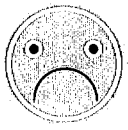
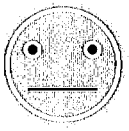
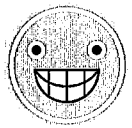
MODEL ANSWERS

Easter Intervention

Foundation / Higher Crossover Questions

Topic			
Angles			
Linear Equations			
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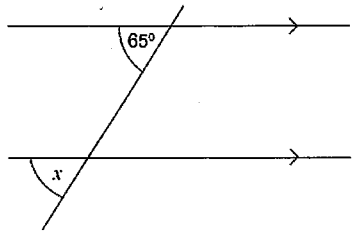
Percentages / Compound Interest			
Probability			
Solving Quadratics			
Transformations			
Volume			
Pythagoras			
Trigonometry			
Drawing Graphs			

Questions only on the HIGHER paper will be marked with a (H)

If you have any questions, feel free to email: bonea@ianramsey.org.uk

Angles

Q1. Write down the size of angle x. Give a reason for your answer.

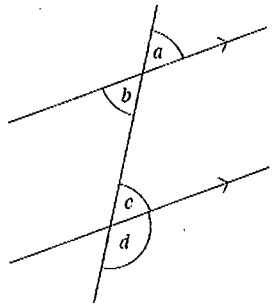


Answer 65° degrees

Reason Corresponding angles are equal

(Total 2 marks)

Q2.



(a) Which angles are vertically opposite? Circle your answer

(a and b) a and c b and c b and d c and d

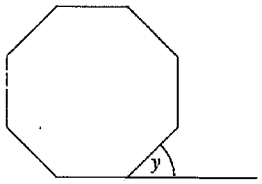
(b) Which angles are alternate? Circle your answer

a and b a and c (b and c) b and d c and d

(c) Which angles are corresponding? Circle your answer

a and b (a and c) b and c b and d c and d

Q3. (a) The diagram shows a regular octagon.



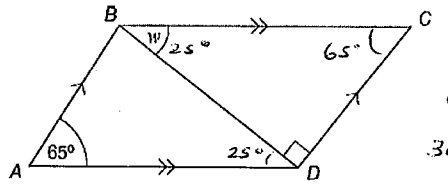
The base line of the octagon is extended. Work out the size of angle y.

360 ÷ 8 = 45°

Answer 45 degrees

(2)

(b) $ABCD$ is a parallelogram. BD is a diagonal.



65 + 65 = 130

360 − 130 = 230

230 ÷ 2 = 115°

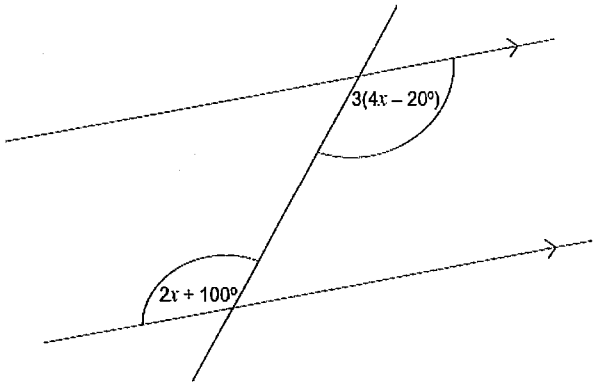
Work out the size of angle w.

Answer 25° degrees

(3)

(Total 5 marks)

Q4. The diagram shows three straight lines.



(a) Which of the following describes the pair of angles marked? Circle your answer.

(Alternate) Corresponding Interior Vertically opposite

(1)

(b) Work out the value of x.

3(4x − 20) = 2x + 100

12x − 60 = 2x + 100

+ 60 + 60

12x = 2x + 160

− 2x − 2x

10x = 160

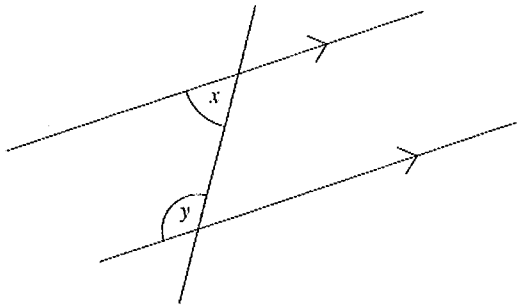
x = 16

x = 16 degrees

(4)

(Total 5 marks)

Q5.



(a) Use the diagram to write an equation connecting x and y.

Answer $x + y = 180$ **(1)**

(b) The ratio $x : y = 2 : 3$

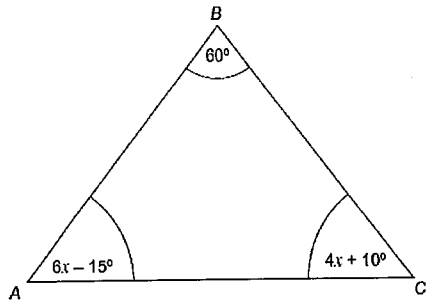
Use this information to write another equation connecting x and y.

$\frac{x}{2} = \frac{y}{3}$

Answer $x = \frac{2y}{3}$ **(1)**

(Total 2 marks)

Q6. Show that *ABC* is an equilateral triangle.



$6x - 15 = 4x + 10$

$+15 \quad +15$

$6x = 4x + 25$

$-4x \quad -4x$

$2x = 25$

$x = 12.5°$

$6x - 15 = 6 \times 12.5 - 15$

$= 60°$

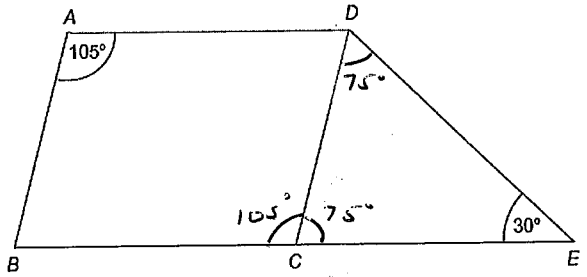
$4x + 10 = 4 \times 12.5 + 10$

$= 60°$

So all angles = 60° which means it is equilateral

(Total 5 marks)

Q7. A parallelogram *ABCD* and a triangle *DCE* are joined as shown. *BCE* is a straight line.



Show that *DCE* is an isosceles triangle. You **must** show your working.

$\triangle BCD = 105°$ as opposite angles in a parallelogram are equal

$180 - 105 = 75°$ (angles on a straight line)

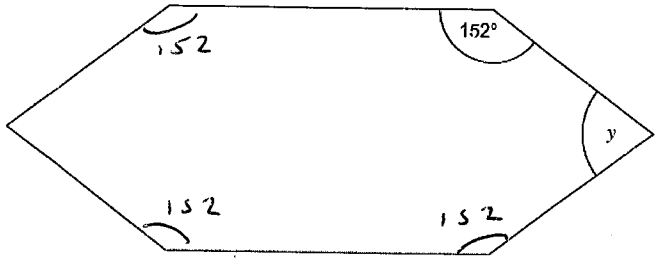
$\triangle CDE = 180 - 75 - 30$

$= 75°$ (angles in a triangle)

so isosceles as two equal angles

(Total 4 marks)

Q8. This hexagon has two lines of symmetry.



Work out the size of angle y.

$(n-2) \times 180 = 4 \times 180$

$= 720$

$4 \times 152 = 608$ $\quad 720 - 608 = 112$

$112 \div 2 = 56°$

Answer 56 degrees

(Total 3 marks)

Linear Equations

Q1. Solve $4x - 5 = 17$

$4x = 22$

$x = 5.5$

$x =$ _____

(Total 2 marks)

Q2. Solve $12x = 3$

Circle your answer.

$x = -9$ $\quad$ $x = \frac{1}{4}$ $\quad$ $x = 4$ $\quad$ $x = 36$

(Total 1 mark)

Q3. Solve $4(x + 5) = 15$

$4x + 20 = 15$

$-20 \quad -20$

$4x = -5$

$x = -1.25$

$x =$ _____

(Total 3 marks)

Q4. Solve $7x - 9 = 3x + 23$

$+9 \quad +9$

$7x = 3x + 32$

$-3x \quad -3x$

$4x = 32$

$x = 8$

$x =$ _____

(Total 3 marks)

Q5.

Solve $4(x - 5) = x + 7$

$4x - 20 = x + 7$

$+20 \quad +20$

$4x = x + 27$

$-x \quad -x$

$3x = 27$

$x = 9$ $x =$ _____

(Total 3 marks)

Q6.

Solve $2x + 3 + \frac{4x - 1}{2} = 10$

Do **not** use trial and improvement.

multiply through by 2

$4x + 6 + 4x - 1 = 20$

$8x + 5 = 20$

$-5 \quad -5$

$8x = 15$

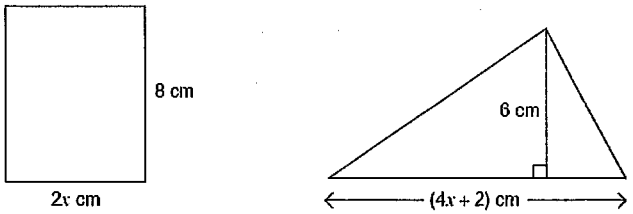
$x = 15/8$

$x =$ $15/8$

(Total 4 marks)

Q7.

The area of the rectangle and the area of the triangle are equal.



Work out the value of x.

□ $= 8 \times 2x = 16x$ △ $= \frac{6(4x+2)}{2}$

$= \frac{24x + 12}{2}$

$= 12x + 6$

$16x = 12x + 6$

$-12x \quad -12x$

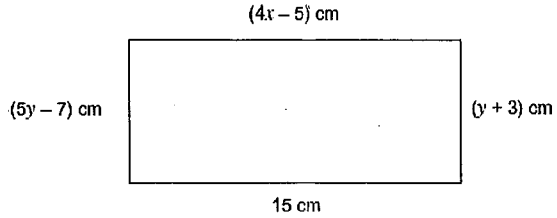
$4x = 6$

$x = 1.5$ $x =$ 1.5

(Total 4 marks)

Q8.

The diagram shows a rectangle.



(a) Set up and solve an equation to work out the value of x.

$4x - 5 = 15$

$+5 \quad +5$

$4x = 20$

$x = 5$

$x =$ 5

(3)

(b) Work out the area of the rectangle.

$5y - 7 = y + 3$

$+7 \quad +7$

$5y = y + 10$

$-y \quad -y$

$4y = 10$

$y = 2.5$

Answer _____ cm²

(5)

(Total 8 marks)

Averages

Q1.

Here is a list of numbers.

0 3 5 7 12 29

(a) Write down **three** numbers from the list with a median of 7.

Answer 5, 7 and 12

(1)

(b) Write down **three** numbers from the list with a range of 7.

Answer 0, 3 and 7

(1)

(c) Find **three** numbers from the list with a mean that is a whole number.

Answer 3, 5 and 7

(2)

(d) Find **three** numbers from the list with the range double the median.
Write down the values of the range and median.

Answer 5, 12 and 24

Range = 24 Median = 12

(3)

(Total 7 marks)

Q2. Five integers have

a mode of 6 ← more 6's than any other number
a median of 8 ← middle no. = 8
a mean of 10 ← total = 50

What is the **greatest** possible range of the five integers?

You **must** show your working.

6, 6, 8, ___, ___ ← needs to be as big as possible

20 30

Answer 6, 6, 8, 9, 21

(Total 3 marks)

Q3. Adam and six other men ran a race.
The times, in seconds, of the six other men are shown.

9.75 9.79 9.80 9.88 9.94 9.98

The mean time for **all** seven men was 9.83 seconds. Did Adam win the race?

You **must** show your working.

Total (7) = 9.83 × 7
= 68.81

Total (6) = 9.75 + 9.79 + 9.80 + 9.88 + 9.94 + 9.98
= 59.14

Adam's Time = 68.81 − 59.14
= 9.67

(Total 3 marks)

Q4.
The table shows information about the marks of 30 students in a test.

Mark	Frequency	
14	2	2 × 14 = 28
15	10	15 × 10 = 150
16	2	16 × 2 = 32
17	3	17 × 3 = 51
18	13	18 × 13 = 234
	Total = 30	= 495

Students who scored less than the mean mark have to retake the test.

