

Name: SOLUTIONS

Forming Equations

**Date:**

**Time:**

**Total marks available:**

**Total marks achieved:** \_\_\_\_\_

**Questions**

Q1.

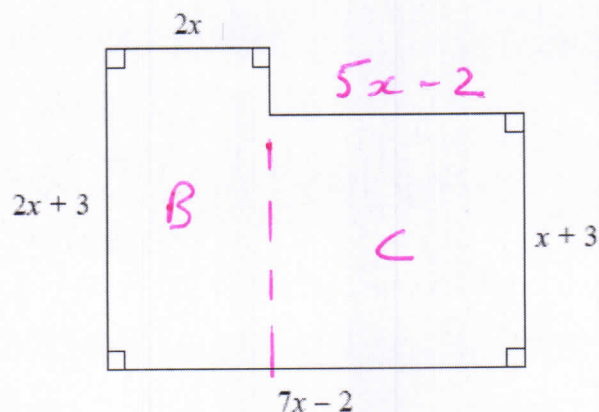


Diagram NOT  
accurately drawn

$$B = (2x+3)(2x) \\ = \underline{4x^2 + 6x}$$

$$C = (5x-2)(x+3) \\ = 5x^2 - 2x + 15x - 6 \\ = \underline{5x^2 + 13x - 6}$$

All the measurements in the diagram are in centimetres.

The area of the shape is  $A \text{ cm}^2$ .

Find a formula for  $A$  in terms of  $x$ .

You must write your formula as simply as possible.

Adding gives

$$A = \underline{9x^2 + 19x - 6}$$

(Total for question = 4 marks)

Q2.

Dan, Harry and Regan sell cars.

Dan sells  $x$  cars.

Harry sells 5 more cars than Dan.

Regan sells twice as many cars as Dan.

Dan  $x$

Harry  $x+5$

Regan  $2x$

Total cars sold

$$= x + x + 5 + 2x = 4x + 5$$

Write an expression, in terms of  $x$ , for the mean number of cars Dan, Harry and Regan sell.

$$\text{Mean} = \frac{\text{Total}}{3} = \frac{4x+5}{3}$$

$$\underline{\underline{\frac{4x+5}{3}}}$$

(Total for question = 2 marks)

Q3.

The diagram shows shape **A**.

All the measurements are in centimetres.

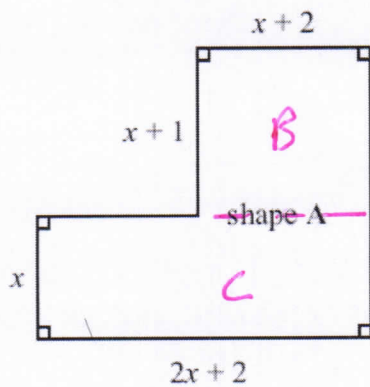


Diagram **NOT** accurately drawn

$$\begin{aligned}
 B &= (x+1)(x+2) \\
 &= x^2 + x + 2x + 2 \\
 &= \underline{x^2 + 3x + 2}
 \end{aligned}$$

(a) Find an expression in terms of  $x$  for the area, in  $\text{cm}^2$ , of shape **A**.  
You must simplify your answer.

$$\begin{aligned}
 C &= (2x+2)x \\
 &= \underline{2x^2 + 2x}
 \end{aligned}$$

$$\begin{aligned}
 A &= 3x^2 + 5x + 2 \\
 &\dots\dots\dots
 \end{aligned}$$

(4)

Shape **B** is a rectangle.  
Shape **B** has the same area as shape **A**.  
Shape **B** has a length of  $(3x+2)$  centimetres.

(b) Find an expression in terms of  $x$  for the width, in centimetres, of shape **B**.

$$(3x+2) \times \text{width} = 3x^2 + 5x + 2$$

$$3x^2 + 5x + 2$$

$$\dots\dots\dots x+1 \dots\dots\dots$$

(1)

$$= (3x+2)(x+1)$$

(Total for Question is 5 marks)

Q4.

