### Whole Numbers

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### Objectives
- Place values of whole numbers
- Rounding/estimating
- Addition
- Subtraction
- Multiplication
- Division
- Factors
- Order of Operations

### Discussion
- How do you think you’ll use math in your job or in life? Or how do you already use it?

### Units
- We will begin using units of measurement frequently. Getting familiar with and converting units will come later but right away we need to understand some of the basics of measurement.
- One conversion we will use right away often is 12 inches = 1 foot
- For inches we will commonly use the shorthand " symbol and for feet we will commonly use the \ symbol.

### Place Values of Whole Numbers

<table>
<thead>
<tr>
<th>Millions</th>
<th>Hundred Thousands</th>
<th>Ten Thousands</th>
<th>Thousands</th>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
</table>

Example: Write out 5,391,087

### Rounding
- Rounding to the nearest ...
  - If the number after the place you are rounding to is a 5 to 9 – round up
  - If the number after the place you are rounding to is a 0-4 – keep the digit that it currently is

Example: Round 36,923 to the nearest...
  - ...ten:
  - ...hundred:
  - ...thousand:
  - ...ten thousand:
Try Yourself

Round 279,928 to the nearest...
- ...ten:
- ...hundred:
- ...thousand:
- ...ten thousand:
- ...hundred thousand:

Addition and Subtraction

As we look at addition and subtraction, there are certain words that indicate we should use those operations.

Words that mean addition:

Words that mean subtraction:

Estimation

Estimation can be used to see if a problem is approximately correct or if we don’t need an exact calculation.

Estimate an answer by rounding the numbers in a problem and performing whatever operation necessary with the rounded numbers.

Example: You are welding together three parts. They are 7”, 33”, and 48”. What will be the total after the pieces are welded together to the nearest ten inches?

Addition

To add or subtract whole numbers, line up the corresponding place values vertically.

Back to welding 7”, 33”, and 48”. Let’s find the exact answer.

Example: 835 + 675

Try Yourself: 1920 + 455 + 75

Subtraction using Estimation

Out of a 48” length of metal you cut off 21”. About how much of your original length is remaining to the nearest ten?
Subtraction (contd.)
  › Example: 48” – 21”
  › Example: 432 – 218
  › Example: 2400 – 1789

Try Yourself
  › 1) 480 – 379
  › 2) Find the missing dimension from the washer below:

Multiplier
  › A shorthand way of repeated addition
  › Example: You have 5 parts that weigh 3 oz each.
      Instead of 3+3+3+3+3 we would write:
      5 \times 3
  
      What is the weight of the parts altogether?

Multiplier
  › Words that mean multiply:
  › Symbols that mean multiply:

Multiplier
  › Multiplying a number by 1 always results in:
  › Multiplying a number by 0 always results in:

Multiplier
  › Example: First estimate, then find the exact answer;
      39 \times 8
Example: 480 × 24

Example: In many trades converting between inches and feet occurs frequently. Complete the chart below and begin to memorize in preparation for working with units of feet and inches frequently.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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<tr>
<td></td>
<td>12</td>
<td>24</td>
<td>36</td>
<td>48</td>
<td>60</td>
<td>72</td>
<td>84</td>
<td>96</td>
<td>108</td>
<td>120</td>
<td>132</td>
<td>144</td>
<td>160</td>
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</table>

You need to determine the wire feed speed of your welder before starting. You run the wire for 6 seconds and you measure 18 inches of wire. What is the wire feed speed in inches/minute? (Hint: There are 60 seconds in a minute.)

In many trades it is important to understand how to do calculations with fractions to the nearest 16th or 32nd of an inch. Fill in the chart below and begin to have these multiplication facts memorized in preparation for working with fractional inches.

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<thead>
<tr>
<th>X</th>
<th>1</th>
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</tbody>
</table>

Reverse of multiplication
Breaking a number into equal parts
Words that mean divide:

Symbols that mean divide:

Dividing a number by 1 always results in:

Dividing a number by 0 always results in:

0 divided by a number always results in:
**Division**

- Example: You are starting with a 72” rod and need 8” pieces, how many pieces will you get out of the original rod? What is your exact calculated answer and what is the logical answer?

- Example: 496 ÷ 8

**Try Yourself**

- 1) 9072 ÷ 12

**Factors**

- Understanding what a factor is and how to break numbers into factors will help with understanding and working with fractions.
- A factor of a whole number is a number that can be divided by that number and leave no remainder
- Example: What are the factors of 8?
  - 8 ÷ 1 = 8, so 1 is a factor of 8
  - 8 ÷ 2 = 4, so 2 is a factor of 8
  - 8 ÷ 3 = 2.666..., 3 is not a factor of 8
  - 8 ÷ 4 = 2, so 4 is a factor of 8
  - 8 ÷ 5 = 1.6, so 5 is not a factor of 8
  - 8 ÷ 6 = 1.333..., so 6 is not a factor of 8
  - 8 ÷ 7 = 1.142857, so 7 is not a factor of 8
  - 8 ÷ 8 = 1, so 8 is a factor of 8
- So, the factors of 8 are 1, 2, 4, and 8.

- What are the factors of 24?

**Try Yourself**

- 2) A set of set of flat bar steel comes into your shop. The invoice shows that it cost $840 and there were 120 feet delivered. What is the cost per foot of the material?

- Try Yourself: What are the factors of 16?
Prime Numbers

- A number who's only factors are 1 and itself
- Basically, the number cannot be broken down anymore
- What are the first 10 prime numbers?

Prime factors

- Listing all of the prime numbers that are multiplied to get a whole number
- Use a factor-tree to break down a number to its prime factors
- Example: Find the product of prime factors of 12.

Prime factors

- Example: Find the product of prime factors of 2520

Try Yourself

- Find the product of prime factors of 315

Finding Prime Factors

- What are some tricks for breaking a number down into its prime factors?

Order of Operations

- 1. Parentheses – perform any calculations possible in the parentheses
- 2. Multiply/divide from left to right
- 3. Add/Subtract from left to right
\section*{Order of Operations}

- Example: $2 + 3 \times 8 - 1$

- Example: $5 + 12 \div 2 - 4 + 3 \times 6$

\section*{Order of Operations}

- Example: $\frac{16 - 8 \times 2 - 1.10}{30 - 5.5}$

\section*{Order of Operations}

- You have to end up with 4 pieces of piping that are 15 in each, 3 pieces that are 4 in each and 5 pieces that are 10 in each. What is the total inches of piping that you will have?

- If you need to cut these parts from an original long piece of piping, realistically about how much piping should you start with?

\section*{Try Yourself}

1) $12 - (2 \times 3 + 5)$

2) $\frac{48}{2 \times 3 + 6}$

\section*{Try Yourself}

3) You make $12/hour and work 23 hours one week. $3 is taken out of your paycheck for each hour worked for taxes, etc. What is your take-home pay for the week. Show how the problem is set up.