Vocabulary

Place Value: the basis of our entire number system, in which the position of a digit in a number determines its value. For example, the number 2 has a different value in each of the following numbers: 25, 2, 238. In the number 25, the 2 represents 2 TENS, the number 2 represents 2 ONES and in the number 238, the 2 represents 2 HUNDREDS.

Ordinal Numbers: a number defining a thing's position in a series, such as "first," "second," or "third."

Commutative Property: applies to both addition and multiplication. You may add the addends in any order and the sum will be the same. You may multiply numbers together in any order and the product will be the same.

Product: the answer to a multiplication problem.

Factor: the numbers being multiplied.

Quotient: the answer to a division problem.

Dividend: the number being divided.

Divisor: the number by which we divide the dividend.

Remainder: the amount left over when a number can't be evenly divided.

Addend: a number added to another.

Sum: the answer to an addition problem.

Difference: the answer to a subtraction problem.

Increment: to add a fixed amount to a number.

Decrement: to subtract a fixed amount from a number.

Congruent: congruent shapes are the same size and shape, congruent lines are the same length.

Horizontal: line that is always parallel to the horizon or the x-axis.

Vertical: lines drawn from top to bottom.

Oblique: in between horizontal and vertical.

Adjacent lines: next to each other.

Adjacent angles: two angles are adjacent if they have a common side and a common vertex.

Parallel lines: always the same distance apart and never touching.

Perpendicular lines: cross each other at 90 degrees forming a right angle.

Right angle: a 90 degree angle.

Acute angle: smaller than 90 degrees.

Obtuse angle: between 90 degrees and 180 degrees.

Straight angle: 180 degrees.

Reflex angle: between 180 degrees and 360 degrees.

Interior angles: the angles inside a polygon.

Supplementary angles: two angles that add up to 180 degrees are supplementary.

Complementary angles: two angles that add up to 90 degrees are complementary.

Indeterminate fraction: Indeterminate means unknown. The fraction 0/0 is indeterminate because mathematicians can't agree on whether it is 1, like most fractions with the same numerator and denominator, or 0, like fractions with a 0 in the numerator, or undefined, like fractions with a 0 in the denominator.

Undefined fraction: fractions with 0 in the denominator are undefined.

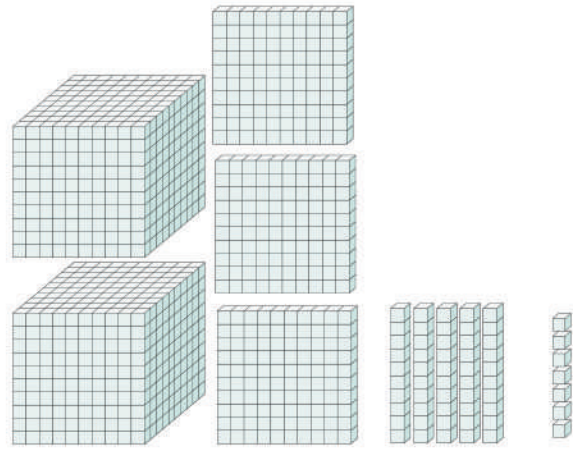**Data Analysis:** the use of math to model data in order to find information.

Discrete Data: data that is counted and has finite values.

Continuous Data: data that is measured and has unlimited values.

Decimal: a fraction whose denominator is a multiple of ten and whose numerator is expressed by figures placed to the right of a decimal point.
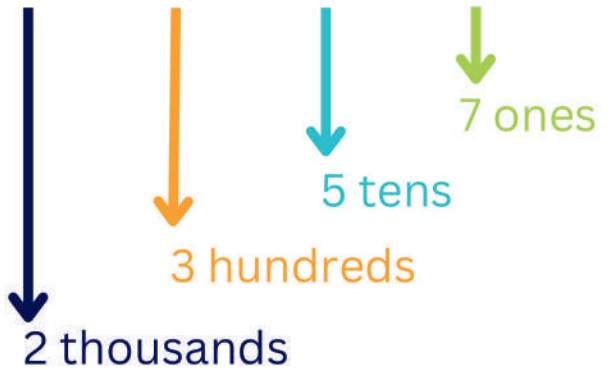
Place Value

