

LEARNING OUTCOME: 6A: I can solve algebra equations with variables on both sides.

1. Solve each of the following equations:

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

$$\begin{array}{r} 18 = k + 12 \\ -12 \quad -12 \end{array}$$

$$\boxed{6 = k}$$

b) $k + k + 1 + k + 2 = 15$

$$\begin{array}{r} 3k + 3 = 15 \\ -3 \quad -3 \end{array}$$

$$\begin{array}{r} 3k = 12 \\ \div 3 \quad \div 3 \end{array}$$

$$\boxed{k = 4}$$

c) $5x + 2 = x + 6$

$$\begin{array}{r} -x \quad -x \end{array}$$

$$\begin{array}{r} 4x + 2 = 6 \\ -2 \quad -2 \end{array}$$

$$\begin{array}{r} 4x = 4 \\ \div 4 \quad \div 4 \end{array}$$

$$\boxed{x = 1}$$

d) $5 - 3c = 2c + 15$

$$\begin{array}{r} +3c \quad +3c \end{array}$$

$$\begin{array}{r} 5 = 5c + 15 \\ -15 \quad -15 \end{array}$$

$$\begin{array}{r} -10 = 5c \\ \div 5 \quad \div 5 \end{array}$$

$$\boxed{-2 = c}$$

e) $-2(v-3) = 3(4-v)$

$$\begin{array}{r} -2v + 6 = 12 - 3v \\ +3v \quad +3v \end{array}$$

$$\begin{array}{r} v + 6 = 12 \\ -6 \quad -6 \end{array}$$

$$\boxed{v = 6}$$

f) $3(10b-2) = 7(1-2b) + 9$

$$30b - 6 = 7 - 14b + 9$$

$$\begin{array}{r} 30b - 6 = -14b + 16 \\ +14b \quad +14b \end{array}$$

$$\begin{array}{r} 44b - 6 = 16 \\ +6 \quad +6 \end{array}$$

$$\begin{array}{r} 44b = 22 \\ \div 44 \quad \div 44 \\ b = \frac{22}{44} \end{array}$$

$$\boxed{b = \frac{1}{2}}$$

LEARNING OUTCOME: 6B: I can solve algebra equations with decimals.

2. Solve each of the following equations. To eliminate the decimals, you can multiply by the appropriate power of 10 if you wish.

a) $(1.4 - 7.3y = 6.2 + 2.5y) \times 10$

$$\begin{array}{r} 14 - 73y = 62 + 25y \\ +73y \quad +73y \end{array}$$

$$\begin{array}{r} 14 = 62 + 98y \\ -62 \quad -62 \end{array}$$

$$\begin{array}{r} -48 = 98y \\ \div 98 \quad \div 98 \end{array}$$

$$y = \frac{-48}{98} = \frac{-24}{49}$$

b) $(0.02x - 0.72 = 0.2x) \times 100$

$$\begin{array}{r} 2x - 72 = 20x \\ -2x \quad -2x \end{array}$$

$$\begin{array}{r} -72 = 18x \\ \div 18 \quad \div 18 \end{array}$$

$$\boxed{-4 = x}$$

LEARNING OUTCOME: 6C: I can solve algebra equations with fractions.

3. Solve the following equations involving fractions. You may want to multiply by the LCD to solve. *or have common denominators.*

a) $\frac{2t}{3} = \frac{t}{2} - \frac{1}{1}$

$$\frac{4t}{6} = \frac{3t}{6} - \frac{6}{6}$$

$$4t = 3t - 6$$

$$-3t \quad -3t$$

$$t = -6$$

b) $-\frac{4}{1} = \frac{(c+3)}{4} - \frac{(c+1)}{2}$

$$-\frac{16}{4} = \frac{(c+3)}{4} - \frac{2(c+1)}{4}$$

$$-16 = c+3 - 2c - 2$$

$$-16 = -c + 1$$

$$-17 = -c$$

$$\div -1 \quad \div -1$$

$$17 = c$$

c) $\frac{1-z}{2} = \frac{z+1}{5} - \frac{1}{10}$

$$\frac{2(1-z)}{10} = \frac{2(z+1)}{10} - \frac{10}{10}$$

$$2 - 2z = 2z + 2 - 10$$

$$2 - 2z = 2z - 8$$

$$+2z \quad +2z$$

$$2 = 4z - 8$$

$$+8 \quad +8$$

$$10 = 4z$$

$$\div 4 \quad \div 4$$

$$2.5 = z$$

LEARNING OUTCOME: 6D: I can understand inequalities & their graphs.

