EPSOM
COLLEGE

Epsom College
Mathematics Department

13+ Academic Scholarship
Sample Paper

Time Allowed: 45 min
Total Marks Available: 45
No calculator allowed

Write all answers in the spaces
provided. Use blue or black pen only.

COLLEGE ROAD, EPSOM, SURREY, KT17 4JQ
01372 821000 INFO@EPSOMCOLLEGE.ORG.UK EPSOMCOLLEGE.ORG.UK

Questions

Q1.

The diagram shows a cuboid.

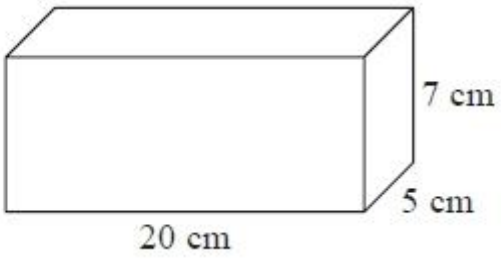


Diagram **NOT** accurately drawn

Work out the volume of the cuboid.

.....

(Total for Question is 1 marks)

Q2.

(a) Work out $2\frac{1}{5} - 1\frac{4}{7}$

.....

(2)

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

.....

(2)

(Total for question = 4 marks)

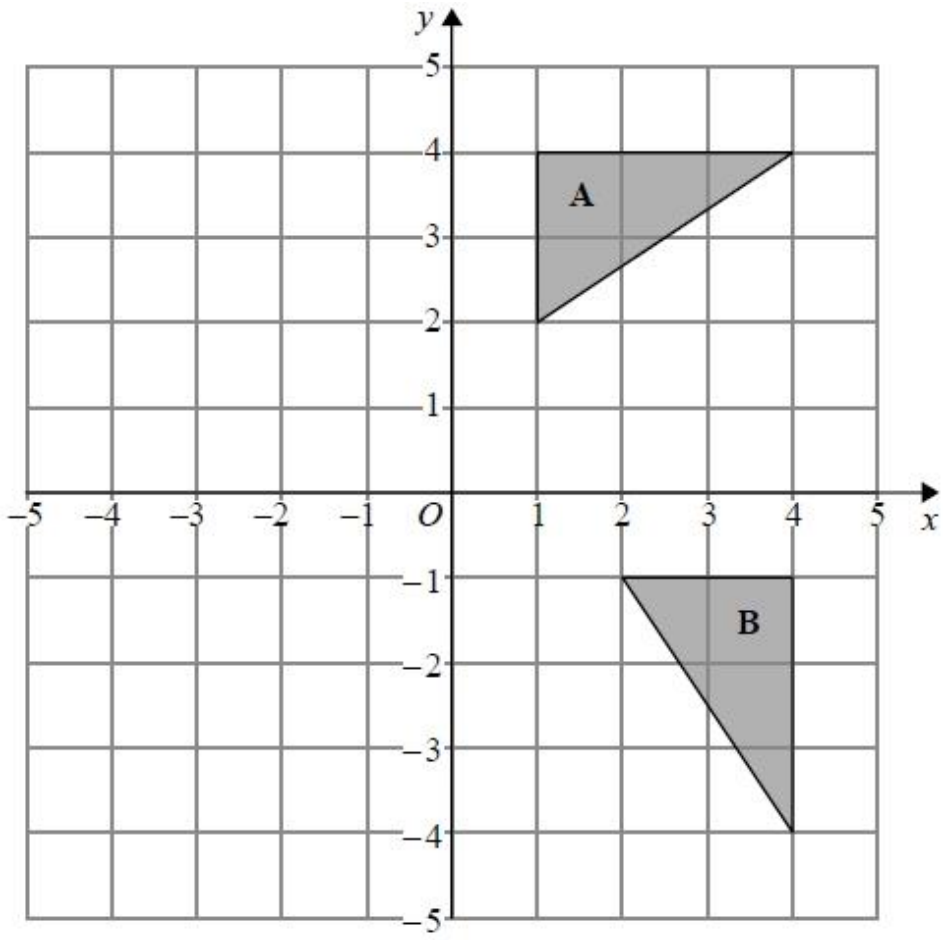
Q3.

(a) Solve $5(x + 3) = 2x + 57$

(2)

(Total for question = 2 marks)

Q4.



Describe fully the single transformation that maps triangle **A** onto triangle **B**.

.....

.....

(Total for question = 2 marks)

Q5.

