## Pre-Algebra

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## Objectives

- Understanding Signed Numbers
- Adding Signed Numbers
- Subtracting Signed Numbers
- Multiplying and Dividing Signed Numbers
- Exponents
- Square Roots
- Order of Operations, including exponents and square roots


## Understanding Signed Numbers

- Number Line

, Example: Order the following numbers from smallest to largest:
$8,-4.5,3 / 4,-1,-0.5,1 \frac{1}{4}, 7.75,-3 / 4,-0.1$


## Understanding Signed Numbers

- Absolute Value - the distance from zero (distance is always positive)

Examples: $|23|=$

$$
|-6|=
$$

- Opposite of a number - the number with the same absolute value but different sign
Examples: What is the opposite of 10 ?
What is the opposite of -2 ?


## Adding Signed Numbers

, Use the number line

- A positive number or addition means move to the right; a negative number means move to the left
- Often, parentheses are around negative numbers to emphasis that they are negative
- Examples: $-2+-4$

- $(-8)+(5)$




## Try Yourself

- 1) $7+(-5)=$
- 2) $(-3)+(-12)=$
-3) $-4+1=$
- 4$)(-1.8)+0.9=$
- 5) $\frac{3}{8}+\left(-\frac{9}{16}\right)=$



## Adding Signed Numbers

, Other way of looking at addition of signed numbers: Same sign - add the absolute values of the numbers, keep the sign
Different signs - find the different of the absolute values of the numbers, keep the sign of the bigger digit

* Use what makes the most sense to you!


## Subtracting Signed Numbers

- Change all subtraction signs to addition of the opposite
- Examples: $-2-8=$

1 $-6-(-3)=$
, $4-9=$

## Try Yourself

-1) $-4-1$
, 2) 8-14
-3) $(-5)-(-7)$

- 4$)-\frac{1}{8}-\left(-\frac{7}{8}\right)$


## Multiplying/Dividing Signed Numbers

- Multiplying or dividing two numbers with the same sign results in a positive number
$(+)(+)=(+)$
$(+) /(+)=(+)$
$(-)(-)=(+)$
$(-) /(-)=(+)$
- Multiplying or dividing two numbers with different signs results in a negative number

$$
\begin{array}{ll}
(+)(-)=(-) & (+) /(-)=(-) \\
(-)(+)=(-) & (-) /(+)=(-)
\end{array}
$$

- See www.mathisfun.com/multiplyingnegatives.html
$0 \div-3=$
$(-10)(-5)(-3)=$
$12 \times-2 \div-6=$
$\frac{3}{8} \div-2 \frac{1}{4}=$

| Application Problems |
| :--- |
| - Example: If today it was $-4^{\circ} \mathrm{F}$ in Alaska and $25^{\circ} \mathrm{F}$ in Green Bay, what is the |
| temperature difference? |
| , Try Yourself: Your shop made a profit of $\$ 1,357$ in January, had a loss of $\$ 1,531$ |
| in February and a profit of $\$ 411$ in March. What was the profit or loss for the |
| first quarter? Represent with a signed number. |

## Multiplying/Dividing Signed Numbers

- Examples:
$(-4)(7)=$
$-8 *-6=$
$(-16) \div(-4)=$

$$
\frac{22}{-11}=
$$

Try Yourself
p) $(-3)(-1)=$
+2) $-30 \div 5=$
-3) $-3 \times 20 \div-6=$
-4) $-\frac{3}{4} \times-\frac{16}{5}=$


## Exponents

- Exponents are used to represent the same number multiplied over and over.
> $\mathrm{a}^{\mathrm{n}}=\mathrm{a}$ *a*a*...... *a,
where $a$ is multiplied $n$ times
a is called the base and n is called the exponent
, Examples:

$$
\begin{aligned}
& 3^{4}= \\
& 2.5^{3}= \\
& 10^{3}=
\end{aligned}
$$

## Exponents with Signed Numbers

, Examples:

$$
\begin{aligned}
& (-2)^{2}= \\
& (-2)^{3}= \\
& (-2)^{4}=
\end{aligned}
$$

- What will be the sign of the answer if the exponent is 11?
14 ?
109 ?


## Square Roots

Taking the square root of a number "undoes" squaring a number.
, Example: $a^{2}=36$

$$
a=\sqrt{36}
$$

$a=6$
, Examples:
$\sqrt{144}=$
$\sqrt{80}=$
Example: A one-story square house is approximately 1500 square feet. What are the dimensions of the home?

## Order of Operations

- 1. Parentheses
- 2. Exponents and Square Roots
- 3. Multiply/Divide from left to right
, 4. Add/Subtract
- Example: $(-3-2)+(-1 \times 4)^{3}$


## Try Yourself

-1) $10^{6}=$

- 2) $4.75^{4}=$
-3) $(-4)^{3}=$
-4) $(-4)^{4}=$


## Try Yourself

-1) $\sqrt{16}$

- 2) First, estimate then find the answer with your calculator, to the nearest hundredth: $\sqrt{48}$
, Example: The following formula will find the side of a triangle across from $90^{\circ}$. Calculate the missing side of the triangle: $\sqrt{3.25^{2}+6.5^{2}}$
, Example: (6-8)-3(12-4*2)


