

Examiner's use only

Team Leader's use only

Paper Reference

1380/3H

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 3 (Non-Calculator)

Higher Tier

Friday 2 March 2012 – Afternoon

Time: 1 hour 45 minutes

Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers

Nil

Candidates

Write your centre number, candidate number, your surname, initials and signature in the correct question paper.
Write your answers in the spaces provided in this question paper.
Do not write on the formulae page.
The formulae page will gain NO credit.
To complete your answer to any question, use additional answer sheets.

Candidates

Equal questions and the parts of questions are shown in round brackets: e.g. (2).
The total mark for this paper is 100.
This question paper. Any blank pages are indicated.
Do not use.

Notes

Do not use a calculator.
Do not spend too long on one question.
If you are stuck on a question, leave it and attempt the next one.
Do not use any of the space you have left out.

Answer ALL TWENTY FOUR questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1. (a) Simplify $2a + 3b - a - b$

$$\frac{a + 2b}{(2)}$$

(b) Expand $4(2m - 3n)$

$$\frac{8m - 12n}{(1)}$$

(Total 3 marks)

2. Work out an estimate for the value of $\frac{60.2 \times 0.799}{223}$
Give your answer as a decimal.

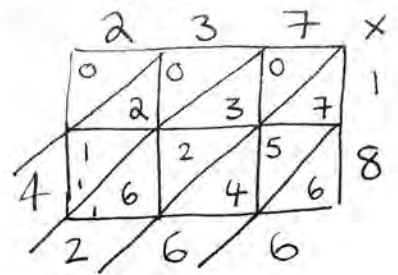
$$\frac{60 \times 0.8}{200} = \frac{48}{200} = \frac{24}{100}$$

$$\frac{0.24}{(3)}$$

(Total 3 marks)

3. Fred buys 18 tins of polish costing £2.37 each.

(a) Work out the total cost.



$2 \times 18 \approx 36$

£ 42.66
(3)

A vacuum cleaner costs £85
Fred gets 10% off the price of the vacuum cleaner.

(b) Work out how much he has to pay.

$10\% = \pounds 8.50$

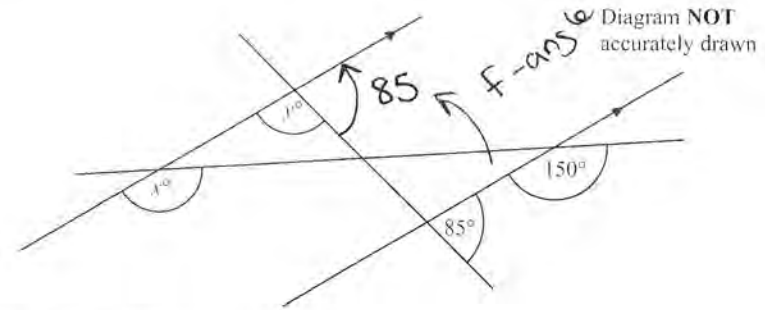
$$\begin{array}{r} 85.00 \\ - 8.50 \\ \hline \pounds 76.50 \end{array}$$

£ 76.50
(3)

(Total 6 marks)

Q3

4.



(a) Find the value of x.

150°
(1)

(b) Find the value of y.
Give reasons for your answer.

$y = 180 - 85 \rightarrow$ F-angle
angles on a st. line
sum to 180°

95°
(2)

(Total 3 marks)

are only red counters, blue counters and green counters in a bag.
 are 5 red counters.
 are 6 blue counters.
 is 1 green counter.

akes at random a counter from the bag.

ork out the probability that Jim takes a counter that is **not** red.

$$\frac{7}{12}$$

(2)

uts the counter back in the bag.

n puts some more green counters into the bag.

robability of taking at random a red counter is now $\frac{1}{3}$

ork out the number of green counters that are now in the bag.

$$\frac{1}{3} \text{ of total} = 5$$

15 counters, extra 3 green added

$$1+3 = 4$$

4

(2)

(Total 4 marks)

Q5

6.