How many students have to retake the test?

You **must** show your working.

495 ÷ 30 = 16.5

So anybody scoring less than 16.5 needs to re-do the test

2 + 10 + 2 = 14 students

Answer 14

(Total 3 marks)

Q5. The table shows information about the pay per hour of 40 people.

Pay per hour, x (£)	Frequency	Midpoint	Fx
$5 < x \leq 15$	14	10	140
$15 < x \leq 25$	12	20	240
$25 < x \leq 35$	11	30	330
$35 < x \leq 45$	2	40	80
$45 < x \leq 55$	1	50	50
	Total = 40		840

(a) Which group contains the median pay per hour? Circle your answer.

$5 < x \leq 15$ $\quad$ $15 < x \leq 25$ $\quad$ $25 < x \leq 35$ $\quad$ $35 < x \leq 45$ $\quad$ $45 < x \leq 55$

(1)

(b) Work out an estimate of the mean pay per hour.

840 ÷ 40 = 21

Answer £ _____

(4)

(Total 5 marks)

Q6. Paula records the times she takes to run 30 marathons.

Time, t (minutes)	Frequency	Midpoint	
$200 < t \leq 240$	16	220	3520
$240 < t \leq 280$	4	260	1040
$280 < t \leq 320$	4	300	1200
$320 < t \leq 360$	0	340	0
$360 < t \leq 400$	2	380	760
$400 < t \leq 440$	0	420	0
$440 < t \leq 480$	2	460	920
$480 < t \leq 520$	2	500	1000

8440

(a) Write down the modal class.

Answer 200 < t ≤ 240

(1)

(b) Use midpoints to calculate an estimate of the mean time Paula takes.

Total = 8440

Mean = 8440 ÷ 30

= 281·3

Answer _____ minutes

(3)

Q7.

The table shows information about water used in a household.
The value for April is missing.

Month	Water used (m³)
January	16.2
February	18.1
March	15.9
April	
May	17.8
June	21.0

The mean monthly water used for the six months is 18 m³

Work out the value for April.

6 × 18 = 108

16·2 + 18·1 + 15·9 + 17·8 + 21·0 = 89

108 − 89 = 19

Answer 19 m³

(Total 3 marks)

Q8. These expressions represent four numbers.

$2x + 2$	$3x - 1$	$4x - 6$	$5x + 2$
16	20	22	37

The sum of the first two expressions is 36. Work out the median of the four numbers.

$2x + 2 + 3x - 1 = 36$

$5x + 1 = 36$

$5x = 35$

$x = 7$

median $= \frac{20 + 22}{2}$

$= 21$

Answer 21

(Total 5 marks)

Q9. Here is information about the scores, t, of class A in a test.

Score	Frequency	Midpoint	fx
$0 < t \leq 10$	4	5	20
$10 < t \leq 20$	8	15	120
$20 < t \leq 30$	9	25	225
$30 < t \leq 40$	3	35	105
$40 < t \leq 50$	1	45	45
	25		515

The mean score for class B in the same test is 22

Dan says, "On average, class A did better than class B."

Is he correct? You **must** show your working.

Mean for class A $= 515 \div 25$

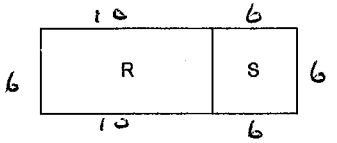
$= 20.6$

So class B did better

Answer _____

Area

Q1. A shape is made from a rectangle R and a square S.



The shape has a perimeter of 44 cm. The area of the square is 36 cm² ← So side = 6 cm

Work out the area of the shape.

$4 \times 6 = 24$ $44 - 24 = 20$

$20 \div 2 = 10$

Area $= 16 \times 6$

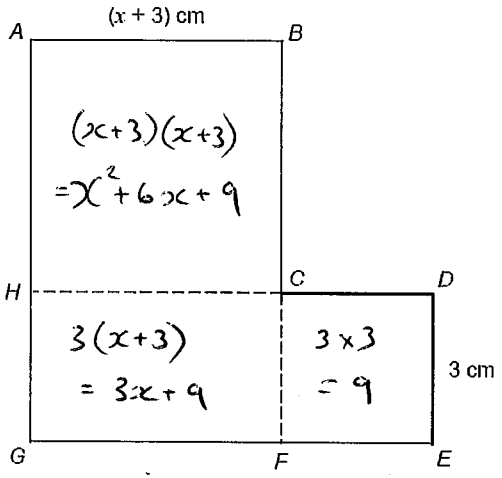
$= 96$ cm²

Answer _____ cm²

(Total 4 marks)

Q2(H). *ABCH* is a square. *HCFG* is a rectangle. *CDEF* is a square.

They are joined to make an L-shape.



Show that the total area of the L-shape, in cm², is $x^2 + 9x + 27$

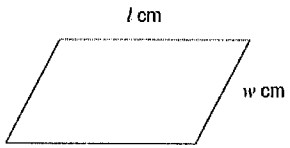
Total area = $x^2 + 6x + 9 + 3x + 9 + 9$

$= x^2 + 9x + 27$

(Total 4 marks)

Q3.

(a)

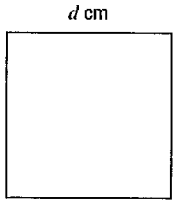


The perimeter of the parallelogram is P cm. Circle the correct formula.

$P = l + w$ $P = lw$ $P = 2(l + w)$ $P = 2lw$

(1)

(b)

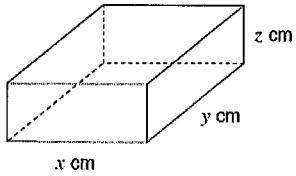


The area of the square is A cm² Circle the correct formula.

$A = 2d$ $A = 4d$ $A = \sqrt{d}$ $A = d^2$

(1)

(c)



The surface area of the cuboid is S cm²

Circle the correct formula.

$S = xyz$ $S = (xyz)^2$ $S = 6xyz$ $S = 2(xy + xz + yz)$

(1)

(d) The surface area of a **cube** is 150 cm²

Work out the volume of the cube. ← so all 6 faces are equal

$150 \div 6 = 25$

$\sqrt{25} = 5$ ← each length/width/height = 5cm

Volume $= 5 \times 5 \times 5$

$= 125 \text{ cm}^3$

Answer _____ cm²

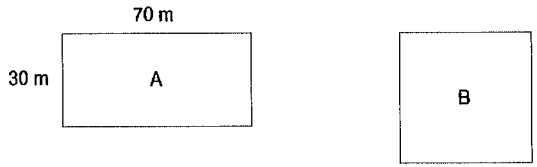
(4)

(Total 7 marks)

Q4.

Field A is a rectangle with sides of 30 m and 70 m

Field B is a square with the same **perimeter** as Field A.



How much bigger in area is Field B than Field A?
You **must** show your working.

Perimeter of A $= 30 + 70 + 30 + 70$

$= 200 \text{ m}$

so length of B $= 200 \div 4$

$= 50 \text{ m}$

Area A $= 30 \times 70 = 2100 \text{ m}^2$

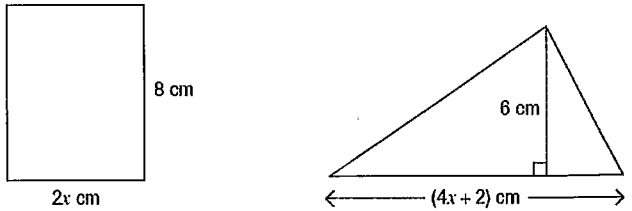
Area B $= 50 \times 50 = 2500 \text{ m}^2$

difference $= 400 \text{ m}^2$

Answer _____ m²

(Total 4 marks)

Q5. The area of the rectangle and the area of the triangle are equal.



Work out the value of x.

$8 \times 2x = 16x$

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

$= 12x + 6$

$16x = 12x + 6$

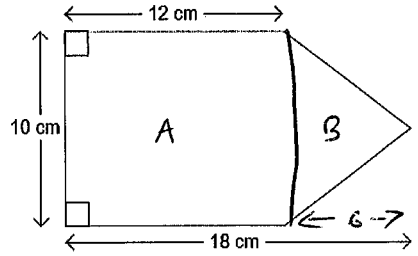
$4x = 6$

$x = 1.5$

$x =$ _____

(Total 4 marks)

Q6. Work out the area of this pentagon.



$A = 10 \times 12 = 120 \text{ cm}^2$

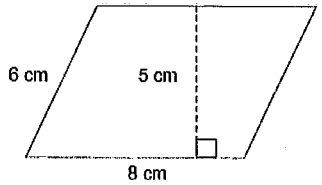
$B = \frac{10 \times 6}{2} = 30 \text{ cm}^2$

150 cm^2

Answer _____ cm²

(Total 3 marks)

Q7.(a) Work out the area of this parallelogram.



State the units of your answer.

$8 \times 5 = 40 \text{ cm}^2$

Answer _____

(3)

(b) Phoebe is drawing quadrilaterals on a nine-point square grid by joining points.

For example

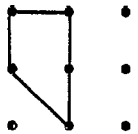
She says,

"If you draw a quadrilateral it will **always** have line or rotational symmetry."

Draw a quadrilateral on the grid below to show that Phoebe is wrong.
Use the first two grids for practice and the bottom grid for your answer.

Practice grids

Answer grid

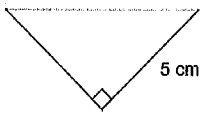


(1)

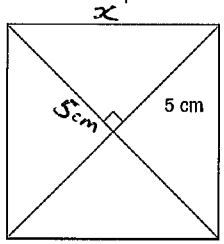
(Total 4 marks)

Q8.

Here is a right-angled triangle.



Four of these triangles are joined to make a square as shown.



Work out the area of the square.

$x^2 = 5^2 + 5^2$

$x^2 = 25 + 25$

$x^2 = 50$

$x = \sqrt{50}$

Area $= \sqrt{50} \times \sqrt{50}$

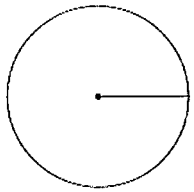
$= 50 \text{ cm}^2$

Answer _____ cm²

(Total 3 marks)

Circles

Q1.(a) The radius of this circle is 2.5 cm



Work out the area. Give your answer to 1 significant figure..

$\pi \times 2.5^2 = 19.6\ cm^2$

Answer 19.6 cm^3

(3)

(b) The diameter of this semicircle is 16 cm

Work out the perimeter of the semicircle.

$\frac{\pi \times 16}{2} = 25.1\ cm$

$25.1 + 16 = 41.1\ cm$

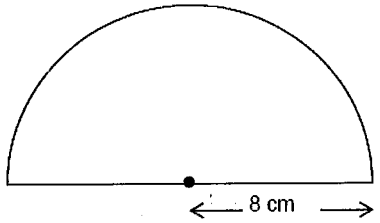
Answer _____

(3)

(Total 6 marks)

Q2.

The diagram shows a semicircle of radius 8 cm



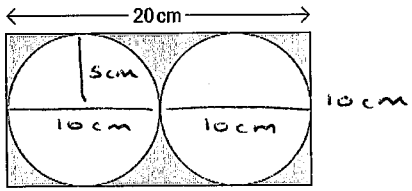
Work out the area of the semicircle. Give your answer in terms of π.

$\frac{\pi \times 8^2}{2} = 32\pi$

Answer _____ cm^2

(Total 2 marks)

Q3. Two identical circles fit inside a rectangle as shown.



The length of the rectangle is 20 cm. Work out the area of the shaded section.

radius = 5cm so Area of $\bigcirc = \pi \times 5^2$

$= 78.5\ cm^2$

Area of $\square = 20 \times 10$

$= 200$

Area of shaded $= 200 - 78.5 = 78.5$

$= 43\ cm^2$

Answer _____ cm^2

(Total 6 marks)

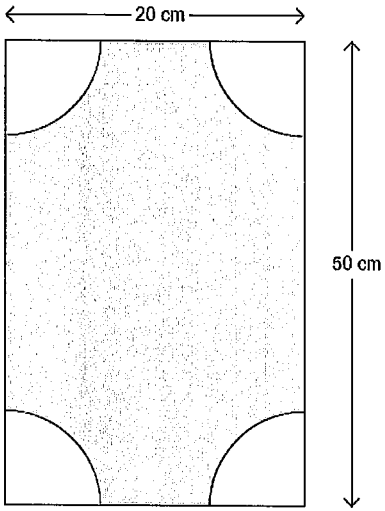
Q4.(a) Work out the area of a circle of radius 6 cm

$\pi \times 6^2 = 113.1$

Answer 113.1 cm²

(2)

(b) Quarter circles of radius 6 cm are cut from the corners of a rectangle as shown.



