

# GCSE Mathematics

## Practice Tests: Set 2

### Paper 1H (Non-calculator)

Time: 1 hour 30 minutes

You should have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

#### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators must not be used.**
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



#### Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

#### Advice

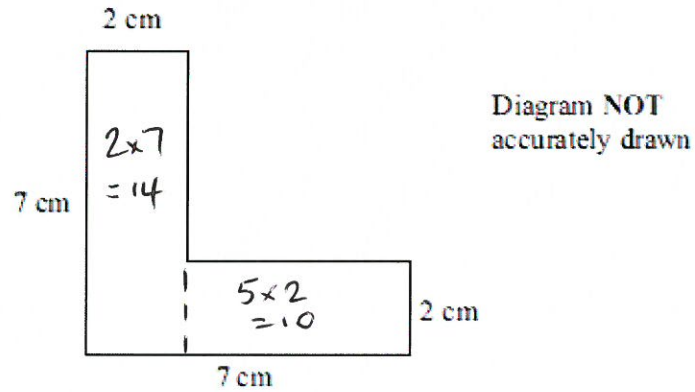
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1.



The diagram shows the cross-section of a solid prism.  
The length of the prism is 2 m.

The prism is made from metal.  
The density of the metal is 8 grams per  $\text{cm}^3$ .

Work out the mass of the prism.

$$\text{TOTAL AREA OF CROSS SECTION} = 14 + 10 = 24 \text{ cm}^2$$

$$\text{LENGTH} = 2 \text{ m} = 200 \text{ cm}$$

$$\therefore \text{VOLUME} = 24 \times 200 = 4800 \text{ cm}^3$$

$$\therefore \text{MASS} = 4800 \times 8 = 38400 \text{ g}$$

.....38400g.....

(Total 5 marks)

2. Dylan is driving from London to Newcastle.  
He will drive a total distance of 240 miles.

Dylan leaves London at 09:30

It takes him  $1\frac{1}{2}$  hours to travel the first 90 miles.

- (a) Use this information to estimate the time Dylan will arrive in Newcastle.  
You must show how you get your answer.

$1\frac{1}{2}$  HRS FOR 90 MILES  
3 HRS FOR 180 MILES  
1 HR FOR 60 MILES  
 $\therefore$  4 HRS FOR 240 MILES

..... 1:30pm .....  
(3)

- (b) Write down **one** assumption you made in your answer to part (a).  
If your assumption is wrong, how would this affect your answer to part (a)?

..... TRAVELLING AT CONSTANT SPEED. IF SPEED REDUCES .....  
..... (INCREASES) TIME TAKEN WILL INCREASE (DECREASE) .....  
(1)

(Total 4 marks)

3. Arwen buys a car for £4000  
The value of the car depreciates by 10% each year.

Work out the value of the car after two years.

$$\text{YR 1} \quad 0.9 \times 4000 = 3600$$

$$\text{YR 2} \quad 0.9 \times 3600 = 3600 - 360 = 3240$$

£ 3240.....

(Total 3 marks)

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4. Suha has a full 600 ml bottle of wallpaper remover.  
She is going to mix some of the wallpaper remover with water.

Here is the information on the label of the bottle.

**Wallpaper remover**  
600 ml

Mix  $\frac{1}{4}$  of the wallpaper remover  
with 4500 ml of water

Suha is going to use 750 ml of water.

How many millilitres of wallpaper remover should Suha use?

You must show your working.

$$\frac{1}{4} \times 600 = 150$$

150 ml WALLPAPER REMOVER WITH 4500ml OF WATER

$$\therefore \frac{150}{4500} \times 750 \text{ ml WALLPAPER REMOVER WITH } 750 \text{ ml OF WATER}$$

$$= \frac{15}{45} \times 75$$

$$= \frac{1}{3} \times 75$$

$$= 25$$

.....ml

(Total 4 marks)

5. There are 18 packets of sweets and 12 boxes of sweets in a carton.

The mean number of sweets in all the 30 packets and boxes is 14.  
The mean number of sweets in the 18 packets is 10.

