TIPS & REMINDERS: TABLE OF CONTENTS

Multiplication

Any number digits • 1 digit

```
    5 4 3
  2, 6 5 4
x         8
-----------
 21, 2 3 2
```

Multiply the 8 by each number starting with the ones place.
(8 • 4 = 32)

Put the digit of the ones (2) in the ones place and carry the digit in the tens place (3).

Continue this process for each digit on the top number. After you multiply, add the number that you carried (if there is one). For example, 8 • 5 = 40 + 3 = 43. Write the digit in the ones place and carry the digit in the tens place.

Multiplication
Any number digits • 2 digits

```
   7,3 4 5
x      6 2
-----------
  1 4 6 9 0
 4 4 0 7 0 0
-----------
 4 5 5, 3 9 0
```

Multiplication can be represented in the following ways:
5 x 7
5 • 7
5 * 7
(5)(7)

Multiplication
Any number digits
"3 digits"

```
      5 8 3
    x 4 1 6
-------------
    3 4 9 8
    5 8 3 0
2 3 3 2 0 0
-------------
2 4 2, 5 2 8
```

Division

Division Without Remainders

2214 ÷ 9 =

Set up the problem:

```
9 | 2 2 1 4
```

Divide:

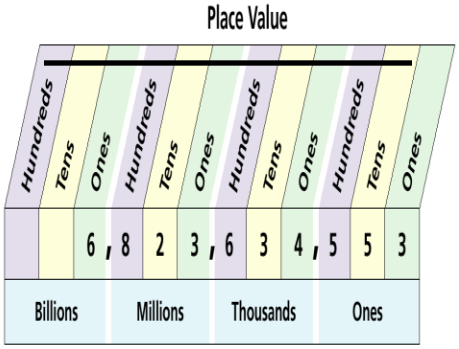
```
    0 2 4 6
  ---------
9 | 2 2 1 4
      ⇩
  - 1 8   ⇩
    -----
      4 1   ⇩
    - 3 6
    -----
        5 4
      - 5 4
      -----
            0
```

2214 ÷ 9 = 246

Check your work by multiplying 246 by 9:

```
      4   5
      2   4   6
X             9
-------------
2     2   1   4
```

Place Value
Whole Numbers



What is the <u>name</u> of the place with the digit of 4? *Thousands.*

What is the <u>value</u> of the 4? *Four thousand.*

Rounding Whole Numbers (Right Round)

Look to the right of the number to be rounded.

- If that number is 5 or greater, round up
- If that number is 4 or less, round down
- Drop all digits to the right of the rounded number and fill in with zeros

Ex: *46,<u>3</u>75*
The digit to the right of the underlined number is 7, so round up. Drop the remaining digits and fill with zeros

46,375 = 46,400

Ex: *963,<u>1</u>54*
The digit to the right of the underlined number is 1, so round down. Drop the remaining digits and fill with zeros
963,154 = 963,000

Standard/Expanded Notation

Standard Form:
2,537
13,602

Expanded Form:
2,000 + 500 + 30 + 7

10,000 + 3,000 + 600 + 2

Place Value
Whole Numbers & Decimals

Thousands	Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths	Ten Thousandths	Hundred Thousandth	Millionths
	1	2	7	.	5	3	6	9		

The digits to the right of the decimal point (**.**) are decimals. They all end with "ths".

What is the <u>name</u> of the place with the digit of 8?
Hundredths.
What is the <u>value</u> of the 8?
Eight hundredths.

Fact Family

Fact families are the groups of addition/subtraction and multiplication/division facts that form a "family":

Add/Sub: **2, 3, 5**
2 + 3 = 5 3 + 2 = 5
5 – 3 = 2 5 – 2 = 3

Mult/Div: **4, 5, 20**
5 • 4 = 20 4 • 5 = 20
20 ÷ 4 = 5 20 ÷ 5 = 4

Exponents (Powers)

An exponent tells the number of times a base is multiplied by itself.
Anything raised to the **3rd power** is called **"cubed".**

5^3
5 = base, 3 = exponent
$5 \cdot 5 \cdot 5 = 125 = 5^3$

Anything raised to the **2nd power** is called **"squared".**

4^2
4 = base, 2 = exponent
$4 \cdot 4 = 16 = 4^2$

$7^0 = 1$

$8^1 = 8$ (Identity Property)

16, Base 2

The base is 2 and 16 is the answer. Figure out, to what power the base should be raised.

2 x 2 x 2 x 2 = 16

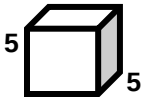
So, 16 Base 2 = 2^4

Square Root: One of the two equal factors of a number.

$\sqrt{36} = 6$
Because $6 \cdot 6 = 6^2 = 36$

Cube Root: One of the three equal factors of a number.

$\sqrt[3]{125} = 5$
Because $5 \cdot 5 \cdot 5 = 5^3 = 125$



Order of Operations
PEMDAS

1st: **P**arenthesis
2nd: **E**xponents
3rd: **M**ultiplication/**D**ivision
4th: **A**ddition/**S**ubtraction
Use the "V"

PEMDAS

1. Do all computations within parenthesis, if there are any.
2. Compute all the exponents.
3. Multiply or divide, in order that they are given, from left to right.
4. Add or subtract, in order that they are given, from left to right.

*" **P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally"*

Ex:

P $5 \cdot 7 + (10 - 4) + 3^2 - 2$
6

E $5 \cdot 7 + 6 + 3^2 - 2$
9

M/D $5 \cdot 7 + 6 + 9 - 2$
35

A/S $35 + 6 + 9 - 2$
$41 + 9 - 2$
$50 - 2$
48

Algebra

Variable: A symbol used to measure a quantity that can change

Expression: A mathematical phrase that contains operations, numbers and/or variables.