Given that $A = 2^4 \times 3^3 \times 5$ and $B = 2^3 \times 3 \times 5^2$

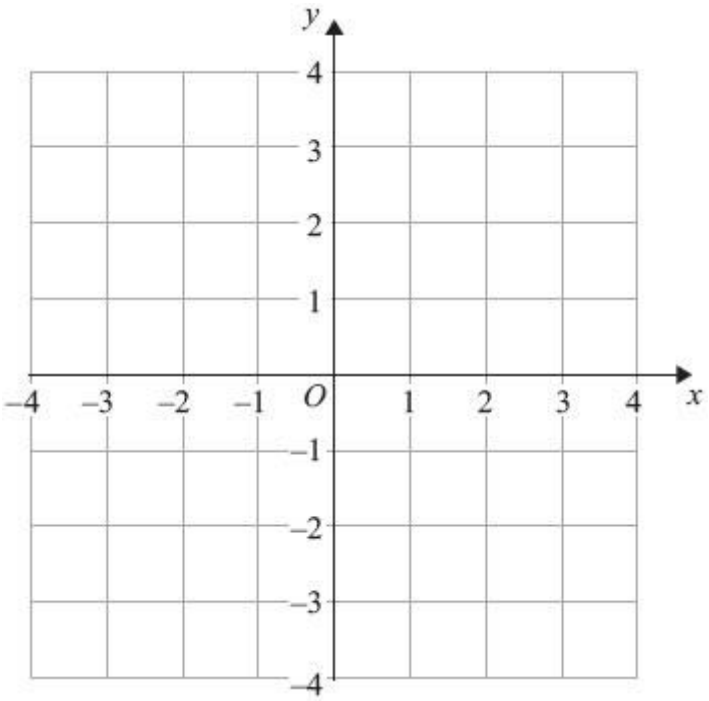
write down, as a product of powers of its prime factors,

(i) the highest common factor (HCF) of A and B

(ii) the lowest common multiple (LCM) of A and B.

(Total for question = 2 marks)

Q6.



(a) On the grid above, draw the line $x = 3$

(1)

(b) On this grid, draw the line $y = x$

(1)

(c) Find the point of intersection between the lines x = 3 and y = x

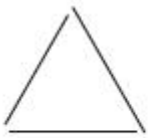
Point of intersection = (……,……)

(1)

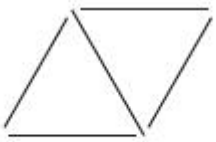
(Total for Question is 3 marks)

Q7.

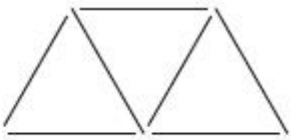
Here are some patterns made from sticks.



Pattern number 1



Pattern number 2



Pattern number 3

(a) In the space below, draw Pattern number 4

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	3	5	7		

(1)

Maria wants to work out how many sticks make Pattern number 50

(c) Write down a method she can use.

.....

.....

.....

(1)

(Total for Question is 3 marks)

Q8.

The diagram shows a semicircle drawn inside a rectangle.

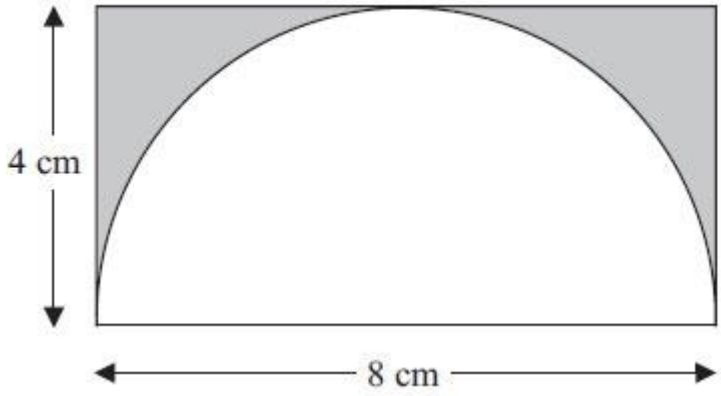


Diagram **NOT** accurately drawn

The semicircle has a diameter of 8 cm.
The rectangle is 8 cm by 4 cm.

Work out the area of the shaded region. Use $\pi = 3$ in your calculations.

. . . . . cm^2

(Total for Question is 4 marks)

Q9.

(a) Expand $5(m + 2)$

.....

(1)

(b) Factorise $y^2 + 3y$

.....

(1)

(c) Simplify $a^5 \times a^4$

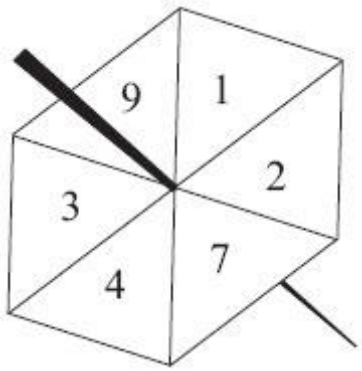
.....

(1)

(Total for Question is 3 marks)

Q10.

Here is a fair 6-sided spinner.



Jake is going to spin the spinner once.
(a) Write down the probability that the spinner will land
(i) on 4

. . . . . .

(ii) on a number greater than 10

. . . . . .

(2)

Liz is going to spin the spinner 120 times.