Work out the shaded area.

□ $= 20 \times 50 = 1000 \text{ cm}^2$

$4 \times$ ◡ = ○ $= \pi \times 6^2$

$= 113.1$

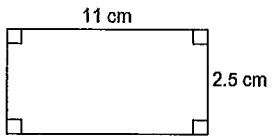
$1000 - 113.1 = 886.9 \text{ cm}^2$

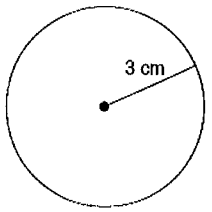
Answer _____ cm²

(3)

(Total 5 marks)

Q5. Which has the **greater** area?





You **must** show your working.

□ $= 11 \times 2.5$

$= 27.5 \text{ cm}^2$

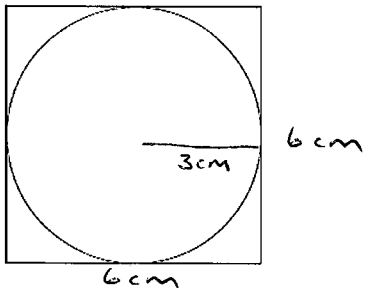
○ $= \pi \times 3^2$

$= 28.3$

Answer Circle

(Total 3 marks)

Q6. The area of this square is 36 cm²



Work out the circumference of the circle.

$\sqrt{36} = 6$

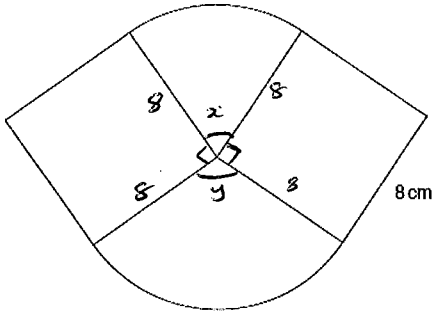
C $= \pi \times 6$

$= 18.84 \text{ cm}$

Answer _____ cm

(Total 3 marks)

Q7(H). This shape is made from two sectors and two squares of side 8 cm.
The radius of each sector is also 8 cm.



Work out the total area of the shape.

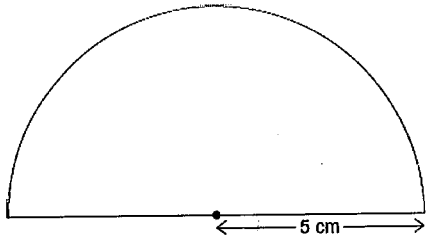
Area of square = 8×8
$= 64 \text{ cm}^2$

$x + y = 180°$ - if you put both sectors together
we get $\frac{180}{360} \times \pi \times 8^2 = 100.5 \text{ cm}^2$

Total area = $100.5 + 64 + 64$
$= 228.5 \text{ cm}^2$

Answer _____ cm^2
(Total 4 marks)

Q8. This semi-circle has a radius of 5 cm



Work out the **perimeter** of the semi-circle. Remember to include the base.

$\pi \times D = \pi \times 10$
$= 31.4$

$31.4 \div 2 = 15.7$

$15.7 + 10 = 25.7 \text{ cm}$

Answer _____ cm
(Total 3 marks)

Standard Form (non-calculator)

Q1.

(a) Work out 2.4×0.002

Answer 0.0048
(1)

(b) Write 1.2×10^{-5} as an ordinary number.

Answer 0.000012
(1)

(c) Write 2 500 000 in standard form.

Answer 2.5×10^7
(1)
(Total 3 marks)

Q2.

(a) Write 0.000 583 in standard form.

Answer 5.83×10^{-4}

(1)

(b) Write 9.416×10^5 as an ordinary number.

Answer 94160

(1)

(c) Divide 7200 million by 300. Give your answer in standard form.

$= 24$ million

$= 24\,000\,000$

$= 2.4 \times 10^7$

Answer 2.4×10^7

(3)

(Total 5 marks)

Q3.(a) Write 0.000 72 in standard form.

Answer 7.2×10^{-4}

(1)

(b) Divide 80 million by 20 000. Write your answer in standard form.

$80\,000\,000 \div 20\,000 = 40\,000$

Answer 4×10^4

(3)

(Total 4 marks)

Q4.(a) Work out $2 \times 10^6 \times 8 \times 10^4$ Give your answer in standard form.

$= 16 \times 10^{10}$

Answer 1.6×10^{11}

(2)

(b) Work out $\dfrac{2 \times 10^6}{8 \times 10^4} = \dfrac{20 \times 10^5}{8 \times 10^4}$

Give your answer as an ordinary number.

$= 2.5 \times 10^1$

$= 25$

Answer

(2)

(Total 4 marks)

Q5. Work out the value of $5.4 \times 10^5 \times 2 \times 10^{-2}$

Give your answer in standard form.

$= 10.8 \times 10^3$

$= 1.08 \times 10^4$

Answer

(Total 2 marks)

Q6.(a) Write the number 0.000 000 7 in standard form.

Answer 7×10^{-7}

(1)

(b) Write 3×10^5 as an ordinary number.

Answer 300000

(1)

(c) Work out $4 \times 10^3 \times 8 \times 10^5$

Give your answer in standard form.

$= 32 \times 10^8$

$= 3.2 \times 10^9$

Answer

(2)

(Total 4 marks)

Q7. Here is a list of numbers.

1 000 000 4.6×10^4 63 000 5×10^3 1.7×10^5

Work out the range. Write your answer in standard form.

$4.6 \times 10^4 = 46000$ $5 \times 10^3 = 5000$ $1.7 \times 10^5 = 170000$

range = 1000000 − 5000

= 9995000

Answer _____

(Total 4 marks)

Q8.

Write the number 4540 million in standard form.

4540000000

Answer 4.54×10^9

(Total 2 marks)

Upper and Lower Bounds

Q1. x = 2500 to the nearest 100

Circle the smallest possible value of x.

2449 (2450) 2495 2499

(Total 1 mark)

Q2. The maximum safe load of a bridge is 1500 kg to the nearest 10 kg.
An average soldier is 75 kg to the nearest kilogram.

Work out an estimate for the maximum number of soldiers that can **safely** cross the bridge at the same time.

1495 ÷ 75.5 = 19.8 so 19

Answer _____

(Total 5 marks)

Q3.

A shelf supports 80 kg, to the nearest kilogram.
Bottles weigh 1.4 kg each, to the nearest tenth of a kilogram.

Work out the greatest number of bottles that can definitely be supported by the shelf.

79.5 ÷ 1.45 = 54.8 so 54 bottles

Answer _____

(Total 4 marks)

Q4. A home gym can take a maximum load of 145 kg of weight plates.
Each weight plate is 10 kg to the nearest kilogram.

Work out the **greatest** number of weight plates that can be safely loaded on the gym.
You **must** show your working.

145 ÷ 10.5 = 13.8 so 13

Answer _____

(Total 4 marks)

Q5.

Amy and Kate each catch three fish.
The weight of each fish, to the nearest tenth of a kilogram, is shown.

	6.75 6.85	4.25 4.35	5.15 5.25
Amy	6.8 kg	4.3 kg	5.2 kg
Kate	8.2 kg	3.4 kg	4.5 kg
	8.15 8.25	3.35 3.45	4.45 4.55

Kate says that the total weight of her fish is more than the total weight of Amy's fish.

Show that this could be true.

Amy Min = 6.75 + 4.25 + 5.15
= 16.15

Kate Max = 8.25 + 3.45 + 4.55
= 16.25

(Total 4 marks)

Q6.

Bags of nails weigh 200 grams each. 195 – 205

Boxes of screws weigh 140 grams each. 135 – 145

Both measurements are given to the nearest 10 grams.

Show that 4 bags of nails **could** weigh the same as 6 boxes of screws.

Nails Min = 195 × 4 = 780
Max = 205 × 4 = 820

Screws Min = 135 × 6 = 840
Max = 145 × 6 = 870

So Nails between 780 & 820
screws between 810 & 870

(Total 3 marks)

Q7(H).

x = 400 to 1 significant figure. 350 – 450
y = 25 to 2 significant figures. 24.5 – 25.5

Work out the maximum **integer** value of $\frac{x}{y}$

Max = $\frac{450}{24.5}$
= 18.37
= 18

Answer _____

(Total 3 marks)

Expanding and Factorising

Q1.(a) Multiply out $3(2x - 7)$

Answer $6x - 21$

(1)

(b) Factorise $x^2 + 8x$

Answer $x(x + 8)$

(1)

(Total 2 marks)

Q2. Expand and simplify $6(x - 3) - 4(x - 5)$

$= 6x - 18 - 4x + 20$

$= 2x + 2$

Answer

(Total 3 marks)

Q3(H). Expand and simplify $(2x + 5)(2x - 5)(3x + 7)$

$(2x + 5)(2x - 5) = 4x^2 + 10x - 10x - 25$

$= 4x^2 - 25$

$(4x^2 - 25)(3x + 7) = 12x^3 + 28x^2 - 75x - 175$

Answer $12x^3 + 28x^2 - 75x - 175$

(Total 3 mark)

Q4. Expand and simplify $(2x + 5y)(3x - 8y)$

$= 6x^2 + 15xy - 16xy - 40y^2$

$= 6x^2 - xy - 40y^2$

Answer

(Total 3 marks)

Q5.(a) Expand and simplify $(x + 5)(x + 9)$

$= x^2 + 5x + 9x + 45$

$= x^2 + 14x + 45$

Answer

(2)

(b) Factorise fully $5x^2 - 10xy$

Answer $5x(x - 2y)$

(2)

(Total 4 marks)

Q6.(a) Multiply out $5(3x + 7)$

Answer $15x + 35$

(1)

(b) Make w the subject of the formula $z = w + 3$

$w = z - 3$

Answer

(1)

(c) Factorise fully $4y^2 + 6y$

Answer $2y(2y + 3)$

(2)

(Total 4 marks)

Q7.

(a) Expand and simplify fully $4(x-2)-2(3-5x)$

$= 4x - 8 - 6 + 10x$

$= 14x - 14$

Answer _____

(3)

(b) Simplify fully $\dfrac{8a^2+10ab}{12a+15b}$

$= \dfrac{2a(4a+5b)}{3(4a+5b)}$

$= \dfrac{2a}{3}$

Answer _____

(3)

(Total 6 marks)

Q8. Expand and simplify $3(2x+5)-2(x-4)$

$= 6x + 15 - 2x + 8$

$= 4x + 23$

Answer _____

(Total 3 marks)

Percentages / Compound Interest

Q1. Circle the calculation that increases 400 by 7%

400 × 0.07 | 400 × 0.7 | 400 × 1.07 | 400 × 1.7

(Total 1 mark)

Q2. In 1999 the minimum wage for adults was £3.60 per hour.

In 2013 it was £6.31 per hour.

Work out the percentage increase in the minimum wage.

$6.31 - 3.60 = 2.71$ $\qquad \dfrac{2.71}{3.60} \times 100 = 75.3\%$

Answer _____ %

(Total 3 marks)

Q3. Sophie sells birthday cards.

She adds 30% profit to the cost price.
She sells the cards for £2.34 each.
She wants to increase her profit to 40% of the cost price.

How much should she sell each card for?

$2.34 = 130\%$ $\qquad 2.34 \div 1.3 = £1.80$

$1.80 \times 1.4 = £2.52$

Answer £ _____

(Total 3 marks)

Q4. Increase 4200 by 38%

4200 × 1·38 = 5796

Answer _____

(Total 2 marks)

Q5. Work out 258% of 6300

6300 × 2·58 = 16,254

Answer _____

(Total 2 marks)

Q6. Work out 51% of 400

400 × 0·51 = 204

Answer _____

(Total 2 marks)

Q7. Nick went to a football training camp.