Base Ten blocks:

Standard Form: 2357

Word Form:
two thousand three hundred fifty-seven

Expanded Form:
(2 x 1000) + (3 x 100) + (5 x 10) + (7 x 1)

2 3 5 7

7 ones

5 tens

3 hundreds
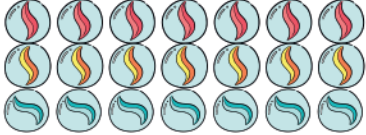
2 thousands

Addition/Subtraction Algorithm:
1. Stack the numbers, making sure they are lined up by place value.
2. Add/subtract the smallest place value. (regroup if necessary)
3. Add/subtract the next smallest place value column. (regroup if necessary)
4. Continue adding/subtracting columns from smallest place value to largest, regrouping where necessary.

Naming an Array: we always CALL arrays by the number of ROWS by the number of COLUMNS.

3 x 4 = 12
rows   columns   stars

row

column

Multiplication & Division Terminology

Multiplication

multiply   equal

$$3 \times 7 = 21$$

factors   product

Division

divide   equal

$$21 \div 7 = 3$$

dividend   divisor   quotient

Math Operators keyword list:

+
- add
- altogether
- both
- combine
- in all
- increase
- increased by
- larger
- larger than
- longer
- longer than
- more
- more than
- perimeter
- plus
- sum
- together
- total

−
- subtract
- minus
- take away
- less
- less than
- change
- decreased
- difference
- fewer
- gave away
- How many more...?
- How many less...?
- left
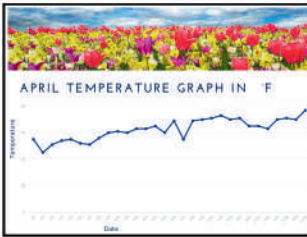- left over
- remain
- shorter than
- smaller than

X
- area
- cubed
- double
- each
- groups
- per
- product
- quadruple
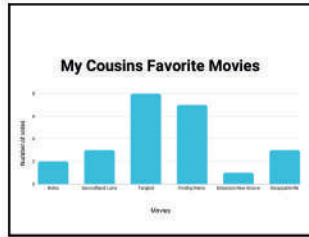- rows
- squared
- times
- triple

÷
- average
- divide
- each
- equal group
- fourth
- half
- quarter
- quotient
- ratio
- share
- separate
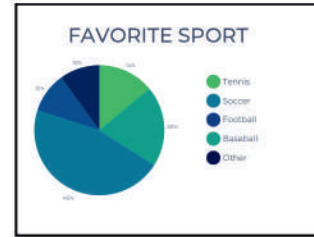- split
- third

LINE GRAPH

Represents continuous data, using lines to connect individual data points.
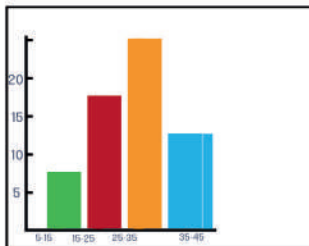
BAR GRAPH

Makes it easy to compare DISCRETE data between different groups, using bars.
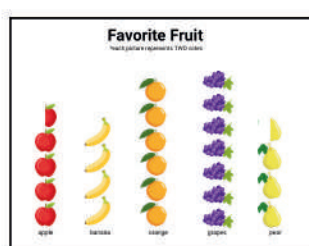
PIE CHART

Represents data as a circle. The slices of pie show the size of the data relative to each other.
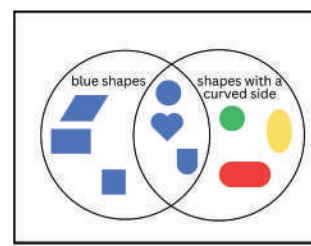
HISTOGRAM

