

GCSE Non Calculator Exam Questions

1. A box contains milk chocolates and dark chocolates only.
 The number of milk chocolates to the number of dark chocolates is in the ratio 2 : 1

There are 24 milk chocolates.

Work out the total number of chocolates.

$$\begin{aligned} 2 \text{ parts} &= 24 \text{ (milk chocs)} \\ 1 \text{ part} &= 12 \text{ (24} \div \text{2)} \\ \text{so, there are } &12 \text{ dark chocs.} \end{aligned}$$

12

(Total 2 marks)

2. Kaysha has a part-time job.
 She is paid £5.40 for each hour she works.
 Last week Kaysha worked for 24 hours.

Work out Kaysha's total pay for last week.

$$\begin{array}{r|l} 5.40 & \\ \times & 24 \\ \hline 2160 & \\ 10800 & + \\ \hline 129.60 & \end{array}$$

£ 129.60

(Total 3 marks)

2. (a) Simplify $4x + 3y - 2x + 5y$

$$\begin{aligned} &\underbrace{4x - 2x} + \underbrace{3y + 5y} \\ &2x + 8y \end{aligned} \quad \dots 2x + 8y \dots \quad (2)$$

Compasses cost c pence each.
 Rulers cost r pence each.

- (b) Write down an expression for the total cost, in pence, of 2 compasses and 4 rulers.

no need for equal sign

$$2c + 4r \text{ pence} \quad (2)$$

3. (a) Complete the table of values for $y = 4x - 3$ $\rightarrow y = 4 \times x - 3$

x	-2	-1	0	1	2	3
y	-11	-7	-3	1	5	9

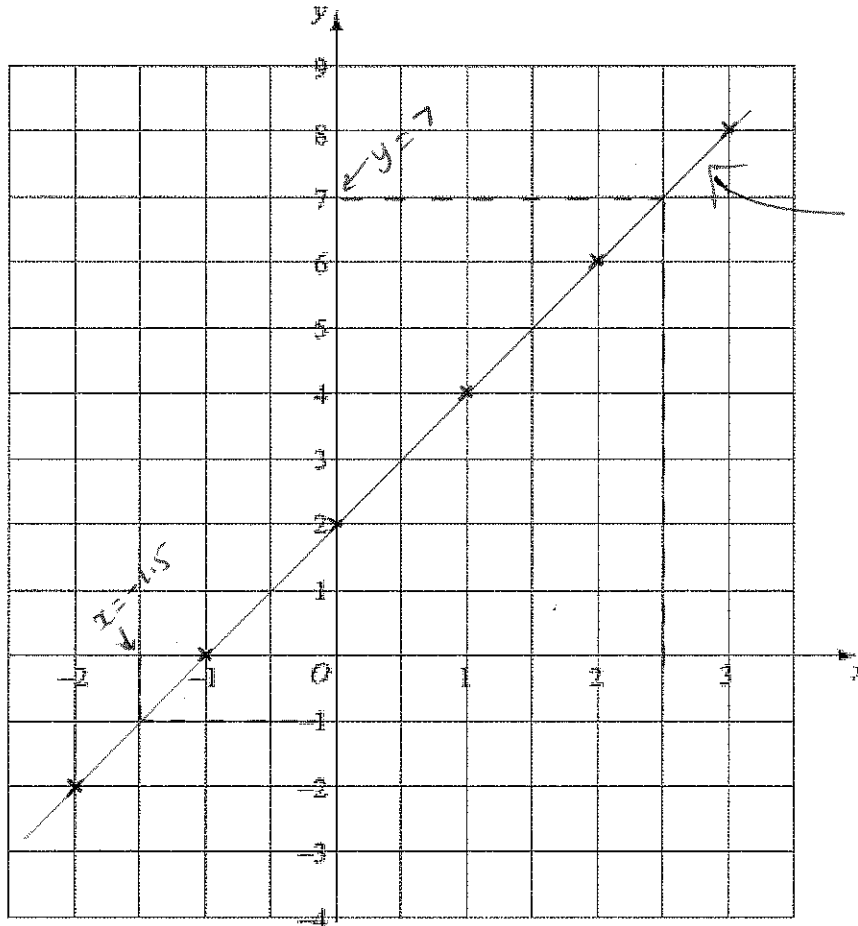
$$\begin{array}{ccc} \downarrow & & \downarrow & & \downarrow \\ (4 \times -1) - 3 & & (4 \times 1) - 3 & & (4 \times 2) - 3 \\ -4 - 3 & & 4 - 3 & & 8 - 3 \end{array} \quad (2)$$

3. (a) Complete the table of values for $y = 2x + 2$ $\rightarrow 2 \times x + 2$

x	-2	-1	0	1	2	3
y	-2	0	2	4	6	8

$$(2 \times -2) + 2 = -4 + 2 \quad (2)$$

- (b) On the grid, draw the graph of $y = 2x + 2$



These are your coordinates

Remember to draw the line!