(a) He weighed 80 kg before the training camp.
He weighed 74 kg after the training camp.

Work out his percentage weight loss.

80 − 74 = 6 $\frac{6}{80}$ × 100 = 7·5%

Answer _____ %

(3)

(b) Nick's backpack weighs 12 kg to the nearest kilogram.

What is the least the backpack could weigh? Circle the correct answer.

11.4 kg | (11.5 kg) | 11.6 kg | 11.9 kg | 12 kg

(1)

(Total 4 marks)

Q8.

An amount of money was invested for 8 years.
It earned **compound** interest at 2.5% per year.
After 8 years the total value of the investment was £11 696.67

(a) Tom is trying to work out the total interest earned.

Tom

Interest for 8 years = £11696.67 × 0.025 × 8

State what is wrong with Tom's method.

* should multiply by 1·025
* should be to the power of 8, not × by 8

(1)

(b) Work out the total interest earned.

$11696.67 \times 1.025^{8} - 11696.67 = £2554.59$

Answer £ _____

(3)

(Total 4 marks)

Q9. £1800 is invested at 4% compound interest per year.

How many years will it take for the investment to be worth £2000?

1800×1.04^n if $n=3$ > £2000

Answer 3 years

years

(Total 4 marks)

Q10. David invests £5000 in a savings account.
The account pays 3.2% compound interest per year.

Work out the value of his investment after 3 years.
Give your answer to the nearest penny.

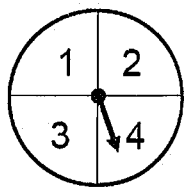
$5000 \times 1.032^3 = £5495.52$

Answer £

(Total 4 marks)

Probability

Q1. A game is played with a fair spinner.



The player spins the spinner twice. The score is the **difference** between the two numbers.

(a) Complete the table to show the scores.

First spin

Second spin	**1**	**2**	**3**	**4**
1	0	1	2	3
2	1	0	1	2
3	2	1	0	1
4	3	2	1	0

(2)

(b) The player **loses** if the score is 0 or 1
The player **wins** if the score is 2 or 3

Amy says,

"Two scores win and two scores lose, so the chance of winning is evens."

Is Amy correct?

Yes ☐ No ☑

Tick a box. Give a reason for your answer.

there are more 0's + 1's than 2's + 3's

(2)

(Total 4 marks)

Q2.

50 cars arrive at a car park. The table shows the number of people in each car.

Number of people	Number of cars
1	9
2	12
3	18
4	7
5	4

(a) One of the cars is chosen at random.

Work out the probability that there are **more than 3** people in the car.

$7 + 4 = 11$

Answer $11/50$ **(2)**

(b) Work out the total number of people in the 50 cars.

$(1 \times 9) + (2 \times 12) + (3 \times 18) + (4 \times 7) + (5 \times 4) = 135$

Answer **(2)**

(Total 4 marks)

Q3. John goes to work by car or by train.

(a) The probability that John goes by car is 0.4

Work out the probability he goes by train.

$1 - 0.4 = 0.6$

Answer 0.6 **(1)**

(b) John works for 200 days each year.

How many days would you expect him to go to work by car?

$0.6 \times 200 = 120$

Answer **(2)**

(c) Ben also goes to work by car or by train.
Out of 200 days, he went by car on 150 days.

Work out the relative frequency that Ben goes to work by car. $\frac{150}{200} = \frac{3}{4}$

Answer **(1)**

(Total 4 marks)

Q4. Ali has an ordinary, fair dice.

(a) Ali is going to throw the dice six times.

He says,

"I will get one of each number."

Give a reason why he could be wrong.

as each result is random - could get each number more than once **(1)**

(b) Lucy throws the dice 50 times. Her results are shown.

Number thrown	1	2	3	4	5	6
Frequency	7	4	12	5	9	13

Work out the relative frequency of throwing an odd number.

$7 + 12 + 9 = 28$

Answer $\frac{28}{50} = \frac{14}{25}$ **(2)**

(Total 3 marks)

Q5. A spinner has four sections A, B, C and D.
The table shows the probabilities of the spinner landing on A, B or C.

Outcome	A	B	C	D
Probability	0.2	0.3	0.15	

Work out the probability of landing on D.

$1 - 0.2 - 0.3 - 0.15 = 0.35$

Answer 0.35

(Total 2 marks)

Q6. Ann picks a 4-digit number.

The first digit is **not** zero. The 4-digit number is a multiple of 5

How many different 4-digit numbers could she pick?

1st digit - 9 choices 4th digit - 2 choices
2nd digit - 10 choices
3rd digit - 10 choices $9 \times 10 \times 10 \times 2 = 1800$

Answer 1800

(Total 3 marks)

Q7(H). A bag contains 10 counters. 4 of the counters are black and 6 are white.

A counter is picked out of the bag and then replaced. A second counter is picked out.

Work out the probability that they are both black.

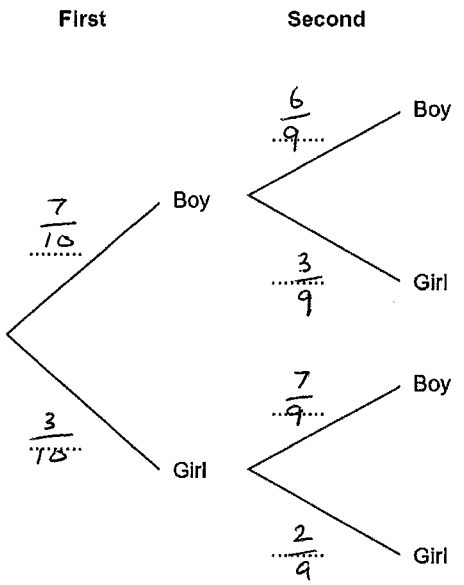
$\frac{4}{10} \times \frac{4}{10} = \frac{16}{100}$

Answer

(Total 3 marks)

Q8. A team has 7 boys and 3 girls. Stevie chooses two of the team at random.

(a) Complete the probability tree diagram. (not replaced)



(3)

(b) Work out the probability that he chooses one boy and one girl.

$P(BG) = \frac{7}{10} \times \frac{3}{9} = \frac{21}{90}$

$P(GB) = \frac{3}{10} \times \frac{7}{9} = \frac{21}{90}$

$\frac{21}{90} + \frac{21}{90} = \frac{42}{90}$

Answer

(3)

(Total 6 marks)

Solving Quadratics

Q1. Circle the equation with roots 4 and –8

$4x(x - 8) = 0$

$(x - 4)(x + 8) = 0$

$(x + 4)(x - 8) = 0$

$x^2 - 32 = 0$

(Total 1 mark)

Q2.

(a) Factorise $x^2 + 10x + 24$

Answer $(x + 4)(x + 6)$ **(2)**

(b) Hence or otherwise, solve $x^2 + 10x + 24 = 0$

$(x+4)(x+6) = 0$

Answer $x = -4$, $x = -6$ **(1)**

(Total 3 marks)

Q3(H). (a) Expand and simplify $(6x - 1)(2x + 3)$

$= 12x^2 - 2x + 18x - 3$

Answer $12x^2 + 16x - 3$ **(2)**

(b) Solve $4x^2 + x - 3 = 0$

$(4x - 3)(x + 1) = 0$

$4x - 3 = 0$ $\quad$ $x + 1 = 0$

$4x = 3$ $\quad$ $x = -1$

$x = 3/4$

Answer $x = 3/4$ or $x = -1$ **(3)**

(Total 5 marks)

Q4(H)

Solve the quadratic equation $5x^2 + 8x + 2 = 0$

Give your answers to 1 decimal place.

$a = 5 \quad b = 8 \quad c = 2$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-8 \pm \sqrt{8^2 - 4 \times 5 \times 2}}{2 \times 5}$

$= \frac{-8 \pm \sqrt{24}}{10}$

$= \frac{-8 + \sqrt{24}}{10}$ or $\frac{-8 - \sqrt{24}}{10}$

Answer $= -0.3$ or -1.3 **(Total 3 marks)**

Q5(H).

Solve $5x^2 + 3x - 4 = 0$

Give your answers to 2 decimal places.

$a = 5 \quad b = 3 \quad c = -4$

$\frac{-3 \pm \sqrt{3^2 - 4 \times 5 \times -4}}{2 \times 5} = \frac{-3 \pm \sqrt{89}}{10}$

$= \frac{-3 + \sqrt{89}}{10}$ or $\frac{-3 - \sqrt{89}}{10}$

$= 0.64$ or -1.24

Answer _____ and _____ **(Total 3 marks)**

Q6(H).

Solve the quadratic equation $3x^2 - 12x - 5 = 0$

Give your answers to 2 decimal places.

$a = 3 \quad b = -12 \quad c = -5$

$$\frac{--12 \pm \sqrt{(-12)^2 - 4 \times 3 \times -5}}{2 \times 3} = \frac{12 \pm \sqrt{204}}{6}$$

$$= \frac{12 + \sqrt{204}}{6} \text{ or } \frac{12 - \sqrt{204}}{6}$$

$$= 4.38 \text{ or } -0.38$$

Answer _____

(Total 3 marks)

Q7.

(a) Factorise $x^2 + 5x - 24$

Answer $(x+8)(x-3)$

(2)

(b) Solve $x^2 + 5x - 24 = 0$

Answer $x = -8, \; x = 3$

(1)

(Total 3 marks)

Q8. Solve $x^2 - 7x - 18 = 0$

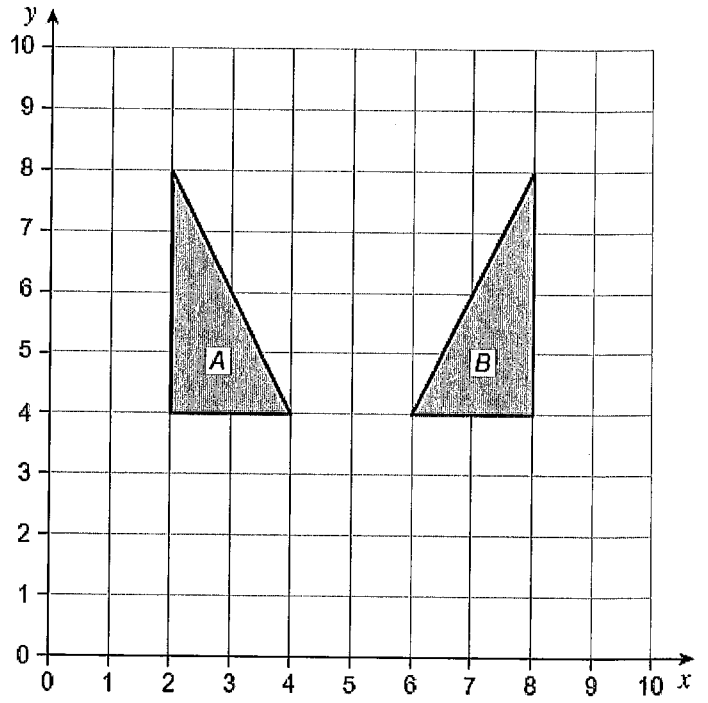
$(x-9)(x+2) = 0$

Answer $x = 9$ or $x = -2$

(Total 3 marks)

Transformations

Q1.