(b) Work out an estimate for the number of times the spinner will land on 7

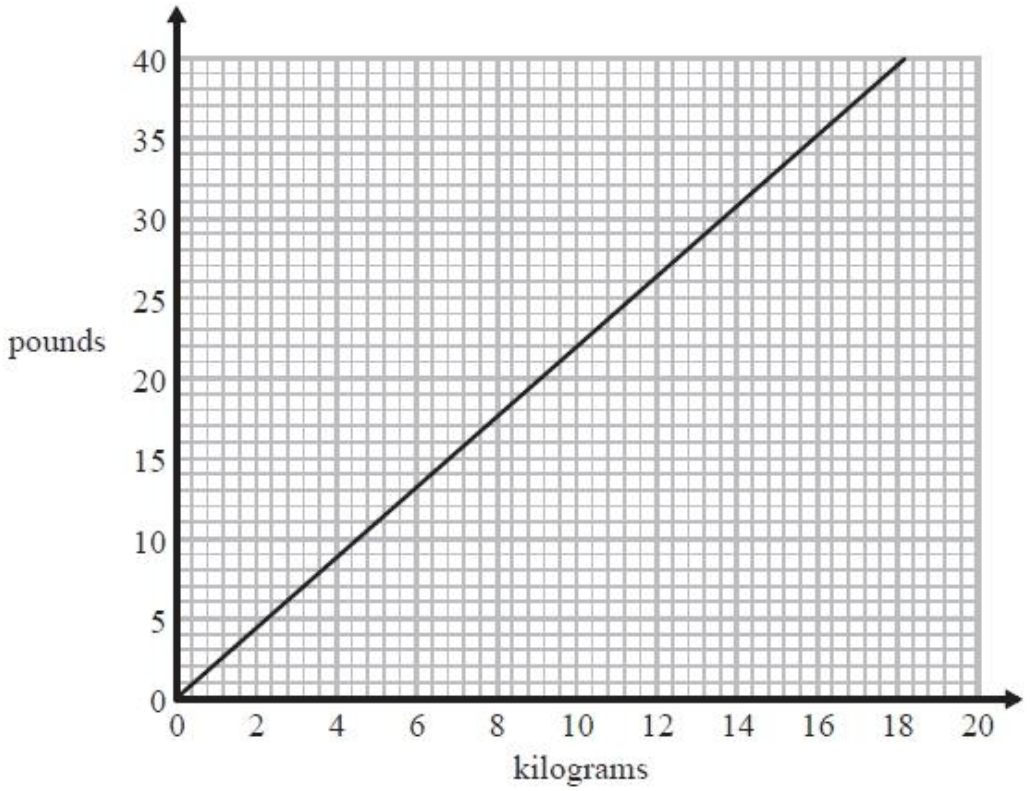
. . . . . .

(1)

(Total for Question is 3 mark)

Q11.

You can use this graph to change between pounds and kilograms.



(a) Change 13 pounds to kilograms.

..... kilograms

(1)

A trolley can carry a maximum weight of 200 pounds.

Jack has 4 bags of potatoes.
Each bag of potatoes weighs 25 kilograms.

*(b) Can the trolley carry the 4 bags of potatoes at the same time?
You must show your working.

(2)

(Total for question = 3 marks)

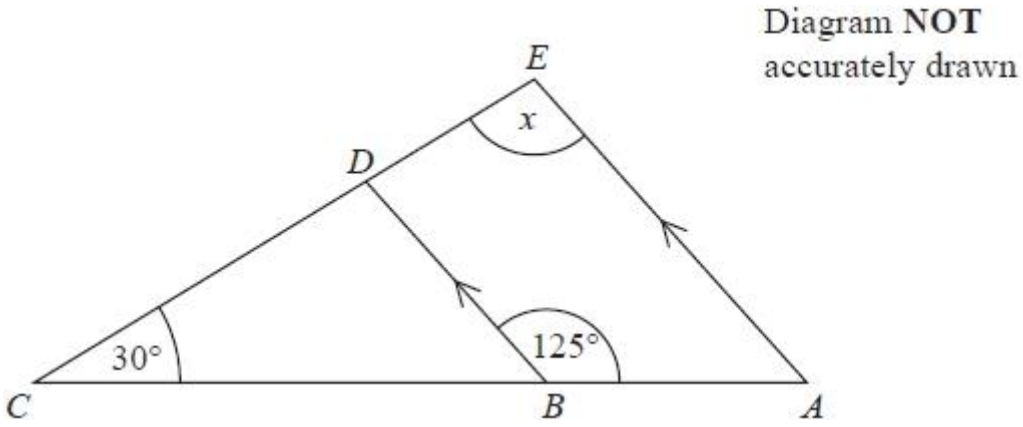
Q12.

Expand and simplify $(m + 7)(m + 3)$

.....

(Total for question = 2 marks)

Q13.



ABC and *EDC* are straight lines.
AE and *BD* are parallel.
Angle *ABD* = 125°
Angle *BCD* = 30°

Work out the size of the angle marked *x*.
Give reasons for your answer.