There are $1\frac{1}{2}$ litres of juice in a jug.

Lisa is going to pour the juice into some glasses.
 She will fill each glass with 175 ml of juice.

Work out the greatest number of glasses she can fill.

$$2 \text{ g} = 350 \text{ ml}$$

$$4 \text{ g} = 700 \text{ ml}$$

$$8 \text{ g} = 1400 \text{ ml}$$

only 100 ml left
 not enough.

$$1\frac{1}{2} = 1500 \text{ ml}$$

8

(Total 4 marks)

7. Jo measured the times in seconds it took 18 students to run 400 m. Here are the times.

67	78	79	98	96	103
75	85	94	92	61	80
82	86	90	95	90	89

(a) Draw an ordered stem and leaf diagram to show this information.

6		1	7
7		5	8 9
8		0 2 5 6 9	
9		0 0 2 4 5 6 8	
10		3	

Key:
8|2 = 82

(b) Work out the median.

$\frac{18+1}{2} = 9.5$ In between 9th - 10th
86 - 89

87.5 seconds

(Total 5 marks)

Q7

8. (a) Solve $13x + 1 = 11x + 8$

$2x = 7$

$x = 3.5$ (2)

(b) Show that $y = -2$ is a solution of the equation $\frac{4}{y} + y = 2y$

$\frac{4}{y} + y = \frac{4}{-2} - 2 = -2 - 2 = -4$

$2y = 2(-2) = -4$

(2)
(Total 4 marks)

9. Sweets are sold in bags and in tins.

There are 20 sweets in a bag.
There are 30 sweets in a tin.

Lee buys B bags of sweets and T tins of sweets.

He buys a total of S sweets.
Write down a formula for S in terms of B and T .

$S = 20B + 30T$

(Total 3 marks)

10. Jim has only 5p coins and 10p coins.

The ratio of the number of 5p coins to the number of 10p coins is 2 : 3

Work out the ratio of

the total value of the 5p coins : the total value of the 10p coins.

Give your answer in its simplest form.

$$\begin{matrix} 2 : 3 \\ \times 5 \\ \hline 10 : 15 \end{matrix}$$

$$10 : 30$$

1 : 3

Q10

(Total 2 marks)

11.

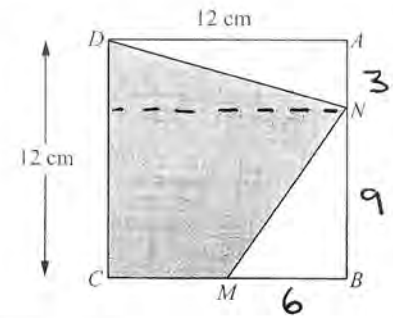


Diagram NOT accurately drawn

ABCD is a square of side 12 cm.

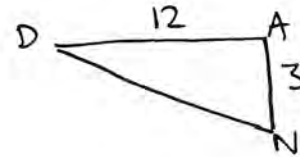
M is the midpoint of CB.

N is a point on AB.

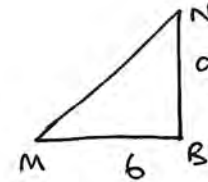
$$AN = \frac{1}{4} AB.$$

$$AN = \frac{1}{4} \times 12 = 3$$

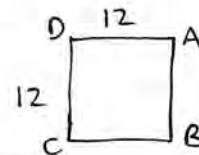
Calculate the area of the shaded region CDNM.



