

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.**



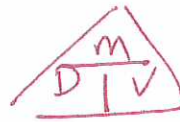
Information

- 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.

Density Mass Volume

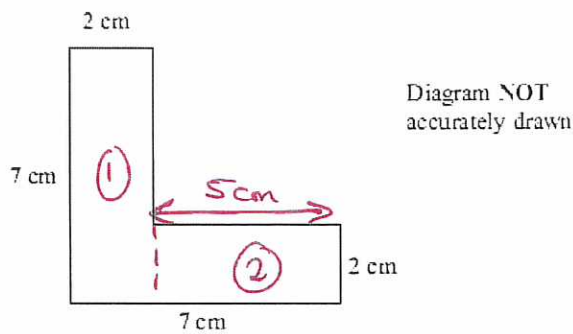


Answer ALL questions.

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 cm^3 .

Work out the mass of the prism.

Cross-sectional area

$$\text{Volume} = \text{CSA} \times \text{length}$$

CSA is a compound shape

$$\text{Length} = 2\text{m}$$

Volume

$$D = \frac{M}{V}$$

$$A = \textcircled{1} + \textcircled{2}$$

$$\textcircled{1} = 7\text{cm} \times 2\text{cm} = 14\text{cm}^2$$

$$\textcircled{2} = 5\text{cm} \times 2\text{cm} = 10\text{cm}^2$$

$$24\text{cm}^2 = \text{CSA}$$

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

$$\therefore V = 24\text{cm}^2 \times 200\text{cm} = 4800\text{cm}^3$$

$$\therefore D = \frac{M}{V} \Rightarrow M = D \times V$$

$$= 8\text{g/cm}^3 \times 4800\text{cm}^3$$

$$= \underline{\underline{38400\text{g}}}$$

(Total 5 marks)

Speed Distance Time



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.

First part of journey:

$$\begin{aligned} \textcircled{1} \quad S &= 60\text{mph} \\ D &= 90\text{miles} \\ T &= 1.5\text{h} \end{aligned}$$

Total journey

$$\begin{aligned} S &= 60\text{mph} \\ D &= 240\text{miles} \\ \textcircled{2} \quad T &= 4\text{hours} \end{aligned}$$

$$\textcircled{1} \quad S = \frac{D}{T} = \frac{90\text{miles}}{1.5\text{h}} = 60\text{mph}$$

$$\textcircled{2} \quad T = \frac{D}{S} = \frac{240\text{miles}}{60\text{mph}} = 4\text{hours}$$

$$\therefore \text{Time} = 09:30 + 4\text{hours} = \underline{\underline{13:30}} \quad (3)$$

- (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)?

I assumed his speed is constant at 60mph for the entire journey. This would change the time of arrival if this wasn't the case. (1)

(Total 4 marks)

Repeated % change

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.

Start \times multiplierⁿ = End
Multiplier = 1 - 10%
= 0.9

$£4000 \times 0.9^2 = £3240$

SINCE THIS IS NON-CALC:

YEAR 1 END	$£4000 \times 0.9 = £3600$	100% = £3600 10% = £360 ∴ 90% = £3240
YEAR 2 END	$£3600 \times 0.9 = \underline{£3240}$	

£ 3240
(Total 3 marks)

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.

Ratio mixture

(÷10)
(÷3)
(×5)

} $\frac{1}{4}$ of 600ml = 150ml

Remover: Water
150ml : 4500ml
15ml : 450ml
5ml : 150ml
25ml : 750ml

.....25.....ml

(Total 4 marks)

missing mean

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.

Total in packets and boxes	$30 \times 14 = 420$
Total in packets	$18 \times 10 = 180$
Total in boxes	$420 - 180 = 240$
mean boxes	$240 \div 12 = \underline{\underline{20}}$

20

(Total 3 marks)

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

Standard Form

0.038×10^2	3800×10^{-4}	380	0.38×10^{-1}
3.8	0.38	380	0.038
(3)	(2)	(4)	(1)

$0.038 \times 10^{-1}, 3800 \times 10^{-4}, 0.038 \times 10^2, 380$

(Total 2 marks)

Index Laws

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

$$\begin{array}{l} a^m \times a^n = a^{m+n} \\ \frac{a^m}{a^n} = a^{m-n} \\ \text{Drop Bases} \end{array} \quad \left| \quad \begin{array}{l} \frac{2^6 \times 2^3}{2^n} = 2^5 \\ \frac{2^9}{2^n} = 2^5 \\ 2^{9-n} = 2^5 \\ 9-n = 5 \\ \underline{\underline{n = 4}} \end{array} \right.$$

(Total 2 marks)

8. $-6 \leq 2y < 5$
 y is an integer.