(Total for question = 3 marks)

Q14.

The diagram shows the floor plan of Mary's conservatory.

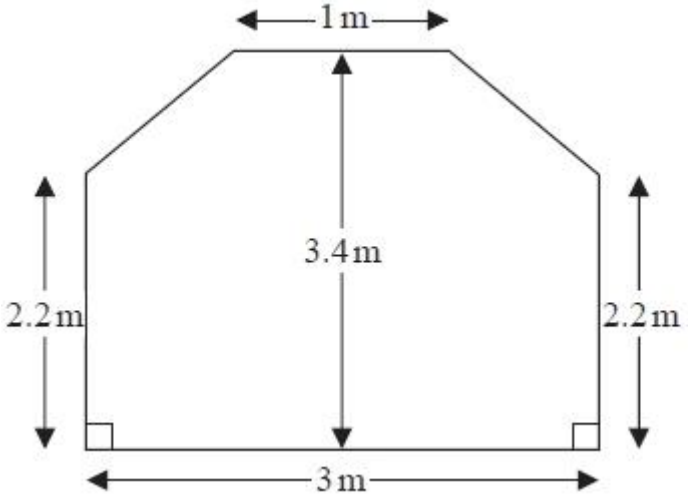


Diagram **NOT** accurately drawn

Mary is going to cover the floor with tiles.

Note: - Area of a Trapezium = $\frac{(a+b)}{2} \times h$

The tiles are sold in packs.
One pack of tiles will cover $2m^2$
A pack of tiles normally costs £24.80
Mary gets a discount of 25% off the cost of the tiles.

Mary has £100

Does Mary have enough money to buy all the tiles she needs?
You must show all your working.

(Total for question = 4 marks)

Q15.
The diagram shows **shape A**.
All the measurements are in centimetres.

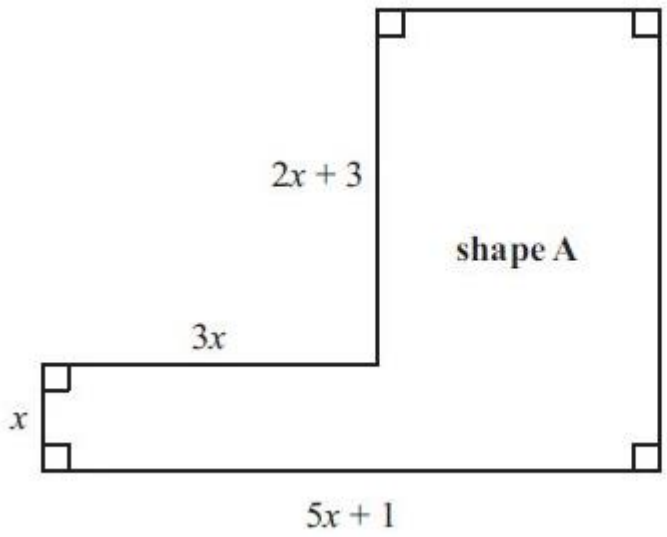


Diagram **NOT** accurately drawn

(a) Find an expression, in terms of *x*, for the perimeter of **shape A**.

. . . . . .

(2)

A square has the same perimeter as **shape A**.

(b) Find an expression, in terms of *x*, for the length of one side of this square.

. . . . . .

(1)

(Total for Question is 3 marks)

Q16.

Dimitar has 20 sweets.
Pip also has 20 sweets.

Dimitar gives Pip $2x$ sweets.

Dimitar then eats 5 of his sweets.
Pip then eats half of her sweets.

Write simplified expressions for the number of sweets Dimitar and Pip now have.

Dimitar ..... Pip .....

(Total for question = 3 marks)

END OF TEST

Name: Mark Scheme

13+ Scholarship Paper

Date:

Time: 45 mins

Total marks available: 45

Total marks achieved: _____

None calculator

MJH

Questions

Q1.

The diagram shows a cuboid.

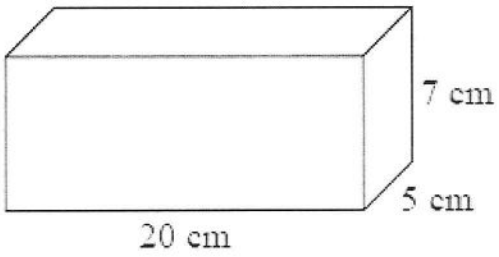


Diagram NOT accurately drawn

Work out the volume of the cuboid.

Vol = 20 × 5 × 7

700 cm³ (A1)

.....

(Total for Question is 1 marks)

Q2.

(a) Work out $2\frac{1}{5} - 1\frac{4}{7}$

(M1) $\frac{11}{5} - \frac{11}{7}$

$\frac{77}{35} - \frac{55}{35} = \frac{22}{35}$

$\frac{22}{35}$ (A1)

.....

(2)

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

(M1) $\frac{5}{3} \times \frac{4}{3} = \frac{20}{9}$

$\frac{20}{9}$ or $2\frac{2}{9}$ (A1)

.....