Gemma has the same number of sweets as Betty.

Gemma gives 24 of her sweets to Betty.

Betty now has 5 times as many sweets as Gemma.

Work out the total number of sweets that Gemma and Betty have.

Let Gemma have  $x$   
so Betty has  $x$

72

Gemma Betty  
 $x-24$   $x+24$

(Total for question = 4 marks)

$$x+24 = 5(x-24)$$

$$x+24 = 5x-120$$

$$24+120 = 5x-x$$

$$144 = 4x$$

$$x = \frac{144}{4} = 36$$

Both Gemma and Betty  
start with 36 each  
so 72 sweets in total

Q5.

The diagram shows a trapezium.

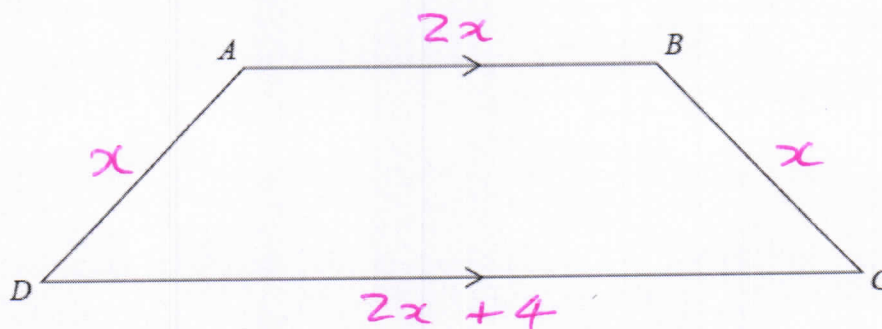


Diagram **NOT** accurately drawn

$AD = x$  cm.

$BC$  is the same length as  $AD$ .

$AB$  is twice the length of  $AD$ .

$DC$  is 4 cm longer than  $AB$ .

The perimeter of the trapezium is 38 cm.

Work out the length of  $AD$ .

$$x + 2x + x + 2x + 4 = 38$$

$$6x + 4 = 38$$

$$6x = 38 - 4$$

$$6x = 34$$

$$x = 5\frac{4}{6}$$

$$x = 5\frac{2}{3} \text{ cm}$$

(Total for Question is 4 marks)

Q6.

$ABC$  is a triangle.

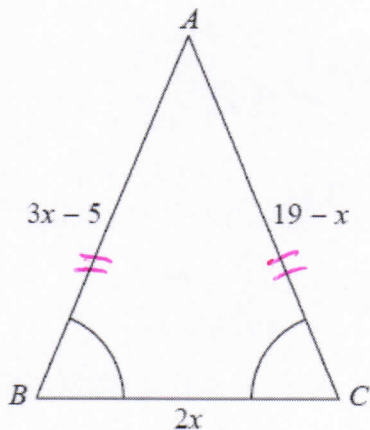


Diagram NOT  
accurately drawn

Isosceles  $\Delta$  so

$$3x - 5 = 19 - x$$

$$3x + x = 19 + 5$$

$$4x = 24$$

$$x = \frac{24}{4}$$

$$x = 6$$

$$\text{Perimeter} = 3x - 5 + 19 - x + 2x$$

$$= 4x + 14$$

$$= 4(6) + 14$$

$$= 24 + 14$$

$$= 38$$

..... cm

(Total for Question is 5 marks)

Steph  $x$

Tobi  $2x$

Ulrika  $2x - 3$

$$\text{Sum} = x + 2x + 2x - 3 = 52$$

$$\underline{5x - 3 = 52}$$

$$5x = 52 + 3$$

(3)

$$5x = 55$$

$$x = \frac{55}{5}$$

$$x = \dots\dots\dots 11$$

$$x = 11$$

(2)

(Total for Question is 5 marks)

Angle  $ABC = \text{angle } BCA$ .