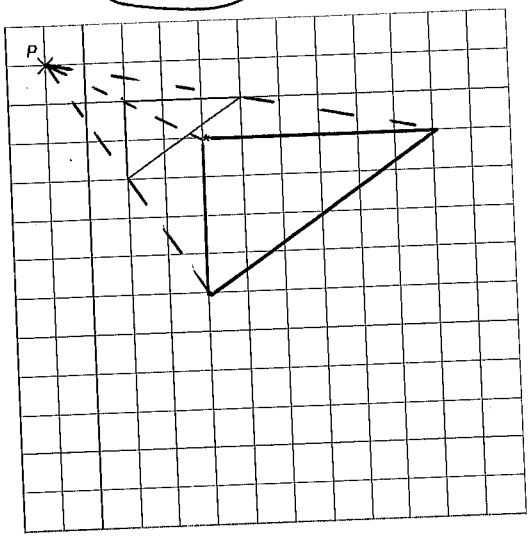
Describe fully the **single** transformation that maps shape *A* to shape *B*.

reflection in line $x = 5$

(Total 2 marks)

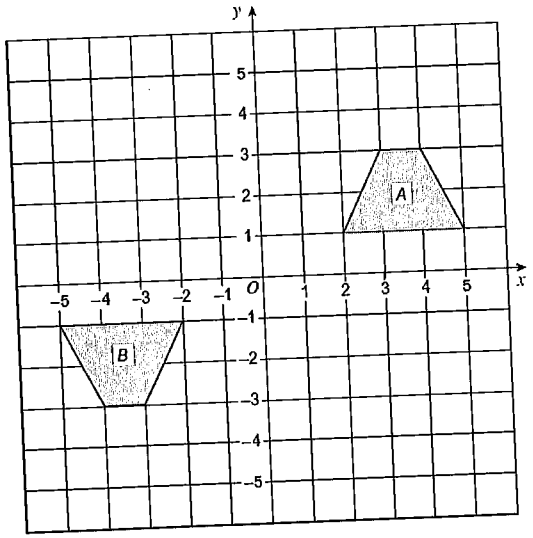
Q2. (a) Enlarge this shape by scale factor 2 with centre of enlargement point *P*.

image needs to be twice the size and twice the distance away from the centre of enlargement



(3)

(b) Describe fully the **single** transformation that maps shape *A* to shape *B*.



Rotation 180° about O

(3)

Q3.(a) On the grid draw a shape that is a reflection of shape A. Show your mirror line.

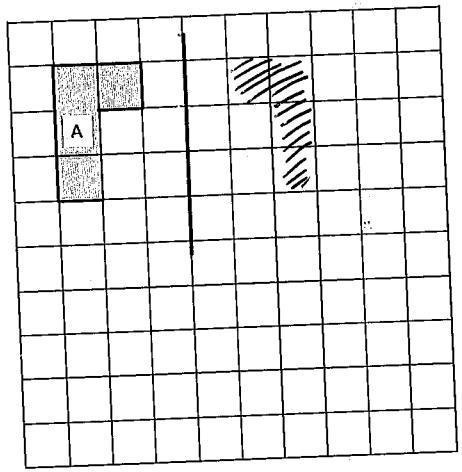
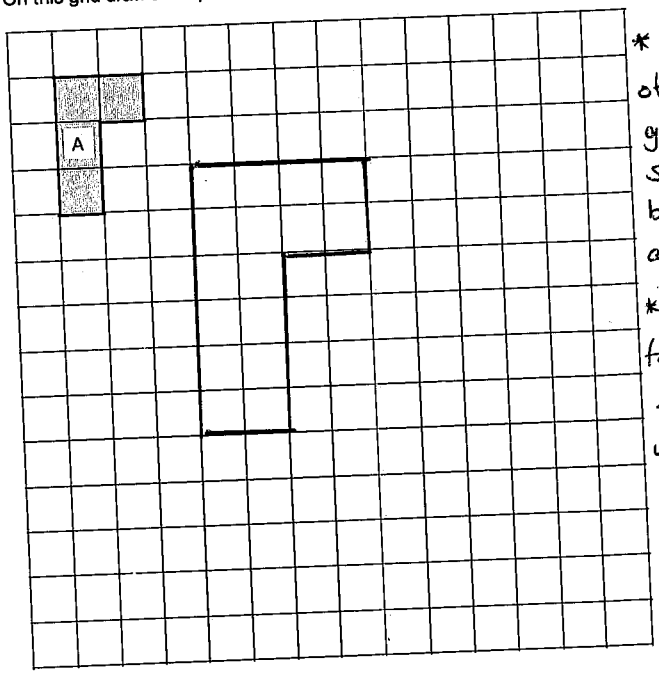


image needs to be same distance from line of reflection as the object

(1)

(b) On this grid draw a shape that is an enlargement of shape A.

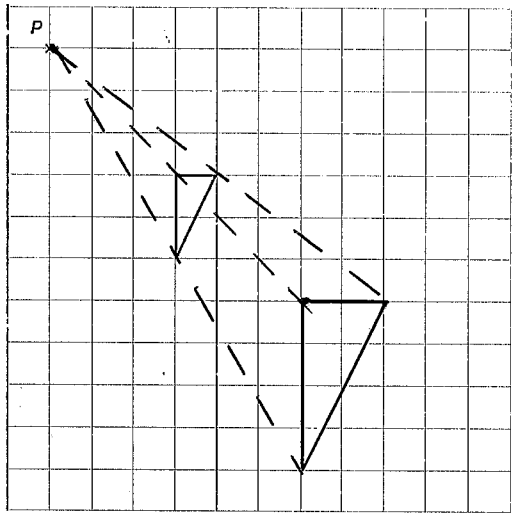


* No centre of enlargement given so shape can be drawn anywhere.
* No scale factor specified - I have used scale factor 2 but could have used 3, 4 etc...

(1)

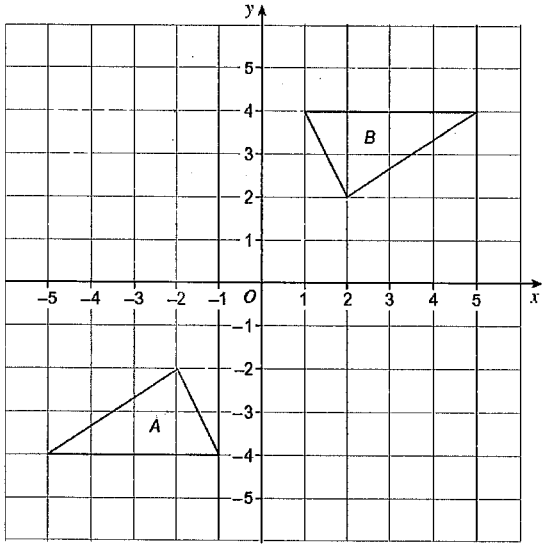
(Total 2 marks)

Q4. (a) Enlarge the triangle by scale factor 2, using point P as the centre of enlargement.



(3)

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

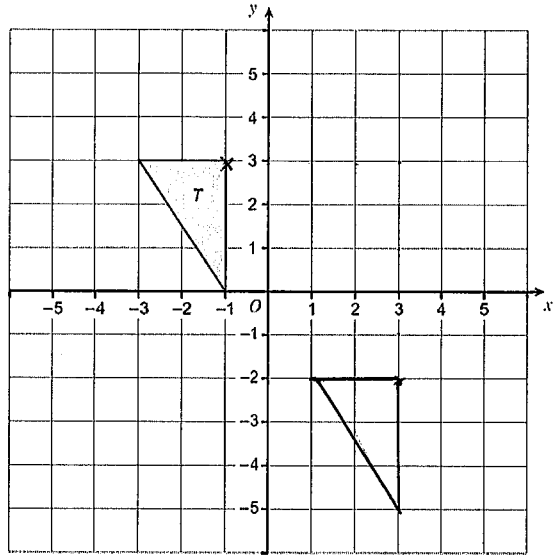


Rotation 180° about O

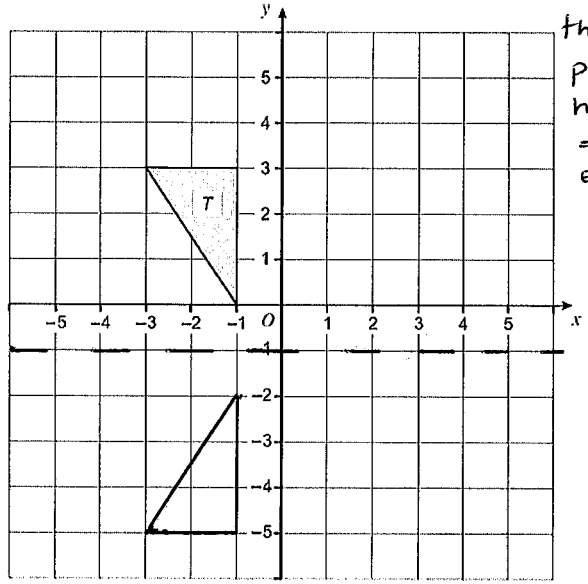
(3)

Q5. (a) Translate triangle T by the vector $\begin{pmatrix} 4 \\ -5 \end{pmatrix}$ ← move shape 4 right 5 down

(2)



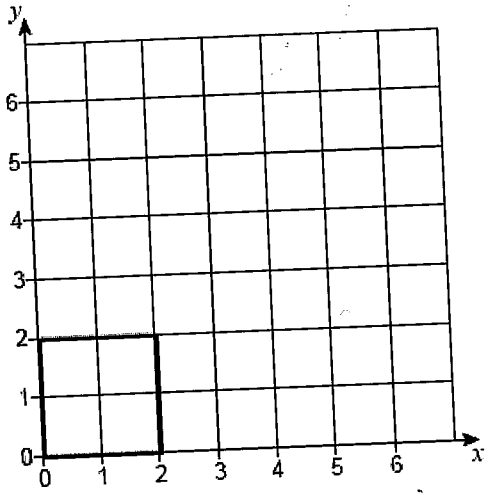
(b) Reflect triangle T in the line $y = -1$ ← the line that passes through all points which have y coordinate = -1 e.g. (0, -1), (1, -1), (2, -1), (3, -1) etc....



(2)

Q6. Square *OABC* is drawn on a centimetre grid.

O is (0, 0) *A* is (2, 0) *B* is (2, 2) *C* is (0, 2)



(a) *OABC* is translated by the vector $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$

invariant means that the points do not move following the transformation

Circle the number of invariant points on the perimeter of the square.

(0) 1 2 4 **(1)**

(b) *OABC* is enlarged, scale factor 2, centre (0, 0)

Circle the number of invariant points on the perimeter of the square.

0 (1) 2 4 **(1)**

(c) *OABC* is reflected in the line $y = x$

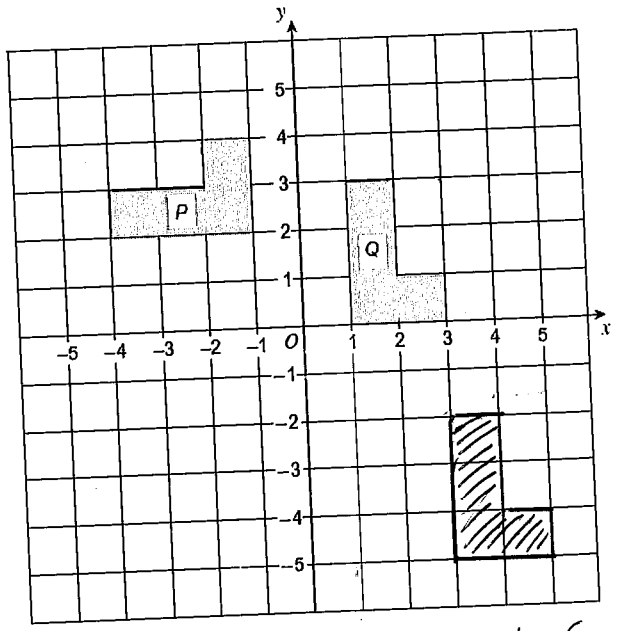
Circle the number of invariant points on the perimeter of the square.

0 1 (2) **(1)**

(Total 3 marks)

Q7.

(a) Describe fully the **single** transformation that maps shape *P* to shape *Q*.



