

## Achievement Standard 2.1

### Algebra

#### Linear equations

1. Get rid of any fractions
2. Expand brackets
3. Combine like terms
4. Get variables on same side
5. Solve for x

Eg,

$$\begin{aligned} 1) \quad 5x - 7(x-4) &= \frac{3x}{5} - 11 \\ 25x - 35(x-4) &= 3x - 55 \\ 25x - 35x + 140 &= 3x - 55 \\ -10x + 140 &= 3x - 55 \\ 140 &= 13x - 55 \\ 195 &= 13x \\ x &= \frac{195}{13} = 15 \end{aligned}$$

$$2) \quad \frac{5x}{2} = \frac{4x}{3} + 7$$

Multiply b.s. by 6

$$\frac{30x}{2} = \frac{24x}{3} + 42$$

$$15x = 8x + 42$$

$$7x = 42$$

$$x = 6$$

$$3) \quad \frac{5x}{4} + \frac{x+3}{10} = 3$$

Multiply b.s. by 20

$$\frac{100x}{4} + \frac{20(x+3)}{10} = 60$$

$$25x + 2(x+3) = 60$$

$$25x + 2x + 6 = 60$$

$$27x = 54$$

$$x = 2$$

## Linear Inequalities

$$\begin{aligned} 1) \quad \frac{2x}{3} + 2(x-1) &\leq 6 \\ 2x + 6(x-1) &\leq 18 \\ 2x + 6x - 6 &\leq 18 \\ 8x - 6 &\leq 18 \\ 8x &\leq 24 \\ x &\leq 3 \end{aligned}$$

**NB** When multiplying or dividing an inequality by a **NEGATIVE** number we **inverse** the inequality.

$$\begin{aligned} 2) \quad 5 - 2(x-1) &> 11 \\ 5 - 2x + 2 &> 11 \\ 7 - 2x &> 11 \\ -2x &> 4 \\ x &< -2 \end{aligned}$$

## Word problems

1) A washing machine takes twice as long to fill as it takes to empty.  
The entire cycle (shown below) takes 32 minutes.

Write and solve an equation to find the time it takes to empty.

Fill	Wash 5min	Empty	Fill	Rinse 6min	Empty
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Let time to empty =  $x$   
fill =  $2x$

$$2x + 5 + x + 2x + 6 + x = 32$$

$$6x + 11 = 32$$

$$6x = 21$$

$$x = 3.5 \text{ minutes}$$

It takes  $3\frac{1}{2}$  minutes to empty

- 2) A group of 20 people went to a cricket match. Adults cost \$15, children cost \$8. The total cost for the group was \$209.  
How many of the group were adults?

Let adults be  $x$   
children be  $20-x$

$$15x + 8(20-x) = 209$$

$$15x + 160 - 8x = 209$$

$$7x + 160 = 209$$

$$7x = 49$$

$$x = 7$$

There were 7 adults in the group.

### Rearranging Equations

1) Make  $t$  the subject of  $v = u + at$

$$v - u = at$$
$$t = \frac{v-u}{a}$$

2) Make  $v$  the subject of  $E = \frac{1}{2} m v^2$

$$2E = m v^2$$
$$\frac{2E}{m} = v^2$$
$$v = \sqrt{\frac{2E}{m}}$$

3)  $F = 2\pi \sqrt{\frac{P}{5}}$   
Make  $P$  the subject

$$F^2 = 4\pi^2 \frac{P}{5}$$

$$5F^2 = 4\pi^2 P$$

$$P = \frac{5F^2}{4\pi^2}$$

4) Make  $y$  the subject of  $3x - 4y = M$

$$3x = M + 4y$$

$$3x - M = 4y$$

$$y = \frac{3x - M}{4}$$

5) Make  $x$  the subject of

$$y = \frac{3x - 2}{x + 5}$$

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

$$xy + 5y = 3x - 2$$

$$xy - 3x = -5y - 2$$

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

$$x = \frac{-5y - 2}{y - 3} \quad \text{or} \quad \frac{5y + 2}{3 - y}$$

## Rational Expressions

$$\begin{aligned} 1) \frac{4}{a+2} + \frac{3}{a-1} &= \frac{4(a-1) + 3(a+2)}{(a+2)(a-1)} \\ &= \frac{4a - 4 + 3a + 6}{(a+2)(a-1)} \\ &= \frac{7a + 2}{(a+2)(a-1)} \end{aligned}$$

$$\begin{aligned} 2) \frac{5}{(x-2)^2} - \frac{7}{(x-2)} &= \frac{5 - 7(x-2)}{(x-2)(x-2)} \\ &= \frac{5 - 7x + 14}{(x-2)(x-2)} = \frac{19 - 7x}{(x-2)^2} \end{aligned}$$