y - 2)$$

(1)

(c) Expand

$$8x(x - 7)$$

(1)

(d) Expand and simplify

$$3(x - 8) + 4(x + 5)$$

(2)

(e) Expand and simplify

$$(x - 5)(x - 8)$$

(2)

Question 18: TOTAL: /8

Question 19

The box plot gives information about the distribution of the weights of bags of toffees.



a) Rob says the heaviest bag weighs 37g.

He is wrong. Explain why.

.....

.....

(1)

(b) Write down the median weight.

..... g (1)

(c) Work out the interquartile range of the weights.

..... g (1)

A factory produces 1024 bags of toffees per day.

(d) Work out the number of bags with a weight of 30g or less.

..... (2)

Question 19: TOTAL: /5

Question 20.

Prove that the recurring decimal $0.\dot{6}\dot{3}$ is $\frac{7}{11}$.

(3)

Question 20: TOTAL: /5

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