Equation: A mathematical sentence that shows that two expressions are equivalent. Contains an equal (=) sign.

Inverse Operation: The operation that reverses the effect of another operation (UNDO)

7 Steps of Algebra

1. Write down the problem
2. Isolate the variable by doing the inverse operation on both sides
3. Cross out- on variable side
4. Draw Line
5. Drop down variable
6. Solve
7. Check ☆

Addition Words:

- Added to
- Plus
- Sum
- More than

Subtraction Words:

- Subtracted
- Minus
- Difference
- Less than
- Take away

Multiplication Words:

- Times
- Multiplied By
- Product
- Groups of

Division Words:

- Divided by
- Quotient
- Into

Rounding Decimals "Right Round"

Look to the **right** of the underlined number to be rounded.

- If the next number is 5 or greater, round up
- If the next number is 4 or less, round down
- Drop all digits to the right of the rounded number

Ex: 42.6<u>3</u>7

The digit to the right of the underlined number is 7, so round up. Drop the remaining digits.

42.637 = 42.64

Ex: 96.<u>3</u>154

The digit to the right of the underlined number is 1, so round down. Drop the remaining digits.

96.3154 = 96.3

Ex: 0.4<u>8</u>52

The digit to the right of the underlined number is 5, so round up. Drop the remaining digits.

0.4<u>8</u>52 = 0.49

Adding/Subtracting Decimals

- Line up the decimal points.
- Annex (add) zeros if necessary
- Add or subtract as you would with whole numbers
- Remember to bring down the decimal point in the exact same spot into the answer

Ex: 24.7 + 48.92 =

```
  1 1
  24.70  (annexed zero)
+ 48.92
  73.62
```

Ex: 59.45 - 17.3 =

```
  59.45
- 17.30  (annexed zero)
  42.15
```

Multiplying Decimals

Multiply as you would with whole numbers. Ignore the decimals. **DO NOT LINE UP THE DECIMALS.**

Count the total number of digits behind the decimals in the problem. That is how many places will be after the decimal in the product (answer).

Ex: 5.4 • 13

```
    1
    5.4
X   1 3
  1 6 2
+ 5 4 0
  7 0.2
```

Dividing Decimals by Whole Numbers*:*

43.26 ÷ 6

```
     0 7 . 2 1
  ┌──────────
6 │ 4 3 . 2 6
  - 4 2
  ─────
    1 2
  - 1 2
  ─────
      0 6
    - 0 6
    ─────
        0
```

Bring up the decimal point into the quotient. Divide as you would with whole numbers.
Annex zeros if necessary.

Dividing Decimals by Decimals

```
4 . 2 ⟌ 2 8 . 5 6
```

Change the divisor to a whole number by moving the decimal point to the right. Move the decimal point in the dividend the same number of spaces to the right. Annex zeros if necessary.

```
4 2. ⟌ 2 8 5 . 6
     ↷       ↷
```

Divide as you would with whole numbers. Remember to bring up the decimal point into the quotient.

```
       6 . 8
  ┌──────────
4 2 │ 2 8 5 . 6
  - 2 5 2
  ─────────
      3 3 6
    - 3 3 6
    ─────────
          0
```

Division with Decimal Remainders

You won't know if there is a remainder until you do the problem. Set it up just like any other division problem.

```
     0 3 4 5
  ┌──────────
6 │ 2 0 7 4
  - 1 8   ⇩
  ─────   ⇓
    2 7   ⇓
  - 2 4   ⇓
  ─────   ⇓
      3 4 ⇓
    - 3 0
    ─────
        4
```

Since you won't leave the remainder as "r", you need to annex (add) up to three zeros until you either terminate, determine that the decimal will repeat, or determine that the decimal will go on beyond the thousandths place.

```
     0 3 4 5 . 6 6 6
  ┌──────────────────
6 │ 2 0 7 4 . 0 0 0
      ⇩ ⇓ ⇓ ⇓ ⇓
  - 1 8 ⇓ ⇓ ⇓ ⇓
  ─────
    2 7 ⇓ ⇓ ⇓ ⇓
  - 2 4   ⇓ ⇓ ⇓
  ─────   ⇓ ⇓ ⇓
      3 4 ⇓ ⇓ ⇓
    - 3 0   ⇓ ⇓
    ─────   ⇓ ⇓
        4 0 ⇓ ⇓
      - 3 6   ⇓
      ─────   ⇓
          4 0 ⇓
        - 3 6
        ─────
            4
```

$= 3\ 4\ 5\ .\ \overline{6}$

This problem has a **repeating decimal**. Instead of writing 345.666, use the repeat bar over the digits that repeat, the 6 in this case.

Terminating, Repeating, & Continuing Decimals

Terminating: A decimal the ends on its own. Ex: 0.75

Repeating: A decimal in which one or more digits repeat infinitely.

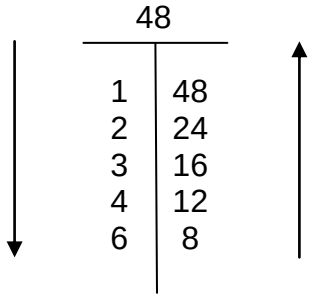
Ex: 0.757575……. = $0.\overline{75}$

Continuing*:* A decimal that neither terminates, nor is repeating.

Ex: 0.548759314…

Factor T-Charts

To find all the factors of a number, make a T-Chart and write the number pairs on it, starting with "1".