Work out the mean number of sweets in the boxes.

$$\text{NO. OF SWEETS IN ALL 30 PACKET + BOXES} = 14 \times 30 = 420$$

$$\text{NO. OF SWEETS IN 18 PACKETS} = 10 \times 18 = 180$$

$$\therefore \text{NO. OF SWEETS IN 12 BOXES} = 420 - 180 = 240$$

$$\therefore \text{MEAN} = \frac{240}{12} = 20$$

20

(Total 3 marks)

6. Write the following numbers in order of size.  
Start with the smallest number.

$$\begin{array}{cccc} 0.038 \times 10^2 & 3800 \times 10^{-4} & 380 & 0.38 \times 10^{-1} \\ 3.8 & 0.38 & 380 & 0.038 \end{array}$$

$$\underline{\underline{\underline{0.038} \quad 0.38 \times 10^{-1} \quad 3800 \times 10^{-4} \quad 0.038 \times 10^2 \quad 380}}}$$

(Total 2 marks)

7. Find the value of  $n$  so that  $\frac{2^6 \times 2^3}{2^n} = 2^5$

$$\begin{aligned}6 + 3 - n &= 5 \\ \therefore 9 - 5 &= n \\ \therefore n &= 4\end{aligned}$$

(Total 2 marks)

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8.  $-6 \leq 2y < 5$

$y$  is an integer.

Write down all the possible values of  $y$ .

$$-3 \leq y < 2.5$$

-3, -2, -1, 0, 1, 2

(Total 3 marks)

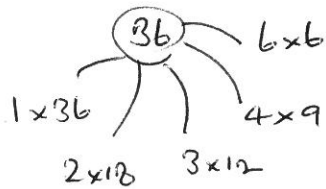
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9.  $x$  and  $y$  are two numbers each greater than 3

The Highest Common Factor (HCF) of  $x$  and  $y$  is 3

The Lowest Common Multiple (LCM) of  $x$  and  $y$  is 36

Find  $x$  and  $y$ .



