FURTHER SIMPLE EQUATIONS

You will remember that, with the equations you saw earlier, there will be an unknown quantity in the question.

YOU WILL HAVE TO FIND THAT UNKNOWN

Read through these examples:-

Example 1

$$\frac{x}{5} - \frac{x}{4} = 2$$

First the denominators must be dealt with, so find the LCM of 5, 4 and 1. Do not forget that 2 can be written as $\frac{2}{1}$

LCM of 5, 4 and 1 = 20

Multiply every term by 20:-

$$\frac{20}{1} \times \frac{x}{5} - \frac{20}{1} \times \frac{x}{4} = 20 \times 2$$

Cancel where possible, giving:-
$x = -40$

Example 2

$$\frac{a}{2} + \frac{a}{3} - 6 = \frac{a}{6}$$

First deal with the denominators. The LCM of 2, 3 and 6 = 6

Multiply every term by 6

$$\frac{6 \times a}{2} + \frac{6 \times a}{3} - \frac{6 \times 6}{1} = \frac{6 \times a}{6}$$

Cancel where possible:-

3a + 2a − 36 = a

Collect like terms together, giving:-

5a − a = 36
   4a = 36

$$a = \frac{36}{4}$$
   a = 9

Example 3a

$$\frac{4}{x} = 3 \text{ (really } \frac{3}{1} \text{)}$$

LCM of x and 1 = x
Multiply both sides by x

$$\frac{4}{x} \text{ x } x = \frac{3}{1} \text{ x } x$$

Cancel where possible

$$4 = 3x$$

$$\frac{4}{3} = x$$

$$1\frac{1}{3} = x$$

A quick method is called "**CROSS MULTIPLICATION**", where the denominator from each side is taken to the other side, and multiplied by the numerator. Look at the above example done by cross multiplication.

Example 3b

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

It becomes

$$4 \text{ x } 1 = 3 \text{ x } x$$
$$4 = 3x \text{ etc. as above}$$

Example 4

$$\frac{3}{a} = \frac{2}{5}$$

Cross multiply like this:-

$$3 \text{ x } 5 = 2 \text{ x } a$$

$$15 = 2a$$

$$\frac{15}{2} = a$$

$$7.5 = a$$

Either way can be used. Choose which method you prefer.

Example 5

$$\frac{4 - t}{3} = \frac{3 - 2t}{2}$$

LCM of 2 and 3 = 6.

Keep the terms which are the numerators together, by placing them in brackets, as shown below.

Then multiply both sides by 6.

$$\frac{6(4 - t)}{3} = \frac{6(3 - 2t)}{2}$$

Cancel where possible, giving

$2(4-t) = 3(3-2t)$

$8 - 2t = 9 - 6t$

$-2t + 6t = 9 - 8$

$4t = 1$

$t = \frac{1}{4}$

Example 6

$$\frac{a + 3}{4} - \frac{a - 3}{5} = 2$$

LCM of 4 and 5 = 20

Multiply both sides by 20

Remember to put the brackets around the numerators in the question.

$$\frac{20(a + 3)}{4} - \frac{20(a - 3)}{5} = 2 \text{ x } 20$$

Cancel, giving:-

$5(a + 3) - 4(a - 3) = 40$
$5a + 15 - 4a + 12 = 40$
$a + 27 = 40$
$a = 40 - 27 = 13$

Be careful with the signs. **REMEMBER** that when removing brackets, a **minus sign   outside brackets**, changes the sign inside the bracket.

Example 7

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

LCM of $2x$, $3x$ and 1 is $6x$.

Remember that 4 can be written as: $\frac{4}{1}$.

Multiply every term by $6x$.

$$\frac{6x(1)}{2x} + \frac{6x(1)}{3x} = 6x \times 4$$

$$3(1) + 2(1) = 24x$$
$$5 = 24x$$
$$\frac{5}{24} = x$$

Exercise

1. $\frac{a}{4} - \frac{a}{3} = 5$

2. $\frac{x}{2} + \frac{x}{3} + \frac{x}{4} = \frac{5}{12}$

3. $\frac{a}{2} + \frac{a}{3} - 2 = \frac{a}{6} - 3$

4. $\frac{4}{a} = 2$

5. $\frac{3}{a} = \frac{5}{7}$

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

7. $\frac{4x-5}{3} = \frac{2-3x}{5}$

8. $\frac{2x+3}{4} - \frac{x+2}{3} = \frac{x+5}{12}$

9. $\frac{x+4}{3} = \frac{2x-5}{4}$

10. $\frac{t-5}{3} = \frac{t+2}{5}$

ANSWERS

1. $\dfrac{12(a)}{4} - \dfrac{12(a)}{3} = 5 \times 12$

    $3a - 4a = 60$

    $- a = 60$

    $- a = 60$

2. $\dfrac{x}{2} \times \dfrac{x}{3} + \dfrac{x}{4} = \dfrac{5}{12}$ cancel $\dfrac{12(x)}{2} + \dfrac{12(x)}{3} + \dfrac{12(x)}{4} = \dfrac{12(5)}{12}$

    $6x + 4x + 3x = 5$

    $13x = 5$

    $x = \dfrac{5}{13}$

3. $\dfrac{a}{2} + \dfrac{a}{3} - 2 = \dfrac{a}{6} - 3$ cancel $\dfrac{6a}{2} + \dfrac{6a}{3} - 6 \times 2 = \dfrac{6a}{6} - 3 \times 6$

    $3a + 2a - 12 = a - 18$

    $5a - 12 = a - 18$

    $4a = -6$

    $a = \dfrac{-6}{+4} = -1.5$

4. $\dfrac{4x a}{a} = 2a$

    $\dfrac{4}{2} = a = 2$

5. $\dfrac{3}{a} = \dfrac{5}{7}$

    $21 = 5a$

    $\dfrac{21}{5} = a$

    $4\dfrac{1}{5} = a$

6. $\dfrac{12(x+2)}{3} - \dfrac{12(x-3)}{4} = 2 \times 12$

$4x + 8 - 3x + 9 = 24$

$x + 17 = 24$

$x = 24 - 17 = 7$

7. $\dfrac{15(4x-5)}{3} = \dfrac{15(2-3x)}{5}$

$20x - 25 = 6 - 9x$

$20x + 9x = 6 + 25$

$29x = 31$

$x = \dfrac{31}{29} = 1\dfrac{2}{29}$

8. $\dfrac{12(2x+3)}{4} - \dfrac{12(x+2)}{3} = \dfrac{12(x+5)}{12}$

$6x + 9 - 4x - 8 = x + 5$

$2x + 1 = x + 5$

$2x - 1x = 5 - 1$

$x = 4$

9. $\dfrac{12(x+4)}{3} = \dfrac{12(2x+5)}{4}$

$4x + 16 = 6x + 15$

$16 - 5 = 6x - 4x$

$1 = 2x$

$x = \dfrac{1}{2}$

10.
$$\frac{15(t-5)}{3} = \frac{15(t+2)}{5}$$

$$5t - 3t = 6 + 25$$

$$2t = 31$$

$$t = \frac{31}{2} = 15\frac{1}{2}$$