

Linear Equations

1 Solve the equation $6 - 5x = -14$.

$$\begin{aligned}6 - 5x &= -14 \\-5x &= -20 \\x &= 4\end{aligned}$$

2 Solve the equation $\frac{x-11}{4} = 10$.

$$\begin{aligned}\frac{x-11}{4} &= 10 \\x-11 &= 40 \\x &= 51\end{aligned}$$

(a) Solve the equation $-\frac{2}{9} = \frac{5}{x}$ by first inverting the equation.

$$\begin{aligned}-\frac{2}{9} &= \frac{5}{x} \\-\frac{9}{2} &= \frac{x}{5} \\x &= -\frac{45}{2}\end{aligned}$$

(b) Solve the equation $\frac{8}{d} = \frac{-2}{11}$ using the cross-multiplication method.

$$\begin{aligned}8 \times 11 &= -2d \\d &= -44\end{aligned}$$

3 Solve the equation $\frac{4}{x+1} = \frac{3}{7}$.

$$\frac{x+1}{4} = \frac{7}{3}$$

$$3(x+1) = 28$$

$$3x+3 = 28$$

$$3x = 25$$

$$x = \frac{25}{3}$$

4 Solve the equation $\frac{2x-1}{3} = -4$.

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

$$2x-1 = -12$$

$$2x = -11$$

$$x = \frac{-11}{2}$$

5 Solve the equation $\frac{-3x+4}{2} = \frac{1}{3}$.

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

$$3(-3x+4) = 2$$

$$-9x+12 = 2$$

$$-9x = -10$$

$$x = \frac{10}{9}$$

Question 6Solve the following linear equation $x + 7(4 - x) = 3x + 2(x - 1)$.

$$x + 28 - 7x = 3x + 2x - 2$$

$$-6x + 28 = 5x - 2$$

$$\therefore 28 = 11x - 2$$

$$30 = 11x$$

$$x = \frac{30}{11}$$

Question 7

An astronomer notices two stars. He observes that one star gives off about 3.6 times as much energy as another star plus 400 units of energy. All together the stars give off 55,844 units of energy. How many units of energy does each star emit?

Let x = amount of energy given off by smaller star

3.6x + 400 = amount of energy given off by larger star

$$x + 3.6x + 400 = 55,844$$

$$4.6x = 55,444$$

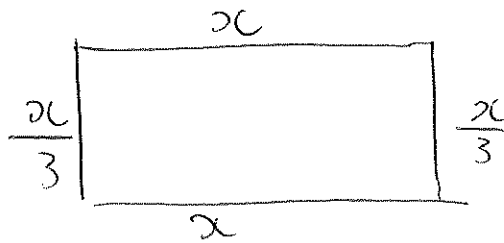
$$x = \frac{55444}{4.6} = 12053.04$$

Smaller star:
12053 units

Larger star: 43390.9
 \approx 43391 units

Question 8

The swimming pool has a perimeter of 120 metres. If the width is one third of the length, determine the area of the pool.



$$2x + \frac{2x}{3} = 120$$

$$3x \left(2x + \frac{2x}{3} \right) = 360$$

$$6x + 2x = 360$$

$$8x = 360$$

$$x = \frac{360}{8} = 45$$

Dimensions of rectangle:

length: 45 m

width: 15 m

$$\text{Area} = 45 \times 15 = 675 \text{ m}^2$$

Question 9

A car rental company charges \$40 per day plus \$0.25 per kilometre. Another company charges \$60 per day but only \$0.15 per kilometre. For how many kilometres are the fees of the two companies the same?

Let $x =$ no. of km

$$40 + 0.25x = 60 + 0.15x$$

$$0.1x = 20$$

$$x = 200$$

\therefore At 200km the fees will be the same.

Question 10

Solve the equation $4 - 5(x + 3) = 25$.

$$4 - 5(x + 3) = 25$$

$$4 - 5x - 15 = 25$$

$$-5x - 11 = 25$$

$$-5x = 36$$

$$x = \frac{-36}{5}$$

Question 11

Solve the equation:

$$\frac{2x-7}{3} = -9$$

$$\frac{2x-7}{3} = -9$$

$$2x - 7 = -27$$

$$2x = -20$$

$$x = -10$$

Question 12

- a. Transpose the formula: $v = u + at$ to make t the subject.

$$\begin{aligned}V &= u + at \\V - u &= at \\t &= \frac{V - u}{a}\end{aligned}$$

- b. If $u = 5$, $a = -2$ and $v = 0$, find the value of t .

$$\begin{aligned}V &= \frac{0 - 5}{-2} \\V &= 2.5\end{aligned}$$

Question 13

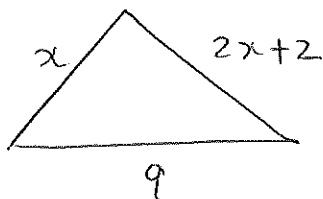
The volume of a solid is given by: $V = \frac{2}{3}\pi r^3 + \pi r^2 h$

Show that if $h = r$, the formula can be rearranged to make r the subject.

$$\begin{aligned}V &= \frac{2}{3}\pi r^3 + \pi r^2 h \\ \text{If } h = r, \quad V &= \frac{2}{3}\pi r^3 + \pi r^3 \\ V &= \frac{2\pi r^3}{3} + \frac{3\pi r^3}{3} = \frac{5\pi r^3}{3} \\ \therefore V &= \frac{5\pi r^3}{3}\end{aligned}$$

Question 14

The lengths of the sides of a triangle are x , $2x+2$ and 9 centimetres. If the perimeter is 35 cm, what are the lengths of the two unknown sides?



$$x + 2x + 2 + 9 = 35$$

$$3x + 11 = 35$$

$$3x = 24$$

$$x = 8$$

$$\begin{aligned}\frac{3V}{5\pi} &= r^3 \\ r &= \left(\frac{3V}{5\pi}\right)^{\frac{1}{3}}\end{aligned}$$