4. Graph on the number line provided.

a) $x \leq 3$



b) $x > -2$



5. Create the inequality that describes the following:

a) A number is AT MOST 14.

$$x \leq 14$$

b) A number is AT LEAST -2.

$$x \geq -2$$

c) A number is between 5 and 7.

$$5 < x < 7$$

d) A number is bigger or equal to 2 but less than 6.

$$2 \leq x < 6$$

LEARNING OUTCOME: 6E: I can solve inequalities using adding and subtracting.

6F: I can solve inequalities using multiplication & division.

6. SOLVE EACH OF THE FOLLOWING INEQUALITIES & GRAPH EACH OF THE SOLUTIONS:

a) $4x - 7 \geq 2x + 5$

$$\begin{array}{r} -2x \quad -2x \\ 4x - 7 \geq 2x + 5 \end{array}$$

$$\begin{array}{r} 2x - 7 \geq 5 \\ +7 \quad +7 \end{array}$$

$$2x \geq 12$$

$$\begin{array}{r} \div 2 \quad \div 2 \end{array}$$

$$\boxed{x \geq 6}$$

b) $-3y + 13 < 5 - 7y$

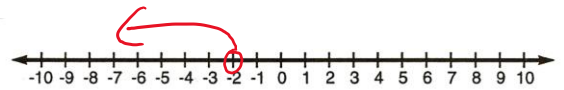
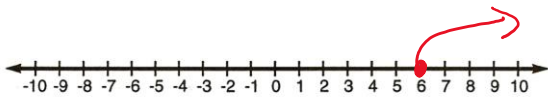
$$\begin{array}{r} +7y \quad +7y \\ -3y + 13 < 5 - 7y \end{array}$$

$$\begin{array}{r} 4y + 13 < 5 \\ -13 \quad -13 \end{array}$$

$$4y < -8$$

$$\begin{array}{r} \div 4 \quad \div 4 \end{array}$$

$$\boxed{y < -2}$$



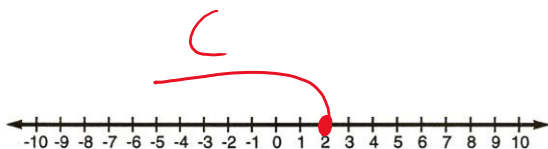
c. $5(2 - 2x) \leq 2(x - 7)$

$$\begin{array}{r} 10 - 10x \leq 2x - 14 \\ +10x \quad +10x \end{array}$$

$$\begin{array}{r} 10 \leq 2x - 14 \\ +14 \quad +14 \end{array}$$

$$\begin{array}{r} 24 \leq 2x \\ \div 2 \quad \div 2 \end{array}$$

$$\boxed{2 \leq x}$$



d. $-4(7 + 2b) \geq 3b + 5$

$$\begin{array}{r} -28 - 8b \geq 3b + 5 \\ +8b \quad +8b \end{array}$$

$$\begin{array}{r} -28 \geq 3b + 5 \\ -5 \quad -5 \end{array}$$

$$\begin{array}{r} -33 \geq 3b \\ \div 3 \quad \div 3 \end{array}$$

$$\boxed{-3 \geq b}$$



CURRICULAR COMPETENCIES QUESTIONS:

7. Frank is a plumber and earns \$36 per hour. His apprentice, Shawn, earns \$18 per hour. Shawn began working at a job 3 hours before Frank arrived.

- a) Write an expression for the total amount of money charged by Frank and Shawn for a time on the job of "t" hours.

$$\text{Cost} = 18t + 36(t-3)$$

- b) How long would it take for the total charge to amount to \$300?

$$300 = 18t + 36(t-3)$$

$$300 = 18t + 36t - 108$$

$$300 = 54t - 108$$

$$+108 \quad +108$$

$$408 = 54t$$

$$408 = 54t$$

$$\div 54 \quad \div 54$$

$$t = 7.56 \text{ hours}$$

- c) After how much time will Frank and Shawn earn the same amount of money on this job?

$$18t = 36(t-3)$$

$$18t = 36t - 108$$

$$18t = 36t - 108$$

$$-36t \quad -36t$$

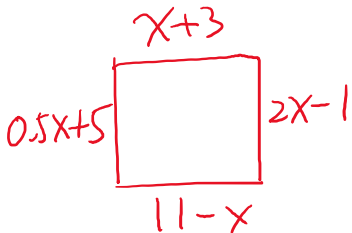
$$-18t = -108$$

$$-18t = -108$$

$$\div -18 \quad \div -18$$

$$t = 6 \text{ hours}$$

8. Is it possible that the sides of the square have the expressions $x + 3$, $2x - 1$, $11 - x$ and $0.5x + 5$? Explain your thinking.



$$x+3 = 2x-1$$

$$+x \quad -x$$

$$3 = x - 1$$

$$+1 \quad +1$$

$$4 = x$$

$$x+3 \rightarrow 4+3 = 7 \checkmark$$

$$0.5x+5 \rightarrow 0.5(4)+5 = 7 \checkmark$$

$$11-x \rightarrow 11-4 = 7 \checkmark$$

$$2x-1 \rightarrow 2(4)-1 = 7 \checkmark$$

Yes it's possible!

