Write your name here

Surname

Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9 - 1)

Centre Number

Candidate Number

Mathematics

mel@justmaths.co.uk.
I have rushed to put these
together so there maybe some
mistakes.

Paper 3 (Calculator)

Higher Tier

Mr Musson's predicted Paper 3

NOTE: THIS IS PRACTICE OF TOPICS THAT HAVE NOT YET
APPEARED IN PAPER'S 1 AND 2.

Soz x

Paper Reference
1MA1/3H

You must have: Ruler graduated in centimetres and millimetres,
protractor, pair of compasses, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Total Marks

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
  be more space than you need.
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be
  3.142 unless the question instructs otherwise.

– there may

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.

Q1.

A company orders a number of bottles from a factory.

The 8 machines in the factory could make all the bottles in 5 days.
All the machines work at the same rate.

$8 \times 5 = 40$ 'machine days)

For 2 days, only 4 machines are used to make the bottles.
From the 3rd day, all 8 machines are used to make the bottles.

Work out the total number of days taken to make all the bottles.

① 4 machine days
② 4 machine days = 8
40 - 8 = 32
③ 8 " "
④ 8 " "
⑤ 8 " "
⑥ 8 " "
‾‾‾‾
40

.... 6 .... days

(Total for question = 3 marks)

Q2. Identical pairs of boots are sold in London, in Geneva and in Paris.

These boots have a price of

£115 in London
189 Swiss francs in Geneva
174 euros in Paris

The exchange rates are

£1 = 1.39 Swiss francs
£1 = 1.27 euros

Are the boots the best value for money in London or in Geneva or in Paris?
You must show how you get your answer.

L
£115

G
189 Swf.
÷ 1.39
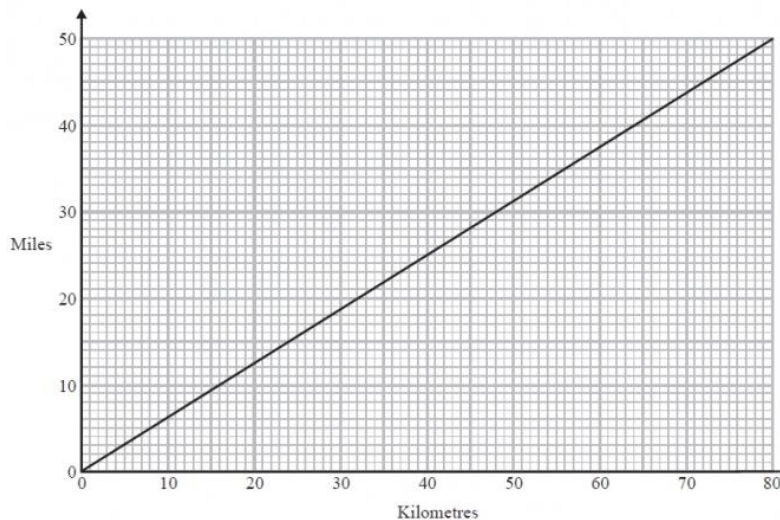= £135.95

P
174 Euro
÷ 1.27
£137.01
.... London ....

115 < 135.95 < 137.01

(Total for question = 3 marks)

Q3.

You can use this conversion graph to change between miles and kilometres.

Handwritten annotation: 80km = 50miles

Mary has to drive from Paris to Calais, and then from Dover to Sheffield.
The total distance she has to drive is 350 miles.

Mary has already driven 240 km from Paris to the ferry at Calais.
She goes on a ferry to Dover.
She now has to drive from Dover to Sheffield.

Mary has enough petrol to drive 180 miles.

Will Mary have to stop for petrol on the way to Sheffield?

Handwritten working:

P → C 🚢 D → S = 350miles

×3 { 240km = 150 miles
     80km = 50miles

350 - 150 = 200 mile
left · 180 < 200

Mary will have to stop

(Total for Question is 4 marks)

Q4.

A set of tyres normally costs £500
In a sale there is a 30% discount.

Work out the sale price of the set of tyres.

Handwritten working: 500 × 0·7 =

£ 350

(Total for Question is 3 marks)

Q5.

Derek buys a house for £150 000
He sells the house for £154 500

(a) Work out Derek's percentage profit.

$$\frac{4000}{150,000} \times 100$$

$$2.6\overset{\circ}{6}\%$$

(3)

Derek invests £154 500 for 2 years at 4% per year compound interest.

(b) Work out the value of the investment at the end of 2 years.

$$154500 \times 1.04^2$$

£167,107.20

(3)

(Total for Question is 6 marks)

Q6.

$$m = \frac{\sqrt{s}}{t}$$

s = 3.47 correct to 2 decimal places
t = 8.132 correct to 3 decimal places

By considering bounds, work out the value of m to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

3.47
S
3.465   3.475

8.132
t
8.1315   8.1325

$$m_{UB} = \frac{\sqrt{3.475}}{8.1315}$$
$$= 0.22924\ldots$$

$$m_{LB} = \frac{\sqrt{3.465}}{8.1325}$$
$$= 0.228890\ldots$$

$m = 0.229$

(both ub + lb round to this!)

(Total for Question is 5 marks)

Q7.

(a) Expand $3(x + 2)$

$3x + 6$

(2)

(b) Factorise completely $12x^3y - 18xy^2$

$6xy(2x^2 - 3y)$

(2)

(c) Expand and simplify $(2x - 3)(x + 4)$

$2x^2 + 8x - 3x - 12$

$2x^2 + 5x - 12$

(2)

(d) Simplify $5x^4y^3 \times 2x^3y^2$

$10x^7y^5$

(2)

(Total for Question is 8 marks)

Q8.

Show that

$$(3x - 1)(x + 5)(4x - 3) = 12x^3 + 47x^2 - 62x + 15$$

for all values of x.

$= (3x^2 + 15x - x - 5)(4x - 3)$

$= (3x^2 + 14x - 5)(4x - 3$

$12x^3 - 9x^2 + 56x^2 - 42x - 20x + 15$

$= 12x^3 + 47x^2 - 62x + 15$. as required.

(Total for question is 3 marks)

Q9.