Rotation 90° clockwise about (-1, 0)

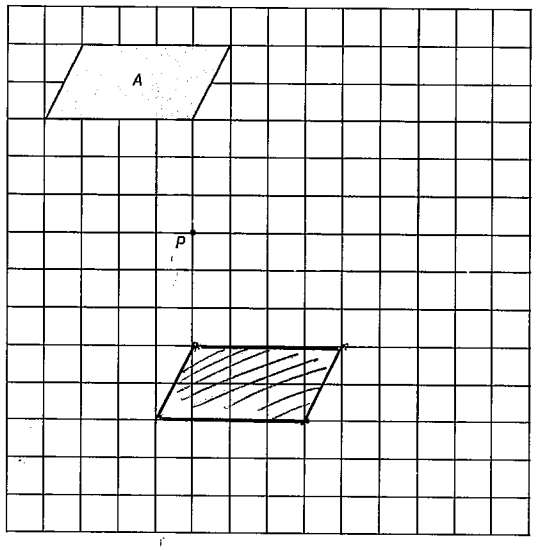
(3)

(b) On the grid, translate shape *Q* by vector $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$

(2)

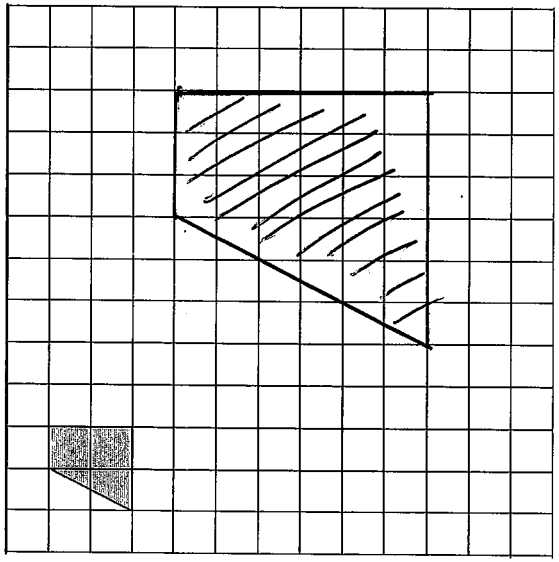
(Total 5 marks)

Q8. On this grid, rotate shape *A* by 90° clockwise about point *P*.



(Total 3 marks)

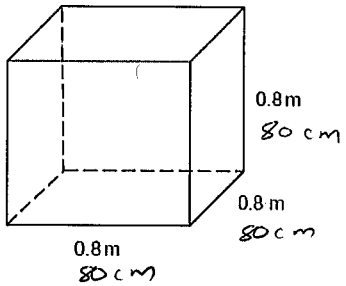
Q9. Enlarge the shape by scale factor 3



(Total 2 marks)

Volume

Q1. A cube has edges of length 0.8 metres.



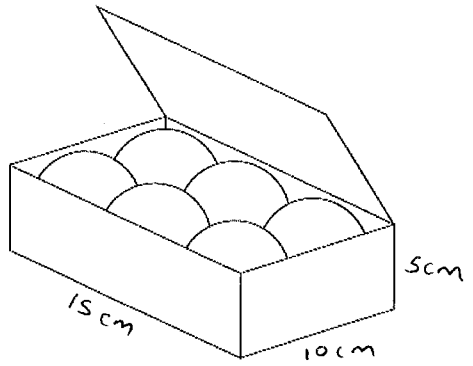
Work out its volume in **cubic centimetres**.

$80 \times 80 \times 80 = 512000 \text{ cm}^3$

Answer _____ cm³

(Total 2 marks)

Q2. Six balls just fit inside a box as shown. The balls each have a diameter of 5 cm.



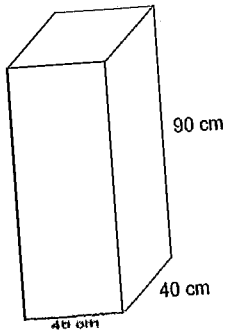
Work out the volume of the box.

$15 \times 10 \times 5 = 750 \text{ cm}^3$

Answer 750 cm³

(Total 3 marks)

Q3. The diagram shows a water tank in the shape of a cuboid.



The tank is full of water. **1 litre = 1000 cm³** ← ÷ by 1000 to change cm³ into litres

How many gallons of water are in the tank?

$V = 45 \times 40 \times 90$

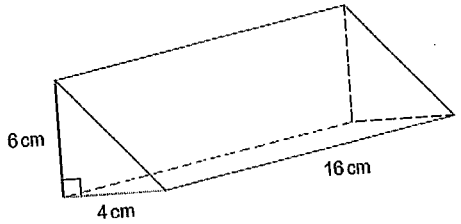
$= 162{,}000 \text{ cm}^3$

$= 162$ litres

Answer _____ gallons

(Total 4 marks)

Q4.



Calculate the volume of the prism. State the units of your answer.

$\triangle = \frac{6 \times 4}{2} = 12 \text{ cm}^2$

$\text{Vol} = 12 \times 16$

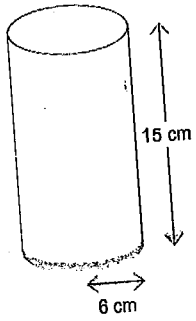
$= 192 \text{ cm}^3$

Answer _____

(Total 4 marks)

Q5.

(a) The diagram shows a cylinder.



The radius of the base is 6 cm
The height is 15 cm

Work out the volume.

$O = \pi \times 6^2 = 113.04$

$\text{Volume} = 113.04 \times 15$

$= 1695.6$

Answer _____ cm³

(3)

(b) 1000 cm³ = 1 litre

A tank contains 45 000 cm³ of water.
The tank leaks at 0.75 litres/minute.

How long does the tank take to empty?

$45000 \text{ cm}^3 = 45$ litres

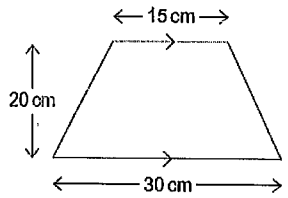
$45 \div 0.75 = 60$ minutes

Answer 60 minutes

(4)

(Total 7 marks)

Q6. The diagram shows a trapezium.



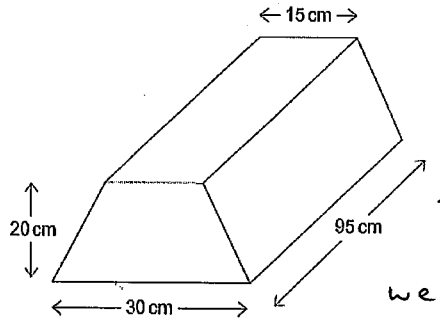
(a) Work out the area of the trapezium.

$\frac{1}{2} \times (15 + 30) \times 20 = 450$

Answer 450 cm²

(2)

(b) The trapezium is the cross-section of this prism.



vol. of prism = (area of the cross-section) x length

we worked out the area of the cross section in part (a) so

Work out the volume of the prism.

$450 \times 95 = 42,750$

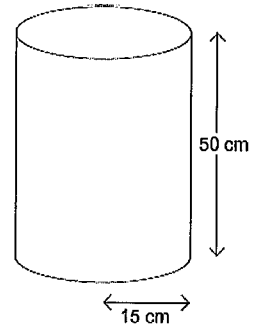
Answer 42,750 cm³

(2)

(Total 4 marks)

Q7.

A tank is in the shape of a cylinder of radius 15 cm and height 50 cm



(a) Work out the volume of the tank.

$O = \pi \times 15^2$

$= 706.5 \text{ cm}^2$

Volume $= 706.5 \times 50$

$= 35,325$

Answer 35,325 cm³

(3)

(b) The volume of another tank is 33 000 cm³

The tank is empty.
The tank is filled at the rate of 0.22 litres a second.

How many **minutes** will it take to fill the tank?

$33000 \text{ cm}^3 = 33$ litres

$33 \div 0.22 = 150$ minutes

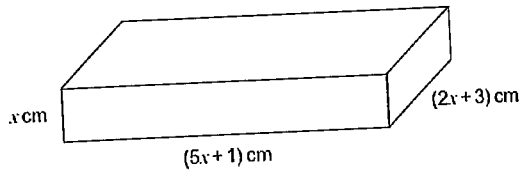
Answer 150 minutes

(4)

(Total 7 marks)

Q8(H).

The diagram shows a cuboid.
The length is $(5x + 1)$ cm.
The width is $(2x + 3)$ cm.
The height is x cm.



The length is 7 cm longer than the width.

Work out the volume of the cuboid.

$5x+1 = 2x+3+7$

$5x+1 = 2x+10$

$5x = 2x+9$

$3x = 9$

$x = 3$

so $5x+1 = 16$ cm , $2x+3 = 9$ cm

Volume $= 3 \times 16 \times 9$

$= 432$ cm^3

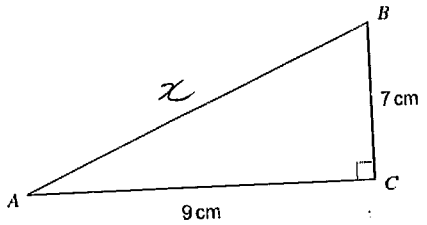
Answer 432 cm^3

(Total 5 marks)

Pythagoras Theorem

Q1. Work out length AB as a decimal.

Not drawn accurately



$x^2 = 7^2 + 9^2$

$x^2 = 130$

$x = \sqrt{130}$

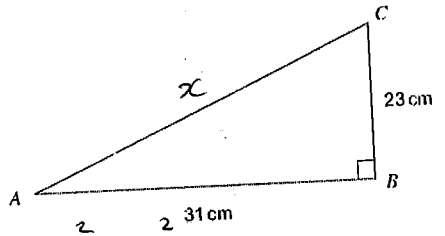
Answer 11.4 cm

(Total 3 marks)

Q2.

Work out the length AC.

Not drawn accurately



$x^2 = 23^2 + 31^2$

$x^2 = 1490$

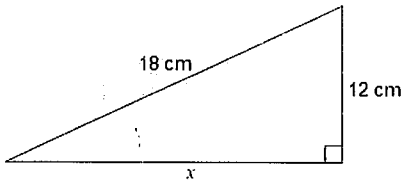
$x = 38.6$

Answer 38.6 cm

(Total 3 marks)

Q3.

Work out the length x.



Not drawn accurately

Give your answer to 1 decimal place.

$x^2 = 18^2 - 12^2$

$x^2 = 180$

$x = 13.4$

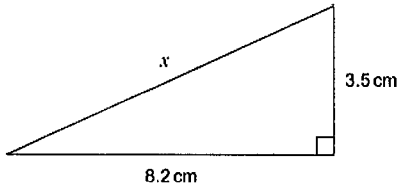
Answer 13.4 cm

(Total 4 marks)

Q4.

Work out the length x.

Not drawn accurately



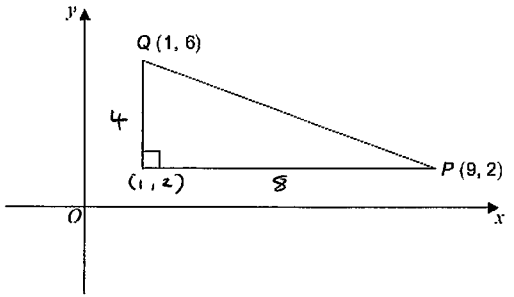
$x^2 = 3.5^2 + 8.2^2$

$x^2 = 79.49$

$x = 8.9$

Answer 8.9 cm

(Total 3 marks)



Not drawn accurately

Q5.

Work out the length of PQ. Give your answer to 3 significant figures.

$PQ^2 = 4^2 + 8^2$

$PQ^2 = 52$

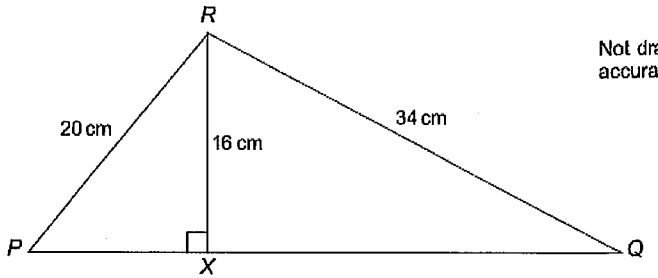
$PQ = \sqrt{52}$

$PQ = 7.21$

$PQ =$ 7.21

(Total 4 marks)

Q6(H). In triangle PQR, X is a point on PQ. RX is perpendicular to PQ.



Not drawn accurately

Work out the ratio $PX : XQ$. Give your answer in its simplest form.