A type of bar graph, histograms are used to represent frequency distributions.
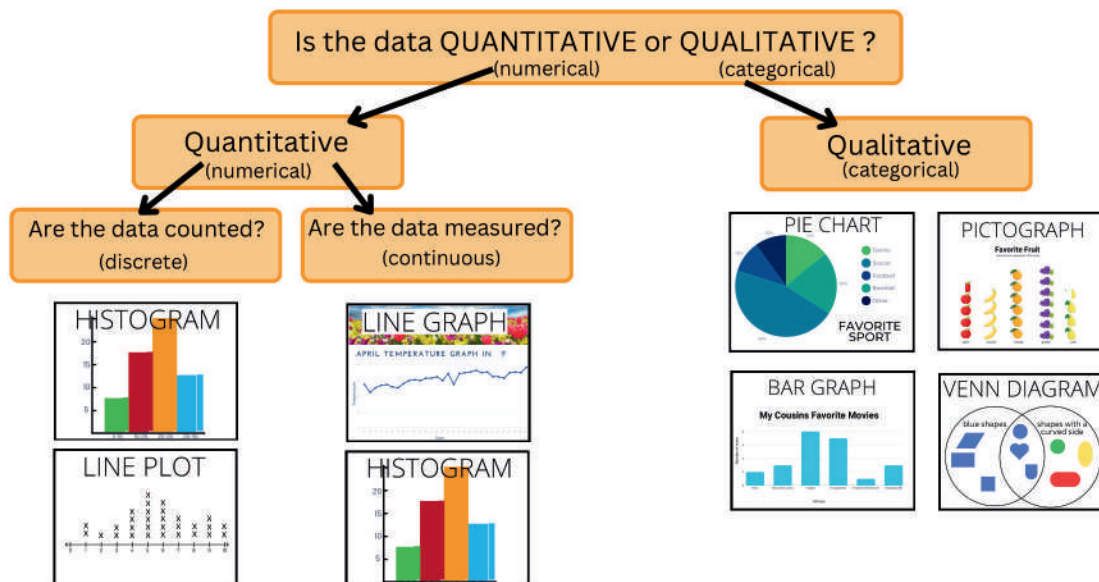
PICTOGRAPH

A type of bar graph, pictographs are pictorial representations of data using images, icons, or symbols.
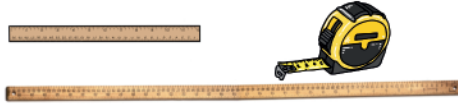
VENN DIAGRAM

Visual organizer of overlapping circles that explores the relationship between a set of different things.

When you want to CREATE or READ a graph, ask yourself...

Is the data QUANTITATIVE or QUALITATIVE ?
(numerical)   (categorical)

Quantitative
(numerical)

Qualitative
(categorical)

Are the data counted?
(discrete)

Are the data measured?
(continuous)

HISTOGRAM

LINE PLOT

LINE GRAPH

HISTOGRAM

PIE CHART

PICTOGRAPH

BAR GRAPH

VENN DIAGRAM

Measurement Chart:

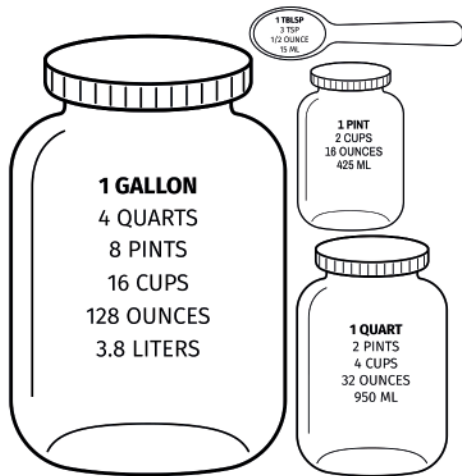| When measuring:	Tools	Customary Units	Metric Units
Capacity (the amount something can hold)		cup, pint, quart, gallon	Liter, milliliter
Temperature		°F	°C
Length		inches, yards, feet, miles	millimeters, centimeters, meters, kilometers
Weight		pounds, ounces	grams, kilograms