Factors of 48:
1, 2, 3, 4, 6, 8, 12, 16, 24, 48

Composite & Prime Numbers

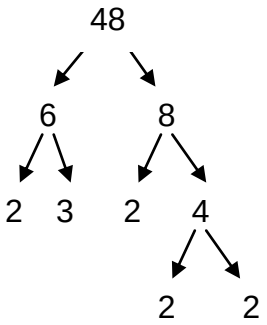
Composite number:
A number that has three or more factors:
10 (1, 2, 5, 10)

Prime number:
Has only two factors,
1 and itself: 3 (1 • 3 = 3)

First 25 Prime Numbers

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Prime Factorization Factor Tree



- Write the number you are factoring at the top of the "tree"

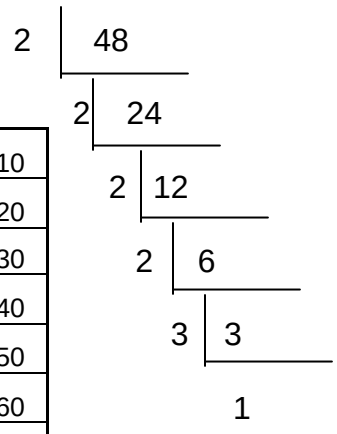
- Choose any pair of factors as branches. If either of these factors are not prime, you need to factor again

- Continue until all the branches end in a prime number

- Write only the prime factors in prime factorization form.

$2^4 \times 3$

Prime Factorization Factor Ladder



- You can only divide by **prime** numbers. Start with 2, 3, 5, 7, 11

-Write the number you are factoring at the top of the "ladder"

- See if you can divide it by "2". If so, write a two on the outside of the ladder, then write what the number divided by 2 equals (48 ÷ 2 =24).

- Continue this until the number cannot be divided by 2 again. Go to three, and divide by three as many times as you can.

- Continue with 4, 5, etc., if necessary, until you end up with a prime number.

- Write the prime factors (excluding 1) in prime factorization form.

$2^4 \times 3$

Greatest Common Factor (GCF)

To find the greatest common factor, first list all the factors of each number:

16: 1, 2, 4, 8, 16
24: 1, 2, 3, 4, 6, 8, 12, 24

- The common factors of 16 and 24 are: 1, 2, 4, and 8.
- The **greatest (largest) common factor** of 16 and 24 is **8**.

Least Common Multiple (LCM)

Multiples of a number are the products of the number and other factors:

5 • 1 = 5; 5 • 2 = 10;
5 • 3 = 15

Multiples of 5: 5, 10, 15, 20,
To find the least common multiple of two numbers, first list out their multiples:

3: 3, 6, 9, **12**, 15, 18, 21, **24**…

4: 4, 8, **12**, 16, 20, **24**, 28….

First two common multiples:
12, 24

Least (or lowest) **C**ommon **M**ultiple: 12

Converting Fractions to Decimals

To change a fraction to a decimal, divide the numerator by the denominator.

Annex zeros if needed. Write the fraction in lowest terms.

$\frac{1}{4} \Longrightarrow$

```
  0 . 2 5
4 1 . 0 0
  - 8
    2 0
  - 2 0
      0
```

Converting Decimals to Fractions

Decimals are fractions with a special set of denominators (tenths, hundredths, thousandths, etc) and a special written form. To write a decimal as a fraction, say it aloud. You'll notice it sounds like a fraction:

Decimal: 0.9
Word name: nine tenths
Fraction: $\frac{9}{10}$

Decimal: 0.47
Word name: forty-seven hundredths
Fraction: $\frac{47}{100}$

Decimal: 3.2
Word name: three and two tenths
Fraction: $3\frac{2}{10}$

Decimal: 5.25
Word name: five and twenty five hundredths
Fraction: $5\frac{25}{100} = 5\frac{1}{4}$

Converting Decimals and Percent using 100
MR. DL

Decimal to percent ⟶

Move the decimal two places to the right because you are **multiplying** by 100. Add the percent symbol.

0 . 4 6 = 46%

0 . 3 0 5 = 30.5%

Percent to Decimal ⟵

Move the decimal two places to the left because you are **dividing** by 100. If one is not present, add it to the end, then move it. Drop the percent symbol.

54% = 5 4 . = 0.54

25.8% = 2 5 . 8 = 0.258

Writing Fractions in Lowest Terms or Simplifying Fractions

Whenever the numerator and denominator of a fraction can be divided by the same non-zero whole number (GCF) it can be "reduced" or written in lower terms.

When the numerator and denominator can no longer be divided by the same non-zero whole number, it is in lowest terms or simplest form.

EX: $\frac{10}{15}$

Both can be divided evenly by "5" which is the GCF of 10 & 15.

$$\frac{10 \div 5 = 2}{15 \div 5 = 3}$$

There is not a whole number that can be evenly divided into 2 and 3, so $\frac{2}{3}$ is in lowest terms.

Improper Fractions & Mixed Numbers

Improper Fraction:
a fraction where the numerator is larger than the denominator
Ex: $\frac{9}{4}$

Mixed Number:
a fraction with a whole number
Ex: $5\frac{1}{2}$

Convert Improper Fraction to Mixed Number

$\frac{11}{2} \longrightarrow 5\frac{1}{2}$

Divide the numerator by the denominator. If it divides evenly, then the answer is a whole number.

If it does not divide evenly, keep the whole number and then the remainder becomes the new numerator and the denominator stays the same.

$\frac{11}{2}$ = 11 ÷ 2 = 5 remainder 1

= $5\frac{1}{2}$

Converting a Mixed Number into an Improper Fraction

Using the order of operations, multiply the denominator by the whole number, then add the numerator. This becomes the new numerator. The denominator stays the same.

$5\frac{1}{2} = 2 \bullet 5 + 1 = 11 = \frac{11}{2}$

Fraction Jingle (By: Mrs. Mackey)

I don't know what you've been told, fractions are the way to go.
Fractions, fractions, don't you know? Each operation has a different flow.
(CHORUS)
Sound off, 7/8
Knock it on down, 3/4
All the way down, 5/8, 1/2, 3/8, 1/4!