$PX^2 = 20^2 - 16^2$ $\quad$ $QX^2 = 34^2 - 16^2$

$PX^2 = 144$ $\quad$ $QX^2 = 900$

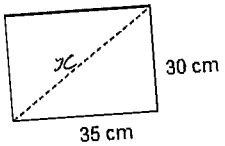
$PX = 12$ $\quad$ $QX = 30$

$PX : XQ = 12 : 30$

$= 2 : 5$

Answer 2 : 5

Q7. (a) The diagram shows a rectangle.



Work out the length of the diagonal.

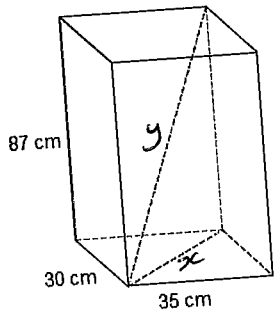
$x^2 = 30^2 + 35^2$

$x^2 = 2125$

$x = 46.1$

Answer 46.1 cm **(3)**

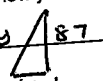
(b) The rectangle in part (a) is the base of this box. The box is a cuboid.



$x^2 = 30^2 + 35^2$

$x = 46.1$ (see part (a))

Will a straight rod of length 1 metre fit in the box?
You **must** show your working.



$y^2 = 87^2 + 46.1^2$

$y^2 = 9694$

$y = 98.5$ cm

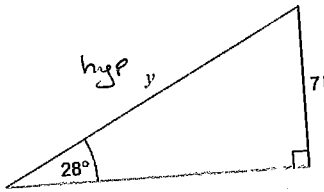
So a rod of 1m will not fit inside of the box

(3)
(Total 6 marks)

Trigonometry

Q1.
An aircraft flies y kilometres in a straight line at an angle of elevation of 28°.
The gain in height is 7 kilometres.

Not drawn accurately



Work out the value of y.

$\sin 28 = \frac{7}{y}$

$y \times \sin 28 = 7$

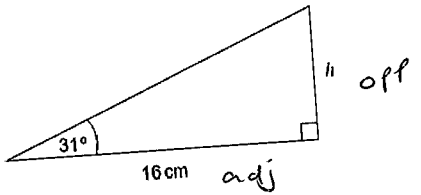
$y = \frac{7}{\sin 28}$

$y = 14.9$ km

$y =$ 14.9 km
(Total 3 marks)

Q2.
Work out the height h.

Not drawn accurately



$\tan 31 = \frac{x}{16}$

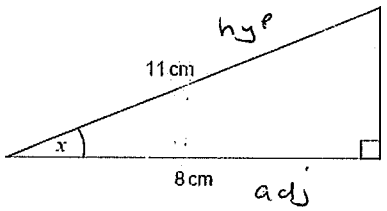
$\tan 31 \times 16 = x$

$x = 9.6$

Answer 9.6 cm
(Total 3 marks)

Q3.

(a) Work out the size of angle x.



Not drawn accurately

To get $\cos^{-1}$ need to press Shift or 2nd F then Cos

$\cos x = 8/11$

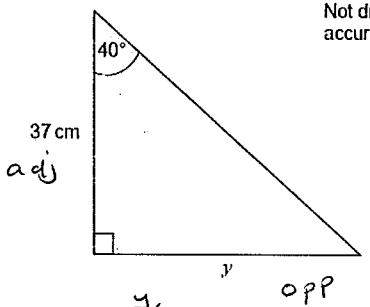
$\cos x = 0.7273$

$x = \cos^{-1} 0.7273$

Answer 43.3° degrees

(2)

(b) Work out length y.



Not drawn accurately

$\tan 40 = y/37$

$37 \times \tan 40 = y$

$y = 31.0$

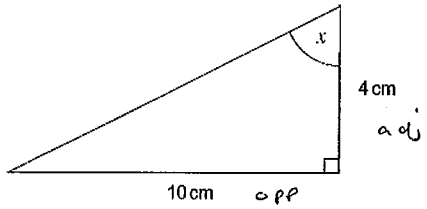
Answer 31.0 cm

(2)

(Total 4 marks)

Q4.

Not drawn accurately



Work out the size of angle x.

$\tan x = 10/4$

$\tan x = 2.5$

$x = \tan^{-1} 2.5$

$= 68.2$

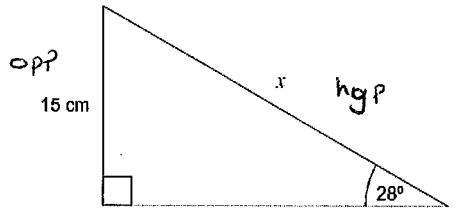
Answer 68.2 degrees

(Total 3 marks)

Q5.

Work out the length x.

Not drawn accurately



$\sin 28 = 15/x$

$x \times \sin 28 = 15$

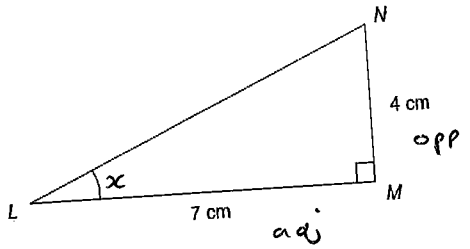
$x = 15 / \sin 28 = 31.96$

Answer 31.96 cm

(Total 3 marks)

Q6.

Not drawn accurately



(a) Work out the size of angle *L*.

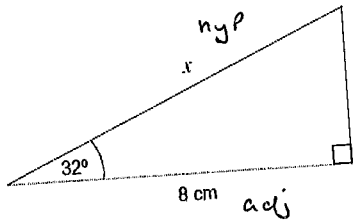
$\tan x = \frac{4}{7}$

$\tan x = 0.5714$

$x = \tan^{-1} 0.5714$

Answer 29.7 degrees **(3)**

(b) Not drawn accurately



Work out *x*.

$\cos 32 = \frac{8}{x}$

$x \times \cos 32 = 8$

$x = \frac{8}{\cos 32}$

$x = 9.43$

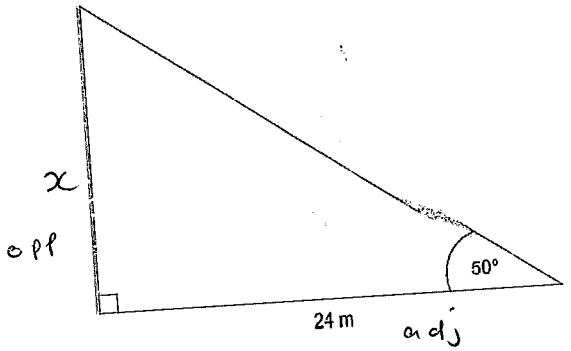
Answer 9.43 cm **(3)**

(Total 6 marks)

Q7.

Work out the area of this right-angled triangle.

Not drawn accurately



Give your answer to 2 significant figures.

$\tan 50 = \frac{x}{24}$

$24 \times \tan 50 = x$

$x = 28.6$

~~$= 29$~~

Area $= 28.6 \times 24$

$= 686.4$ which is $690\ m^2$ to 2 sf.

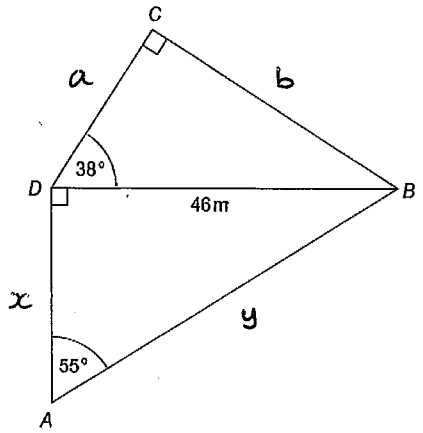
Answer 690 m^2

(Total 5 marks)

Q8.

The diagram shows five straight paths.

Not drawn accurately



Harry walks along paths *AD* and *DC*.

Work out the total distance he walks.

Tan 55 = $\frac{46}{x}$

$x \times \text{Tan } 55 = 46$

$x = \frac{46}{\text{Tan } 55} = 32.2\text{ m}$

$y^2 = 32.2^2 + 46^2 = 3152.84 \rightarrow y = 56.2\text{ m}$

$\text{Cos } 38 = \frac{a}{46} \rightarrow a = 46 \times \text{Cos } 38 = 36.2\text{ m}$

$b^2 = 46^2 - 36.2^2 = 805.56 \rightarrow b = 28.4\text{m}$

Total distance

= 36.2 + 32.2

= 68.4 m

Answer 68.4 m

(Total 6 marks)

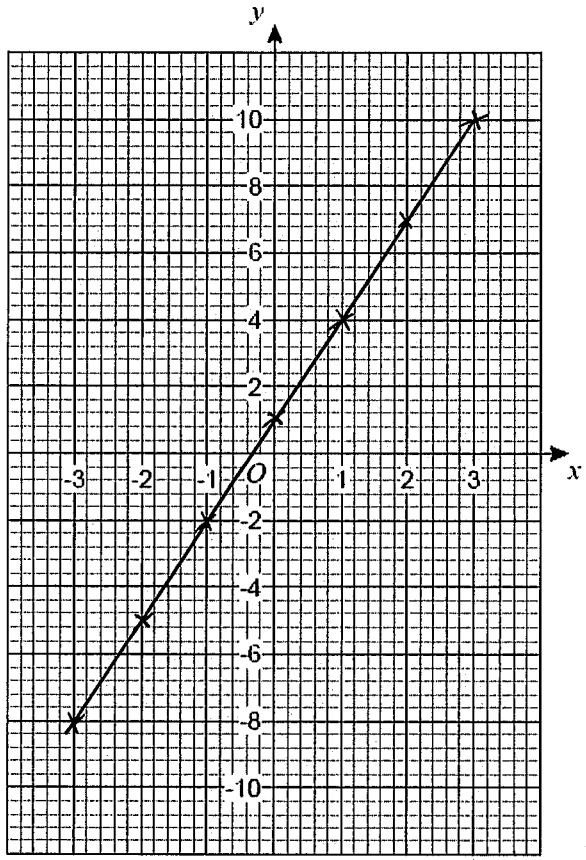
Graphs

Q1. (a) Complete the table for $y = 3x + 1$

x	−3	−2	−1	0	1	2	3
y	−8	−5	−2	1	4	7	10

(2)

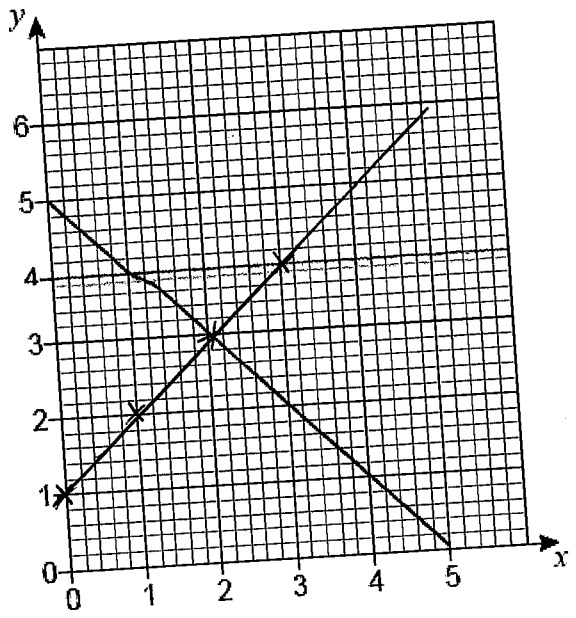
(b) On the grid draw the graph of $y = 3x + 1$ for values of x from −3 to 3



(2)

Q2.