(2)

(Total for question = 4 marks)

Q3.

(a) Solve $5(x + 3) = 2x + 57$

(M1) $5x + 15 = 2x + 57$

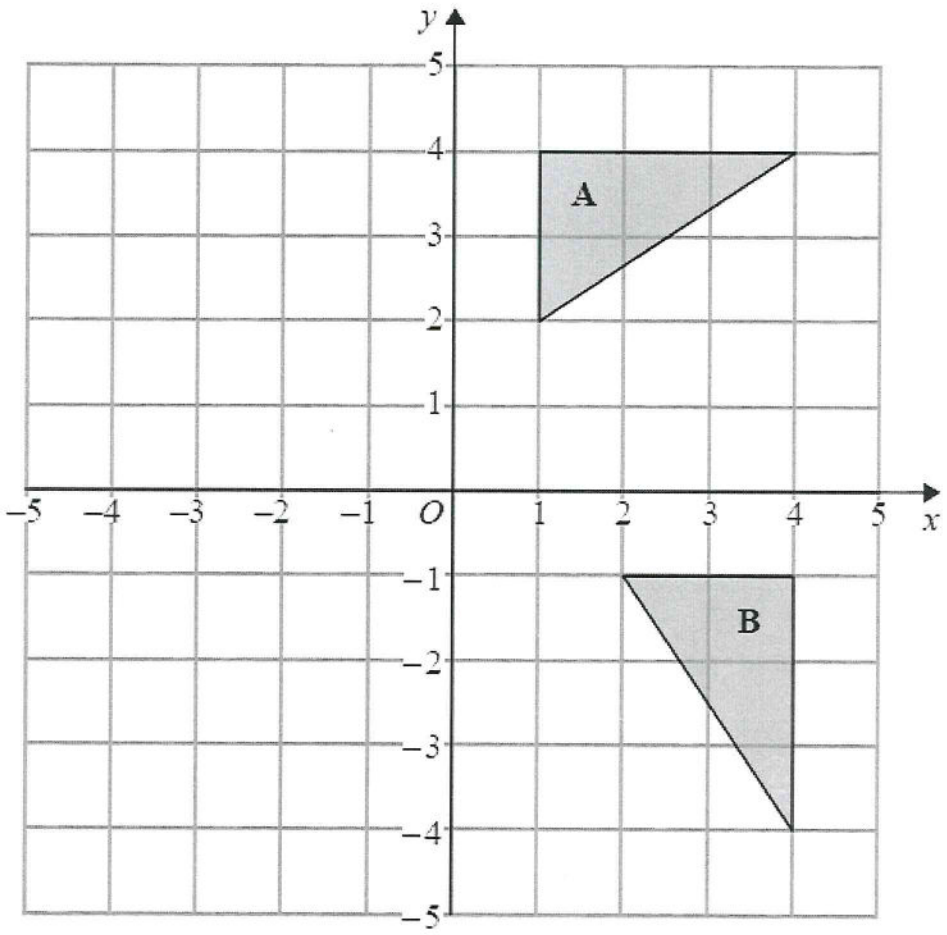
$3x = 42$

$x = 14$ (A1)

(2)

(Total for question = 2 marks)

Q4.



Describe fully the single transformation that maps triangle **A** onto triangle **B**.

Rotation of 90° clockwise about (0,0)

(A2)

(Total for question = 2 marks)

Q5.

Given that $A = 2^4 \times 3^3 \times 5$ and $B = 2^3 \times 3 \times 5^2$

write down, as a product of powers of its prime factors,

(i) the highest common factor (HCF) of A and B

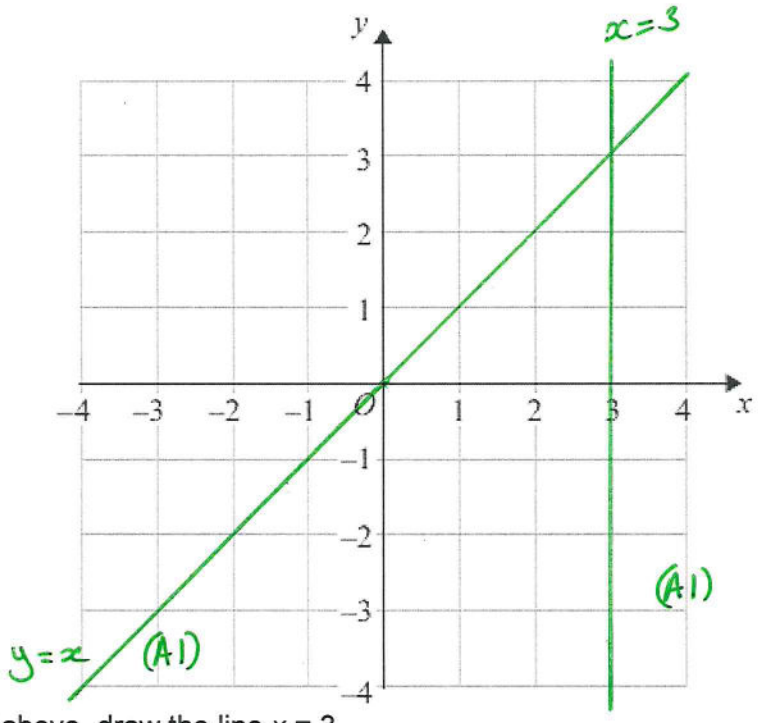
$2^3 \times 3 \times 5$ (A1)

(ii) the lowest common multiple (LCM) of A and B.