Approximate Measurements:
Metric Capacity:

- milliliter (mL) - about 20 drops of water
- liter (L) - about half of a family-sized (2L) bottle of soda
- 1000 mL = 1 L

1L   2L

Customary		Metric
1 Tablespoon	3 teaspoons	14.8 milliliters
1 fluid ounce	2 Tablespoons	29.6 milliliters
1 cup	8 fluid ounces	236.6 milliliters
1 pint	2 cups	473.2 milliliters
1 quart	2 pints	946.4 milliliters
1 quart	4 cups	946.4 milliliters
1 gallon	4 quarts	3.79 liters
1 gallon	16 cups	3.79 liters
1 gallon = 4 quarts = 16 cups = 128 fluid ounces		

Capacity

US Customary Units

Length

12 inches = 1 foot
3 feet = 1 yard
5280 feet = 1 mile

1 TBLSP
3 TSP
1/2 OUNCE
15 ML

1 PINT
2 CUPS
16 OUNCES
425 ML

1 GALLON
4 QUARTS
8 PINTS
16 CUPS
128 OUNCES
3.8 LITERS

1 QUART
2 PINTS
4 CUPS
32 OUNCES
950 ML

Weight

16 ounces = 1 pound
2000 pounds = 1 ton

Metric Conversions

King	**Henry**	**Died**	**By**	**Drinking**	**Chocolate**	**Milk**
kilo-	hecto-	deca-	base unit	deci-	centi-	milli-
10 x 10 x 10 x LARGER than a unit	10 x 10 x LARGER than a unit	10 x LARGER than a unit	meter (length) liter (capacity) gram (mass)	10 x SMALLER than a unit	10 x 10 x SMALLER than a unit	10 x 10 x 10 x SMALLER than a unit
1000 meters = 1 kilometer	100 meters = 1 hectometer	10 meters = 1 decameter		1 meter = 10 decimeters	1 meter = 100 centimeters	1 meter = 1000 millimeters
km = kilometer kL = kiloliter kg = kilogram	hm = hectometer hL = hectoliter hg = hectogram	dam = decameter daL = decaliter dag = decagram	m = meter L = liter g = gram	dm = decimeter dL = deciliter dg = decigram	cm = centimeter cL = centiliter cg = centigram	mm = millimeter mL = milliliter mg = milligram

MULTIPLY numbers by ten when you get smaller (move decimal one place to the right)

DIVIDE numbers by ten when you get larger (move decimal one place to the left)

3 Types of Division Equations
(and their parts)

$$9$$ ← quotient

divisor → $8 \overline{)72}$ ← dividend

• •

dividend → $\dfrac{72}{8} = 9$ ← quotient

divisor →

• •

$$72 \div 8 = 9$$

dividend   divisor   quotient

Long Division Algorithm

Remember! DSMB
Divide Multiply
Subtract Bring Down
(think Daddy, Mommy, Sister, Brother, Repeat)

Long Division Algorithm

1. **Divide.** How many times will the divisor go into the leftmost digit(s) of the dividend? Write that quotient above the digit of the dividend from which it was divided.
2. **Multiply** the divisor by the quotient you just found. Write the product below, keeping all of your columns tidy.
3. **Subtract** the product you just found from the digits above it.
4. **Bring down** the next digit and repeat until there are no more digits to "bring down".
5. Repeat. Repeat steps 1-4 until all of the digits in the dividend have been divided.