Here is the graph of $y = 5 - x$ for values of x from 0 to 5



(a) On the same grid, draw the graph of $y = x + 1$ for values of x from 0 to 5 **(2)**

(b) Use the graphs to solve the simultaneous equations

$y = 5 - x$ and $y = x + 1$

$x =$ 2

$y =$ 3

(1)

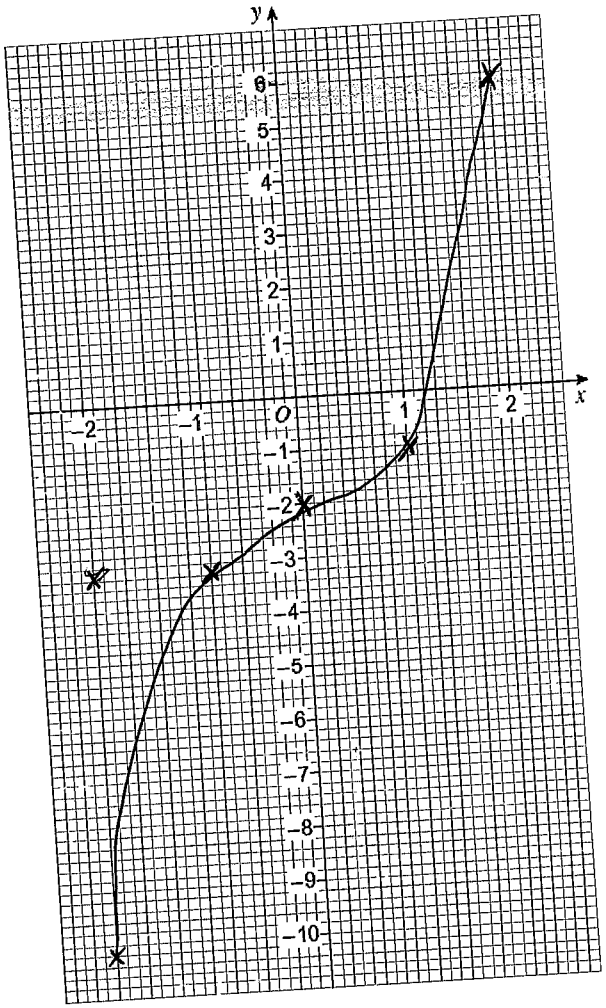
(Total 3 marks)

Q3.

Here is a table of values for $y = x^3 - 2$ for $x = -2$ to 2

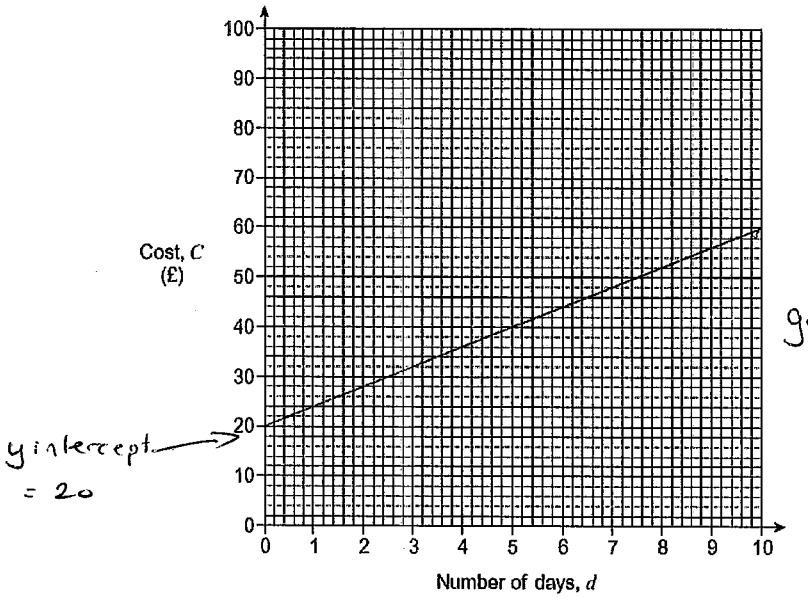
x	−2	−1	0	1	2
y	−10	−3	−2	−1	6

Draw the graph of $y = x^3 - 2$ for values of x from −2 to 2



(Total 2 marks)

Q4. This graph is used to work out the cost, C (£), to hire a drill for a number of days, d.



(a) Circle the correct formula for the cost, C, to hire a drill.

$C = 20d + 4$ $C = 4d + 24$ $C = 4d + 20$ $C = 24d - 4$

(b) The cost of hiring a sander is given by the formula

$C = 6d + 10$

Dev hires a drill and a sander for the **same** number of days. The **total** cost is £90

Work out the number of days that he hires the drill and sander.

$4d + 20 + 6d + 10 = 10d + 30$

$10d + 30 = 90$

$10d = 60$

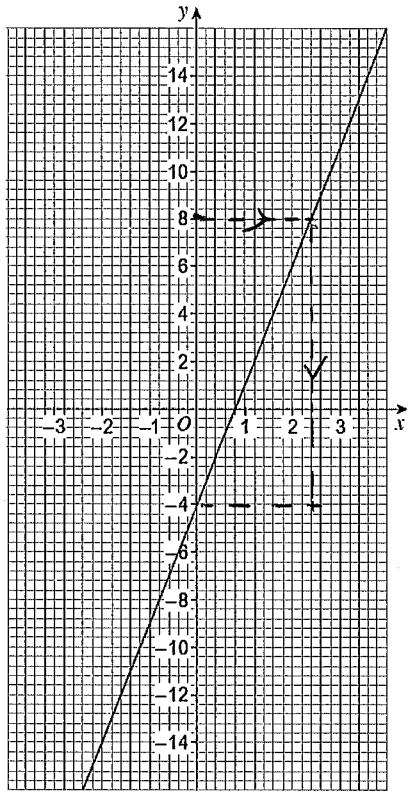
$d = 6$

Answer 6 days

(Total 4 marks)

Q5.

Here is a straight-line graph.



(a) Use the graph to work out the value of x when y = 8

Answer 2·4

(1)

(b) Work out the gradient of the line.

$\frac{8 - -4}{2.4 - 0} = \frac{12}{2.4}$

$= 5$

Answer

(3)

(Total 4 marks)

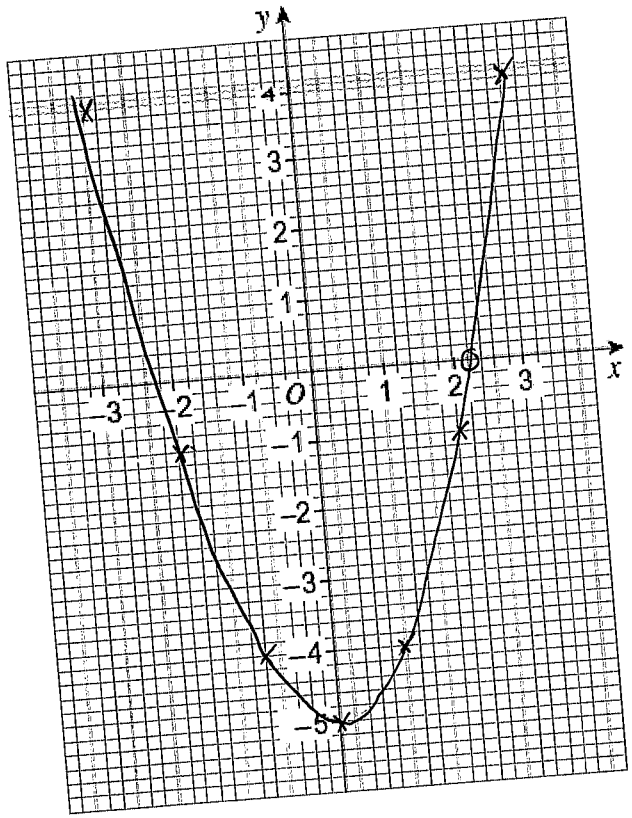
Q6.

(a) Complete the table of values for $y = x^2 - 5$ for values of x from –3 to 3

x	–3	–2	–1	0	1	2	3
y	4	–1	–4	–5	–4	–1	4

(2)

(b) Draw the graph of $y = x^2 - 5$ for values of x from –3 to 3



where graph cuts x-axis

(2)

(c) Use the graph of $y = x^2 - 5$ to write down the values of x when $y = 0$

Answer -2.2 and 2.2

(1)

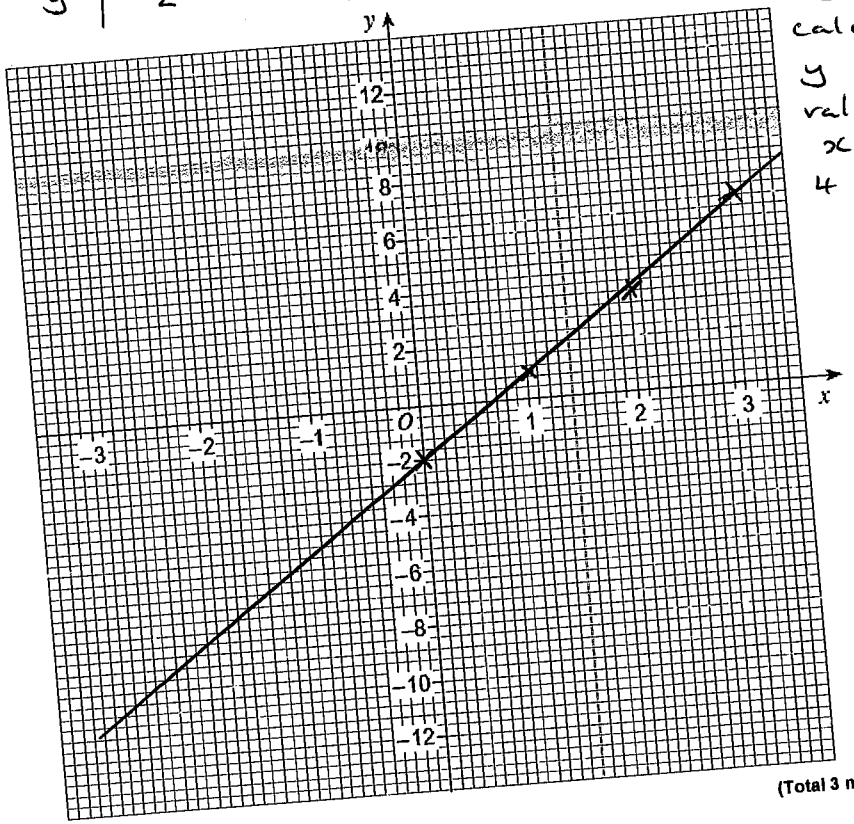
(Total 5 marks)

Q7.

Draw the graph of $y = 3x - 2$ for values of x from –3 to 3

need to make own table - as graph is linear do not need to calculate y for all values of x - 3 or 4 will do.

x	0	1	2	3
y	-2	1	4	7



(Total 3 marks)

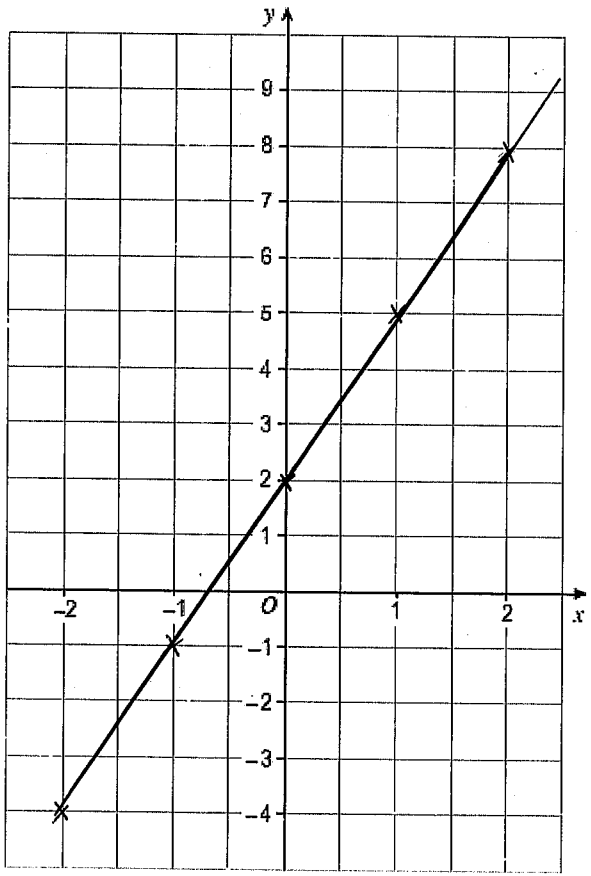
Q8.

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

x	−2	−1	0	1	2
y	−4	−1	2	5	8

(2)

(b) On the grid draw the graph of $y = 3x + 2$ for values of x from −2 to 2



(2)

(c) Work out the gradient of the line $y = 3x + 2$

Answer 3

(1)

(Total 5 marks)