- (c) Use your graph to find

(i) the value of y when $x = -1.5$

$$y = -1$$

(ii) the value of x when $y = 7$

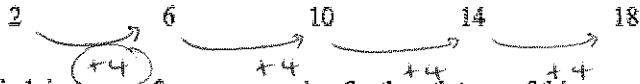
$$x = 2.5$$

(2)

(2)

draw a line till you reach the graph then read the value

4. Here are the first five terms of an arithmetic sequence.



(a) Find, in terms of n , an expression for the n th term of this sequence.

$4n$

$4n$:	1	2	3	4	5
$4n$:	4	8	12	16	20
sequence:	:	2	6	10	14	18

so n th term is $4n - 2$

$\dots\dots\dots$
 \uparrow
 $4n - 2$ (2)

(b) An expression for the n th term of another sequence is $10 - n^2$

(i) Find the third term of this sequence.

$\hookrightarrow n = 3$

$10 - 3^2 = 10 - 9$

$\dots\dots\dots$
 1

(ii) Find the fifth term of this sequence.

$\hookrightarrow n = 5$

$10 - 5^2 = 10 - 25$

$\dots\dots\dots$
 -15
 $\dots\dots\dots$
 (2)

5.

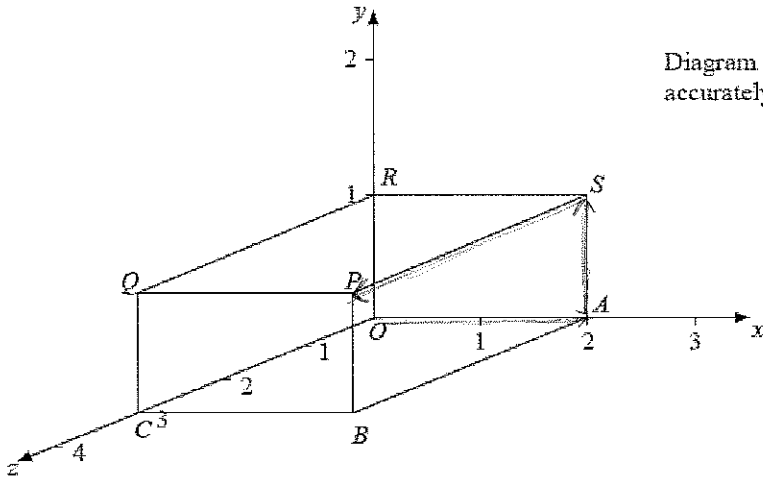


Diagram NOT accurately drawn

Remember:
 (x, y, z)

A cuboid is shown on a 3-dimensional grid.

(a) Write down the letter of the point with coordinates $(2, 1, 0)$.

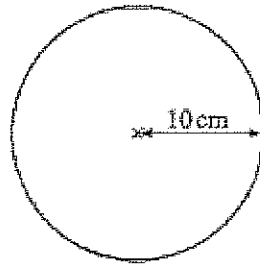
$\dots\dots\dots$
 S
 $\dots\dots\dots$
 (1)

(b) Write down the coordinates of the point P .

$\dots\dots\dots$
 $(2, 1, 0)$
 $\dots\dots\dots$
 (1)

(Total 2 marks)

5.

Diagram NOT
accurately drawn

The radius of a circle is 10 cm.

Work out the area of this circle.

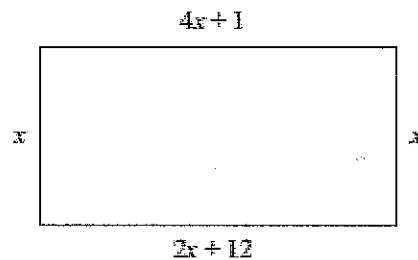
Use $\pi = 3.14$

$$\begin{aligned} \rightarrow \text{area} &= \pi r^2 \\ &= 3.14 \times 10^2 \\ &= 3.14 \times 100 \end{aligned}$$

.....314.....cm²

(Total 2 marks)

6.