$2^4 \times 3^3 \times 5^2$ (A1)

(Total for question = 2 marks)

Q6.



(a) On the grid above, draw the line $x = 3$

(1)

(b) On this grid, draw the line $y = x$

(1)

(c) Find the point of intersection between the lines x = 3 and y = x

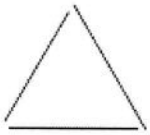
Point of intersection = (..3..,..3..) (A1)

(1)

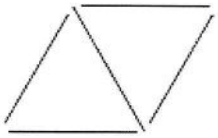
(Total for Question is 3 marks)

Q7.

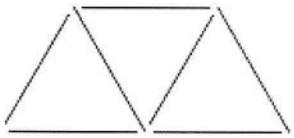
Here are some patterns made from sticks.



Pattern number 1

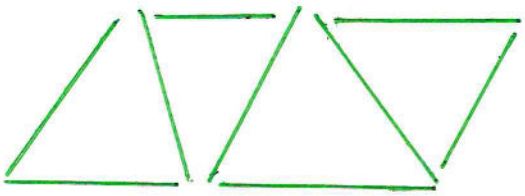


Pattern number 2



Pattern number 3

(a) In the space below, draw Pattern number 4



(A1)

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	3	5	7	9	11

(A1)

(1)

Maria wants to work out how many sticks make Pattern number 50

(c) Write down a method she can use.

Multiply by 2, then add one.

2n + 1

(A1)

(1)

(Total for Question is 3 marks)

Q8.

The diagram shows a semicircle drawn inside a rectangle.

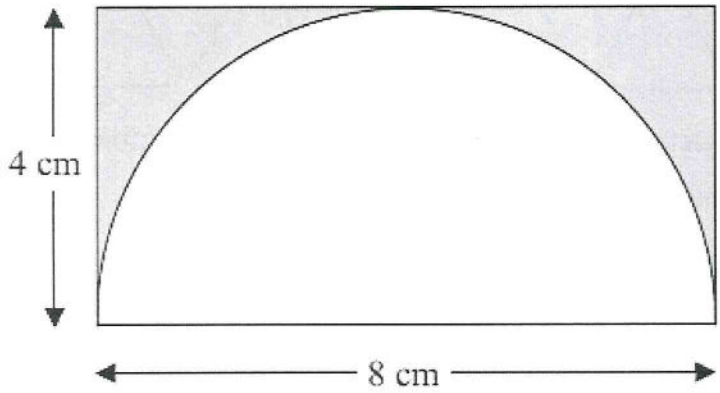


Diagram **NOT** accurately drawn

The semicircle has a diameter of 8 cm.
The rectangle is 8 cm by 4 cm.

Work out the area of the shaded region. Use $\pi = 3$ in your calculations.

Area of $\square$ = $8 \times 4 = 32$ (M1)

Area of $\cap$ = $\frac{\pi \times 4^2}{2} = \frac{3 \times 16}{2} = 3 \times 8 = 24$ (M1)

$\therefore$ Shaded region = $32 - 24 = 8\ cm^2$ (M1)

8 (A1)

..... cm^2

(Total for Question is 4 marks)

Q9.

(a) Expand $5(m + 2)$

$5m + 10$ (A1)

(1)

(b) Factorise $y^2 + 3y$

$y(y + 3)$ (A1)

(1)

(c) Simplify $a^5 \times a^4$

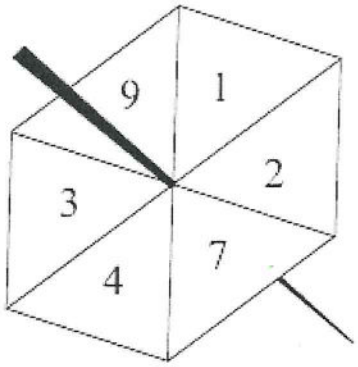
a^9 (A1)

(1)

(Total for Question is 3 marks)

Q10.

Here is a fair 6-sided spinner.



Jake is going to spin the spinner once.

(a) Write down the probability that the spinner will land

(i) on 4

$\frac{1}{6}$ (A1)

(ii) on a number greater than 10

0 (A1)

(2)

Liz is going to spin the spinner 120 times.