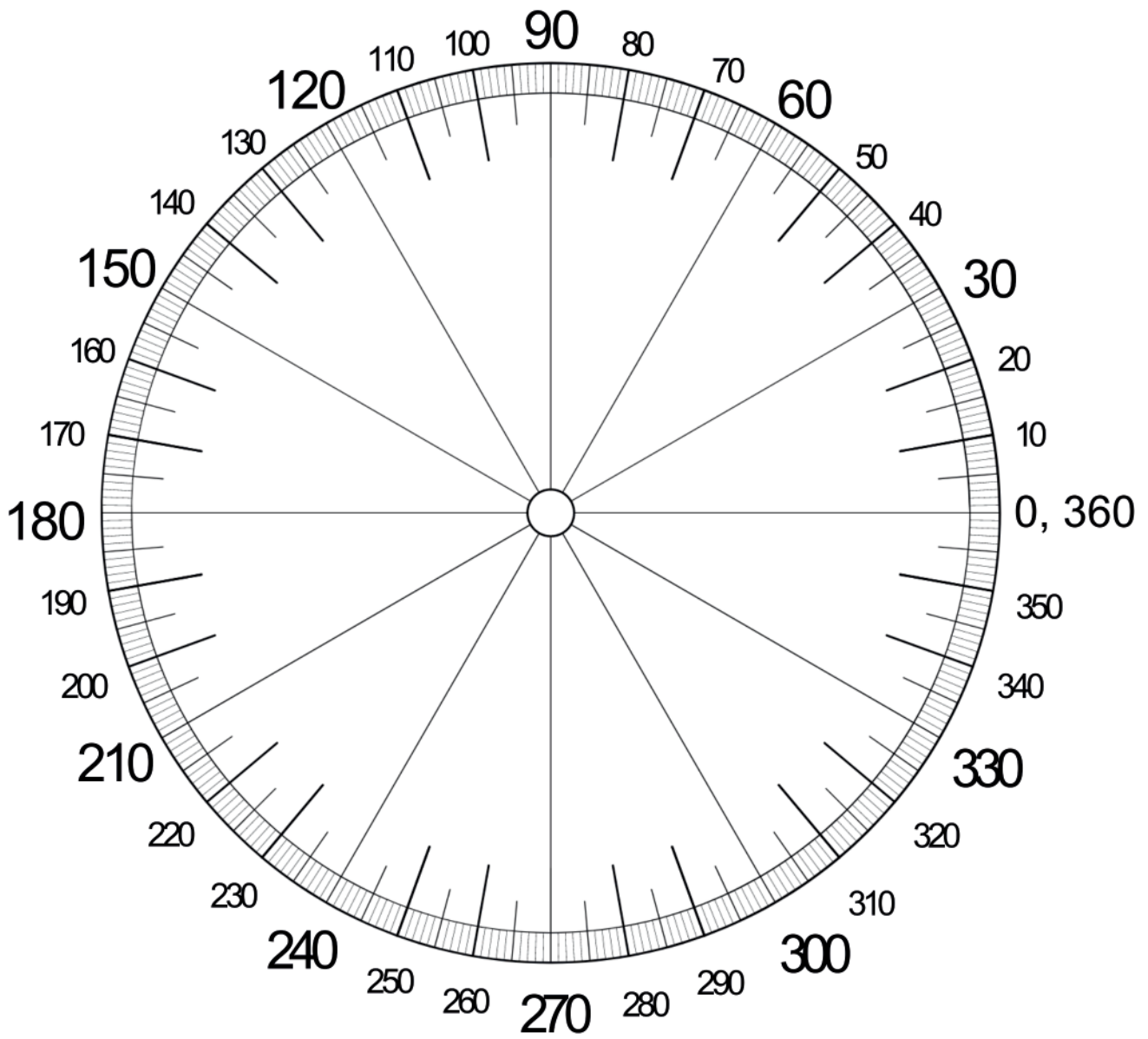The steps stay the same, no matter how big the problem is.