Adding and subtracting are so cool. It's quite easy, here's the rule. Change the denominators so they match. Then add the numerators, that's the catch.

(CHORUS)

Multiplication rules, we can name. The denominators aren't the same. Multiply the tops and then the bottoms. Simplify and then you got 'em!

(CHORUS)

Dividing fractions, that's the test
It's more confusing than the rest
We don't divide we multiply.
By the right reciprocal, and that's no lie!

Sound off, 7/8
Knock it on down , 3/4
All the way down, 5/8, 1/2, 3/8, ooh rah!

Adding/Subtracting Fractions with LIKE Denominators

Add or subtract the numerators. Write the new numerator, the denominator stays the same. Simplify when necessary.

EX:

$\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$

$\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$

Common Denominators

Common denominators may be found by different methods:

- Multiply each fraction by denominator of the opposite fraction:

EX: $\frac{2}{3}$; $\frac{1}{2}$

$\frac{2}{3} \bullet \frac{2}{2} = \frac{4}{6}$

$\frac{1}{2} \bullet \frac{3}{3} = \frac{3}{6}$

- Find the LCM (least common denominator) of the 2 denominators:

3: 3, (6,)

2: 2, 4, (6)

- Then, multiply the numerator by the number that you would need to multiply both the numerator and the denominator by to get the LCM as the new denominator.

$\frac{2}{3} \bullet \frac{2}{2} = \frac{4}{6}$

$\frac{1}{2} \bullet \frac{3}{3} = \frac{3}{6}$

Equivalent Fractions

Multiply the numerator and denominator by the same number to find equivalent fractions:

$\frac{3}{4} = \frac{3 \bullet 2}{4 \bullet 2} = \frac{6}{8}$

$\frac{3}{4} = \frac{3 \bullet 3}{4 \bullet 3} = \frac{9}{12}$

$\frac{3}{4} = \frac{6}{8} = \frac{9}{12}$

Compare Fractions with LIKE Denominators

If fractions have the same denominator, compare the numerators.
$\frac{4}{7} > \frac{2}{7}$, because 4 is greater than 2.

$\frac{1}{9} < \frac{5}{9}$, because 1 is less than 5.

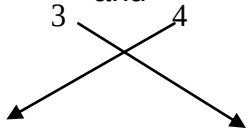
Ordering Fractions with UNLIKE Denominators

Either find common denominators or convert to decimals, then put in order as requested.

Comparing Fractions with UNLIKE Denominators

One method is to get a common denominator by multiplying each fraction by the denominator of the opposite fraction, and then comparing numerators:

$\frac{2}{3}$ and $\frac{3}{4}$



$\frac{2 \bullet 4}{3 \bullet 4} = \frac{8}{12}$ $\frac{3 \bullet 3}{4 \bullet 3} = \frac{9}{12}$

$\frac{8}{12} < \frac{9}{12}$, so $\frac{2}{3} < \frac{3}{4}$

Another method is to convert each fraction to a decimal, by dividing the numerator by the denominator, and then compare the decimals:

$\frac{2}{3}$ and $\frac{3}{4}$

$\frac{2}{3} = 0.67 < \frac{3}{4} = 0.75$

$\frac{2}{3} < \frac{3}{4}$

Adding or Subtracting Fractions with UNLIKE Denominators

Since you need to have the same denominator to add or subtract fractions, multiply each fraction by denominator of the opposite fraction to find a common denominator.

EX:

$\frac{2}{3} + \frac{1}{2}$

$\frac{2}{3} \bullet \frac{2}{2} = \frac{4}{6}$

$+ \frac{1}{2} \bullet \frac{3}{3} = + \frac{3}{6}$

$\frac{7}{6} = 1\frac{1}{6}$

Rewrite in lowest terms/mixed numbers if necessary

Adding or Subtracting Mixed Numbers

Adding:
Add the whole numbers, then add the fractions. If you do not have common denominators, you need to get common denominators before you may add. Write answer in lowest terms (reduce if necessary).

$5\frac{3}{8} + 4\frac{1}{8} = 9\frac{4}{8} = 9\frac{1}{2}$

Subtraction:
Do subtraction problems the same way. If you do not have common denominators, you need to get common denominators before you may subtract.

$5\frac{2}{3} + 9\frac{1}{2}$

$5\frac{2}{3} \bullet \frac{2}{2} = 5\frac{4}{6}$

$+ 9\frac{1}{2} \bullet \frac{3}{3} = + 9\frac{3}{6}$

$14\frac{7}{6}$

$14 + \frac{7}{6} = 14 + 1\frac{1}{6} = 15\frac{1}{6}$

Multiplying Fractions

- Multiply the numerators.
- Multiply the denominators.
- Write the product in lowest terms (reduce) if necessary.

$\frac{2}{3} \bullet \frac{3}{7} = \frac{6}{21} = \frac{2}{7}$

If multiplying a whole number by a fraction, make the whole number a fraction by placing it over 1.

$9 \bullet \frac{3}{7} = \frac{9}{1} \bullet \frac{3}{7} =$

$\frac{27}{7} = 3\frac{6}{7}$

Dividing Fractions

- Invert (flip) the numerator and denominator of the second fraction (the right reciprocal).
- Change the operation to multiplication

Dividing Fractions (Continued)

- Multiply the numerators
- Multiply the denominators
- Write the product in lowest terms (reduce) if necessary.

$$\frac{2}{3} \div \frac{3}{7} = \frac{2}{3} \cdot \frac{7}{3} =$$

$$\frac{14}{9} = 1\frac{5}{9}$$

- If dividing a whole number by a fraction, or a fraction by a whole number, make the whole number a fraction by placing it over 1. Then follow the above steps.

Rates, Ratios & Proportions

Ratio: is a comparison of two quantities using division. Reduce when possible.