$$\text{Area} = \frac{12 \times 3}{2} = 18$$



$$\text{Area} = \frac{6 \times 9}{2} = 27$$



$$12 \times 12 = 144$$

99 cm²

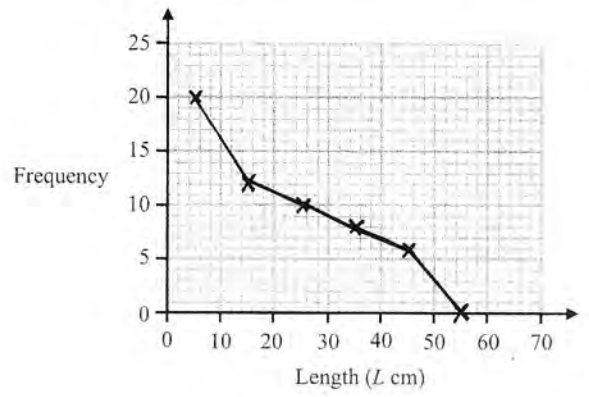
(Total 6 marks)

$$144 - 45 = 99$$

12. The table gives information about the lengths of the branches on a bush.

Length (L cm)	Frequency
$0 \leq L < 10$	20
$10 \leq L < 20$	12
$20 \leq L < 30$	10
$30 \leq L < 40$	8
$40 \leq L < 50$	6
$50 \leq L < 60$	0

(a) Draw a frequency polygon to show this information.



(2)

(b) Write down the modal class interval.

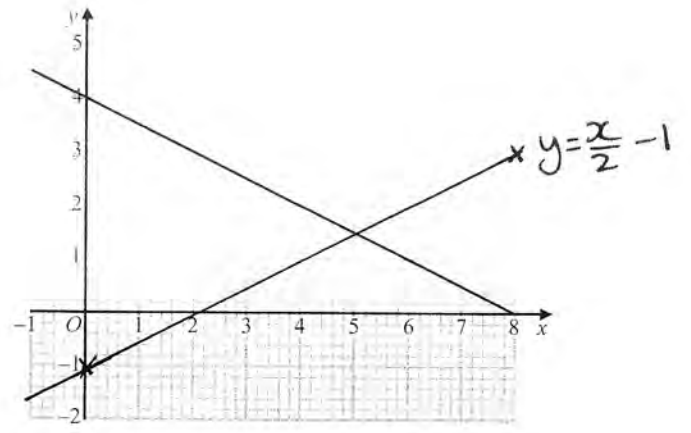
↓
most common

$0 \leq L < 10$
(1)

(Total 3 marks)

Q12

13.



The graph of the straight line $x + 2y = 8$ is shown on the grid.

(a) On the grid, draw the graph of $y = \frac{x}{2} - 1$

$x=0, y=-1$ $x=8, y=4-1=3$

(3)

(b) Use the graphs to find estimates for the solution of

$$x + 2y = 8$$

$$y = \frac{x}{2} - 1$$

$x = \dots 5 \dots$ $y = \dots 1.5 \dots$
(1)

(Total 4 marks)

Q13

14. (a) Write 6.43×10^5 as an ordinary number.

$$\underline{643000}$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$
Give your answer in standard form.

$$\begin{aligned} 16 \times 10^{7-12} \\ 16 \times 10^{-5} \\ 1.6 \times 10^1 \times 10^{-5} \\ 1.6 \times 10^{1-5} \end{aligned}$$

$$\underline{1.6 \times 10^{-4}}$$

(2)

Q14

(Total 3 marks)

15. (a) Factorise fully $2x^2 - 4xy$

$$\underline{2x(x-2y)}$$

(2)

- (b) Factorise $p^2 - 6p + 8$

$$\underline{(p-4)(p-2)}$$

(2)

- (c) Simplify $\frac{(x+2)^2}{x+2}$

$$\underline{x+2}$$

(1)

- (d) Simplify $2a^2b \times 3a^3b$

$$\underline{6a^5b^2}$$

(2)