The length of side  $AB$  is  $(3x - 5)$  cm.

The length of side  $AC$  is  $(19 - x)$  cm.

The length of side  $BC$  is  $2x$  cm.

Work out the perimeter of the triangle.

Give your answer as a number of centimetres.

Q7.

Stephanie is  $x$  years old.

Tobi is twice as old as Stephanie.

Ulrika is 3 years younger than Tobi.

The sum of all their ages is 52 years.

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

(b) Work out the value of  $x$ .



Q8.

Asha and Lucy are selling pencils in a school shop.  
They sell boxes of pencils and single pencils.

Asha sells 7 boxes of pencils and 22 single pencils.  
Lucy sells 5 boxes of pencils and 2 single pencils.  
Asha sells twice as many pencils as Lucy.

Work out how many pencils there are in a box.

Let a box contain  $x$  pencils

Asha  $7x + 22$

Lucy  $5x + 2$

$$7x + 22 = 2(5x + 2)$$

$$7x + 22 = 10x + 4$$

$$22 - 4 = 10x - 7x$$

$$18 = 3x$$

$$\frac{18}{3} = x$$

(Total for question = 4 marks)

$$6 = x$$

6 pencils in a box

Q9.

Dan has some marbles.  
Ellie has twice as many marbles as Dan.  
Frank has 15 marbles.

Dan, Ellie and Frank have a total of 63 marbles.

How many marbles does Dan have?

Let Dan have  $x$

Ellie  $2x$

Frank 15

$$x + 2x + 15 = 63$$

$$3x + 15 = 63$$

$$3x = 63 - 15$$

$$3x = 48$$

$$x = \frac{48}{3}$$

$$x = 16$$

$$16$$

(Total for Question is 3 marks)

Q10.

The diagram shows a prism.

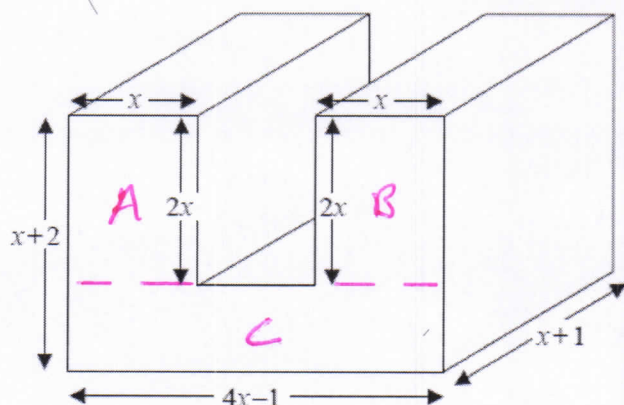


Diagram NOT  
accurately drawn

Volume = Area of cross-section  $\times$  Length

All measurements are in centimetres.  
All corners are right angles.

Find an expression, in terms of  $x$ , for the volume, in  $\text{cm}^3$ , of the prism.  
You must show your working.  
Give your answer in its simplest form.

$$9x^2 + 7x - 2$$

Find area of cross-section

$$A = 2x \times x = 2x^2$$

$$B = 2x \times x = 2x^2$$

(Total for question = 4 marks)

$$\text{Height of } C = x + 2 - 2x = 2 - x$$

$$\begin{aligned} \text{so } C &= (2 - x)(4x - 1) \\ &= 8x - 4x^2 - 2 + x \\ &= 9x - 4x^2 - 2 \end{aligned}$$

Cross-section area

$$\begin{aligned} &= 2x^2 + 2x^2 + 9x - 4x^2 - 2 \\ &= \underline{9x - 2} \end{aligned}$$

$$\begin{aligned} \text{Volume} &= (9x - 2)(x + 1) \\ &= 9x^2 - 2x + 9x - 2 \\ &= 9x^2 + 7x - 2 \end{aligned}$$