$x$  AND  $y$  ARE FACTORS OF 36 AND EACH GREATER THAN 3  $\therefore$  POSSIBILITIES ARE

4, 6, 9, 12, 18, 36

$x$  AND  $y$  ARE DIVISIBLE BY 3  $\therefore$  POSSIBILITIES ARE NOW

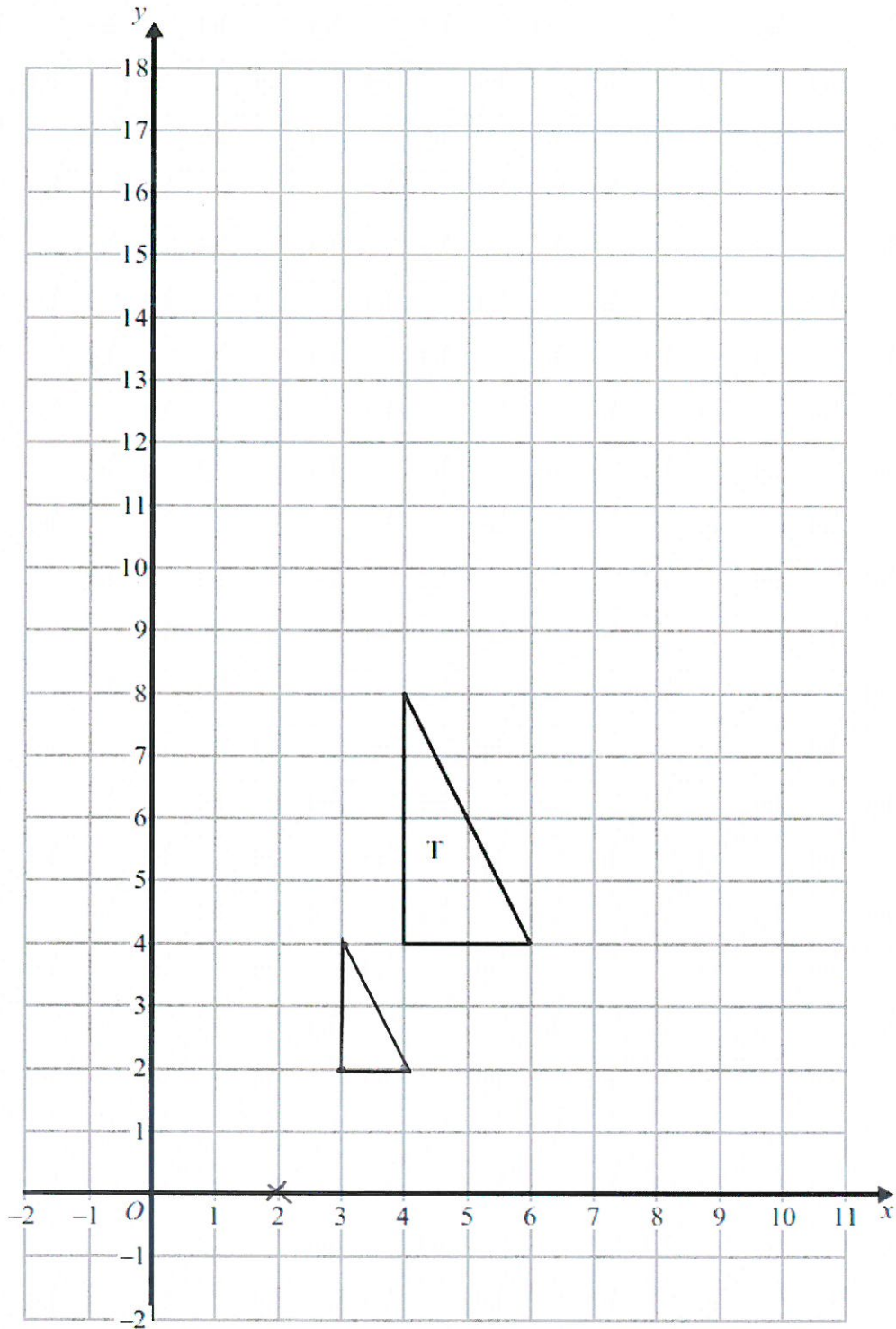
6, 9, 12, 18, 36

..... 9, 12 .....

(Total 2 marks)



10.



Enlarge triangle T by a scale factor  $\frac{1}{2}$ , centre (2, 0).

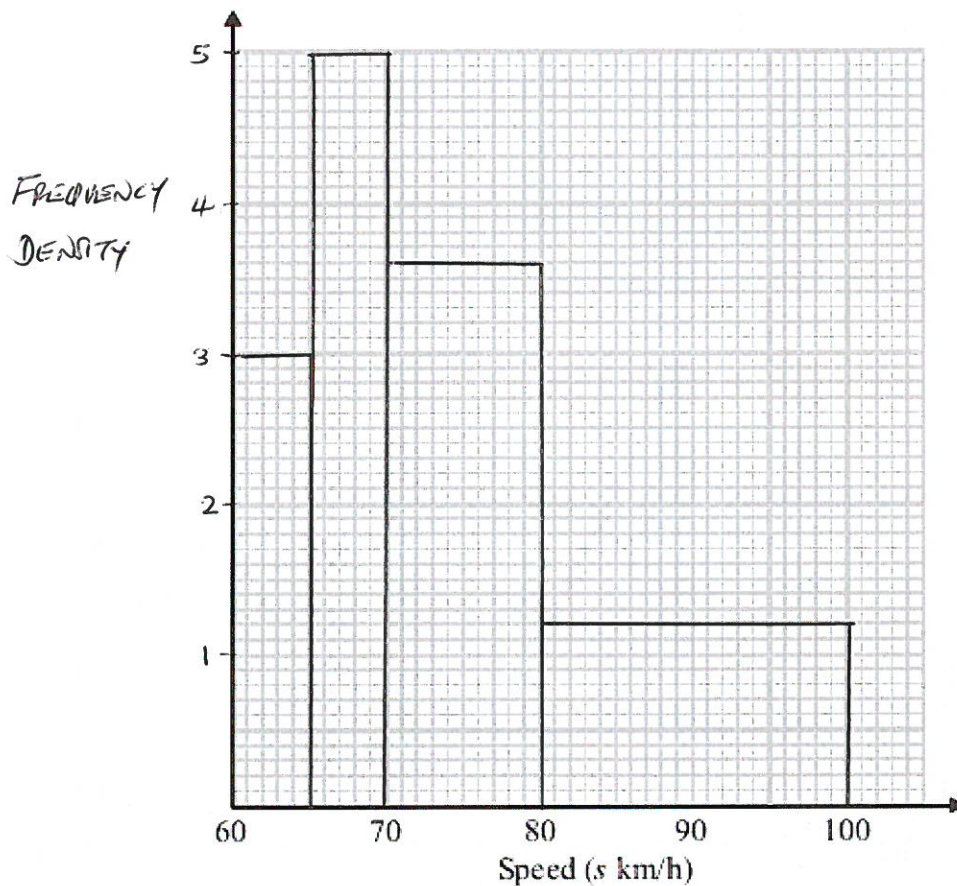
(Total 3 marks)