Factorise $x^2 + 3x - 4$

1, 4 ✓
2, 2

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

(Total for question is 2 marks)

Q10.

Solve the equation $8x^2 - 30x - 27 = 0$

$a = 8$
$b = -30$
$c = -27$

$x = \dfrac{-(-30) \pm \sqrt{(-30)^2 - 4 \times 8 \times -27}}{2 \times 8}$

$= \dfrac{30 \pm \sqrt{1764}}{16}$

$x = 4.5 \qquad x = -0.75$

(Total for Question is 3 marks)

Q11.

Here are the first four terms of an arithmetic sequence.

+5

11 $\underset{6}{\frown}$ 17 $\underset{6}{\frown}$ 23 $\underset{6}{\frown}$ 29

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

$6n + 5$

$6n + 5 = 121 \quad 6n = 116 \quad n = 116/6 \quad n = 23.2$

(2)

(b) Is 121 a term of this arithmetic sequence?
You must explain your answer.

No. its not a term in the sequence n is not an integer.

(2)

(Total for question = 4 marks)

Q12.

The nth term of a sequence is given by $an^2 + bn$ where a and b are integers.

The 2nd term of the sequence is –2
The 4th term of the sequence is 12

$n=2$ $a(2)^2 + b(2) = -2$ $4a + 2b = -2$ ①
$n=4$ $a(4)^2 + b(4) = 12$ $16a + 4b = 12$ ②

(a) Find the 6th term of the sequence.

①×② $8a + 4b = -4$ ③

②−③ $8a = 16$
      $a = 2$

sub $a=2$ into $4a + 2b = -2$
                $8 + 2b = -2$
                $2b = -10$ $b = -5$

$a = 2$
$b = -5$

(4)

Here are the first five terms of a different quadratic sequence.

0 2 6 12 20
 ⌣2 ⌣4 ⌣6 ⌣8
  ⌣2 ⌣2 ⌣2

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

n^2 1   4   9   16   25
$-n$ -1   -2   -3   -4   -5

$n^2 - n$

(2)

(Total for question = 6 marks)

Q13.

Stephanie is x years old.
Tobi is twice as old as Stephanie.
Ulrika is 3 years younger than Tobi.

S   T   U
x $2x$ $2x-3$

The sum of all their ages is 52 years.

(a) Show that $5x - 3 = 52$

$x + 2x + 2x - 3 = 52$
$5x - 3 = 52$

(3)

(b) Work out the value of x.

$5x = 55$
$x = \dfrac{55}{5} = 11$

$x = 11$

(2)

(Total for Question is 5 marks)

Q14.

(a) Expand and simplify $(p + 9)(p - 4)$

$$p^2 + 5p - 36$$

(2)

(b) Solve $\dfrac{5w - 8}{3} = 4w + 2$

$$5w - 8 = 12w + 6$$
$$-14 = 7w$$
$$w = -14/7 \quad w = -2$$

$w =$ . . . .

(3)

(c) Factorise $x^2 - 49$

$$(x+7)(x-7)$$

(1)

(d) Simplify $(9x^8y^3)^{½}$

$$9^{1/2} \; x^{8x^{1/2}} \; y^{3x^{1/2}} = 3x^4 y^{3/2}$$

(2)

(Total for Question is 8 marks)

Q15.

3 teas and 2 coffees have a total cost of £7.80
5 teas and 4 coffees have a total cost of £14.20

Work out the cost of one tea and the cost of one coffee.

$$3T + 2C = 7.80 \times 2 \quad ①$$
$$5T + 4C = 14.20 \quad ②$$
$$6T + 4C = 15.60 \quad ③$$
$$③ - ② \quad T = £1.40$$

$$3 \times 1.40 + 2C = 7.8$$
$$2C = 7.8 - 4.2 \quad C = 1.80$$

tea £ . . . . 1.40 . . . .

coffee £ . . . . 1.80 . . . .

(Total for question = 4 marks)

Q16.

Solve the inequality $x^2 > 3(x + 6)$

$$x^2 - 3x - 18 > 0$$

$$(x - 6)(x + 3) > 0$$

$$x > 6 \qquad x > -3$$

1, 18
2, 9
3, 6

....

(Total for question = 4 marks)

Q17.

(a) On the grid, construct the graph of $x^2 + y^2 = 16$

circle with a radius of 4

(2)

(b) Find estimates for the solutions of the simultaneous equations

$$x^2 + y^2 = 16$$
$$y = 2x + 1$$

....

(3)
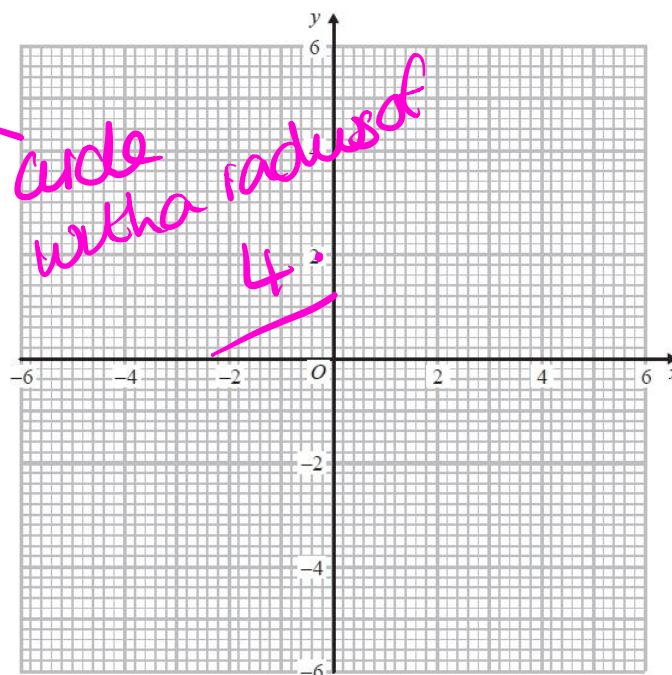
(Total for question = 5 marks)

Q18.