(b) Work out an estimate for the number of times the spinner will land on 7

$\frac{1}{6} \times 120 = 20$

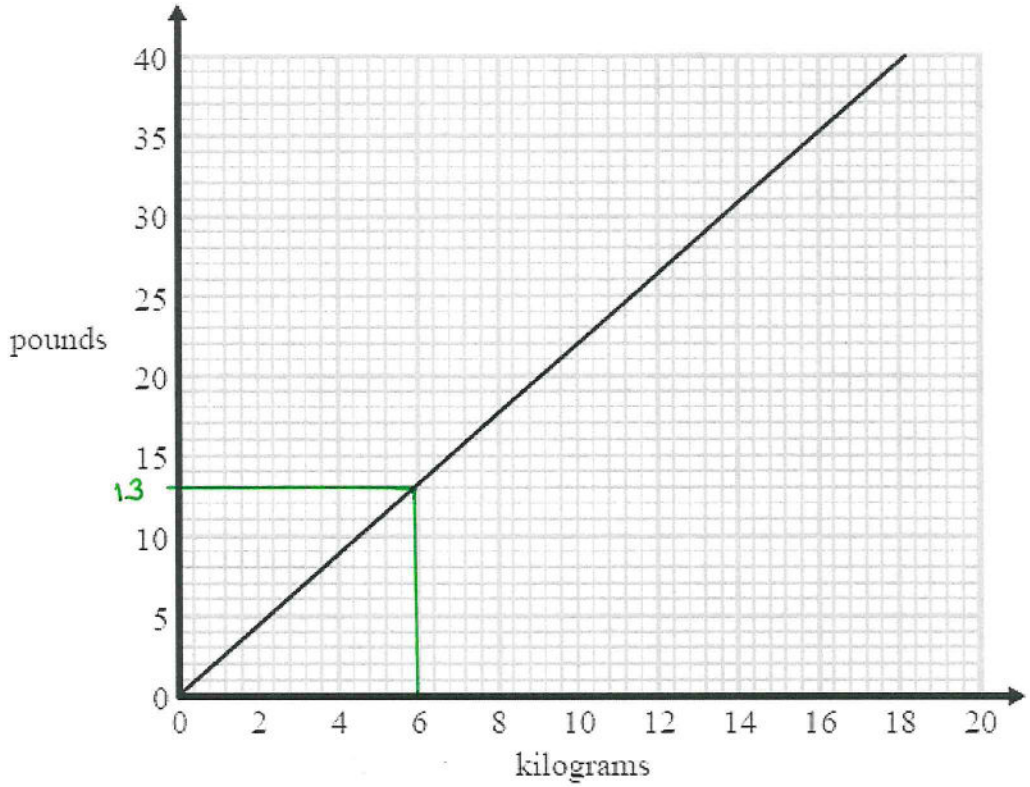
20 (A1)

(1)

(Total for Question is 3 mark)

Q11.

You can use this graph to change between pounds and kilograms.



(a) Change 13 pounds to kilograms.

6 (A1)

..... kilograms

(1)

A trolley can carry a maximum weight of 200 pounds.

Jack has 4 bags of potatoes.
Each bag of potatoes weighs 25 kilograms.

*(b) Can the trolley carry the 4 bags of potatoes at the same time?
You must show your working.

10kg = 22 pounds

5kg = 11 pounds

∴ 25kg = 55 pounds (M1)

4 × 55 pounds = 220 pounds (A1)

∴ The trolley can not carry all 4 bags at the same time. (A1)

(2)

(Total for question = 3 marks)

Q12.

Expand and simplify $(m + 7)(m + 3)$

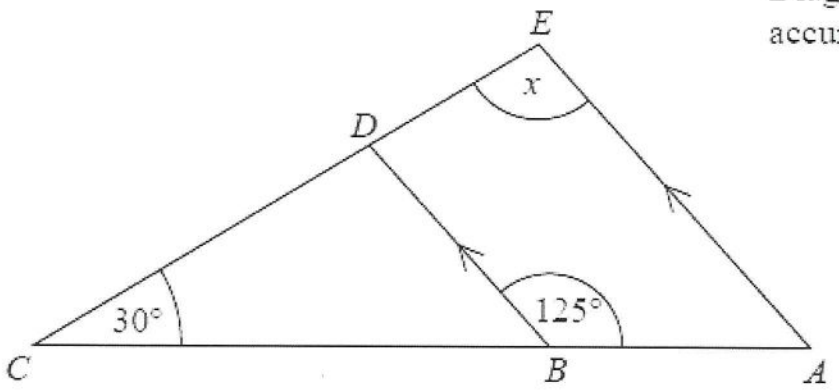
$m^2 + 7m + 3m + 21$ (M1)

$m^2 + 10m + 21$ (A1)

(Total for question = 2 marks)

Q13.

Diagram NOT accurately drawn



ABC and *EDC* are straight lines.
AE and *BD* are parallel.
Angle *ABD* = 125°
Angle *BCD* = 30°

Work out the size of the angle marked *x*.
Give reasons for your answer.

