Warm up

- Sydney subscribes to an online company that allows her to download electronic books. Her subscription costs a flat fee of $30 for up to 10 downloads each month. For each download over 10, there is an additional charge per download

- 1. During the month of Sept. She downloaded 22 books and was charged $75. How much does each additional download cost?   **$3.75**

- 2. In Oct., she was incorrectly charged $67.50 for 18 books. How much should she have been charged? **$60**

- 3. If she received a bill for $101.25, how many books did she download?   **29 books**

Hand back test

Properties of Equality

- Properties are rules that allow you to balance, manipulate, and solve equations

Addition Property of Equality

- Adding the same number to both sides of an equation does not change the equality of the equation.

- If $a = b$, then $a + c = b + c$.

- Ex: $x = y$, so $x + 2 = y + 2$

<u>Subtraction Property of Equality</u>

- Subtracting the same number to both sides of an equation does not change the equality of the equation.

- If $a = b$, then $a - c = b - c$.

- Ex: $x = y$, so $x - 4 = y - 4$

<u>Multiplication Property of Equality</u>

- Multiplying both sides of the equation by the same number, other than 0, does not change the equality of the equation.

- If $a = b$, then $ac = bc$.

- Ex: $x = y$, so $3x = 3y$

Division Property of Equality

- Dividing both sides of the equation by the same number, other than 0, does not change the equality of the equation.

- If a = b, then a/c = b/c.

- Ex: x = y, so x/7 = y/7

Reflexive Property of Equality

- A number is equal to itself. (Think mirror)

- a = a

- Ex: 4 = 4

<u>Symmetric Property of Equality</u>

- If numbers are equal, they will still be equal if the order is changed.

- If $a = b$, then $b = a$.

- Ex: $x = 4$, then $4 = x$

Transitive Property of Equality

- If numbers are equal to the same number, then they are equal to each other.

- If $a = b$ and $b = c$, then $a = c$.

- Ex: If $x = 8$ and $y = 8$, then $x = y$

Substitution Property of Equality

- If numbers are equal, then substituting one in for the another does not change the equality of the equation.

- If $a = b$, then b may be substituted for a in any expression containing a.

- Ex: $x = 5$, then $y = x + 6$ is the same as $y = 5 + 6$.

Other Properties

Commutative Property

- Changing the order of addition or multiplication does not matter.

- "Commutative" comes from "commute" or "move around", so the Commutative Property is the one that refers to moving stuff around.

__Commutative Property__

- Addition:

$$a + b = b + a$$

- Ex: $1 + 9 = 9 + 1$

__Commutative Property__

- Multiplication:

    $$a \cdot b = b \cdot a$$

- Ex: $8 \cdot 6 = 6 \cdot 8$

Associative Property

- The change in grouping of three or more terms/factors does not change their sum or product.

- "Associative" comes from "associate" or "group", so the Associative Property is the one that refers to grouping.

Associative Property

- Addition:

$$a + (b + c) = (a + b) + c$$

- Ex: $1 + (7 + 9) = (1 + 7) + 9$

<u>Associative Property</u>

- Multiplication:

$$a \cdot (b \cdot c) = (a \cdot b) \cdot c$$

- Ex: $8 \cdot (3 \cdot 6) = (8 \cdot 3) \cdot 6$

Distributive Property

- The product of a number and a sum is equal to the sum of the individual products of terms.

Distributive Property

- $a \cdot (b + c) = a \cdot b + a \cdot c$

- Ex: $5 \cdot (x + 6) = 5 \cdot x + 5 \cdot 6$

<u>Additive Identity Property</u>

- The sum of any number and zero is always the original number.

- Adding nothing does not change the original number.

- $a + 0 = a$

- Ex: $4 + 0 = 4$

<u>Multiplicative Identity Property</u>

- The product of any number and one is always the original number.

- Multiplying by one does not change the original number.

- $a \cdot 1 = a$

- Ex: $2 \cdot 1 = 2$

<u>Additive Inverse Property</u>

- The sum of a number and its inverse (or opposite) is equal to zero.

- $a + (-a) = 0$

- Ex: $2 + (-2) = 0$

<u>Multiplicative Inverse Property</u>

- The product of any number and its reciprocal is equal to 1.

- $\dfrac{a}{b} \cdot \dfrac{b}{a} = 1$

- **Ex:** $\dfrac{4}{5} \cdot \dfrac{5}{4} = 1$

<u>Multiplicative Property of Zero</u>

- The product of any number and zero is always zero.

- $a \cdot 0 = 0$

- Ex: $298 \cdot 0 = 0$

Exponential Property of Equality

- $a^b = a^c$, then $b = c$
- **Ex:** $2^x = 2^4$, then $x = 4$

M-A-T-H-O

Homework

Worksheet