Inequalities

Write down all the possible values of y .

$$\begin{array}{l} (\div 2) \\ y \text{ is an integer} \end{array} \quad \left| \quad \begin{array}{l} -6 \leq 2y < 5 \\ -3 \leq y < \frac{5}{2} \\ \underline{\underline{-3, -2, -1, 0, 1, 2}} \end{array} \right.$$

(Total 3 marks)

HCF LCM

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 .

factors of 36 = 1, 2, 3, 4, 6, 9, 12, 18, 36.

multiples of 3: 3, 6, 9, 12, 15, 18, 21, ...

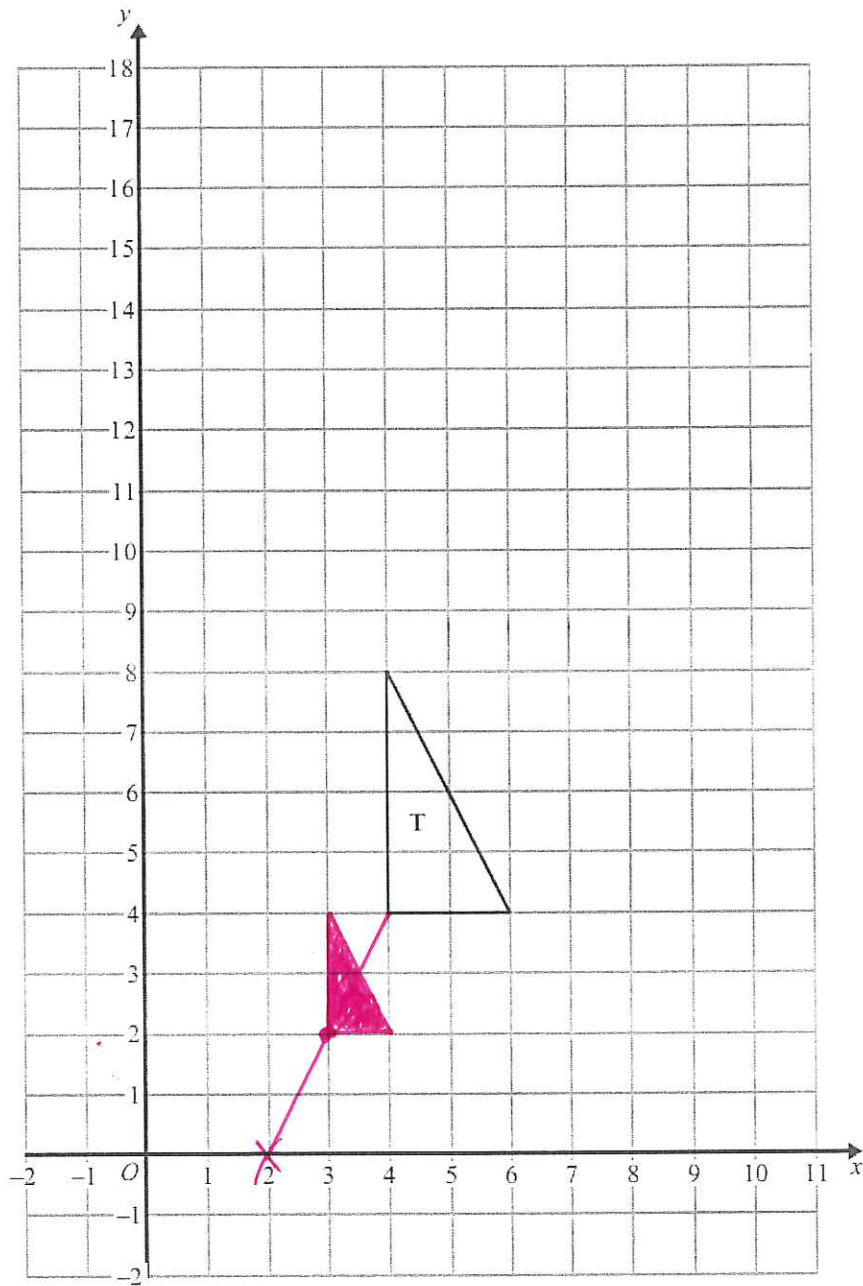
.....
9 and 12

(Total 2 marks)

Enlargements

vector = $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ $SF = \frac{1}{2}$ $\frac{1}{2} \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

10.