Q15

16. All the students in Mathstown school had a test.

The lowest mark was 18

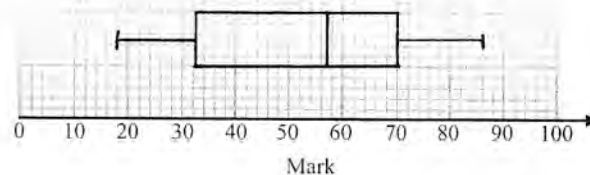
The highest mark was 86

The median was 57

The lower quartile was 32

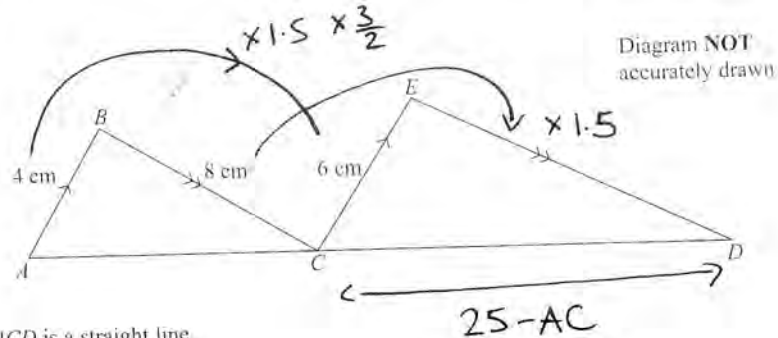
The interquartile range was 38 $\Rightarrow UQ = 32 + 38 = 70$

On the grid, draw a box plot to show this information.



(Total 3 marks)

17.



ACD is a straight line.
 AB is parallel to CE .
 BC is parallel to ED .

$AB = 4$ cm.
 $CE = 6$ cm.
 $BC = 8$ cm.

(a) Calculate the length of ED .

$$8 \times \frac{3}{2}$$

..... 12 cm
 (2)

$AD = 25$ cm.

(b) Calculate the length of AC .

$$AC \times 1.5 = 25 - AC$$

$$2.5AC = 25$$

$$AC = \frac{25}{2.5} = \frac{250}{25} \dots\dots\dots 10 \dots\dots\dots \text{cm}$$

(2)

(Total 4 marks)

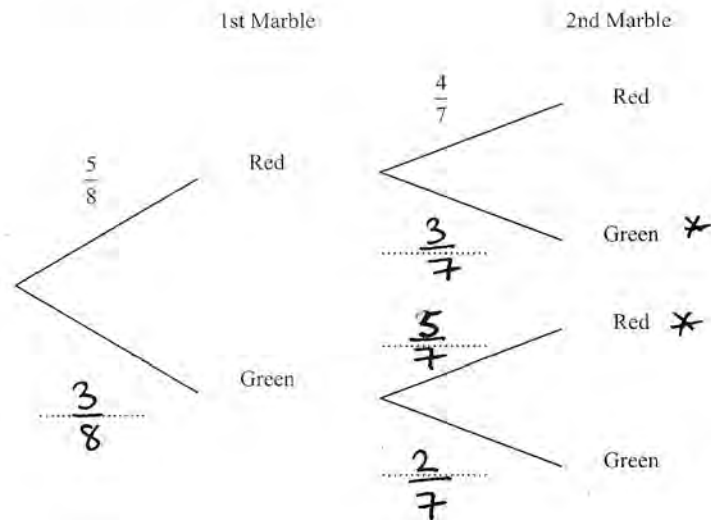
Q17

18. There are only red marbles and green marbles in a bag.
 There are 5 red marbles and 3 green marbles.

Dwayne takes at random a marble from the bag.
 He does not put the marble back in the bag.

Dwayne takes at random a second marble from the bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dwayne takes marbles of different colours.

$$RG = \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$$

$$GR = \frac{3}{8} \times \frac{5}{7} = \frac{15}{56}$$

$$\frac{15}{56} + \frac{15}{56} = \frac{30}{56} = \frac{15}{28}$$

..... $\frac{15}{28}$

(3)

(Total 5 marks)

19.

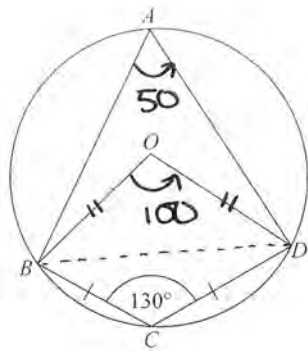


Diagram NOT accurately drawn

A, B, C and D are points on a circle, centre O.
 $BC = CD$.
 Angle $BCD = 130^\circ$.