Stars to Hearts=

$\frac{5}{2}$ 5:2 5 to 2

Rate: Compares 2 quantities that have different units of measure. (Must be labeled)

2-liter bottle of soda costs $1.98.

$$\text{rate} = \frac{Price}{\#\ of\ Liters} = \frac{\$1.98}{2\ liters}$$

Unit Rate: The comparison to one unit. Unit rates make it easier to compare quantities.

- Divide both the numerator & denominator by the bottom number.

$$\frac{\$1.98}{2\ liters} = \frac{\div 2}{\div 2} = \frac{\$0.49}{1\ liter}$$

Proportion: An equation that shows two equivalent ratios.

$$\frac{3}{8} = \frac{6}{16}$$

Data Analysis: Mean, Median, Mode, Range & Outliers

Mean: (Average) Add the numbers and divide by the total number in the set:
$\{4, 4, 2, 3, 5, 5\}$ =

4 + 4 + 2 + 3 + 5 + 5 = 23

23 ÷ 6 = 3.8 Mean = 3.8

- Round to the hundredths place if necessary.

Median: (Middle Number) Place the numbers in ORDER. Find the middle number. **"Whack, Whack"**

4, 4, 2, 3, 5, 5, 1=
1, 2, 3, 4, 4, 5, 5

Median = 4

- If there isn't one middle number, find the median by adding the two middle numbers (5 & 6) and divide by 2.

6, 9, 2, 7, 5, 1 = 1, 2, 5, 6, 7, 9
5 + 6 = 11 ÷ 2 = 5.5

Median = 5.5

Mode: (*Most Frequent*) Find the number that occurs most frequently. There can be more than one mode if two or more numbers occur "most often"

$\{4, 4, 2, 3, 4, 5, 5\}$= Mode: 4

$\{4, 4, 2, 3, 5, 5\}$=
Modes: 4 & 5

$\{4, 1, 2, 3, 5, 6\}$= No Mode

Range: The difference between the greatest number and the least number:

$\{4, 4, 2, 3, 4, 5, 5\}$ =

5 – 2 = 3

Range = 3

Outlier: The number(s) that do not fit with the rest of the data.

Geometry

Point: An exact location ●

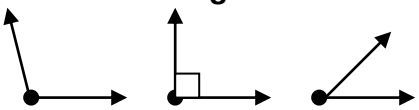
Line: A straight path that extends without end in opposite directions ←→

Ray: Has one endpoint and extends in only one direction ●→

Line Segment: Made of 2 endpoints and all the points in-between 

Plane: A flat surface that extends without end in all directions 

Angles



Obtuse 91°-179°

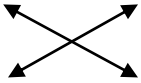
Right 90°

Acute 0°-89°

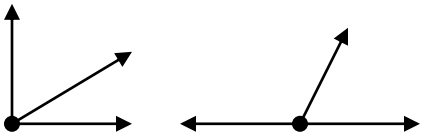
Straight Angle 180°

Angle Relationships:

Vertical Angles: Formed opposite each other when 2 lines intersect (kissing angles)



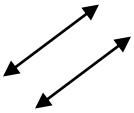
Adjacent Angles: Side by side and have a common vertex and ray. They do not have to be congruent.

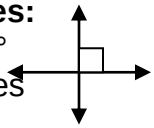


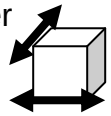
Complimentary 2 angles whose measures have a a sum of 90°

Supplementary 2 angles whose measures have sum of 180°

Classifying Lines:

Parallel Lines: Lines in the same plane that NEVER intersect 

Perpendicular Lines: Intersect to form 90° angles or right angles 

Skew Lines: Lines that line in different planes. Neither parallel nor perpendicular 

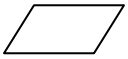
Polygons:

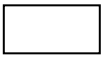
- **Triangle:** 3 sides
- **Quadrilateral:** 4 sides
- **Pentagon:** 5 sides
- **Hexagon:** 6 sides
- **Heptagon:** 7 sides
- **Octagon:** 8 sides
- **Nonagon:** 9 sides
- **Decagon:** 10 sides

Triangles: Sum of angles are 180°

- **Equilateral:** All sides are equal
- **Isosceles:** 2 sides are equal
- **Scalene:** No sides are equal
- **Acute:** All angles measure less than 90°
- **Obtuse:** 1 angle measures greater than 90°
- **Right:** 1 angle measures exactly 90°

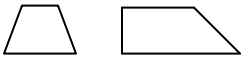
Quadrilaterals

Parallelogram: Opposite sides are parallel & congruent. Opposite angles are congruent 

Rectangle: Parallelogram with 4 right angles 

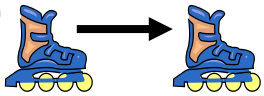
Rhombus: Parallelogram with 4 congruent sides 

Square: Parallelogram with 4 congruent sides and 4 right angles 

Trapezoid: Quadrilateral with exactly 2 parallel sides; may have 2 right angles 

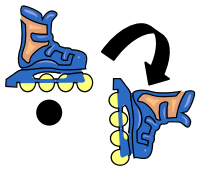
Transformations:

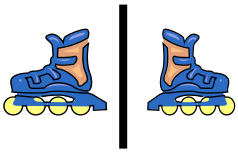
Moves a figure without changing its size or shape, so that the original figure and the transformed figure are always congruent

Translation: A movement of a figure along a straight line (slide) 

Rotation: The movement of a figure around a point.

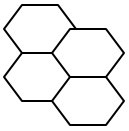
- Every quarter turn is 90°



Reflection: When a figure flips over a line, creating a mirror image 

Line of Reflection: The line the figure is flipped over.

Line Symmetry: A figure can be folded or reflected so that the 2 parts of the figure match or are congruent.

Tessellation: A repeating arrangement of one or more shapes that completely covers a plane with no gaps and no overlaps. 