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

(Total 3 marks)

Histograms

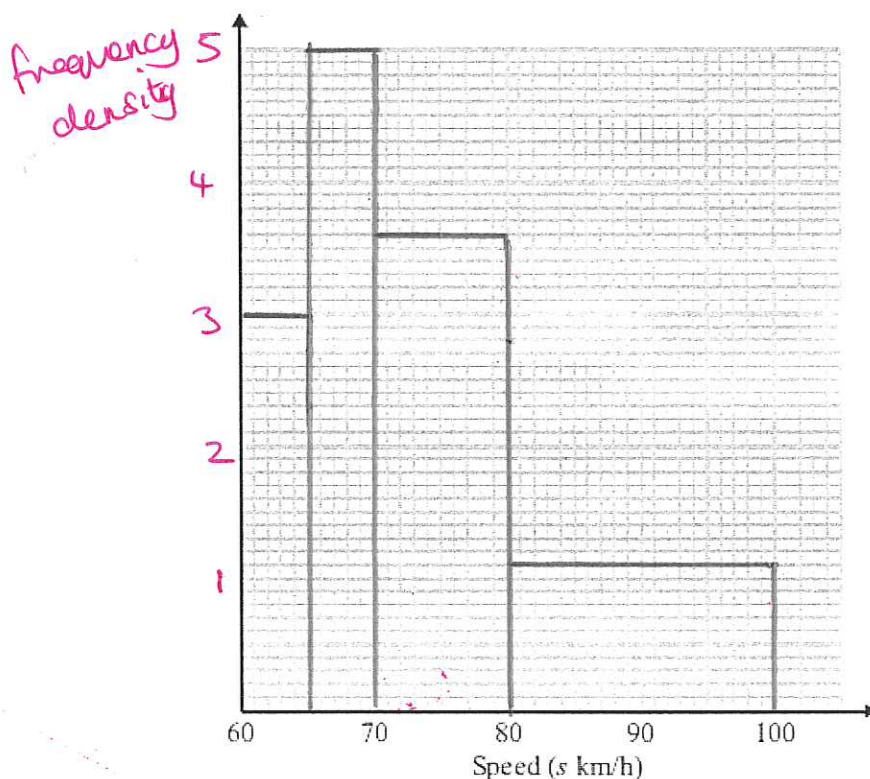
11. The table gives some information about the speeds, in km/h, of 100 cars.

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

$f.d = \frac{f}{c.w}$

3
5
3.6
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.

85 km or more is $\frac{3}{4}$ of the interval $80 < s \leq 100$.
 $\therefore \frac{3}{4}$ of 24 = 18

18.

(2)

(Total 5 marks)

Simplifying Algebraic Fractions

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

factorise top

$$(x+4)(x-1)$$

factorise bottom

$$(2x-3)(x-1)$$

simplify

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

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

(3)

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

Combining Algebraic Fractions

Cross multiply

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

expand

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

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

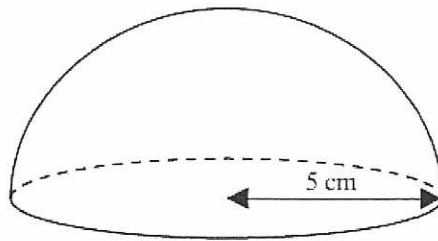
$$\frac{7x-2}{(x+2)(x-2)}$$

(3)

(Total 6 marks)

Surface Area of Spheres

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



Surface area of sphere = $4\pi r^2$

Find the **total** surface area of the solid hemisphere.
Give your answer in terms of π .

