

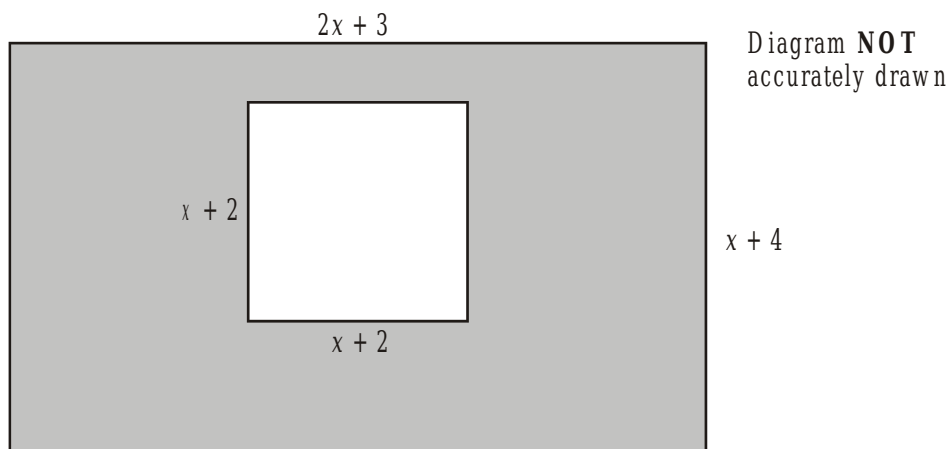
ALGEBRA

1. Solve the equation

$$\frac{7}{x+2} + \frac{1}{x-1} = 4$$

[3 MARKS]

2. Peter cuts a square out of a rectangular piece of metal.



The length of the rectangle is $2x + 3$.

The width of the rectangle is $x + 4$.

The length of the side of the square is $x + 2$.

All measurements are in centimetres.

The shaded shape in the diagram shows the metal remaining.

The area of the shaded shape is 20 cm^2 .

(a) Show that $x^2 + 7x - 12 = 0$

(4)

- (b) (i) Solve the equation $x^2 + 7x - 12 = 0$
Give your answers correct to 4 significant figures.

- (ii) Hence, find the perimeter of the square.
Give your answer correct to 3 significant figures.

3. Solve $7r + 2 = 5(r - 4)$

4. Simplify fully

(i) $(p^3)^3$

(ii) $\frac{3q^4 \times 2q^5}{q^3}$

5. The force, F , between two magnets is inversely proportional to the square of the distance, x , between them.

When $x = 3$, $F = 4$.

- (a) Find an expression for F in terms of x .

- (b) Calculate F when $x = 2$.

- (c) Calculate x when $F = 64$.

6. (a) Solve $\frac{40-x}{3} = 4 + x$

(b) Simplify fully $\frac{4x^2 - 6x}{4x^2 - 9}$

7. A van can carry a maximum load of 400 kg. It carries boxes weighing 20 kg and 40 kg. It carries at least 7 boxes weighing 40 kg. The number of boxes weighing 40 kg is not more than twice the number of 20 kg boxes.

Let x represent the number of 20 kg boxes and y the number of 40 kg boxes.

a) Write down three inequalities involving x and y .

b) Illustrate the three inequalities by a suitable diagram on graph paper. Let 2 cm represent 1 box on both axes.

c) From the diagram determine the least weight the van carries.

d) What combinations give the greatest weight?

8. The dimensions of a rectangle are such that its perimeter is greater than 20 metres and less

than 30 metres. One side must be greater than the other. The larger side must be less than twice the size of the smaller side.

Let x represent the length of the smaller side and y the length of the larger one.

a) Write down four inequalities involving x and y .

b) On graph paper, illustrate these inequalities using a scale of 2 cm to represent 2 metres on each axis, clearly showing the area containing the solution.

c) What whole number dimensions will satisfy these three inequalities?

9. Given that $3p = \frac{5p-4q}{2r-3q}$, express q in terms of p and r . Find the value of q when $p = 2$ and

$$r = -5.$$

10. The surface area of a solid cone is given by the formula

$$A = \pi r^2 + \pi r l.$$

(i) Factorise fully the expression $A = \pi r^2 + \pi r l$.

(ii) Rearrange the formula to express l in terms of π , r and A .

11. The formula used in connection with the mirror is

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

(i) Given that $v = 9$, and $f = 5$, find u .

(ii) Express v in terms of u and f .