What do the diagrams below mean to you? What could be in each box? Assume each box is not identical.
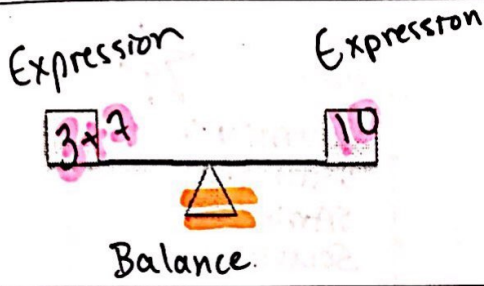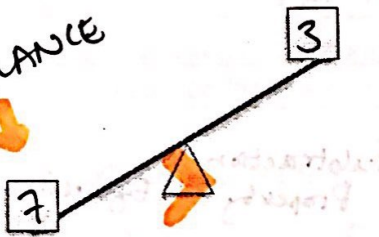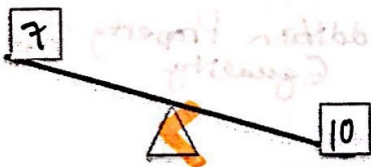
Expression   Expression

$3+7$ 10

Balance.

IMBALANCE

3

7

7

10

When two expressions represent the __SAME__ amount, they are said to be __EQUAL__;

two equal expressions make an __EQUATION__.

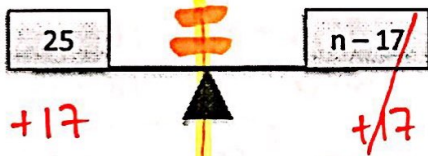INEQUALITIES

When solving an equation, we are trying to get variable alone - we must be careful to keep the balance.

Example 1:

25 $n-17$

$+17$ $+17$

$25 + 17 = n$

$\boxed{42 = n}$

Check!

$25 = 42 - 17$

$25 = 25 \checkmark$

· The reason we can do this is because inverse operations were performed on both sides of the __EQUATION__ in order to isolate the variable.

Inverse Operations:

Opposites!

used to get variable alone

· $+ / -$ (together they make zero)

· $\times / \div$ (together to get one)

Foldable Activity

Now with the help of your foldable solve and write the properties.

$$25 = n - 17$$
$$+17 \qquad +17$$
$$42 = n$$

← Addition Property of Equality

Equivalent Equations: ⭐

EQUATIONS WITH THE SAME SOLUTION SET

Solve and Justify with listing the properties used.

$$b - 21 = 42$$
$$+21 \qquad +21$$
$$B = 42 + 21$$
$$\boxed{B = 63}$$

Addition Property of Equality

C:
$$63 - 21 = 42$$
$$42 = 42 \checkmark$$

$$(m - 3) + 5 = 12$$
$$-5 \qquad -5$$
$$m - 3 = 7$$
$$+3 \qquad +3$$
$$\boxed{m = 10}$$

Subtraction Property of Equality

Addition Property of Equality

C: $(10 - 3) + 5 = 12$
$$7 + 5 = 12$$
$$12 = 12 \checkmark$$

$$\boxed{\dfrac{5y}{3}} = \boxed{20}$$
▲

$$\dfrac{5}{3}y = 20$$
$$\div \dfrac{5}{3} \qquad \div \dfrac{5}{3}$$

Division Property of Equality

C: $\dfrac{5(12)}{3} = 20$

$$\dfrac{60}{3} = 20$$
$$20 = 20 \checkmark$$

$$y = 20 \div \dfrac{5}{3}$$
$$y = \dfrac{20}{1} \cdot \dfrac{3}{5}$$
$$y = \dfrac{60}{5} \rightarrow \boxed{y = 12}$$

Solve, show each step and justify each step by listing the properties

$$7w = 105$$
$$\dfrac{7w}{7} = \dfrac{105}{7}$$
$$\boxed{W = 15}$$

Division Property of Equality

C: $7(15) = 105$
$$105 = 105 \checkmark$$

$$\dfrac{4}{5}x = 16$$
$$\div \dfrac{4}{5} \qquad \div \dfrac{4}{5}$$

Division Property of Equality

$$x = 16 \div \dfrac{4}{5}$$
$$x = \dfrac{16}{1} \cdot \dfrac{5}{4}$$
$$x = \dfrac{80}{4}$$
$$\boxed{x = 20}$$

C:
$$\dfrac{4 \cdot 20}{5} = 16$$
$$\dfrac{80}{5} = 16$$
$$16 = 16 \checkmark$$

$$\dfrac{3}{4}\left(\dfrac{2}{3}a\right) = 24$$
$$\dfrac{6}{12}a = 24$$
↓ reduce
$$\dfrac{1}{2}a = 24 \div \dfrac{1}{2}$$

Division prop of equality

$$a = 24 \cdot \dfrac{2}{1}$$
$$\boxed{a = 48}$$

C:
$$\dfrac{3}{4} \cdot \dfrac{2}{3} \cdot \dfrac{48}{1} = 24$$
$$\dfrac{288}{12} = 24$$
$$24 = 24 \checkmark$$

1.2

Word Problems: *Write the question, write the equation that best suits the question, and use inverse operations to solve.*

Example 1: Linda gavè $\frac{1}{6}$ of her cookies to her sister. She gave her sister 4 cookies.

How many cookies did linda have   **?**

Variable: C = # of cookies Linda has

$$\frac{1}{6} \cdot C = 4 \div \frac{1}{6}$$

$$\div \frac{1}{6}$$

$$C = 4 \cdot 6 \leftarrow \boxed{C = 24 \text{ cookies}}$$

Example 2: One serving of soybeans contains 10 grams of protein, which is 4 times the amount of one serving of kale.   **?**

How many grams of protein does Kale have?

Variable: k = grams of protein in one serving of kale

$$\frac{4 \cdot k}{4} = \frac{10g}{4}$$

$$\boxed{k = \frac{5}{2}g \text{ or } 2.5g}$$

Example 3: The Earth's radius is 6,371km, which is 2,981km longer than the radius of Mars.   **?**
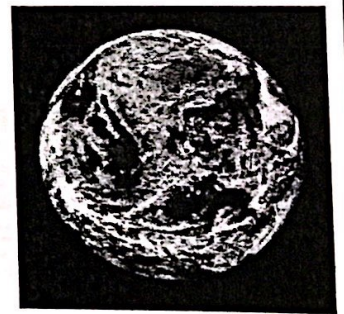
How long is the radius of Mars (in km)?

Variable: m = radius of Mars (km)

$$6,371 = m + 2,981$$
$$-2,981 \qquad -2,981$$

$$\boxed{3,390 = m \\ km}$$

Ticket out the Door

Explain the role inverse operations play in solving equations. Use 2x = 8 and y − 4 = 9 as examples.