Perimeter

Perimeter is the distance around a figure:
"Add up all lengths as you go around…perimeter is what you've found!"

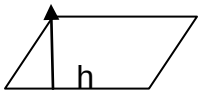
2 cm + 3 cm + 3 cm = 8 cm
The perimeter of this figure is 8 centimeters

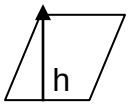
Area

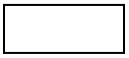
The area of a figure is the number of square units inside the figure.

Area of Squares & Rectangles & Parallelograms

A=bh **A=lw**







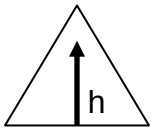
The area is 9 square units, or 9 u^2. If you were measuring in inches, it would be 9 in^2.

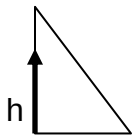
"Night or day, day or night… area equals base times height"

Area of Triangles:

A= ½ bh or A= bh ÷ 2

"Area of triangles are easy to do…base times height and divide by 2"



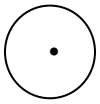


Ex: base = 12 m
height = 6 m

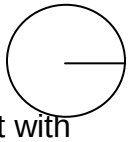
$(12 \cdot 6) \div 2 = 36\ m^2$
OR
$\frac{1}{2}(12 \cdot 6) = 36\ m^2$

Circles

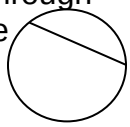
Center: The middle of the circle



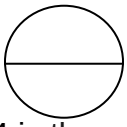
Radius: A line segment with one endpoint at the center of the circle and the other endpoint on the circle



Chord: A line segment with both endpoints on a circle- does not have to go through the center of the circle



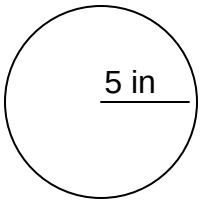
Diameter: A chord that passes through the center of the circle. The length of the diameter is twice the length of the radius



Pi: $(\Pi)\frac{22}{7}$ or 3.14 is the ratio of a circle's circumference to its diameter.

Area of a Circle:

A= Πr²



A= Π r²
A= 3.14 x 5²
A= 3.14 x 25
A= 78.5 in²

Circumference: The distance around (perimeter)

C= Πd OR	**C= 2Πr**
C=3.14 x 10	C= 2 x 3.14 x 5
C= 31.4 in	C= 10 x 3.14
	C= 31.4 in

Probability

Probability-the measure of how likely an event is to occur:

- Impossible: 0%
- Unlikely: 25%
- As likely as not/ equally likely: 50%
- Likely: 75%
- Certain: 100%

Experimental Probability- the ratio of the number of times the event occurs to the total number of times the experiment is performed.

$$P \approx \frac{number\ of\ times\ the\ event\ occurs}{total\ number\ of\ trial}$$

Experiment- an activity involving chance that can have different results.
Outcomes-the different results that can occur

Sample Space-the set of all possible outcomes

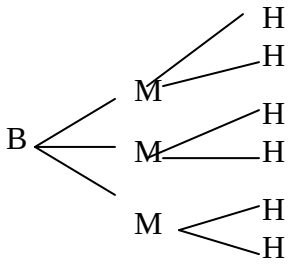
Theoretical Probability- the ratio of the number of equally likely outcomes in an event to the total number of possible outcomes.

$$P \approx \frac{number\ of\ ways\ the\ event\ can\ occur}{total\ number\ possible\ outcomes}$$

Fair- An experiment with equally likely outcomes.

Organized List: Tree Diagram

How many different sandwich combinations are possible with 1 type of bread, 3 meats and 2 cheeses?



Count the leaves (H's)=
6 combinations

Math Properties

Commutative Property of Addition- Add numbers in any order.

- 6 + 1 = 1 + 6

Commutative Property of Multiplication- Multiply numbers in any order.

- 6 x 1 = 1 x 6

Associative Property of Addition- When adding, group numbers together with parentheses.

- (9+3) + 2 = 9+ (3 + 2)

Associative Property of Multiplication- When multiplying, group numbers together with parentheses.

- (9x3) x 2 = 9 x (3 x 2)

Identity Property of Zero- The sum of any number and zero is equal to the number.

- 9 + 0 = 9

Identity Property of One- The product of any number and one is equal to the number.

- 6 x 1 = 6

Property of Zero- The product of any number and zero is zero.

- 4 x 0 = 0

Distributive Property- When sum, find the sum first and then multiply, or multiply each number in the sum and then add.

- 6 x (4 + 5)= 6x4 + 6x5
  OR
- 6 x (4 + 5)= 24 + 30

Fraction, Decimal & Percent Benchmarks

Percent	Fraction	Decimal
10%	$\frac{1}{10}$	.10 or .1
12.5%	$\frac{1}{8}$	.125
17%	$\frac{1}{6}$	.17
20%	$\frac{1}{5}$	.20 or .2
25%	$\frac{1}{4}$	.25
30%	$\frac{3}{10}$	.30 or .3
33%	$\frac{1}{3}$	.33
37.5%	$\frac{3}{8}$	.375
40%	$\frac{2}{5}$	.40 or .4
50%	$\frac{1}{2}$	.50 or .5
60%	$\frac{3}{5}$	.60 or .6
62.5%	$\frac{5}{8}$	.625
66.6%	$\frac{2}{3}$	.66 or .67
75%	$\frac{3}{4}$	.75
80%	$\frac{4}{5}$	.80 or .8
83%	$\frac{5}{6}$	.83
87.5%	$\frac{7}{8}$	.875
100%	$\frac{1}{1}$	1