Division:

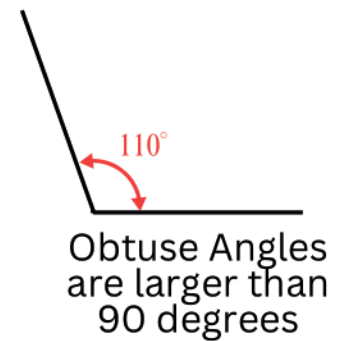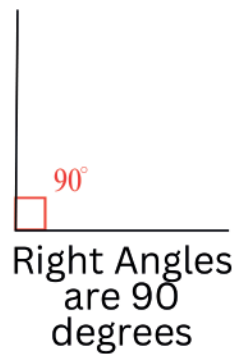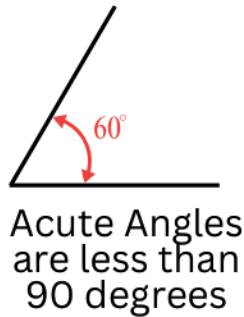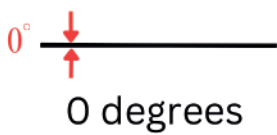| $\dfrac{8}{4} = 2$	$8 \div 4 = 2$	$4 \overline{)\dfrac{2}{8}}$	$\text{divisor} \overline{)\,\text{dividend}}^{\text{quotient}}$

Truths:

Division by ZERO is ILLEGAL.
0/0 is INDETERMINATE.
Division by ONE is ITSELF.
Multiplication by one is itself.

Protractor markings (outer ring, clockwise from right):
0, 360 — 10 — 20 — 30 — 40 — 50 — 60 — 70 — 80 — 90 — 100 — 110 — 120 — 130 — 140 — 150 — 160 — 170 — 180 — 190 — 200 — 210 — 220 — 230 — 240 — 250 — 260 — 270 — 280 — 290 — 300 — 310 — 320 — 330 — 340 — 350

Special Angles

$0°$

0 degrees

$60°$

**Acute Angles
are less than
90 degrees**

$90°$

**Right Angles
are 90
degrees**

$110°$

**Obtuse Angles
are larger than
90 degrees**

$180°$

**Straight Angles
are 180 degrees**

$220°$

**Reflex Angles are
between 180 degrees
and 270 degrees**

$360°$

**360 degrees is one
full revolution**

Exponents & Roots

Number	Base	Exponent	Expanded Notation	Standard Notation
2^0	2	0	1	1
2^1	2	1	2	2
2^2	2	2	2x2	4
2^3	2	3	2x2x2	8
2^4	2	4	2x2x2x2	16
2^5	2	5	2x2x2x2x2	32
3^2	3	2	3x3	9
3^3	3	3	3x3x3	27
3^4	3	4	3x3x3x3	81
4^2	4	2	4x4	16
4^3	4	3	4x4x4	64
4^4	4	4	4x4x4x4	256
5^2	5	2	5x5	25

Any number to the power of zero is one. $5^0 = 1$

Any number to the power of one is itself. $5^1 = 5$

Perfect Squares

$1^2 = 1$

$2^2 = 4$

$3^2 = 9$

$4^2 = 16$

$5^2 = 25$

$6^2 = 36$

$7^2 = 49$

$8^2 = 64$

$9^2 = 81$

$10^2 = 100$

Square Roots

$\sqrt{1} = 1$

$\sqrt{4} = 2$

$\sqrt{9} = 3$

$\sqrt{16} = 4$

$\sqrt{25} = 5$

$\sqrt{36} = 6$

$\sqrt{49} = 7$

$\sqrt{64} = 8$

$\sqrt{81} = 9$

$\sqrt{100} = 10$

Exponents and square roots.