11. The table gives some information about the speeds, in km/h, of 100 cars.

Speed( $s$ km/h)	Frequency
$60 < s \leq 65$	15
$65 < s \leq 70$	25
$70 < s \leq 80$	36
$80 < s \leq 100$	24

FREQUENCY DENSITY  
 $15 \div 5 = 3$   
 $25 \div 5 = 5$   
 $36 \div 10 = 3.6$   
 $24 \div 20 = 1.2$

(a) On the grid, draw a histogram for the information in the table.



(3)

(b) Work out an estimate for the number of cars with a speed of more than 85 km/h.

$$80 - 100 \quad 15 \quad 20$$

$$85 - 100 \quad 15 \quad 15$$

$$\therefore \frac{15}{20} \times 24 = \frac{3}{4} \times 24 = 18$$

18

(2)

(Total 5 marks)

12. (a) Simplify fully  $\frac{x^2 + 3x - 4}{2x^2 - 5x + 3}$

$$\frac{(x+4)(x-1)}{(2x-3)(x-1)}$$

$$\frac{x+4}{2x-3}$$

(3)

- (b) Write  $\frac{4}{x+2} + \frac{3}{x-2}$  as a single fraction in its simplest form.

$$\frac{4(x-2) + 3(x+2)}{(x+2)(x-2)}$$

$$= \frac{4x - 8 + 3x + 6}{(x+2)(x-2)}$$

$$= \frac{7x - 2}{(x+2)(x-2)}$$

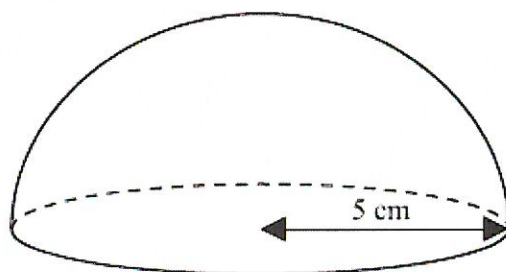
$$= \frac{7x - 2}{x^2 - 4}$$

$$\frac{7x-2}{(x+2)(x-2)}$$

(3)

(Total 6 marks)

13. The diagram shows a solid hemisphere of radius 5 cm.



Surface area of sphere = $4\pi r^2$
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Find the **total** surface area of the solid hemisphere.  
Give your answer in terms of  $\pi$ .

$$\begin{aligned}\text{SURFACE AREA} &= \frac{1}{2} \times 4\pi r^2 + \pi r^2 \\ &= 3\pi r^2 \\ &= 3\pi \times 5^2 \\ &= 75\pi\end{aligned}$$

.....  $75\pi$  .....  $\text{cm}^2$

(Total 3 marks)