Diagram NOT
accurately drawnThe diagram shows a rectangle.
All the measurements are in centimetres.(a) Explain why $4x + 1 = 2x + 12$Opposite sides of a rectangle are equal in length.....
(1)(b) Solve $4x + 1 = 2x + 12$

$$\begin{array}{r} 4x + 1 = 2x + 12 \\ -1 \qquad -1 \end{array}$$

$$\begin{array}{r} 4x = 2x + 11 \\ -2x \quad -2x \end{array}$$

$$\frac{2x}{2} = \frac{11}{2}$$

$$x = \frac{11}{2} \text{ or } 5\frac{1}{2} \text{ or } 5.5$$

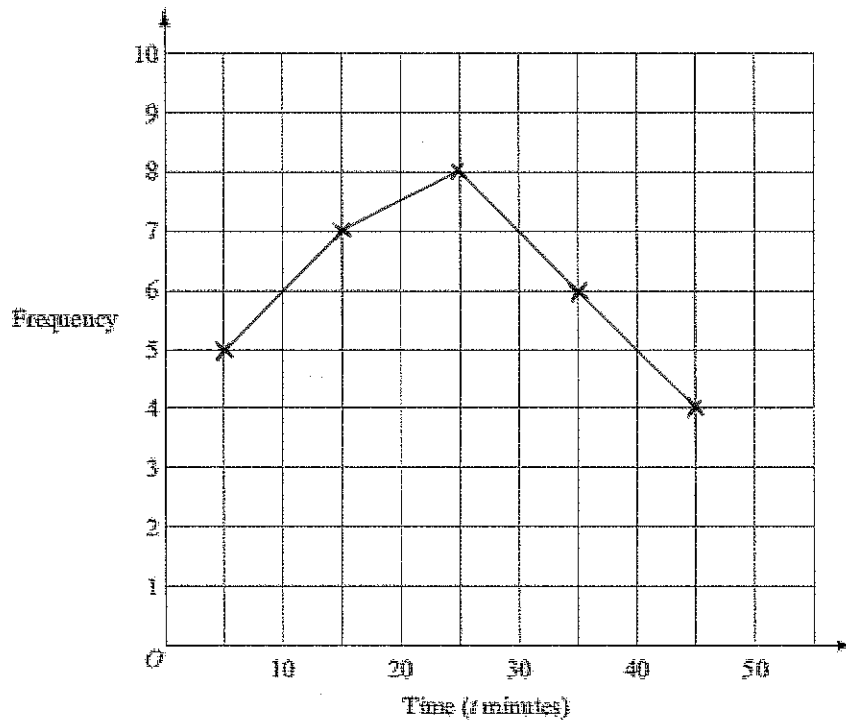
.....
Either answer is acceptable

6. 30 students took a test.
The table shows information about how long it took them to complete the test.

Time (t minutes)	Frequency
$0 < t \leq 10$	5
$10 < t \leq 20$	7
$20 < t \leq 30$	8
$30 < t \leq 40$	6
$40 < t \leq 50$	4

plot midpoint of interval against the frequency

- (a) On the grid, draw a frequency polygon for this information.



Join up with ruler - straight lines not curve

(2)

8. $2x^2 = 72$

- (a) Find a value of x .

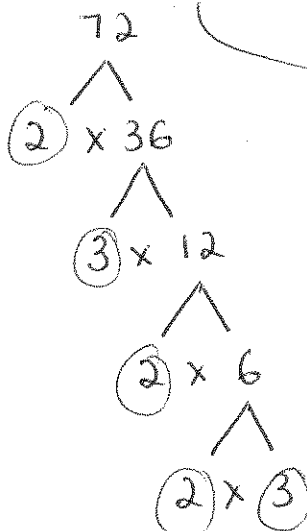
$$\frac{2x^2}{2} = \frac{72}{2}$$

$$x^2 = 36$$

$$x = \sqrt{36} = 6$$

$$\frac{6}{6} \quad (2)$$

- (b) Express 72 as a product of its prime factors.



$$2 \times 2 \times 2 \times 3 \times 3$$

Both are correct

$$2^3 \text{ or } 3^2$$

(2)

6. This rule is used to work out the total cost, in pounds, of hiring a carpet cleaner.

Multiply the number of days' hire by 4

Add 6 to your answer

Peter hires a carpet cleaner.