(a) Write down the size of angle BAD .
 Give a reason for your answer.

opposite angles in a cyclic quadrilateral sum to 180°

..... 50
 (2)

(b) Work out the size of angle ODC .
 Give reasons for your answer.

$OB = OD$ radii
 $\therefore \triangle OBD$ is isosceles

$\angle ODB = \frac{180 - 100}{2} = 40$

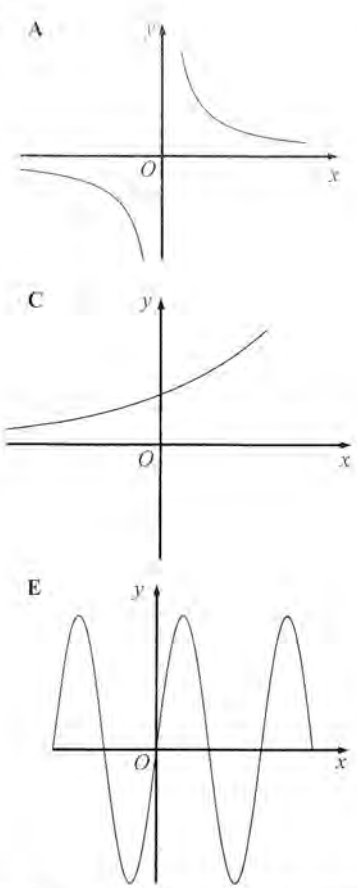
$\angle BDC = \frac{180 - 130}{2} = 25$

..... 65
 (4)

(Total 6 marks)

Q19

20.



Each equation in the table represents one of the graphs A to F.

Write the letter of each graph in the correct place in the table.

Equation	Graph
$y = 4 \sin x^\circ$	E
$y = 4 \cos x^\circ$	B
$y = x^2 - 4x + 5$	F
$y = 4 \times 2^x$	C
$y = x^3 + 4$	D
$y = \frac{4}{x}$	A

(Total 3 marks)

21. Here is a shape $ABCDE$.

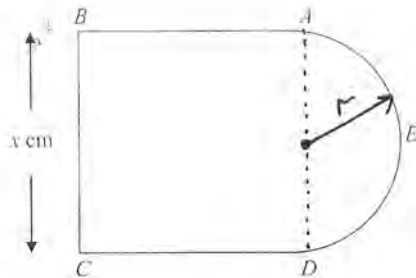


Diagram NOT accurately drawn

AB , BC and CD are three sides of a square.

$BC = x$ cm.

AED is a semicircle with diameter AD .

The perimeter, P cm, of the shape $ABCDE$ is given by the formula

$$P = 3x + \frac{\pi x}{2}$$

(a) Rearrange this formula to make x the subject.

$$P = \frac{6x}{2} + \frac{\pi x}{2}$$

$$P = \frac{6x + \pi x}{2}$$

$$2P = 6x + \pi x$$

$$2P = (6 + \pi)x$$

$$\div$$

$$x = \frac{2P}{6 + \pi} \quad (2)$$

The area, A cm², of this shape is given by $A = kx^2$ where k is a constant.

(b) Find the exact value of k .

Give your answer in its simplest form.

$$\begin{array}{|c|} \hline x \\ \hline \square \\ \hline 2 \end{array} \quad A = x^2$$

$$\begin{array}{l} \text{D} \quad A = \frac{\pi(\frac{1}{2}x)^2}{2} \\ A = \frac{1}{2}\pi \times \frac{1}{4}x^2 \\ A = \frac{1}{8}\pi x^2 \end{array}$$

$$\begin{aligned} \text{Area} &= x^2 + \frac{1}{8}\pi x^2 \\ &= (1 + \frac{1}{8}\pi)x^2 \end{aligned}$$

$$k = 1 + \frac{1}{8}\pi \quad (3)$$

(Total 5 marks)

22. Expand and simplify $(2 + \sqrt{2})(3 + \sqrt{8})$

Give your answer in the form $a + b\sqrt{2}$ where a and b are integers.