Area & Perimeter Formulas

- Rectangle:
  - A=bh
  - A= lw
  - P= 2l + 2w
- Square:
  - A= s^2
  - A= bh
  - A= lw
  - P= 4s
- Parallelogram:
  - A= bh
  - P= 2l + 2w
- Rhombus:
  - A= bh
  - P= 4s
- Triangle**:**
  - A= bh ÷ 2
  - A= ½ bh
  - P= s + s + s
- Trapezoid:
  - A= ½ h (b_1+ b_2)
  - P= s + s + s + s
- Circle:
  - **A= Πr²**
  - **C= Πd**
  - **C= 2Πr**

KEY:

- A = Area
- P = Perimeter
- b = base
- h = height
- l = length
- w = width
- s = sides
- $\Pi = \text{pi} = 3.14 \text{ or } \frac{22}{7}$
- r = radius
- d = diameter
- C = Circumference

Three-Dimensional Shapes

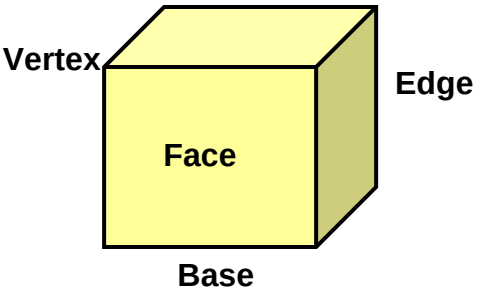
Polyhedron: Three-dimensional object, or solid figure, with flat surfaces.

Face: Flat surfaces that make up polyhedrons.

Edge: The side that 2 faces share.

Vertex: A point at which 3 or more edges meet.

- **Vertices:** More than one vertex.



Prism: A polyhedron with 2 congruent, parallel bases and other faces that are all parallelograms.

- Named for the shape of its bases.

Bases: Prisms & Cylinders have 2 congruent & parallel ends.

Cylinder: Has 2 congruent, parallel bases, but bases of a cylinder are circular.

- Not a polyhedron because not every surface is a polygon.

Pyramid: Has 1 polygon shaped base, and the other faces are triangles that come to a point.

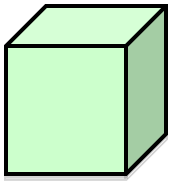
- Named for the shape of its base.

Cone: A circular base and a curved surface that comes to a point.

- Not a polyhedron because not every surface is a polygon.

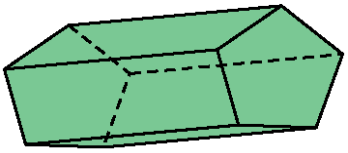
Prisms

- **Cube**



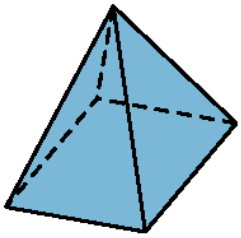
- **Rectangular Prism**

- **Hexagonal Prism**

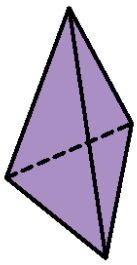


Pyramids

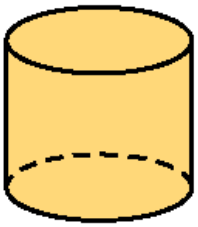
- **Square Pyramid**



- **Triangular Pyramid**

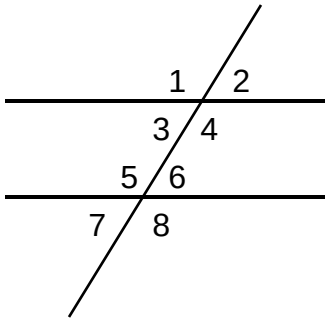


Cylinder



Cone

Transversal



Corresponding Angles:

- $\angle 1 = \angle 4$
- $\angle 6 = \angle 7$

Alternate Interior Angles:

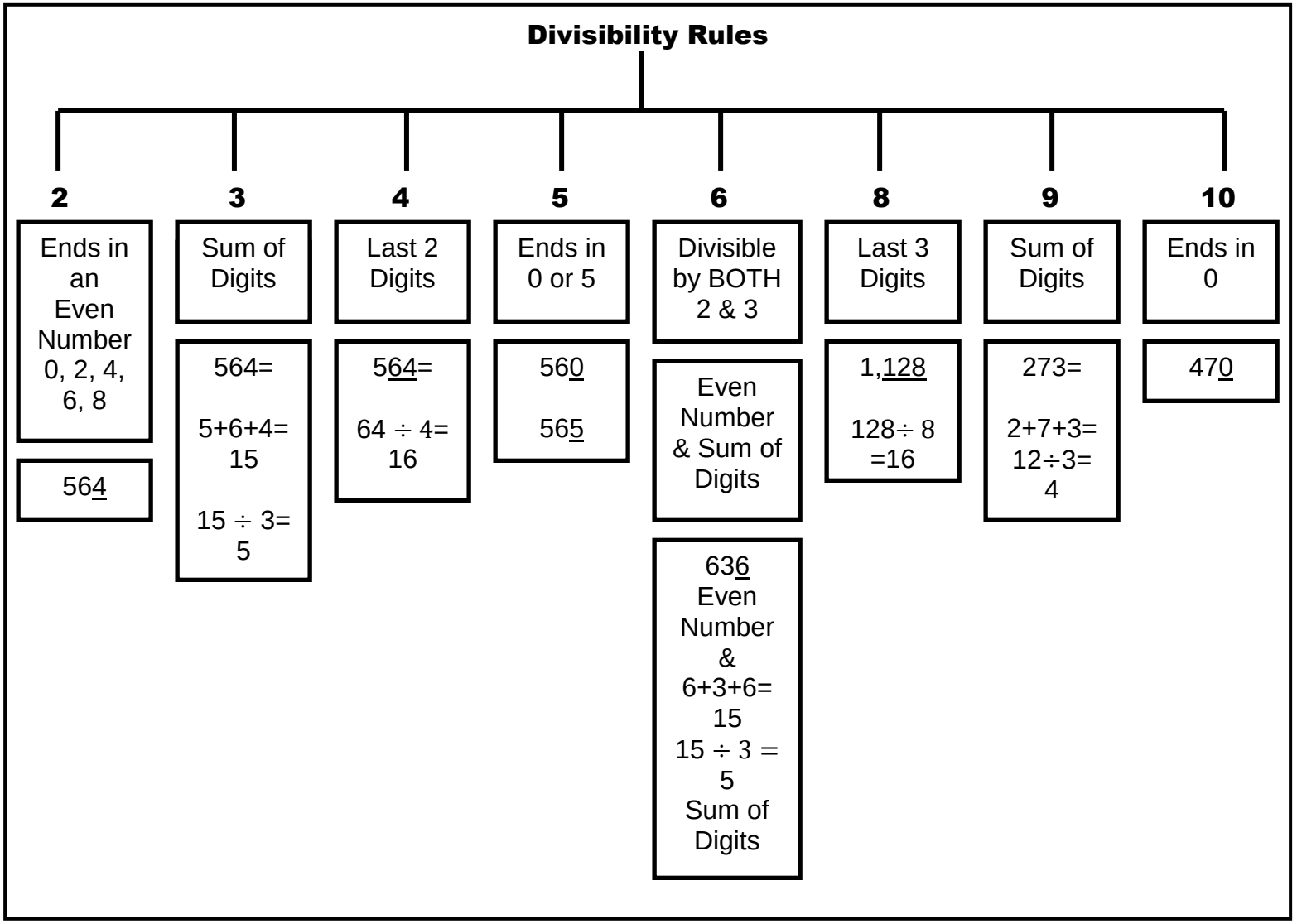
- $\angle 3 = \angle 6$
- $\angle 4 = \angle 5$