The total cost is £18

- (a) Work out for how many days he hires the carpet cleaner.

$$\begin{array}{r} 4 \times \text{days} + 6 = 18 \\ - 6 \quad - 6 \\ \hline 4 \times \text{days} = 12 \quad \dots\dots\dots 3 \text{ days} \\ \text{days} = 3 \quad (12 \div 4) \end{array} \quad (2)$$

- (b) Write down an expression, in terms of n , for the total cost, in pounds, of hiring a carpet cleaner for n days.

$$\begin{array}{l} 4 \times \text{days} + 6 \\ 4 \times n + 6 \end{array} \quad \underline{4n + 6} \quad (2)$$

(Total 4 marks)

7. (a) Work out $\frac{3}{8} + \frac{1}{4}$ ← make denominators the same
LCM of 4 and 8 is 8
Give your answer in its simplest form.

$$\frac{3}{8} + \frac{1 \times 2}{4 \times 2} = \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$$

$$\underline{\frac{5}{8}} \quad (2)$$

- (b) Work out $\frac{2}{3} \times \frac{4}{5}$ ← multiply top and bottom

$$\frac{2}{3} \times \frac{4}{5} = \frac{2 \times 4}{3 \times 5} = \frac{8}{15}$$

$$\underline{\frac{8}{15}} \quad (2)$$

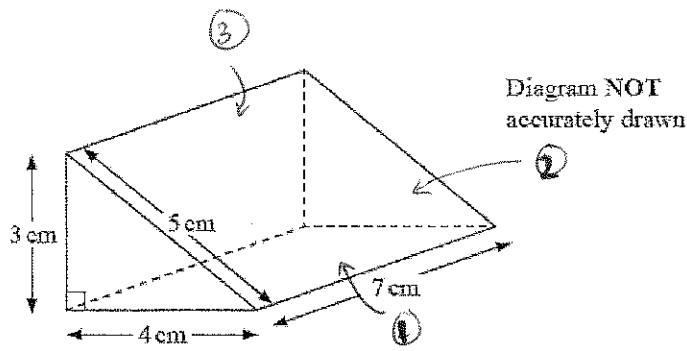
- (c) Work out 423×12

You must show all your working.

$$\begin{array}{r} 423 \\ \times 12 \\ \hline 846 \\ 4230 \\ \hline 5076 \end{array}$$

$$\underline{5076} \quad (3)$$

7.



Work out the total surface area of the triangular prism.
Give the units with your answer.

2 triangles + 3 rectangles

$$\text{area of triangle} = \frac{b \times h}{2} = \frac{4 \times 3}{2} = \frac{12}{2} = 6 \text{ cm}^2$$

$$\text{area of rectangle ①} = l \times w = 4 \times 7 = 28 \text{ cm}^2$$

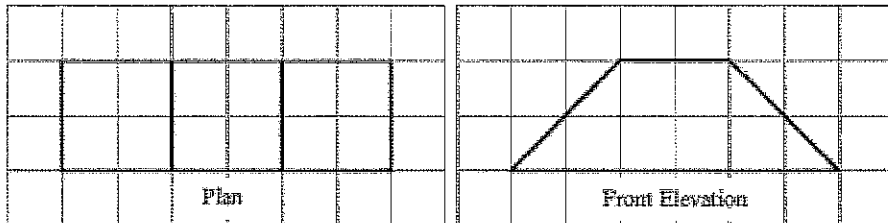
$$\text{rectangle ②} = 5 \times 7 = 35 \text{ cm}^2$$

$$\text{③} = 3 \times 7 = 21 \text{ cm}^2$$

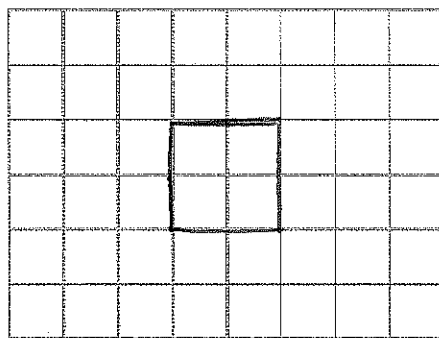
So total surface area: $\dots\dots\dots 96 \text{ cm}^2$
 $(2 \times 6) + 28 + 35 + 21$ (Total 4 marks)

$$\begin{array}{r} 12 \\ 28 \\ 35 \\ 21 \\ \hline 96 \end{array}$$

9. Here are the plan and front elevation of a solid shape.



(a) On the grid below, draw the side elevation of the solid shape.



(2)

(b) In the space below, draw a sketch of the solid shape.



(2)

Go through the my maths forum on this!

8. Simon wants to find out how much people spend using their mobile phone.

He uses this question on a questionnaire.

How much do you spend using your mobile phone?		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
£1-£5	£5-£10	£10-£15

(a) Write down two things that are wrong with this question.