Curved surface area	$= \frac{4\pi r^2}{2} = 2\pi r^2$
Radius = 5 cm	$= 2\pi (5)^2$ $= 50\pi \text{ cm}^2$
Flat circular base	$= \pi r^2$
Radius = 5 cm	$= \pi (5)^2 = 25\pi \text{ cm}^2$
Total surface area	$\therefore = 50\pi + 25\pi$ $= \underline{\underline{75\pi \text{ cm}^2}}$

..... 75π cm^2
(Total 3 marks)

Dependent Probability Trees

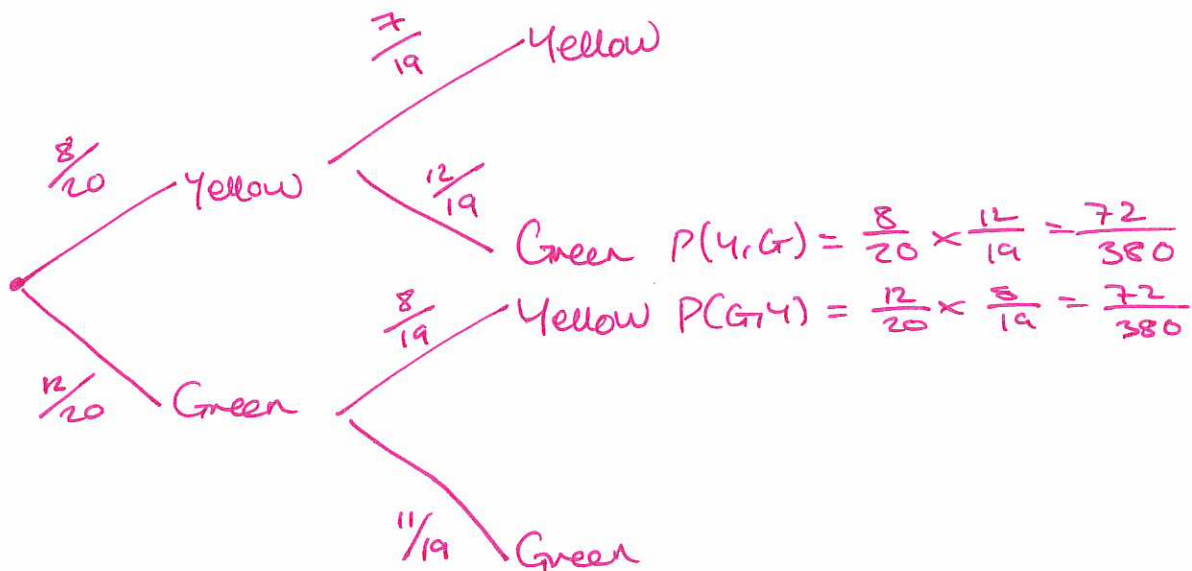
14. There are 20 counters in a bag.

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.



$$P(\text{Different colours}) = P(Y,G) + P(G,Y)$$

$$= \frac{72}{380} + \frac{72}{380}$$

$$= \frac{144}{380}$$

$$\frac{144}{380}$$

(Total 4 marks)

Algebraic Proof -

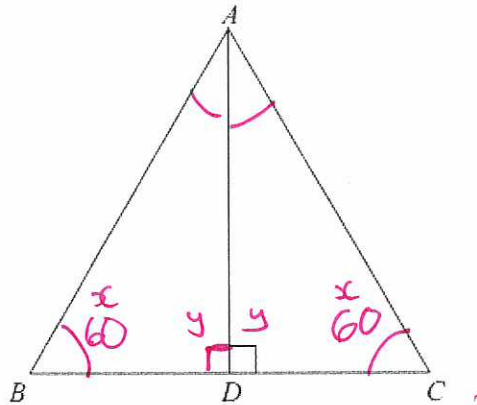
15. n is an integer greater than 1.

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

	$n^2 - 1 + (n - 1)^2$
expand	$= n^2 - 1 + (n - 1)(n - 1)$
	$= n^2 - 1 + n^2 - n - n + 1$
collect	$= 2n^2 - 2n$
factorise	$= 2(n^2 - n)$
Conclusion	2 multiplied by anything is even. \square .

(Total 4 marks)

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 .

- (A) $\hat{A}B\hat{D} = \hat{A}C\hat{D} = 60^\circ$
- (A) $\hat{A}D\hat{B} = \hat{A}D\hat{C} = 90^\circ$
- (A) $\hat{B}A\hat{D} = \hat{C}A\hat{D} = 30^\circ$
- (S) $AD = AD$

□

Equilateral triangle ~~← NOT NEEDED~~

Angles on a straight line = 180°

Angles in a $\Delta = 180$ and $x+y = 150^\circ$

Shared.

