

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

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

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.

Addition

(First estimate the answer.)

- Example: $835 + 675$
- Try Yourself: $1920 + 455 + 75$

Subtraction using Estimation

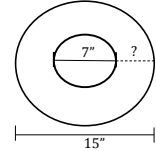
- Out of a 48" length of metal you cut off 21". About how much of your original length is remaining to the nearest ten?

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:



Multiplication

- ▶ 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:
 - What is the weight of the parts altogether?

Multiplication

- ▶ Words that mean multiply:
- ▶ Symbols that mean multiply:

Multiplication

- ▶ Multiplying a number by 1 always results in:
- ▶ Multiplying a number by 0 always results in:

Multiplication

- ▶ Example: First estimate, then find the exact answer,
 39×8

Multiplication

- ▶ Example: 480×24

Multiplication

- ▶ 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.

x	1	2	3	4	5	6	7	8	9	10	11	12	20
12													

Try Yourself

- ▶ 1) 120×72
- ▶ 2) 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.)

Try Yourself

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

X	1	2	3	4	5	6	7	8	9
2									
4									
8									
16									
32									

Division

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

Division

- ▶ 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: $496 \div 8$

Division

- ▶ Example: $1360 \div 16$

Try Yourself

- ▶ 1) $9072 \div 12$

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?

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?
 - $8 \div 1 = 8$, so 1 is a factor of 8
 - $8 \div 2 = 4$, so 2 is a factor of 8
 - $8 \div 3 = 2.666...$, 3 is not a factor of 8
 - $8 \div 4 = 2$, so 4 is a factor of 8
 - $8 \div 5 = 1.6$, so 5 is not a factor of 8
 - $8 \div 6 = 1.333...$, so 6 is not a factor of 8
 - $8 \div 7 = 1.142857$, so 7 is not a factor of 8
 - $8 \div 8 = 1$, so 8 is a factor of 8
 - So, the factors of 8 are 1, 2, 4, and 8.

Factors

- ▶ What are the factors of 24?
- ▶ 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

Order of Operations

► Example: $2 + 3 \cdot 8 - 1$

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

Order of Operations

► Example: $\frac{16 - 8 \cdot 2 + 1 \cdot 10}{30 - 5 \cdot 5}$

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?

Try Yourself

► 1) $12 - (2 \times 3 + 5)$

► 2) $\frac{48}{2 \times 3 + 6}$

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.