1 He needs to state a time frame e.g. per week, per month.

2 The groups overlap.

(2)

(b) Design a better question for his questionnaire to find out how much people spend using their mobile phone.

You should include some response boxes.

How much do you spend each week using your mobile phone?

0

£1-£5

£6-£10

£11+

(2)

11. The length of a line is 63 centimetres, correct to the nearest centimetre.

(a) Write down the least possible length of the line.

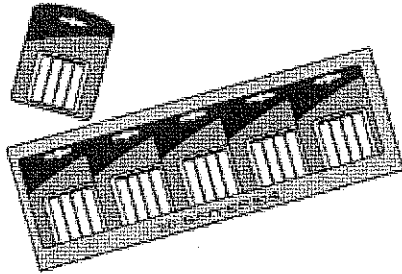
62.5 centimetres
(1)

(b) Write down the greatest possible length of the line.

63.5 centimetres
(1)

12. Batteries are sold in packets and boxes.

Each packet contains 4 batteries.
Each box contains 20 batteries.



20b ← Bill buys p packets of batteries $\rightarrow 4p$
and b boxes of batteries.
Bill buys a total of N batteries.

Write down a formula for N in terms of p and b .

\hookrightarrow needs = sign

$$N = 4p + 20b$$

$$\underline{N = 4p + 20b}$$

(Total 3 marks)

13. (a) Write in standard form 213000

$$\underline{2.13 \times 10^5}$$
 (1)

(b) Write in standard form 0.00123

$$\underline{1.23 \times 10^{-3}}$$
 (1)

13. (a) Write down the reciprocal of 4

\hookrightarrow 1 over the number

$$\underline{\frac{1}{4}}$$
 (1)

(b) Work out the value of $2\frac{4}{5} - 1\frac{3}{4}$

Give your answer as a fraction in its simplest form.

$$\frac{2 \times 5 + 4}{5} = \frac{14}{5}$$

$$\frac{1 \times 4 + 3}{4} = \frac{7}{4}$$

$$\frac{14 \times 4}{5 \times 4} - \frac{7 \times 5}{4 \times 5} = \frac{56}{20} - \frac{35}{20} = \frac{21}{20} = 1\frac{1}{20}$$

make denominator
the same

(3)

13. Make v the subject of the formula $t = \frac{v}{5} + 2$

$v = \dots$

$$t = \frac{v}{5} + 2$$

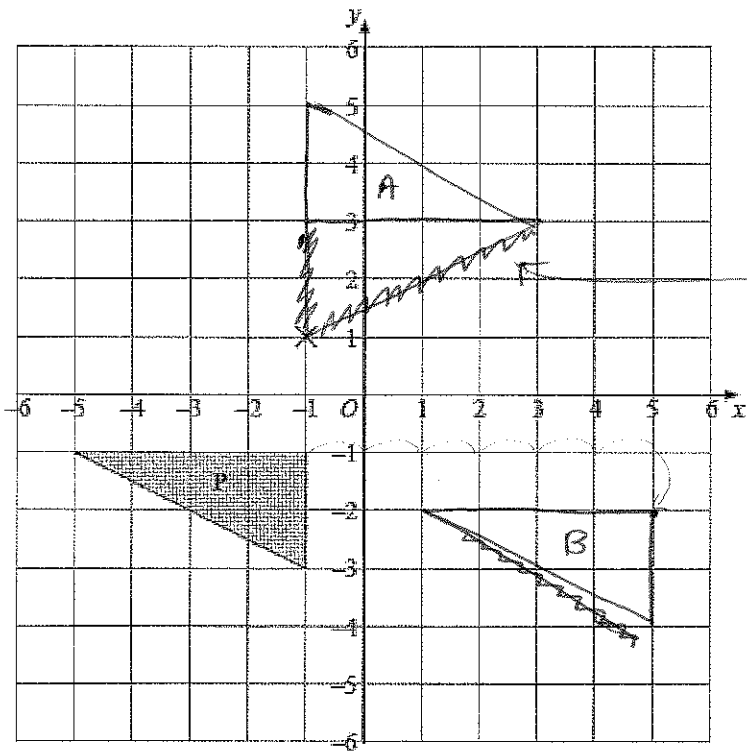
$$t - 2 = \frac{v}{5}$$

$$v = (t - 2) \times 5$$

$v = 5(t - 2)$

(Total 2 marks)

14.



Double check your answer!

use pencil!

(a) Rotate triangle P 180° about the point $(-1, 1)$.

Label the new triangle A

(2)

(b) Translate triangle P by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.

Label the new triangle B.