(a) Complete the table of values for $y = x^2 - 2x - 1$

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

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 1$ for values of x from $x = -2 = 3$
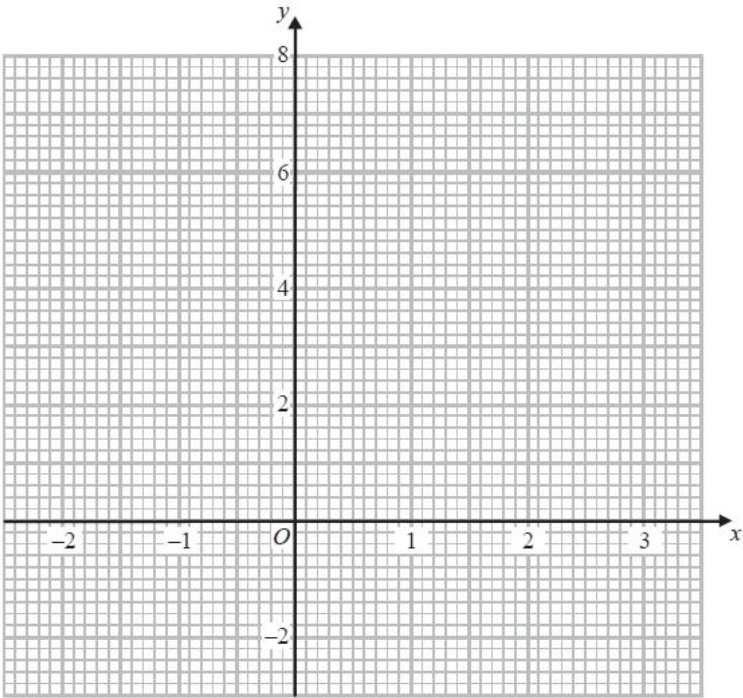
(2)

(c) Find estimates for the solutions of the equation $x^2 - 2x - 1 = 0$

....

(2)

(Total for Question is 6 marks)

Q19.

Here are the first five terms of a sequence.

$$4 \qquad 11 \qquad 22 \qquad 37 \qquad 56$$

Find an expression, in terms of n, for the nth term of this sequence.

....
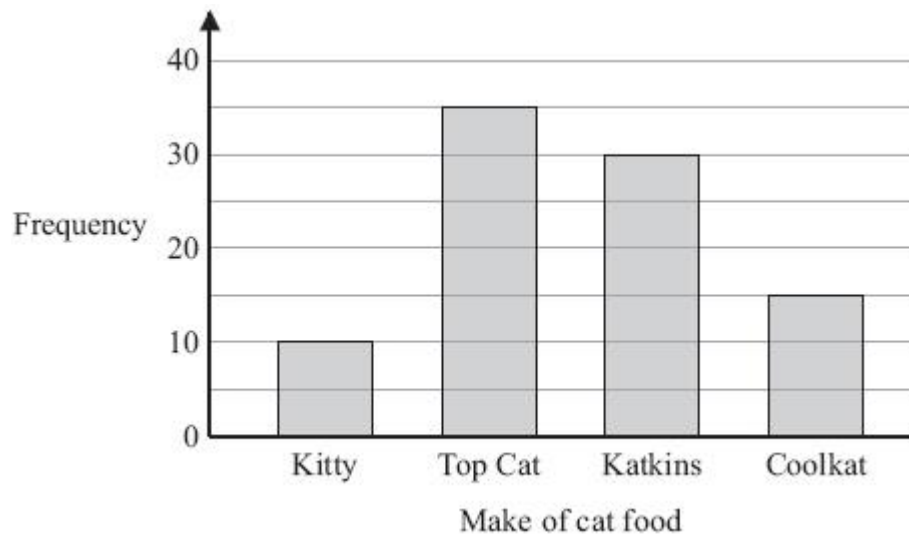
(Total for question = 3 marks)

Q20.

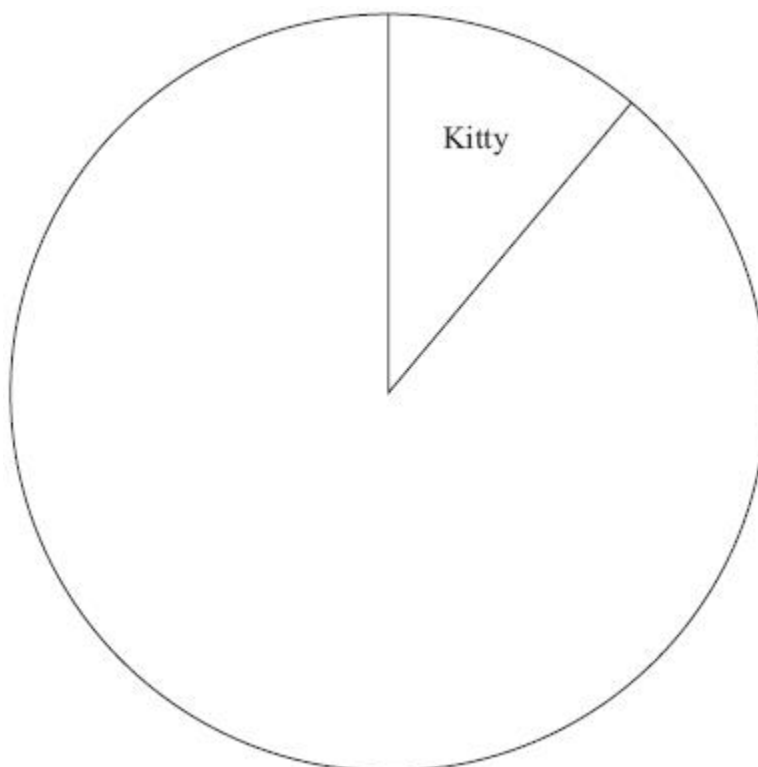A survey was carried out for a magazine.
90 cat owners were asked to write down the make of cat food their cats liked best.

The bar chart shows information about the results.

