

Math 9 – Unit 3: Solving Equations

Name: Mrs. Janel

Lesson 3.2: Solving with Brackets and Fractions

Date: March 3, 2025**Learning Goal:** We are learning to solve multi-step equations that contain brackets and have fractions.

The next layer to solving equations is to have brackets in the equations. With brackets, you first need to expand (using the Distributive Property), simplify, then use the skills from the last two lessons to solve. Here we go!!

a) $2(3p+4)=14$

$$\Rightarrow 6p + 8 = 14$$

$$6p = 14 - 8$$

$$\frac{6p}{6} = \frac{6}{6}$$

$$\boxed{p = 1}$$

b) $3(m+1)+10=8-2m$

$$\Rightarrow 3m + 3 + 10 = 8 - 2m$$

$$\Rightarrow 3m + 2m = 8 - 3 - 10$$

$$\Rightarrow \frac{5m}{5} = \frac{-5}{5}$$

$$\Rightarrow \boxed{m = -1}$$

c) $4(d+7)=-44+2(d+6)$

$$4d + 28 = -44 + 2d + 12$$

$$4d - 2d = -44 + 12 - 28$$

$$\frac{2d}{2} = \frac{-60}{2}$$

$$\boxed{d = -30}$$

d) $3(2x+1)-(x-2)=2(x+4)$

$$\Rightarrow 6x + 3 - x + 2 = 2x + 8$$

$$\Rightarrow 6x - x - 2x = 8 - 3 - 2$$

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

$$\Rightarrow \boxed{x = 1}$$

Now fractions?!?!

e) $\frac{x}{4} = \frac{1}{2}$

METHOD 1:

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

$$x = 2$$

METHOD 2:

$$\frac{x}{4} = \frac{1 \times 2}{2 \times 2}$$

$$\Rightarrow \frac{x}{4} = \frac{2}{4}$$

$$\Rightarrow \boxed{x = 2}$$

f) $\frac{3(5n)}{3 \times 2} = \frac{2(4n)}{(3)} - \frac{7}{6}$

$$LCD(2, 3, 6) = 6$$

$$\Rightarrow \frac{15n}{6} = \frac{8n}{6} - \frac{7}{6}$$

$$\Rightarrow 15n = 8n - 7$$

$$\Rightarrow 15n - 8n = -7$$

$$\Rightarrow \frac{7n}{7} = \frac{-7}{7}$$

$$\Rightarrow \boxed{n = -1}$$

MTH1W

METHOD 2

$$\frac{5n}{5 \times 3} + \frac{2}{1 \times 15} = \frac{3n}{1 \times 15} + \frac{4}{1 \times 15} \quad \text{LCD}(3, 5, 1) = 15$$

$$\Rightarrow \frac{5n}{15} + \frac{2}{15} = \frac{3n}{15} + \frac{4}{15}$$

$$\Rightarrow 5n + 2 = 3n + 4$$

$$\Rightarrow \frac{2n}{2} = \frac{2}{2} \Rightarrow \boxed{n = 15}$$

$$g) \frac{n}{3} + 2 = \frac{n}{5} + 4$$

$$\Rightarrow \frac{5n}{5 \times 3} - \frac{3n}{5 \times 3} = 4 - 2$$

$$\Rightarrow \frac{5n}{15} - \frac{3n}{15} = 2$$

$$\Rightarrow \frac{2n}{15} = 2 \Rightarrow n = \frac{2(15)}{2} = 15$$

$$i) \frac{n+5}{3 \times 2} - \frac{2n}{3 \times 2} = \frac{1 \times 6}{1 \times 6} \quad \text{LCD}(3, 2, 1) = 6$$

$$\frac{3n+15}{6} - \frac{2n}{6} = \frac{6}{6}$$

$$3n - 2n = 6 - 15$$

$$\boxed{n = -9}$$

$$k) \frac{4x+5}{2 \times 3} - \frac{3x}{3 \times 2} = \frac{-x \times 6}{1 \times 6} \quad \text{LCD}(3, 2, 1) = 6$$

$$\Rightarrow \frac{8x+10}{6} - \frac{9x}{6} = \frac{-6x}{6}$$

$$\Rightarrow 8x - 9x + 6x = -10$$

$$\Rightarrow \frac{5x}{5} = \frac{-10}{5}$$

$$\Rightarrow \boxed{x = -2}$$

* FRACTION BAR —
is LIKE A BRACKET.