(1)

15. (a) Expand $x(3x-5y)$

$$\underline{3x^2 - 5xy} \quad (2)$$

(b) Factorise $x^2 - 36$

↑
difference of two squares

$$\underline{(x-6)(x+6)} \quad (1)$$

(Total 3 marks)

16. (a) Expand and simplify $3(x+5) + 2(5x-6)$

$$\begin{aligned} & 3x + 15 + 10x - 12 \\ &= 3x + 10x + 15 - 12 \\ &= 13x + 3 \end{aligned}$$

$$\underline{13x + 3} \quad (2)$$

(b) Simplify $\frac{2x+4}{2} = \frac{\cancel{2}(x+2)}{\cancel{2}}$

$$\underline{x+2} \quad (1)$$

(c) Factorise $5x + 10$

$$\underline{5(x+2)} \quad (1)$$

(d) Factorise fully $x^2y + xy^2$

$$\underline{xy(x+y)} \quad (2)$$

15. k is an integer such that $-1 \leq k < 3$

(a) List all the possible values of k .

$$\underline{-1, 0, 1, 2} \quad (2)$$

(b) Solve the inequality $6y \geq y + 10$

Like solving an equation

$$6y \geq y + 10$$

$$-y \quad -y$$

$$\frac{5y}{5} \geq \frac{10}{5}$$

$$y \geq 2$$

$$\underline{y \geq 2} \quad (2)$$

(Total 4 marks)

16. Make q the subject of the formula $5(q+p) = 4 + 8p$
Give your answer in its simplest form.

$$5(q+p) = 4 + 8p$$

$$5q + 5p = 4 + 8p \quad -5p$$

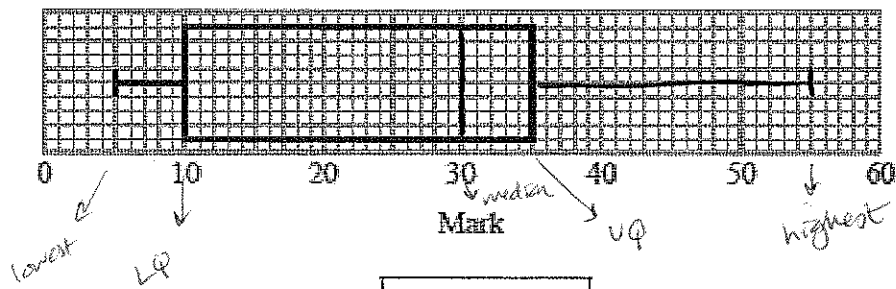
$$5q = 4 + 8p - 5p$$

$$5q = 4 + 3p$$

$$q = \frac{4 + 3p}{5}$$

$$q = \underline{\frac{4 + 3p}{5}} \quad (Total 3 marks)$$

16. The incomplete box plot and table show some information about some marks.



	Mark
Lowest mark	5
Lower quartile	10
Median	30
Upper quartile	35
Highest mark	55

(a) Use the information in the table to complete the box plot.

(2)

(b) Use the information in the box plot to complete the table.

(1)

(Total 3 marks)

17. (a) Write 6.4×10^4 as an ordinary number.

$$6 \times 4000$$

$$64000$$

(1)

(b) Write 0.0039 in standard form.

$$3.9 \times 10^{-3}$$

(1)

(c) Write 0.25×10^7 in standard form.

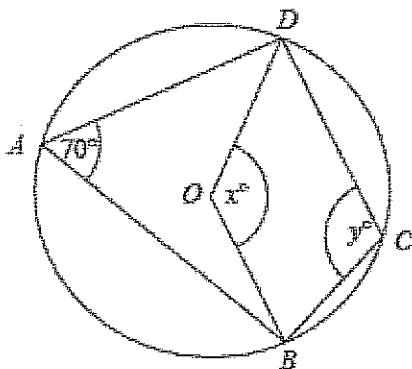
$$2.5 \times 10^6$$

(1)

(Total 3 marks)

18.

Diagram NOT
accurately drawn



In the diagram, A , B , C and D are points on the circumference of a circle, centre O .

Angle $BAD = 70^\circ$.

Angle $BOD = x^\circ$.

Angle $BCD = y^\circ$.

(a) (i) Work out the value of x .

$$x = 140^\circ$$

(ii) Give a reason for your answer.

Angle at centre is double the
angle at the circumference.

(2)

(b) (i) Work out the value of y .