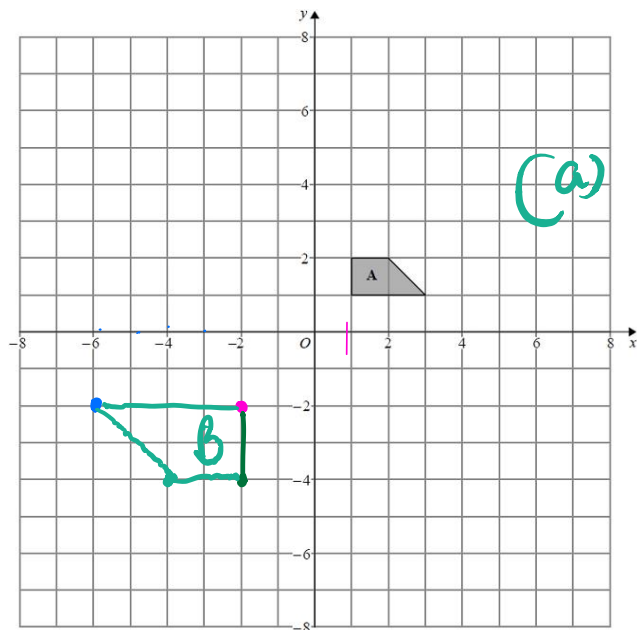The information in the bar chart is going to be shown in a pie chart.

Use the information in the bar chart to complete the pie chart.

(Total for Question is 3 marks)

Q21.

(a) Enlarge shape **A** by scale factor −2, centre (0, 0)
Label your image **B**. ✓

(2)

(b) Describe fully the single transformation that will map shape **B** onto shape **A**.

(a)

→1 ↑1   →3 ↑1
←2 ↓2   ←6 ↓2

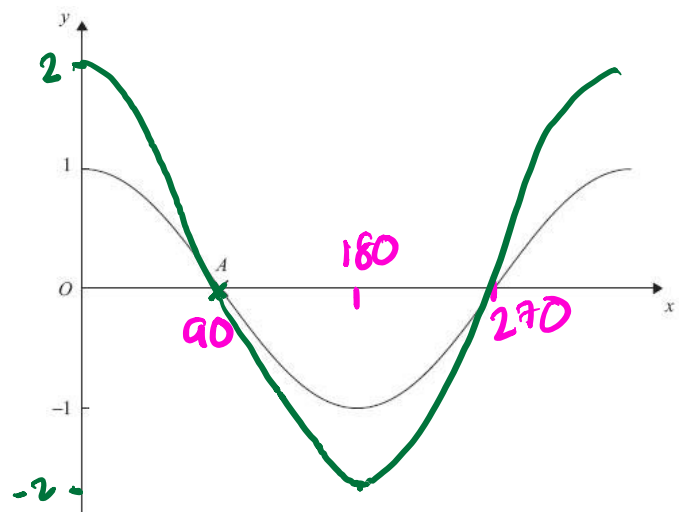→1 ↑2   →2 ↑2
←2 ↓4   ←4 ↓4

centre (0,0) Enlargement, scale factor $-\frac{1}{2}$

(1)

(Total for question = 3 marks)

Q22.

The diagram shows a sketch of the graph of $y = \cos x°$
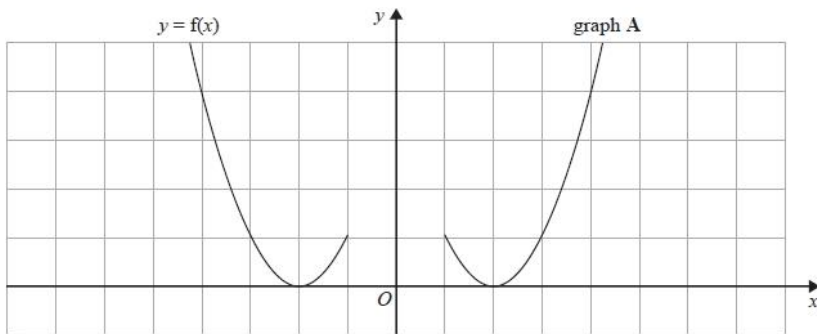
(a) Write down the coordinates of the point *A*.

180

90

270

-2

(90,0)

(1)

(b) On the same diagram, draw a sketch of the graph of $y = 2 \cos x°$

(1)

(Total for Question is 2 marks)

Q23.

The graph of $y = f(x)$ is shown on the grid.

Graph **A** is a reflection of the graph of $y = f(x)$.
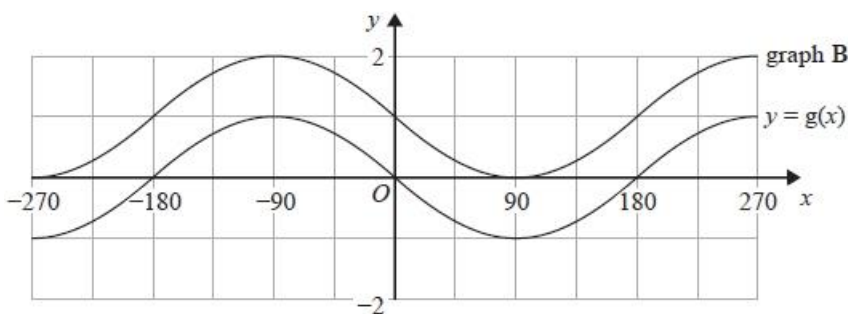
(a) Write down the equation of graph **A**.

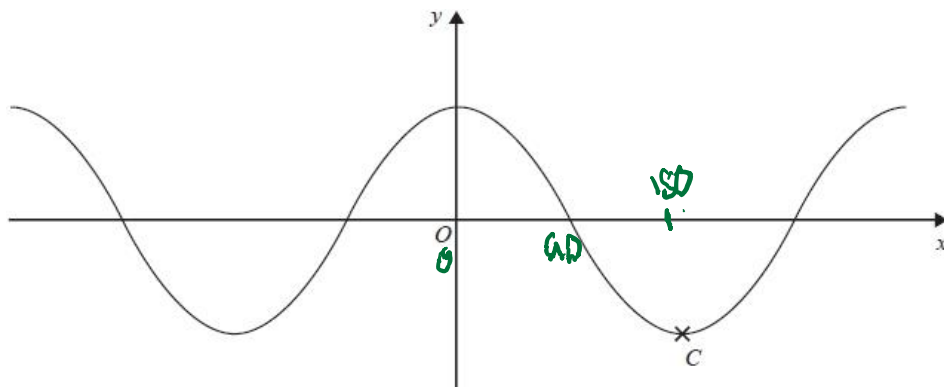$y = f(-x)$

(1)

The graph of $y = g(x)$ is shown on the grid.