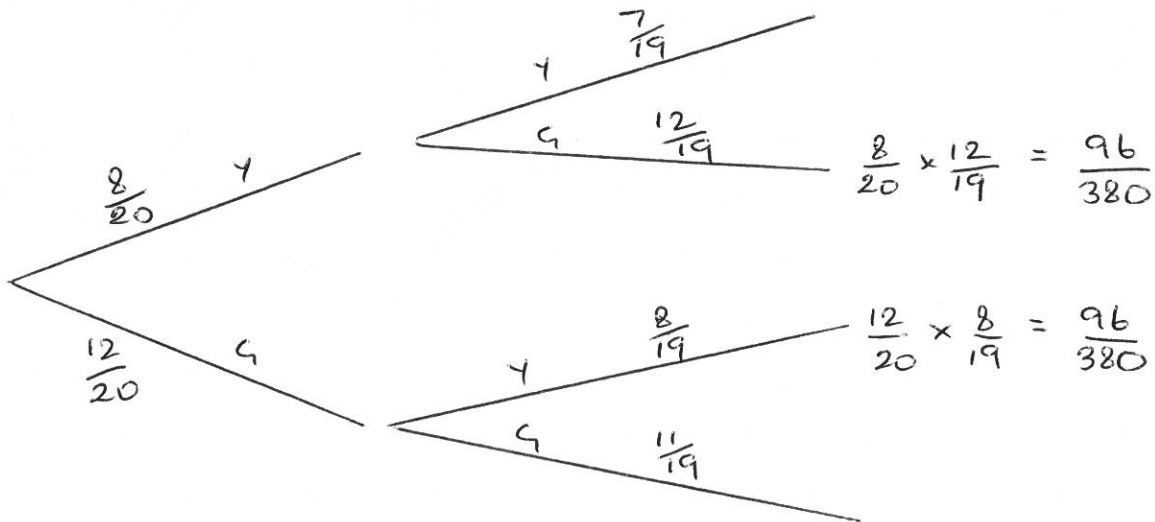
14. There are 20 counters in a bag.

8 of the counters are yellow.

12 of the counters are green.

Asif takes at random two of the counters.

Work out the probability that the two counters are different colours.



$$\frac{96}{380} + \frac{96}{380} = \frac{192}{380}$$

$$\frac{192}{380}$$

(Total 4 marks)

15.  $n$  is an integer greater than 1.

Use algebra to show that  $(n^2 - 1) + (n - 1)^2$  is always equal to an even number.

$$(n-1)^2 = (n-1)(n-1) = n^2 - 2n + 1$$

$$\therefore (n^2 - 1) + (n-1)^2 = n^2 - 1 + n^2 - 2n + 1$$

$$= 2n^2 - 2n$$

$$= 2(n^2 - n)$$

MULTIPLE OF 2

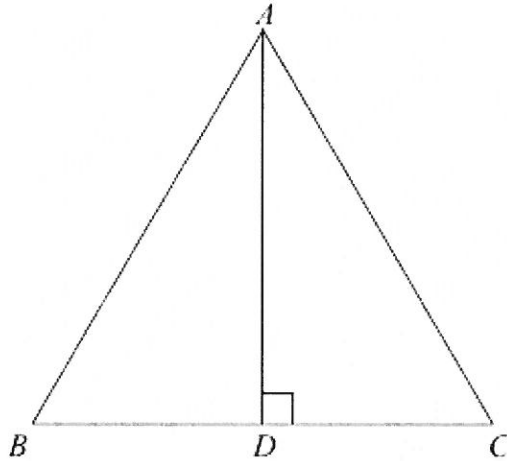
$\therefore$  EVEN

QED

(Total 4 marks)

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16.



$ABC$  is an equilateral triangle.  
 $D$  lies on  $BC$ .  
 $AD$  is perpendicular to  $BC$ .

(a) Prove that triangle  $ADC$  is congruent to triangle  $ADB$ .

$AB = AC$  BECAUSE  $ABC$  IS EQUILATERAL  
 $AD$  IS A LENGTH IN COMMON TO BOTH  $ADC$  AND  $ADB$   
 $\therefore ADC$  AND  $ADB$  ARE CONGRUENT BY RHS

(3)

(b) Hence, prove that  $BD = \frac{1}{2} AB$ .

SINCE  $ADC$  AND  $ADB$  ARE CONGRUENT, LENGTH  $BD =$  LENGTH  $DC$   
 $AB = BC = BD + DC = 2BD$   
 $\therefore BD = \frac{1}{2} AB$ .

