More Solving

eg 1) Solve
$$2x - 7 = 10$$
$$2x = 17$$
$$x = \frac{17}{2}$$

2) Solve
$$\frac{3x}{4} \overset{\times 4}{=} 12 \overset{\times 4}{}$$
$$3x = 48$$
$$x = \frac{48}{3}$$
$$x = 16$$

* Aim: $x = \text{☺}$

* What you do to one side of eqn, you must do to the other

* Look at last thing done + undo it

3) Solve
$$2(x+1) - 7 = 5$$
$$2(x+1) = 12$$
$$x+1 = 6$$
$$x = 5$$

← can check ans
  Let $x=5$ + sub into original.
  $2(5+1) - 7$
  $= 2(6) - 7$
  $= 12 - 7$
  $= 5$ ✓

Multiple Terms:

eg i)
$$3x + 6 = x + 10$$
$$2x + 6 = 10$$
$$2x = 4$$
$$x = 2$$

. Involving brackets:

eg 1) Solve $4(2x+5) = 2(x-2)$

$$8x + 20 = 2x - 4$$
$$6x = -24$$
$$x = -4$$

. expand brackets
before combining

2) Solve $5(y+2) - 4(y-1) = 6$

$$5y + 10 - 4y + 4 = 6$$
$$y + 14 = 6$$
$$y = -8$$

· Involving fractions:

eg 1) Solve $\dfrac{x}{3} = x + 4$

$$x = 3x + 12 \qquad \leftarrow \text{Everything gets mult by 3.}$$
$$-2x = 12$$
$$x = -6$$

2) Solve $\dfrac{x}{4} \overset{\times 12}{-2} \overset{\times 12}{=} \overset{\times 12}{\dfrac{x}{3}}$

$$3x - 24 = 4x$$
$$-24 = x$$
$$x = -24$$

3) $\dfrac{x-3}{4} = \dfrac{x+5}{6}$

mult of 4 are   4, 8, ⑫ · · ·

"   "   6 "   6, ⑫ · ·

Lowest common mult = 12

$\therefore \; 12\left(\dfrac{x-3}{4}\right) = 12\left(\dfrac{x+5}{6}\right)$

$3(x-3) = 2(x+5)$

$3x - 9 = 2x + 10$

$x = 19$

4. The relationship between Farenheit(F) and Celcius(C) is given by the formula $C = \frac{5}{9}(F - 32)$. Find the temperature in Farenheit when it is 45 degrees C.

$C = \dfrac{5}{9}(F - 32)$

$\dfrac{9}{5}C = F - 32$

$F = \dfrac{9}{5}C + 32$

$\therefore \; F = \dfrac{9}{5}(45) + 32 \; = 113\,^{\circ}F$

(Try Prob Set Q3)

Word Problems

5. A car rental charges $45 per day, and 20c per kilometre after the first 100 kilometres. If the bill for the day was $67, how far has the car driven?

Let x = dist car has travelled after first 100 kms

$\therefore$ Cost for day = $45 + 0.2x$

So
$$67 = 45 + 0.2x$$
$$22 = 0.2x$$
$$x = \frac{22}{0.2} = 110$$

$\therefore$ Total dist driven = $x + 100 = 110 + 100$
$$= 210 \text{ kms.}$$

6. The power P from a windmill is proportional to the cube of the wind speed, s.

(a) Write done an equation to represent this relationship.

(b) If 96 Watts are produced at a wind speed of 32 kilometres per hour, calculate the constant of proportionality.

(c) How much power is produced when the wind speed is 48 kilometres per hour?

a) $P \propto s^3$ so $P = ks^3$ where k = const of prop.

b) $P = 96$ when $S = 32$ $\rightarrow$ $96 = k(32)^3$
$$k = \frac{96}{(32)^3} = 0.00293\cdots$$

c) want P when $S = 48$ $\rightarrow$ $P = ks^3$
$$= (0.00293)(48)^3$$
$$= 324 \text{ watts.}$$

7. A drink manufacturer sells an orange juice as "naturally flavoured" - with orange juice content of 5%. New laws stipulate that for this advertising tag to be used, a minimum juice content must be 10%. How much pure orange juice must be added to a 400L container to satisfy the new law?

- We know   - we have 400 L
    - 5% is orange juice   ie: 5% of 400 = 20L

Let x = pure orange juice added

∴ Total amt of pure orange juice = $x + 20$

We want this to be 10% of total.

ie! $x + 20 = 10\%$ of $(400 + x)$

ie: $x + 20 = 0.1(400 + x)$

Solving: $x + 20 = 40 + 0.1x$

$x - 0.1x = 20$

$0.9x = 20$

$x = \dfrac{20}{0.9} = 22.22$ L

∴ Need 22.22 L added.

Factorising

- Just as numbers have factors, so do algebraic expressions.

    6 has factors $1, 2, 3, 6$

    ab has factors $1, a, b, ab$

    $a+b$ has factors $1, a+b$

- Remember $3(a+b) = 3a + 3b$ expand / factorise

    ie: * Take out common factors.

eg 1) $4x + 8y = 4(x + 2y)$

   2) $4x + 8xy = 4x(1 + 2y)$

   3) $6x^2y - 27x^3y^2 = 3x^2y(2 - 9xy)$

   4) $x(x-1) + 5(x-1) = (x-1)(x+5)$