Graph **B** is a translation of $y = g(x)$.

(b) Write down the equation of graph **B**.

$y = g(x) + 1$

(1)

The graph of $y = \cos x°$ is shown.

(c) Write down the coordinates of the point marked C.

(180 , -1)

(1)

(Total for question = 3 marks)

Q24.

The histogram shows information about the times taken by some students to finish a puzzle.
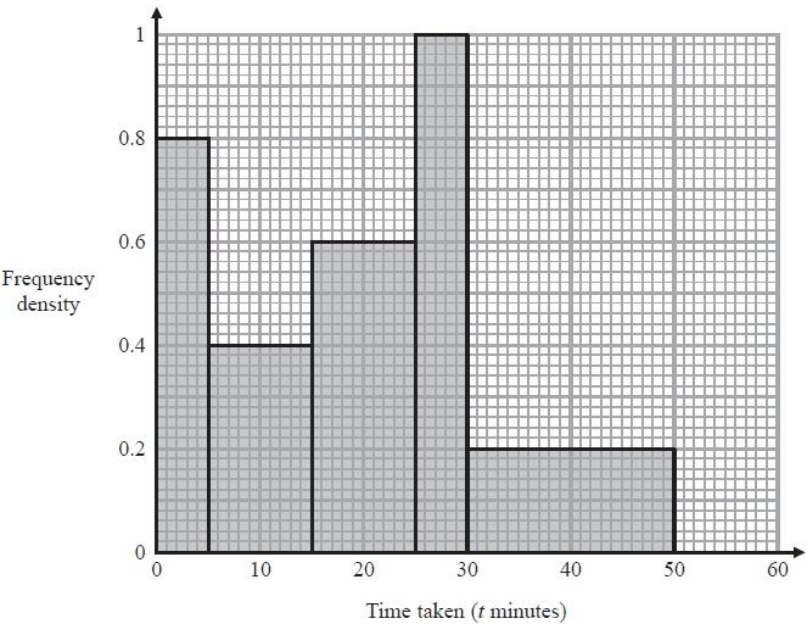
(a) Complete the frequency table for this information.

FD   width

	Time taken (*t* minutes)		Frequency
0·8	0 < t ⩽ 5	5	4
0·4	5 < t ⩽ 15	10	4
0·6	15 < t ⩽ 25	10	6
1	25 < t ⩽ 30	5	5
0·2	30 < t ⩽ 50	20	4

23

(2)

(b) Find an estimate for the lower quartile of the times taken to finish the puzzle.

.... minutes

(2)

(Total for question = 4 marks)

Q25.

Carlos has a cafe in Clacton.
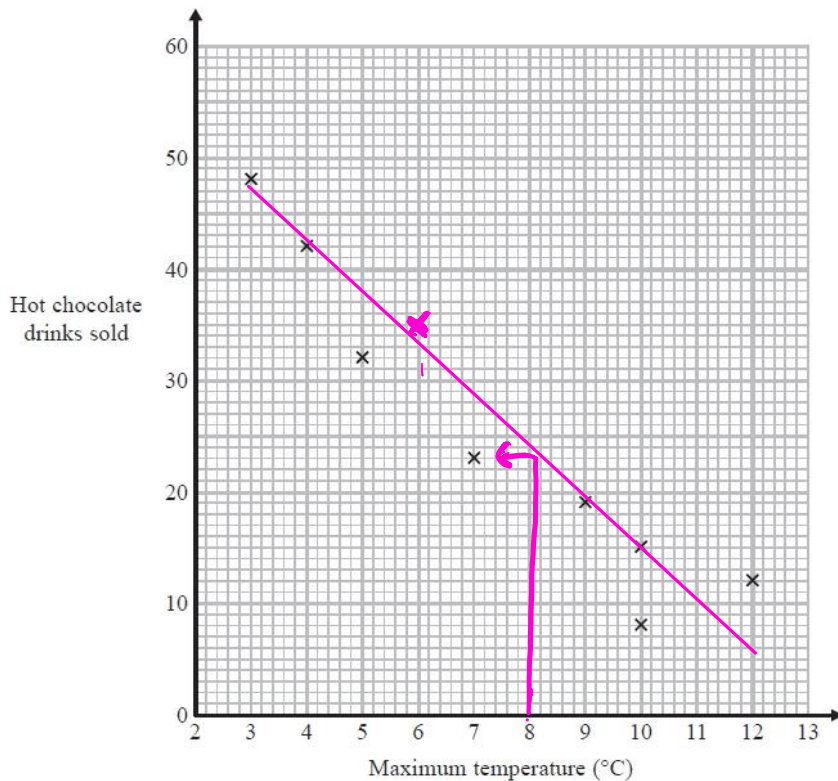Each day, he records the maximum temperature in degrees Celsius (°C) in Clacton and the number of hot chocolate drinks sold.

The scatter graph shows this information.

On another day the maximum temperature was 6 °C and 35 hot chocolate drinks were sold.

(a) Show this information on the scatter graph.

(1)

(b) Describe the relationship between the maximum temperature and the number of hot chocolate drinks sold.

its a negative correlation

....

....

(1)

(c) Draw a line of best fit on the scatter diagram.

(1)

One day the maximum temperature was 8 °C.

(d) Use your line of best fit to estimate how many hot chocolate drinks were sold.

23.

(1)

(Total for Question is 4 marks)

Q26.

Here is a scale drawing of a rectangular garden *ABCD*.

A ⌐────────────────────────────────────┐ *B*

D └────────────────────────────────────┘ *C*

Scale: 1 cm represents 1 metre.

Jane wants to plant a tree in the garden

at least 5m from point *C*,
nearer to *AB* than to *AD*
and less than 3m from *DC*.