$$h) \frac{3-y}{4 \times 5} = \frac{-2-3y}{4 \times 5} \quad \text{LCD}(5, 4) = 20$$

$$\Rightarrow \frac{+12-4y}{20} = \frac{-10-15y}{20}$$

$$\Rightarrow -4y + 15y = -10 - 12$$

$$\Rightarrow \frac{11y}{11} = \frac{-22}{11} \Rightarrow \boxed{y = -2}$$

$$j) \frac{x+1}{2 \times 3} - \frac{3x-2}{3 \times 2} = \frac{-1 \times 6}{1 \times 6} \quad \text{LCD}(3, 2, 1) = 6$$

$$\Rightarrow \frac{2x+2}{6} - \frac{9x+6}{6} = \frac{-6}{6}$$

$$\Rightarrow 2x - 9x = -6 - 2 - 6$$

$$\Rightarrow \frac{-7x}{-7} = \frac{-14}{-7}$$

$$\Rightarrow \boxed{x = 2}$$

$$l) -\frac{9}{4}y = \sqrt{5y^2 + 1}$$

$$\left(-\frac{9}{4}y\right)^2 = 5y^2 + 1$$

$$+ \frac{81y^2}{16} = \frac{5y^2}{16 \times} + \frac{(1) \times 16}{1 \times 16}$$

$$\Rightarrow \frac{81y^2}{16} = \frac{+80y^2}{16} + \frac{16}{16}$$

$$\Rightarrow 81y^2 - 80y^2 = 16$$

$$\begin{aligned} y^2 &= 16 \\ y &= \sqrt{16} \\ y &= \pm 4 \end{aligned}$$

Success Criteria:

- I can use the distributive property to eliminate brackets, then solve the equation normally
- I can create equivalent fractions using a common denominator
- I can recognize that once every fraction has a common denominator, the denominator does not matter
- I can then solve the equation using methods from prior lessons

Build your Skills: :)

1. A number is increased by 17 and the result is tripled, giving a final value of 24.

Let the unknown number = x

- a) Create an equation that could be used to find the number.

$$3(x + 17) = 24$$

- b) Use your equation to find the number.

$$\Rightarrow 3(x + 17) = 24$$

$$\Rightarrow 3x + 51 = 24$$

$$\Rightarrow 3x = 24 - 51$$

$$\Rightarrow x = \frac{-27}{3} = -9$$

$\therefore$ Unknown number = -9

2. Increasing a number by 14 and doubling the result gives the same value as decreasing the number by 27 and tripling the result.

Let the unknown number be x

- a) Create an equation that could be used to find the number.

$$2(x + 14) = 3(x - 27)$$

- b) Use your equation to find the number.

$$\Rightarrow 2(x + 14) = 3(x - 27)$$

$$\Rightarrow 2x + 28 = 3x - 71$$

$$\Rightarrow 71 + 28 = 3x - 2x$$

$$\Rightarrow 99 = x$$

$\therefore$ Unknown number = 99

3. Shyla is a member of a movie streaming club. Her first 5 movies are free. After that, she pays \$4.95 per movie.

- a) Create an equation to model the total cost (C) of streaming n movies, where $n \geq 5$.

variables defined

$$C = 4.95(n - 5)$$

- b) After the first month of using the service, Shyla received a bill for \$34.65. How many movies did she stream that month?

$$34.65 = 4.95(n - 5)$$

$$\Rightarrow \frac{34.65}{4.95} = n - 5$$

$$\Rightarrow 7 = n - 5$$

$$\Rightarrow 7 + 5 = n$$

$$n = 12$$

$\therefore$ She streamed 12 movies that month.



4. The Nuts for Nuts outlet sells peanuts for \$2/kg and cashews for \$3/kg. A mixture of these nuts is to be made such that 300 kg will be sold for \$2.40/kg.

- a) Create an equation that could be used to determine the mass of peanuts, p (in kilograms), in the mixture.

Let amount of peanuts used be p kg $\therefore$ Its cost = $2p$ \$
 $\therefore$ Amount of cashews used = $(300 - p)$ kg $\therefore$ Its cost = $3(300 - p)$ \$
 $\therefore$ According to the Question:

$$2p + 3(300 - p) = 2.4(300)$$

- b) Determine the mass of peanuts in the mixture.

$$\begin{aligned} 2p + 3(300 - p) &= 2.4(300) \\ \Rightarrow 2p + 900 - 3p &= 720 \\ \Rightarrow 2p - 3p &= 720 - 900 \\ \Rightarrow -p &= -180 \\ \Rightarrow \boxed{p} &= \boxed{180} \end{aligned}$$

$\therefore$ There is 180 kg of peanuts in the 300 kg of nut mixture

- c) Determine the mass of cashews in the mixture.

Mass of cashew in 300 kg nut-mixture =

$$\begin{array}{r} 300 \\ - 180 \\ \hline 120 \text{ kg.} \end{array}$$