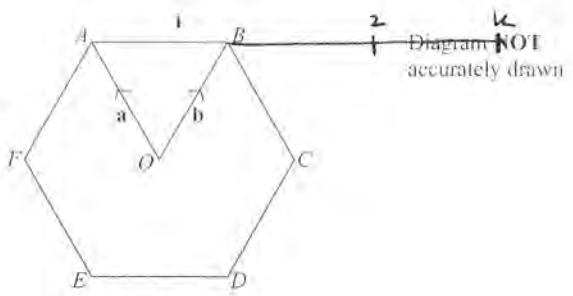
$$\sqrt{8} = \sqrt{4}\sqrt{2} = 2\sqrt{2}$$

$$\begin{aligned} \sqrt{2} \times 2\sqrt{2} \\ &= 2 \times \sqrt{4} \\ &= 2 \times 2 = 4 \end{aligned}$$

	3	$2\sqrt{2}$
2	6	$4\sqrt{2}$
$\sqrt{2}$	$3\sqrt{2}$	4

$$= \underline{10 + 7\sqrt{2}}$$

23.



ABCDEF is a regular hexagon, with centre O.

$\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$.

(a) Write the vector \vec{AB} in terms of \mathbf{a} and \mathbf{b} .

$$\frac{-\mathbf{a} + \mathbf{b}}{\dots}$$

(1)

The line AB is extended to the point K so that $AB : BK = 1 : 2$

(b) Write the vector \vec{CK} in terms of \mathbf{a} and \mathbf{b} .
Give your answer in its simplest form.

$$\begin{aligned} \vec{AK} &= 3\vec{AB} = -3\mathbf{a} + 3\mathbf{b} \\ \vec{BK} &= 2\vec{AB} = -2\mathbf{a} + 2\mathbf{b} \\ \vec{CK} &= \vec{CB} + \vec{BK} \\ &= \mathbf{a} + (-2\mathbf{a} + 2\mathbf{b}) \\ &= -\mathbf{a} + 2\mathbf{b} \end{aligned}$$

$$\frac{-\mathbf{a} + 2\mathbf{b}}{\dots}$$

(3)

(Total 4 marks)

Q23

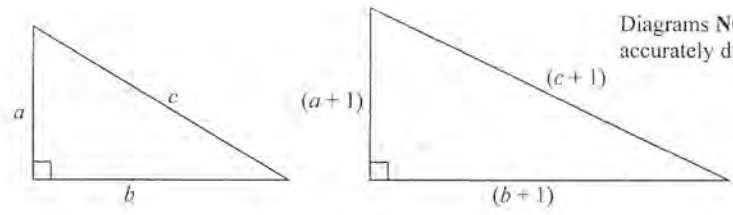
24. Umar thinks $(a+1)^2 = a^2 + 1$ for all values of a .

(a) Show that Umar is wrong.

$$(a+1)^2 = (a+1)(a+1) = a^2 + 2a + 1$$

(2)

Here are two right-angled triangles. All the measurements are in centimetres.



(b) Show that $2a + 2b + 1 = 2c$

$$\begin{aligned} a^2 + b^2 &= c^2 \\ (a+1)^2 + (b+1)^2 &= (c+1)^2 \\ a^2 + 2a + 1 + b^2 + 2b + 1 &= c^2 + 2c + 1 \\ (a^2 + b^2) + 2a + 1 + 2b + 1 &= c^2 + 2c + 1 \\ c^2 + 2a + 1 + 2b + 1 &= c^2 + 2c + 1 \\ 2a + 1 + 2b &= 2c \quad \# \end{aligned}$$

(3)

a , b and c cannot all be integers.

(c) Explain why.

$$\begin{aligned} 2a + 2b + 1 &= 2(a+b) + 1 \\ 2(a+b) &= \text{even} \\ 2(a+b) + 1 &= \text{odd} \\ 2c &= \text{even} \end{aligned}$$

\therefore can not be equal

(Total 6 marks)

Q24