(2)

(Total 5 marks)

17. (a) Rationalise the denominator of  $\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$$= \frac{6\sqrt{5}}{5}$$

$$\frac{6\sqrt{5}}{5}$$

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(2)

(b) Expand and simplify  $(2 + \sqrt{10})(\sqrt{5} + \sqrt{20})$

$$\begin{aligned} & 2\sqrt{5} + 2\sqrt{20} + \sqrt{50} + \sqrt{200} \\ = & 2\sqrt{5} + 4\sqrt{5} + 5\sqrt{2} + 10\sqrt{2} \\ = & 6\sqrt{5} + 15\sqrt{2} \end{aligned}$$

$$6\sqrt{5} + 15\sqrt{2}$$

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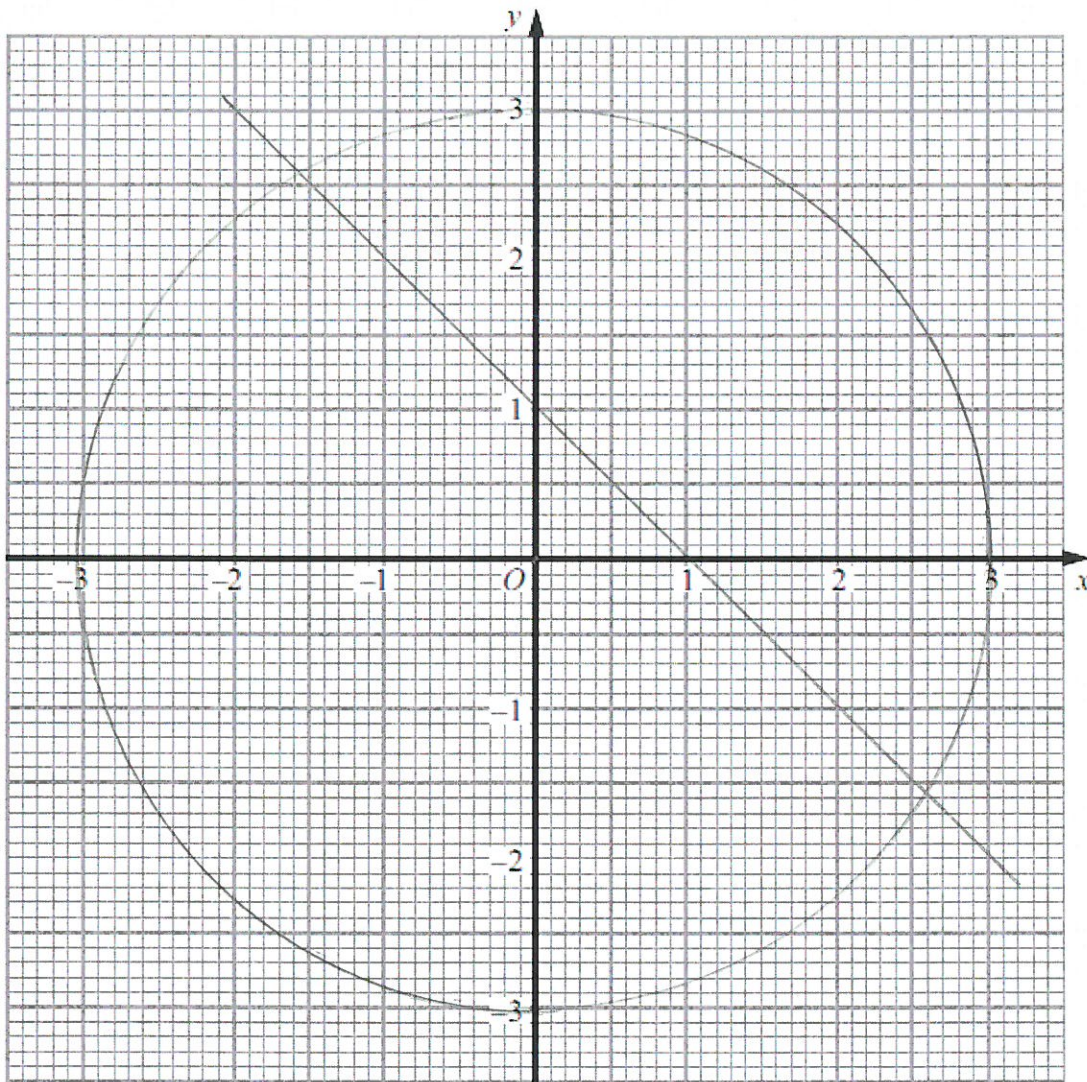
(4)

(Total 6 marks)

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18. (a) Construct the graph of  $x^2 + y^2 = 9$



(2)

(b) By drawing the line  $x + y = 1$  on the grid, solve the equations  $x^2 + y^2 = 9$   
 $x + y = 1$

$x = \dots 2.6 \dots, y = \dots -1.6 \dots$   
 or  $x = \dots -1.6 \dots, y = \dots 2.6 \dots$

(3)

(Total 5 marks)

19.  $P$  is inversely proportional to  $V$ .