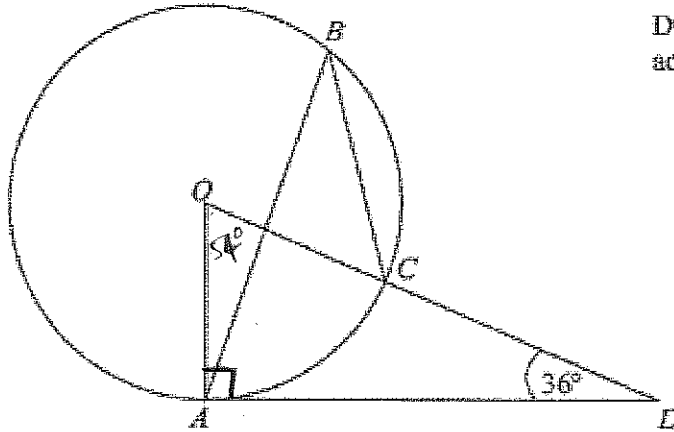
$$y = 110^\circ$$

(ii) Give a reason for your answer.

Opposite angles in a cyclic quadrilateral
add up to 180° .

(2)

18.

Diagram NOT
accurately drawn

The diagram shows a circle centre O .
 A , B and C are points on the circumference.

DCO is a straight line.
 DA is a tangent to the circle.

Angle $ADO = 36^\circ$

(a) Work out the size of angle AOD .

Radius and tangent meet at 90°
 So, $\angle AOD = 180^\circ - 90^\circ - 36^\circ$

54

 (2)

(b) (i) Work out the size of angle ABC .

27

 (3)

(ii) Give a reason for your answer.

Angle at centre ($\angle AOD$) is double the
 angle at circumference ($\angle ABC$) (3)

18. (a) Work out $2\frac{17}{20} - 1\frac{2}{5}$

$$\begin{array}{c} \swarrow \quad \searrow \\ \frac{57}{20} - \frac{7 \times 4}{5 \times 4} = \frac{57}{20} - \frac{28}{20} = \frac{29}{20} \end{array}$$

.....
(3)

(b) Work out $2\frac{2}{3} \times 1\frac{3}{4}$

$$\begin{array}{c} \swarrow \\ \frac{8}{3} \times \frac{7}{4} = \frac{56}{12} \end{array}$$

.....
(3)

19. Solve the simultaneous equations.

$$\begin{aligned} 2x + 3y &= 0 \\ x - 3y &= 9 \end{aligned}$$

eliminate y

$$\begin{array}{r} 2x + 3y = 0 \\ + \quad x - 3y = 9 \\ \hline 3x = 9 \end{array}$$

$$x = 3$$

So, $x - 3y = 9$

$$3 - 3y = 9$$

$$-3y = 6$$

$$y = -2$$

check:

$$2x + 3y$$

$$(2 \times 3) + (3 \times -2)$$

$$6 + -6 = 0 \checkmark$$

$$x = 3, y = -2$$

(Total 3 marks)

21. Work out

$$(2 + \sqrt{3})(2 - \sqrt{3})$$

like expanding brackets

Give your answer in its simplest form.

$$4 - 2\sqrt{3} + 2\sqrt{3} - \sqrt{3}\sqrt{3}$$

$$= 4 - 3$$

$$= 1$$

remember
 $\sqrt{a}\sqrt{a} = a$

(Total 2 marks)