By **ASA**, the two triangles are congruent (3)

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

$AB = BC$

$BD = DC = \frac{1}{2}BC$

$\therefore \frac{1}{2}AB = \frac{1}{2}BC = BD$

$\frac{1}{2}AB = BD$ □

Equilateral triangle

Congruent triangles from (a)

In particular,

(2)

(Total 5 marks)

Rationalising Surds

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

Rationalise $\times \left(\frac{\sqrt{5}}{\sqrt{5}}\right)$ $\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{6\sqrt{5}}{5}$

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

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

Expanding Brackets (Surds) ⁽²⁾

expand

$$\begin{aligned} & 2\sqrt{5} + 2\sqrt{20} + \sqrt{50} + \sqrt{200} \\ \sqrt{20} &= \sqrt{4}\sqrt{5} & &= 2\sqrt{5} + 4\sqrt{5} + \sqrt{50} + \sqrt{200} \\ \sqrt{50} &= \sqrt{25}\sqrt{2} & &= 2\sqrt{5} + 4\sqrt{5} + 5\sqrt{2} + \sqrt{200} \\ \sqrt{200} &= \sqrt{100}\sqrt{2} & &= 2\sqrt{5} + 4\sqrt{5} + 5\sqrt{2} + 10\sqrt{2} \\ \text{collect} & & &= 6\sqrt{5} + 15\sqrt{2} \end{aligned}$$

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

(4)

(Total 6 marks)

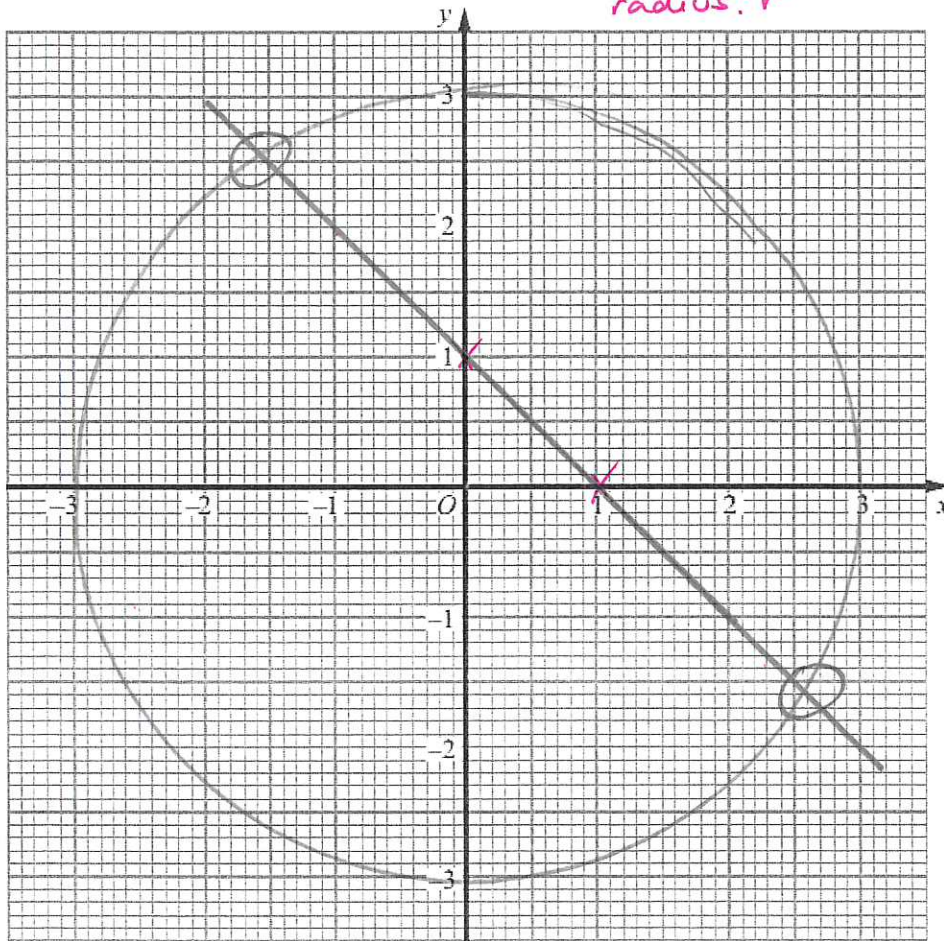
Equation of Circles

$$(x-a)^2 + (y-b)^2 = r^2$$

centre: (a, b)

radius: r

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 $x^2 + y^2 = 9$ *circle*
 $x + y = 1$ *implicit function*
(0,1) and (1,0)

$$x = 2.6, y = -1.6$$

$$\text{or } x = -1.6, y = 2.6$$

(3)