$2^0 = 1$

$2^1 = 2 = 2$

$2^2 = 2 \times 2 = 4$

$2^3 = 2 \times 2 \times 2 = 8$

$2^4 = 2 \times 2 \times 2 \times 2 = 16$

$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$

$2^6 = 2 \times 2 \times 2 \times 2 \times 2 = 64$

$2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$

$2^8 = 256$

$2^9 = 512$

$2^{10} = 1,024$

$2^{11} = 2,048$

$2^{12} = 4,096$

$2^{13} = 8,192$

$2^{14} = 16,384$

$2^{15} = 32,768$

$2^{16} = 65,536$

$2^{17} = 131,072$

$2^{18} = 262,144$

$2^{19} = 524,288$

$2^{20} = 1,048,576$

Multiplication Algorithm:

1. Stack the numbers with the smaller number (the multiplier) on the bottom, lining up digits by place value.
2. Multiply the number in the ONES PLACE of the multiplier by the number in the ones place of the top number, writing the answer under the line. Always begin with the ONES place. If the product of these two numbers is greater than nine, move the TEN over to the TENS PLACE.
3. Multiply the number in the ones place of the bottom number by EACH DIGIT in the top number until complete. Regroup where necessary.
4. If the multiplier has a digit in the TENS PLACE, start a new line for the this product. Write a placeholder zero in the ONES PLACE on the new line, and multiply the digit in the TENS PLACE of the multiplier by each of the places in the top number, following steps 2 and 3.
5. If the multiplier has a digit in the HUNDREDS PLACE, start a new line for this product. Write TWO placeholder zeroes on the new line, then multiply the digit in the HUNDREDS PLACE of the multiplier by each digit in the top number, following steps 2 and 3.
6. Repeat for each PLACE beyond the HUNDREDS PLACE until each multiplier digit has been multiplied by each digit in the top number.
7. Add each product line together to get the final product.

Multiplication Algorithm for 1-digit Multipliers:

1. Stack the numbers with the smaller number (the multiplier) on the bottom, lining up digits by place value.
2. Multiply the number in the ONES PLACE of the multiplier by the number in the ones place of the top number, writing the answer under the line. Always begin with the ONES place. If the product of these two numbers is greater than nine, move the TEN over to the TENS PLACE.
3. Multiply the number in the ones place of the bottom number by EACH DIGIT in the top number until complete. Regroup where necessary.

Order of Operations (PEMDAS):
1. **P**arentheses
2. **E**xponents
3. **M**ultiply & **D**ivide from left to right
4. **A**dd & **S**ubtract from left to right

Long Division Algorithm

Pattern	Divide	Multiply	Subtract	Bring Down

Pattern

Divide.
Multiply.
Subtract.
Bring Down.
Repeat.

Divide

Divide. How many times will 5 go into 6?

5)6 5

Multiply

Multiply the divisor by the quotient.

1
5)6 5

Subtract

Subtract

1
5)6 5
5

Bring Down

1
5)6 5
−5
1

Bring Down

Repeat

Divide

Divide. How many times will 5 go into 15?

1
5)6 5
−5
1 5

Multiply

Multiply the divisor by the quotient.

1 3
5)6 5
5
1 5

Subtract

1 3
5)6 5
−5
1 5
−1 5

Subtract → No Remainder

We're finished! There are no more numbers to bring down.

Visual Fraction	Numerical Fraction	Percent	Decimal
	$\dfrac{1}{10}$	10%	0.1
	$\dfrac{2}{10}$	20%	0.2
	$\dfrac{3}{10}$	30%	0.3
	$\dfrac{4}{10}$	40%	0.4
	$\dfrac{5}{10}$	50%	0.5
	$\dfrac{6}{10}$	60%	0.6
	$\dfrac{7}{10}$	70%	0.7
	$\dfrac{8}{10}$	80%	0.8
	$\dfrac{9}{10}$	90%	0.9
	$\dfrac{10}{10} = 1$	100%	1

Visual Fraction	Numerical Fraction	Percent	Decimal
	$\dfrac{1}{12}$	8.3%	0.083
	$\dfrac{1}{10}$	10%	0.1
	$\dfrac{1}{8}$	12.5%	0.125
	$\dfrac{1}{6}$	16.6%	0.166
	$\dfrac{1}{5}$	20%	0.2
	$\dfrac{1}{4}$	25%	0.25
	$\dfrac{1}{3}$	33.3%	0.33
	$\dfrac{1}{2}$	50%	0.5
	1	100%	1