$$\rightarrow x^2 - 4x + 2$$

20. (a) Complete the table of values for $y = x^2 - 4x + 2$

x	-1	0	1	2	3	4	5
y	7	2	-1	-2	-1	2	7

$$(-1)^2 - (4 \times -1) + 2$$

$$= 1 + 4 + 2$$

$$2^2 - (4 \times 2) + 2$$

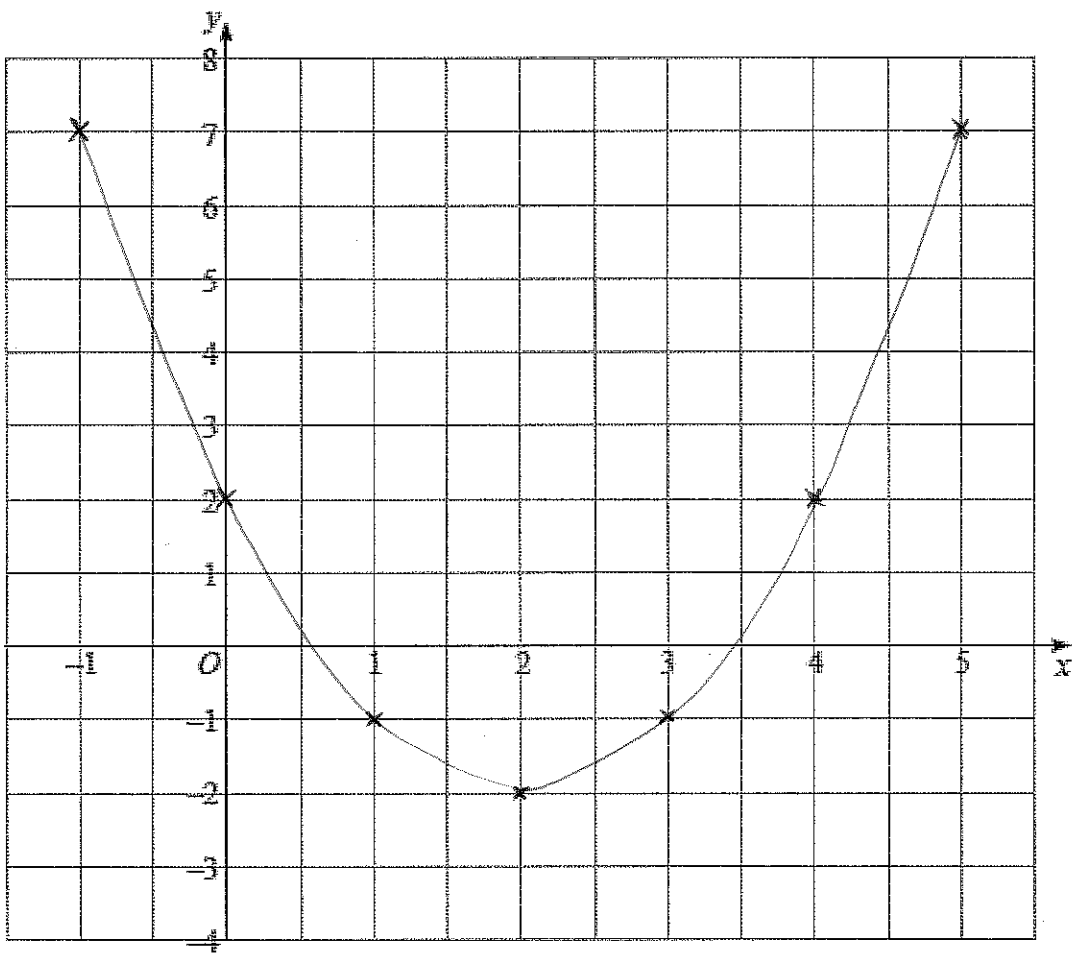
$$= 4 - 8 + 2$$

$$4^2 - (4 \times 4) + 2$$

$$= 16 - 16 + 2$$

(2)

(b) On the grid, draw the graph of $y = x^2 - 4x + 2$



(2)

Remember to join the points!

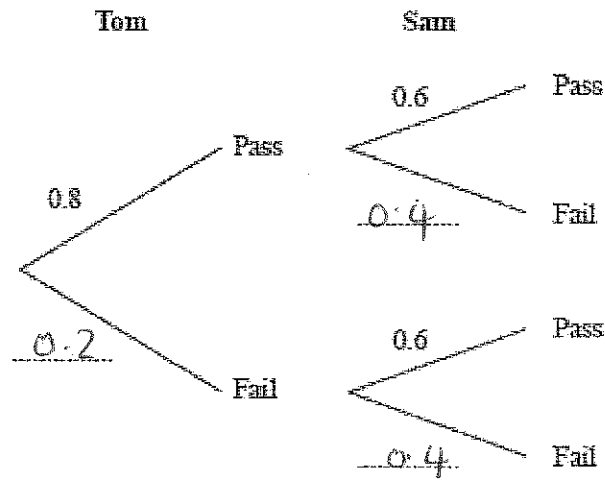
(Total 4 marks)

21. Tom and Sam each take a driving test.

The probability that Tom will pass the driving test is 0.8

The probability that Sam will pass the driving test is 0.6

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that both Tom and Sam will pass the driving test.

Tom pass and Sam pass

0.8 x 0.6

0.48

(2)

23. (a) Expand and simplify $(x-3)(x+5)$

$$x^2 + 5x - 3x - 15$$

$$x^2 + 2x - 15$$

(2)

(b) Solve $x^2 + 8x - 9 = 0$

↓
factorise

$$x^2 + 8x - 9 = 0$$

$$(x+9)(x-1) = 0$$

since $9 \times -1 = -9$
 $9 + -1 = 8$

$$\text{so, } x = -9 \text{ or } x = 1$$

(3)