(Total 5 marks)

Inverse Proportion

19. P is inversely proportional to V .

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

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

Inverse Proportion

$V = 8, P = 5$	$P \propto \frac{1}{V}$	$P = \frac{k}{V}$	\longrightarrow	$P = \frac{40}{V}$
$(\times 8)$	$5 = \frac{k}{8}$	$40 = k$	\nearrow	$P = \frac{40}{V}$

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

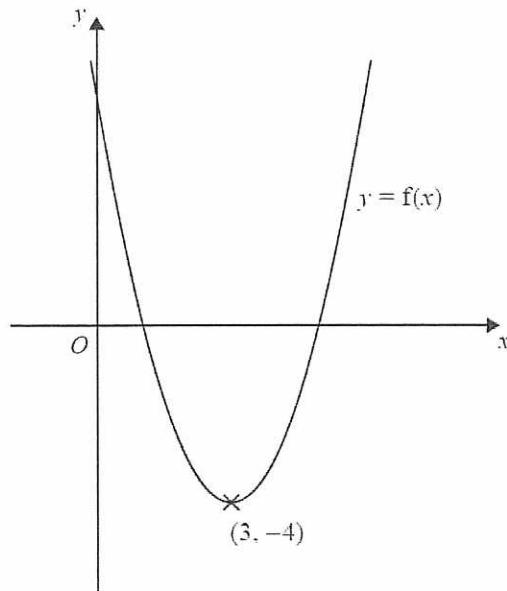
(b) Calculate the value of P when $V = 2$

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

..... (1)

(Total 4 marks)

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) $y = f(x) + 3$

Translation of $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$

(..... 3 -1)

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

Inputs halved to make $f(x)$

(..... $\frac{3}{2}$ -4)

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

Inputs negated

(..... -3 -4)

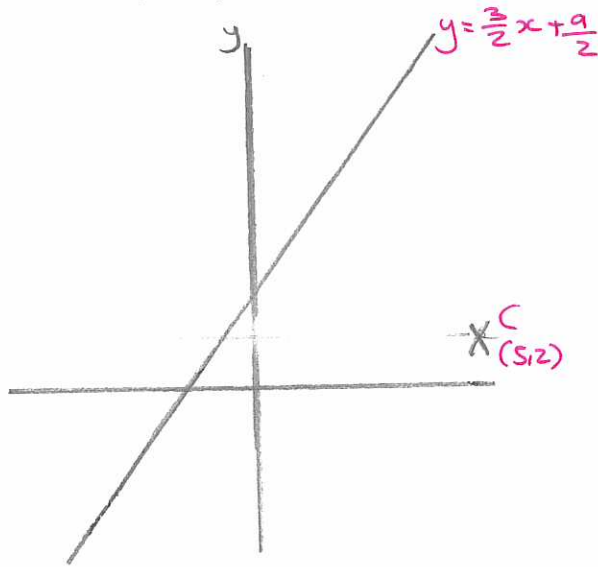
(Total 3 marks)

Perpendicular Lines

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. NEED: Equation of line AB .



Straight Line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_1 \times m_2 = -1$$

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

at $(5, 2)$

$$(+\frac{10}{3})$$

$$(x3)$$

$$y = mx + c$$

$$m = \frac{6 - 0}{1 - (-3)} = \frac{6}{4} = \frac{3}{2}$$

$$\therefore \text{perpendicular gradient} = -\frac{2}{3}$$

$$2 = -\frac{2}{3}(5) + c$$

$$2 = -\frac{10}{3} + c$$

$$\frac{16}{3} = c$$

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

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

(Total 4 marks)

TOTAL FOR PAPER IS 80 MARKS

$$(+2x)$$

$$2x + 3y = 16$$