$D\hat{B}C = 180 - 125 = 55^\circ$ (angles on a straight line) (M1)

$C\hat{D}B = 180 - 55 - 30 = 95^\circ$ (angles in a Δ) (M1)

$\therefore x = 95^\circ$ (corresponding angles to $C\hat{D}B$) (A1)

(Total for question = 3 marks)

Q14.

The diagram shows the floor plan of Mary's conservatory.

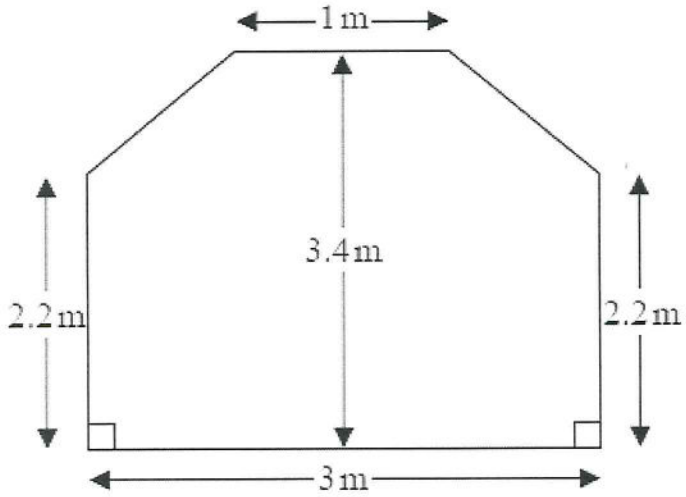


Diagram **NOT** accurately drawn

Mary is going to cover the floor with tiles.

Note: - Area of a Trapezium = $\frac{(a+b)}{2} \times$?

The tiles are sold in packs.
One pack of tiles will cover $2m^2$
A pack of tiles normally costs £24.80
Mary gets a discount of 25% off the cost of the tiles.

Mary has £100

Does Mary have enough money to buy all the tiles she needs?
You must show all your working.

Area □ = $3 \times 2.2 = 6.6$

Area ⏢ = $\frac{1}{2}(3+1) \times 1.2 = 2.4$

Total = $6.6 + 2.4 = 9\ m^2$ (M1)

$\frac{9m^2}{2m^2} = 4.5$ packs ∴ 5 packs are needed (M1)

£24.80 × 5 = £124.00

25% = £31 (M1)

124.00 − 31 = £93.00 (A1)

∴ Mary has enough money

(Total for question = 4 marks)

Q15.

The diagram shows **shape A**.

All the measurements are in centimetres.

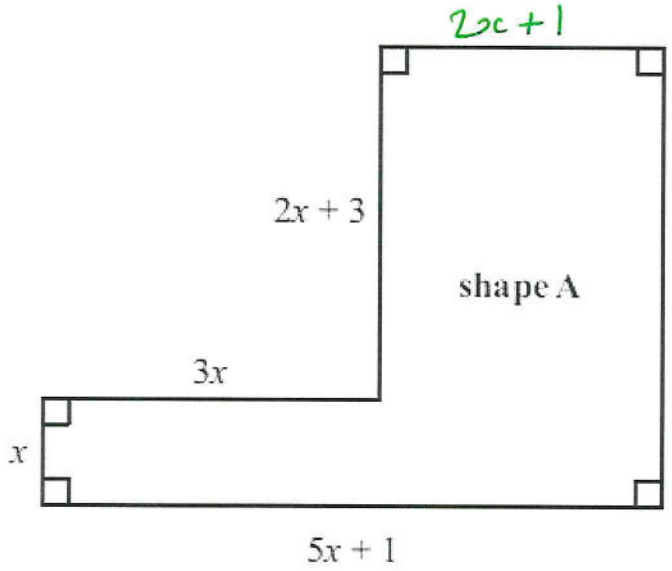


Diagram **NOT** accurately drawn

(a) Find an expression, in terms of x, for the perimeter of **shape A**.

$2x+1+3x+3+5x+1+x+3x+2x+3$ (M1)

$16x+8$ (A1)

(2)

A square has the same perimeter as **shape A**.

(b) Find an expression, in terms of x, for the length of one side of this square.

$\frac{16x+8}{4}$

$4x+2$ (A1)

(1)

(Total for Question is 3 marks)

Q16.

Dimitar has 20 sweets.
Pip also has 20 sweets.

Dimitar gives Pip $2x$ sweets.

Dimitar then eats 5 of his sweets.
Pip then eats half of her sweets.

Write simplified expressions for the number of sweets Dimitar and Pip now have.

D → $20 - 2x - 5$ (M1)

$15 - 2x$

P → $\frac{20 + 2x}{2}$ (M1)

$10 + x$

Dimitar ..... $15 - 2x$ ..... Pip ..... $10 + x$ ..... (A1)

(Total for question = 3 marks)

END OF TEST