9. A group of 262 students went on a field trip. 14 students travelled by car and the rest travelled on school buses. If each school bus can only fit 48 students, how many school buses are needed?

x : # of school buses.

$$48x + 14 = 262$$

$$-14 \quad -14$$

$$48x = 248$$

$$\div 48 \quad \div 48$$

$$x = 5.17$$

\therefore 6 buses are needed.

10. An archeologist uses the following relationships to estimate the heights "h" of ancient people based on the lengths "r" of their radius bone (lower bone). All measurements are in centimetres.

Female: $h = 2.81r + 76.4$

Male: $h = 2.64r + 79.1$

a) For what length of radius will the females and males be the same height?

$$\begin{array}{r}
 2.81r + 76.4 = 2.64r + 79.1 \\
 -2.64r \qquad \qquad +2.64r \\
 \hline
 0.17r + 76.4 = 79.1 \\
 -76.4 \qquad -76.4 \\
 \hline
 0.17r = 2.7 \\
 \div 0.17 \quad \div 0.17 \\
 \hline
 r = 15.88 \text{ cm}
 \end{array}$$

b) What is that height?

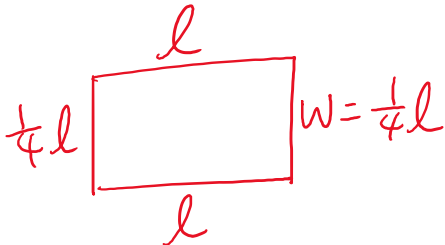
$$\begin{aligned}
 h &= 2.81(15.88) + 76.4 \\
 &= \boxed{121.03 \text{ cm}}
 \end{aligned}$$

11. Determine if there are any mistakes in the following student work for solving the equation. If so, state the mistake and solve the equation correctly.

$$\begin{aligned}
 2(x + 4) + 5 &= 6 - (2x + 2) \\
 2x + 8 + 5 &= 6 - 2x - 2 \\
 2x + 13 &= 4 - 2x \\
 2x + 2x &= 4 - 13 \\
 4x &= -9 \\
 x &= -13
 \end{aligned}$$

$$\begin{aligned}
 4x &= -9 \\
 \div 4 \quad \div 4 \\
 x &= \frac{-9}{4}
 \end{aligned}$$

12. Mr. H is designing a rectangular garden for his backyard. The perimeter of the garden is 20 metres. If the width is $\frac{1}{4}$ of the length, what are the dimensions of the garden?



$$l + \frac{1}{4}l + \frac{1}{4}l + l = 20$$

$$2.5l = 20$$

$$\div 2.5 \quad \div 2.5$$

$$l = 8 \text{ m} \quad w = \frac{1}{4}(8) = 2 \text{ m}$$

13. In still water, a boat travels at a speed of 16.5 km/h. On the river, the boat travels faster downstream than upstream, because of the current. The boat takes 5 hours for a trip upstream, but only 2 hours to cover the same distance on the return trip downstream. Determine the speed of the current. (Hint: Remember some physics from Science 8?)

x : speed of the current.

distance = speed \times time.

speed downstream: $16.5 + x$

speed upstream: $16.5 - x$.

$$5(16.5 - x) = 2(16.5 + x)$$

$$82.5 - 5x = 33 + 2x$$

$$82.5 = 33 + 7x$$

$$49.5 = 7x$$

$$\div 7 \quad \div 7$$

$$x = 7.07 \text{ km/h}$$

14. How is solving $0.3x + 2 = 1.5 - 5$ similar to solving $3x + 20 = 15 - 50$? How are they different?

Similar:

Same equation

Different:

one with decimals

one without.

15. The monthly cost to run the electrical system in a company's office is \$355, plus \$18 per hour. In another one of its offices, the monthly cost is \$514, plus \$15 per hour. After how many hours would the two offices have the same electrical costs?

$$355 + 18x = 514 + 15x$$

$$355 + 3x = 514$$

$$3x = 159$$

$$\div 3 \quad \div 3$$

$$x = 53 \text{ hours}$$

x = # of hours