On the diagram, shade the region where Jane can plant the tree.

(Total for Question is 4 marks)

Q27.
The table shows some information about the foot lengths of 40 adults.

Foot length (f cm)	Number of adults
$16 \leqslant f < 18$ 14	3
$18 \leqslant f < 20$ 19	6
$20 \leqslant f < 22$ 21	10
$22 \leqslant f < 24$ 23	12
$24 \leqslant f < 26$ 25	9

(a) Write down the modal class interval.

$22 \leqslant f < 24$

(1)

(b) Calculate an estimate for the mean foot length.

$(16 \times 3 + 19 \times 6 + 21 \times 10 + 23 \times 12 + 25 \times 9) \div 40$

$867 \div 40$

21.675

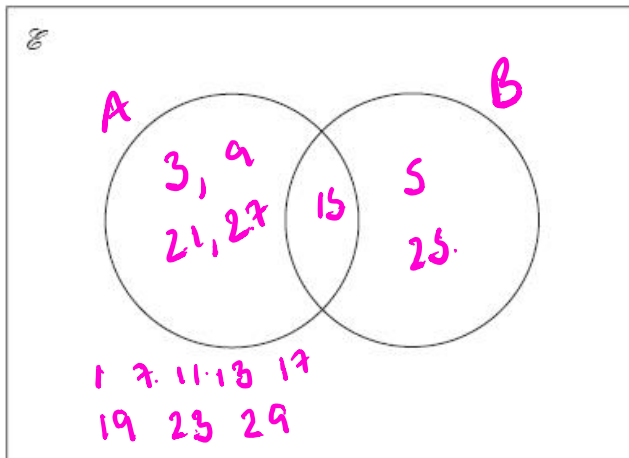................21.675................ cm

(3)

(Total for question = 4 marks)

Q28.

Handwritten in Venn diagram:
- ℰ (top left)
- A (circle label)
- B (circle label)
- 3, 9, 21, 27 (in A only)
- 15 (in intersection)
- 5, 25 (in B only)
- 1 7. 11.13 17 19 23 29 (outside circles)

LOOK ↓

ℰ = odd numbers less than 30
A = 3, 9, 15, 21, 27
B = 5, 15, 25

(a) Complete the Venn diagram to represent this information.

(4)

A number is chosen at random from the universal set, ℰ.

(b) What is the probability that the number is in the set A ∪ B?

$\frac{1}{15}$

....

(2)

(Total for question = 6 marks)

Q29.

Diagram **NOT** accurately drawn

Handwritten angle labels: 36, 72, 108, 108, 36, 72, 108, 90, 108 etc.
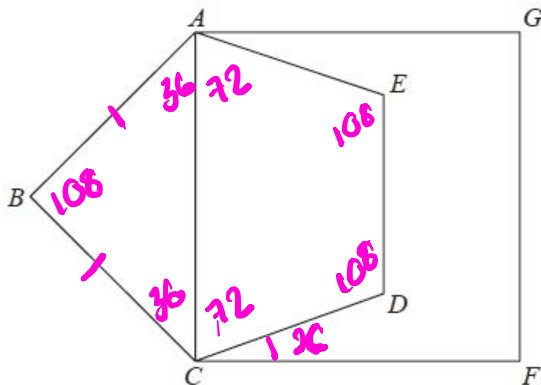
ABCDE is a regular pentagon.
ACFG is a square.

Work out the size of angle DCF.
You must show all your working.

Handwritten working:
3 = 180
4 = 360
5 = 540
540 ÷ 5 = 108

180 − 108 = 72
72 ÷ 2 = 36
108 − 36 = 72
90 − 72

$D\hat{C}F$ ......18...... °
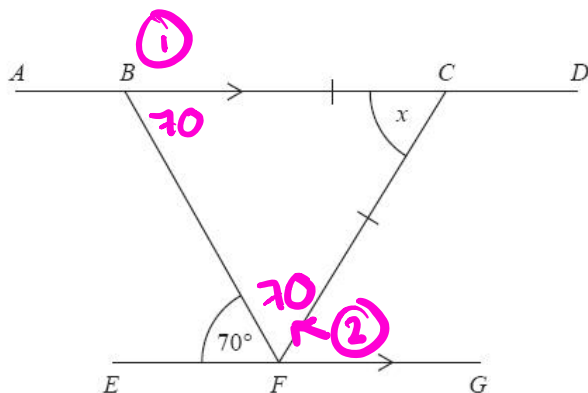
(Total for question = 4 marks)

Q30.

Diagram **NOT** accurately drawn

ABCD and *EFG* are parallel lines.
BC = *CF*
Angle *BFE* = 70°

Work out the size of the angle marked *x*.
Give reasons for each stage of your working.

① alternate angles are equal.
② 70 as 2 angles in an isosceles are equal.
$x = 180 - (70 + 70) = 40°$.
angles in a triangle = 180.

(Total for question = 4 marks)

Q31.

The diagram shows the positions of a tower and a tree.
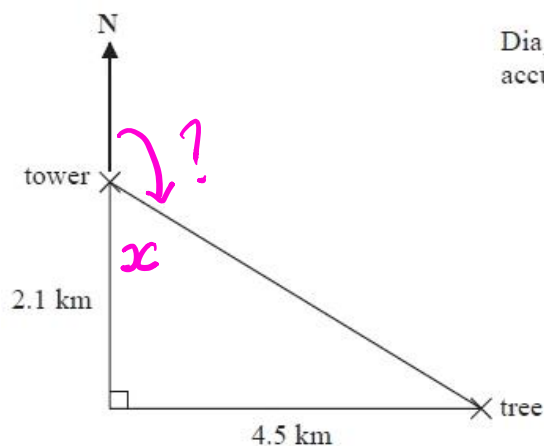

Diagram **NOT** accurately drawn

The tree is 2.1 km South of the tower and 4.5 km East of the tower.

(a) Work out the distance between the tower and the tree.
Give your answer correct to one decimal place.

$\sqrt{4.5^2 + 2.1^2} = 4.96588\ldots$

5·0

.... km
(3)

(b) Work out the bearing of the tree from the tower.
Give your answer correct to the nearest degree.