When  $V = 8$ ,  $P = 5$

(a) Find a formula for  $P$  in terms of  $V$ .

$$P \propto \frac{1}{V}$$

$$\therefore P = \frac{k}{V}$$

$$\therefore 5 = \frac{k}{8}$$

$$\therefore k = 5 \times 8 = 40$$

$$P = \frac{40}{V} \dots\dots\dots (3)$$

(b) Calculate the value of  $P$  when  $V = 2$

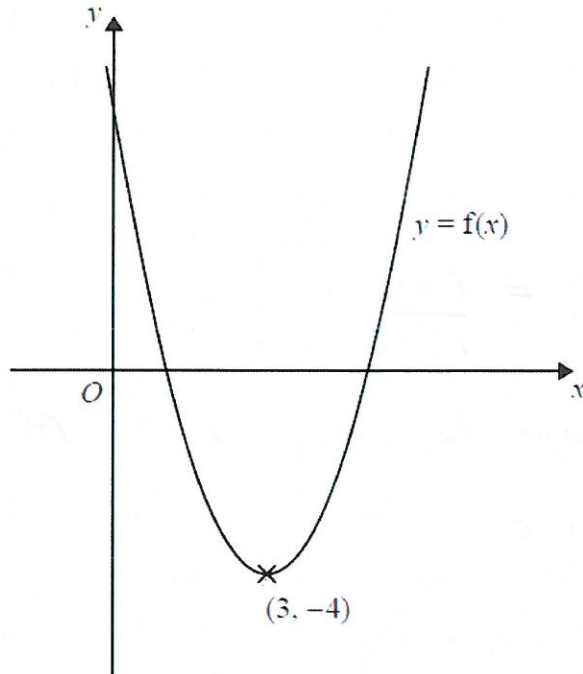
$$P = \frac{40}{2} = 20$$

$$\dots\dots\dots 20 \dots\dots\dots (1)$$

(Total 4 marks)

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20.



The diagram shows part of the curve with equation  $y = f(x)$ .  
The coordinates of the minimum point of this curve are  $(3, -4)$ .

Write down the coordinates of the minimum point of the curve with equation

(i)  $y = f(x) + 3$

(.....<sup>3</sup>....., .....<sup>-1</sup>.....)

(ii)  $y = f(2x)$

(.....<sup>3/2</sup>....., .....<sup>-4</sup>.....)

(iii)  $y = f(-x)$

(.....<sup>-3</sup>....., .....<sup>-4</sup>.....)

**(Total 3 marks)**

21.  $A$  has coordinates  $(-3, 0)$

$B$  has coordinates  $(1, 6)$

$C$  has coordinates  $(5, 2)$

Find an equation of the line that passes through  $C$  and is perpendicular to  $AB$ .

Give your equation in the form  $ax + by = c$  where  $a$ ,  $b$  and  $c$  are integers.

$$\text{GRADIENT OF } AB = \frac{6-0}{1-(-3)} = \frac{6}{4} = \frac{3}{2}$$

$$\therefore \text{GRADIENT OF LINE PERPENDICULAR TO } AB = -\frac{2}{3}$$

$$\therefore y = -\frac{2}{3}x + c$$

$$\text{AT } C \quad 2 = -\frac{2}{3} \times 5 + c = -\frac{10}{3} + c$$

$$\therefore c = 2 + \frac{10}{3} = \frac{6}{3} + \frac{10}{3} = \frac{16}{3}$$

$$\therefore y = -\frac{2}{3}x + \frac{16}{3}$$

$$\therefore 3y = -2x + 16$$

$$\therefore 2x + 3y = 16$$

$$\underline{2x + 3y = 16}$$

(Total 4 marks)

**TOTAL FOR PAPER IS 80 MARKS**