Alternate Exterior Angles:

- $\angle 2 = \angle 7$
- $\angle 1 = \angle 8$

Adjacent Angles:

- Supplementary Angles= 180°
- $\angle 1$ & $\angle 2$
- $\angle 5$ & $\angle 6$



Squares & Square Roots

Squared	1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	11^2	12^2
Answers	1	4	9	16	25	36	49	64	81	100	121	144
Square Roots	$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{121}$	$\sqrt{144}$
Answers	1	2	3	4	5	6	7	8	9	10	11	12

Cubes & Cube Roots

Cubed	1^3	2^3	3^3	4^3	5^3
Answers	1	4	9	16	25
Cubed Roots	$\sqrt[3]{1}$	$\sqrt[3]{8}$	$\sqrt[3]{27}$	$\sqrt[3]{64}$	$\sqrt[3]{125}$
Answers	1	2	3	4	5

King Henry Doesn't Usually Drink Chocolate Mini-Milks

K H D U D C MM

Metric Mass/ Metric Volume/Metric Length

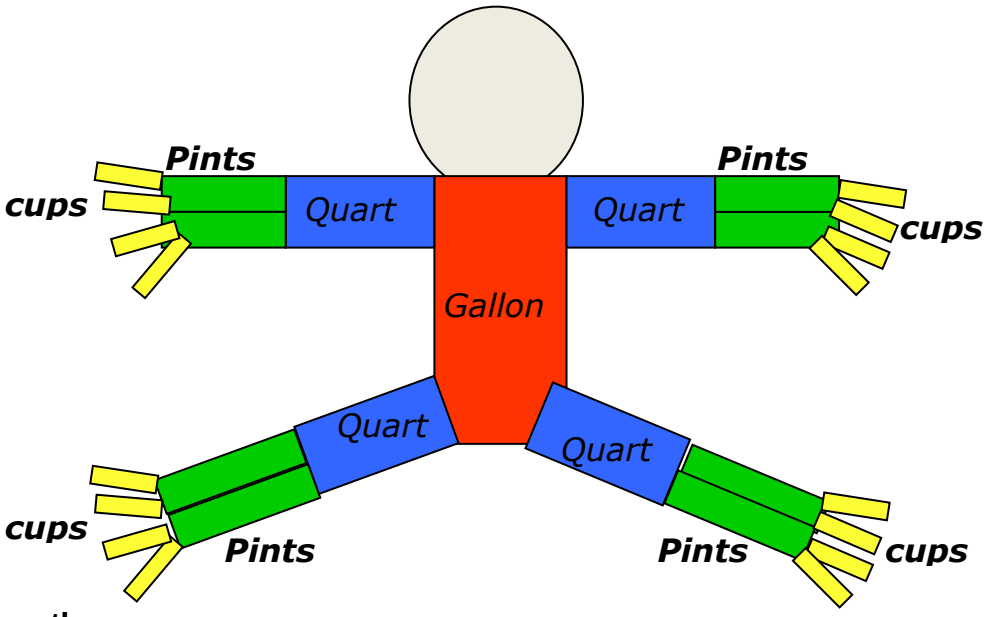
1 kg	1 kg	1 g	1 km	1 km	1 cm	1 km	1 m	1 m	1 L
1000 g	1,000,000 mg	1000 mg	1,000,000 mm	1000 m	10 mm	100,000 cm	100 cm	1000 mm	1000 mL

Customary Time

1 min	1 hr	1 day	1 wk	1 yr	1 leap year	1 yr	1 yr
60 sec	60 min	24 hr	7 days	12 months	366 days	365 days	52 wks

Customary Volume

8 oz	2 cups	2 pts	4 cups	16 cups	8 pts	4 qts
1 cup	1 pts	1 qt	1 qt	1 gal	1 gal	1 gal



Customary Length

12 in	1 yd	1 yd	1 mi	1 mi	1 lb	1 ton
1 ft	36 in	3 ft	5280 ft	1760 yds	16 oz	2000 lbs

MUTIPLICATION TABLE

x	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144