$\tan x = \dfrac{4.5}{2.1}$ $x = \tan^{-1}\dfrac{4.5}{2.1}$

$= 64.983\ldots$

$180 - 64.983$.

115°.

.... °
(4)

(Total for Question is 7 marks)

Q32.

A $180 - (120 + 25)$

$= 35.$

35
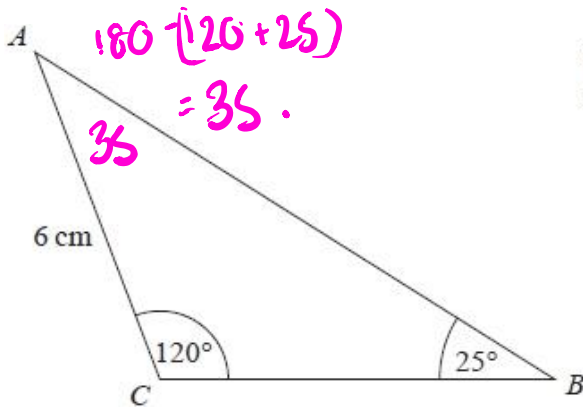
6 cm

$120°$

C

$25°$ *B*

Diagram **NOT** accurately drawn

In triangle *ABC*,
AC = 6 cm
Angle *ACB* = 120°
Angle *ABC* = 25°

Work out the area of triangle *ABC*.
Give your answer correct to 1 decimal place.
You must show all your working.

$\dfrac{6}{\sin 25} = \dfrac{CB}{\sin 35}$ $\quad CB = \dfrac{6 \sin 35}{\sin 25} = 8.14...$

$\text{area} = 0.5 \times 6 \times 8.14 \times \sin 120$

$= 21.1566..$

21.2cm^2

.... cm²

(Total for question = 4 marks)

Q33.

x

$2x$

$x + 3$

$2x$

x

$x - 1$ $x - 1$

$x+3$ $x+3$

$4x-2$

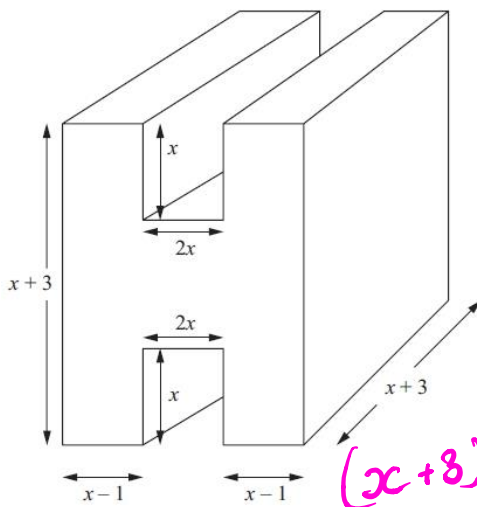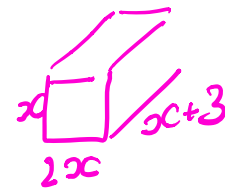Diagram **NOT** accurately drawn
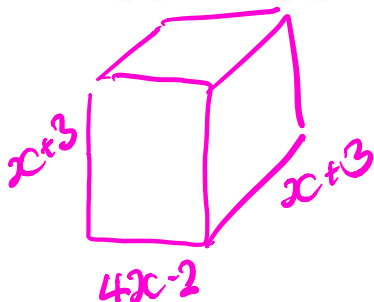
The diagram shows a prism.
All measurements are in cm.
All corners are right angles.
The volume of the prism is *V* cm³.

Find a formula for *V*.

x $x+3$

$2x$

$\dfrac{\cancel{2}}{\cancel{2}} \times 2x^2(x+3)$

$4x^2(x+3.$

$(x+3)(x+3)(4x-2) \quad - 4x^2(x+3)$

$(x^2+6x+9)(4x-2) \quad -4x^3 - 12x^2$

$\cancel{4x^3}-2x^2+24x-12x + 36x + 18 - \cancel{4x^3} - 12x^2$
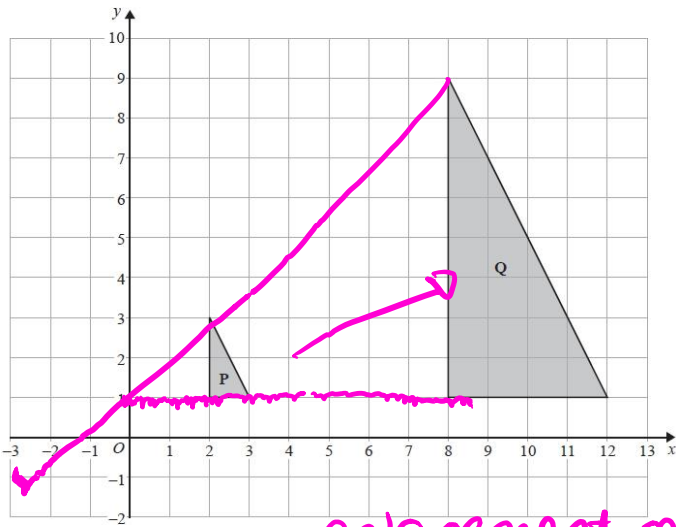
$-14x^2 + 48x - 18.$

$V = \;.....................$

(Total for Question is 4 marks)

Q34.
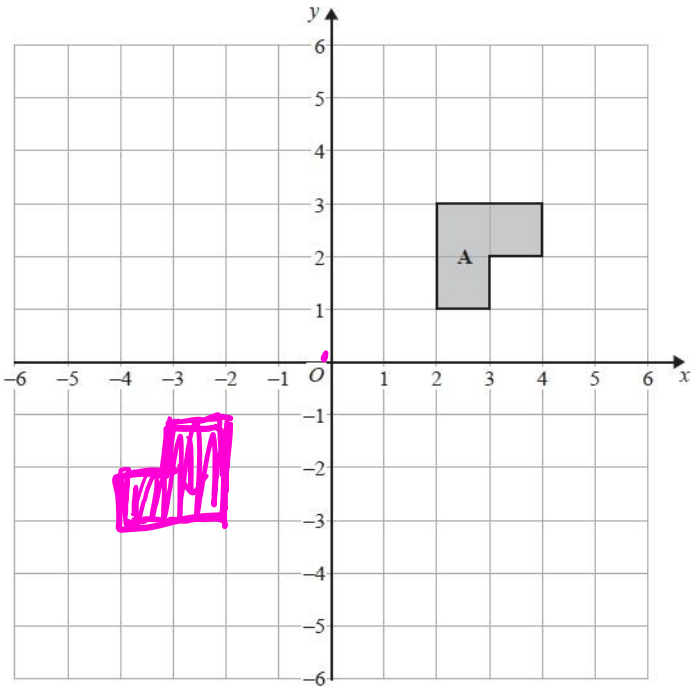
(a) Rotate shape **A** 180° about the point (0, 0).

(2)

(b) Describe fully the single transformation which maps triangle **P** onto triangle **Q**.

enlargement centre(0, 1)
Scale Factor : 4

(3)

(Total for question = 5 marks)
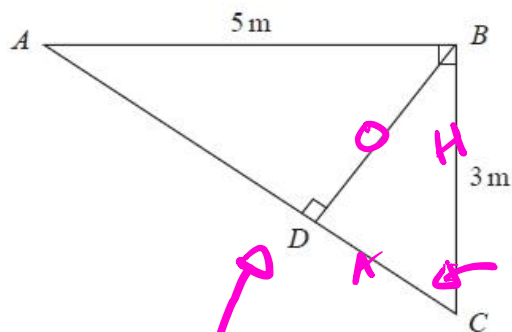
Q35.

The diagram represents a metal frame.

5 m

A ___ *B*

Diagram **NOT** accurately drawn

3 m

D

C

using ABC

$\tan x = \frac{5}{3}$

$x = \tan^{-1} \frac{5}{3}$

$= 59.0362 \ldots$

The frame is made from four metal bars, *AB*, *AC*, *BC* and *BD*.

Angle *ABC* = angle *ADB* = 90°
AB = 5 m
BC = 3 m

Work out the total length of the four metal bars of the frame.
Give your answer correct to 3 significant figures.

length

$5 + 3 + 5.8309 + 2.5724$
$= 16.4033$.

$AC = \sqrt{5^2 + 3^2}$
$= 5.8309 \ldots$

16.4 m

_____ 16.4 m _____ m

BD $\sin 59.03 = \frac{DB}{3}$ $DB = 3 \sin 59.036 \ldots$
$= 2.5724$

(Total for question = 5 marks)

Q36.

(a) Show that the equation $x^3 - 3x^2 + 3 = 0$ has a solution between $x = 2$ and $x = 3$

$x = 2$ $2^3 - 3 \times 2^2 + 3 = -1$

$x = 3$ $3^3 - 3 \times 3^2 + 3 = 3$

there is a change in sign so the sol^n must be between 2 and 3

(2)

(b) Show that the equation $x^3 - 3x^2 + 3 = 0$ can be rearranged to give $x = \sqrt[3]{3x^2 - 3}$

$x^3 = 3x^2 - 3$

$x = \sqrt[3]{3x^2 - 3}$

(1)

(c) Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt[3]{3x_n^2 - 3}$ to find the value of x_2
Give your answer correct to 3 decimal places.

$x_0 = 2$

$x_1 = 2.08 \ldots$

$x_2 = 2.153015 \ldots$

2.15

_____ 2.15 _____

(3)

(Total for question = 6 marks)

Q37.

$$a^2 = b^2 + c^2 - 2bc \cos A$$

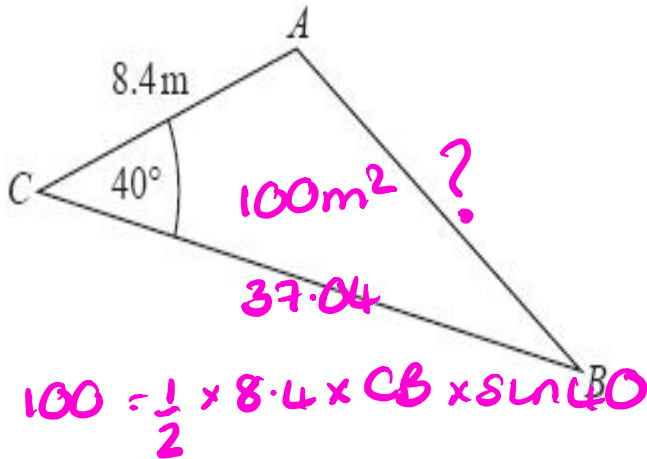ABC is a triangle.

A

8.4m

C 40° 100m² ?

37.04

B

Diagram **NOT** accurately drawn

AC = 8.4m
Angle ACB = 40°

The area of the triangle = 100m².

Work out the length of AB.
Give your answer correct to 3 significant figures.
You must show all your working.

$$100 = \frac{1}{2} \times 8.4 \times CB \times \sin 40$$

$$\frac{200}{8.4 \times \sin 40} = CB = 37.0410435$$

$$AB^2 = 8.4^2 + 37.04^2 - 2 \times 8.4 \times 37.04 \times \cos 40$$

$$= 965.897\ldots$$

$$AB = \sqrt{965.897\ldots}$$

$$= 31.0788\ldots$$

.......................31.1....................... m

(Total for question = 5 marks)

Q38.

The function f is such that

$$f(x) = 4x - 1$$

(a) Find $f^{-1}(x)$

$$y = 4x - 1 \qquad \frac{y+1}{4} = x$$

$$f^{-1}(x) = \dfrac{x+1}{4}$$

(2)

The function g is such that

$$g(x) = kx^2 \text{ where } k \text{ is a constant.}$$

Given that fg(2) = 12

(b) work out the value of k

$$g(2) = k(2)^2 = 4k.$$

$$f(x) = 4x - 1$$

$$fg(2) = 4(4k) - 1 = 12$$

$$16k - 1 = 12$$

$$16k = 13$$

$$k = \frac{13}{16}$$

$$k = \dfrac{13}{16} \quad (?)$$

(2)

(Total for question = 4 marks)