

MEASUREMENT

LIQUIDS	
$1\text{ c} = 8\text{ oz}$ $1\text{ pt} = 16\text{ oz}$ $1\text{ qt} = 32\text{ oz}$	

DAYS OF WEEK
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday

EQUIVALENCE TABLE FOR UNITS	
LENGTH	
U.S. Customary	Metric
12 in. = 1 ft	10 mm = 1 cm
3 ft = 1 yd	1000 mm = 1 m
5280 ft = 1 mi	100 cm = 1 m
1760 yd = 1 mi	1000 m = 1 km
WEIGHT	MASS
U.S. Customary	Metric
16 oz = 1 lb	1000 g = 1 kg
2000 lb = 1 ton	1000 mg = 1 g
CAPACITY (LIQUID MEASURE)	
U.S. Customary	Metric
16 oz = 1 pt	1000 mL = 1 L
2 pt = 1 qt	
4 qt = 1 gal	
There are no common fractions in the metric system. Use decimals .	

TIME
1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 year = 52 weeks
1 year = 12 months
1 common year = 365 days
1 leap year = 366 days
1 decade = 10 years
1 century = 100 years
1 millennium = 1000 years

MONTHS OF YEAR			
MONTH	ORDER	DAYS	
January	First	31	
February	Second	28 or 29	
March	Third	31	
April	Fourth	30	
May	Fifth	31	
June	Sixth	30	
July	Seventh	31	
August	Eighth	31	
September	Ninth	30	
October	Tenth	31	
November	Eleventh	30	
December	Twelfth	31	

COUNTS
1 dozen → 12 items
1 score → 20 items

LENGTH	
1 foot = 12 inches	1 yard = 3 feet
	1 yard = 36 inches
1 mile = 5280 feet	1 mile = 1760 yards

FAHRENHEIT AND CELSIUS TEMPERATURE SCALES		
212°F	100°C	boiling temperature of water
98.6°F	37°C	normal body temperature
32°F	0°C	freezing temperature of water

COMPUTATION

MULTIPLICATION TABLE																
×	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	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	13	14	15
2	0	2	④	6	8	10	12	14	16	18	20	22	24	26	28	30
3	0	3	6	⑨	12	15	18	21	24	27	30	33	36	39	42	45
4	0	4	8	12	⑩	20	24	28	32	36	40	44	48	52	56	60
5	0	5	10	15	20	⑫	30	35	40	45	50	55	60	65	70	75
6	0	6	12	18	24	30	⑬	42	48	54	60	66	72	78	84	90
7	0	7	14	21	28	35	42	⑭	56	63	70	77	84	91	98	105
8	0	8	16	24	32	40	48	56	⑮	72	80	88	96	104	112	120
9	0	9	18	27	36	45	54	63	72	⑯	90	99	108	117	126	135
10	0	10	20	30	40	50	60	70	80	90	⑰	110	120	130	140	150
11	0	11	22	33	44	55	66	77	88	99	110	⑱	132	143	154	165
12	0	12	24	36	48	60	72	84	96	108	120	132	⑲	156	168	180
13	0	13	26	39	52	65	78	91	104	117	130	143	156	⑳	182	195
14	0	14	28	42	56	70	84	98	112	126	140	154	168	182	㉑	210
15	0	15	30	45	60	75	90	105	120	135	150	165	180	195	210	㉒
16	0	16	32	48	64	80	96	112	128							
17	0	17	34	51	68	85	102	119	136							
18	0	18	36	54	72	90	108	126	144							
19	0	19	38	57	76	95	114	133	152							
20	0	20	40	60	80	100	120	140	160							
21	0	21	42	63	84	105	126	147	168							
22	0	22	44	66	88	110	132	154	176							
23	0	23	46	69	92	115	138	161	184							
24	0	24	48	72	96	120	144	168	192							
25	0	25	50	75	100	125	150	175	200							
26	0	26	52	78	104	130	156	182	208							
27	0	27	54	81	108	135	162	189	216							
28	0	28	56	84	112	140	168	196	224							

FACTORS

Factors of 6: 1, 2, 3, 6
 Factors of 9: 1, 3, 9
 GCF of 6 and 9 → 3
 GCF → Greatest Common Factor

MULTIPLES

Multiples of 6: 6, 12, 18, 24, 30, 36, ...
 Multiples of 9: 9, 18, 27, 36, 45, 54, ...
 LCM of 6 and 9 → 18
 LCM → Least Common Multiple

DIVISION

Three ways to show division:

$$\begin{array}{r} \text{quotient} \\ \text{divisor} \overline{) \text{dividend}} \end{array} = \frac{\text{dividend}}{\text{divisor}} = \text{quotient}$$

$\text{dividend} \div \text{divisor} = \text{quotient}$

Example: "Twelve divided by four equals three."

$$\begin{array}{r} 3 \\ 4 \overline{) 12} \end{array} \quad \frac{12}{4} = 3 \quad 12 \div 4 = 3$$

SEQUENCE

An ordered list of numbers that follow a pattern
 1, 3, 5, 7, 9, ...

AVERAGE

Average → add numbers; then divide.
 Halfway → add numbers; then divide by two.

ESTIMATE

Estimate means to round off.

4③7 → 400
 5⑨2 → 600

EXPANDED NOTATION

$$\begin{aligned} 7163 &= (7 \times 1000) + (1 \times 100) + (6 \times 10) + (3 \times 1) \\ &= (7 \times 10^3) + (1 \times 10^2) + (6 \times 10^1) + (3 \times 10^0) \end{aligned}$$

COMPUTATION

MISSING NUMBERS	
OPERATION	EXAMPLES
ADDITION: To find the missing addend → subtract	$\begin{array}{r} 2 \quad 5 \\ + A \quad - 2 \\ \hline 5 \quad A = 3 \end{array}$ $\begin{array}{r} B \quad 5 \\ + 3 \quad - 3 \\ \hline 5 \quad B = 2 \end{array}$
SUBTRACTION: 1. To find the missing top number (minuend) → add 2. To find the missing bottom number (subtrahend) → subtract	$\begin{array}{r} N \quad 3 \\ - 3 \quad + 2 \\ \hline 2 \quad N = 5 \end{array}$
	$\begin{array}{r} 5 \quad 5 \\ - Y \quad - 2 \\ \hline 2 \quad Y = 3 \end{array}$
MULTIPLICATION: To find the missing factor → divide	$\begin{array}{r} 3 \quad N = 2 \\ \times N \quad 3)6 \\ \hline 6 \end{array}$ $\begin{array}{r} N \quad N = 3 \\ \times 2 \quad 2)6 \\ \hline 6 \end{array}$
DIVISION: 1. To find the missing dividend → multiply 2. To find the missing divisor → divide	$\begin{array}{r} 8 \\ 2)N \\ \hline \end{array}$ $\begin{array}{r} 8 \\ \times 2 \\ \hline N = 16 \end{array}$
	$\begin{array}{r} 2 \\ N)8 \\ \hline \end{array}$ $\begin{array}{r} N = 4 \\ 2)8 \\ \hline \end{array}$

WORD PROBLEM KEYWORDS			
ADD	SUBTRACT	MULTIPLY	DIVIDE
\oplus sum total, together, joined (after)	\ominus difference profit, before, minus; comparisons such as: more than, less than	\otimes product times, of, cover, double	\div quotient each, per, average

DECIMAL ARITHMETIC REMINDERS CHART				
OPERATION	+ or -	×	÷ by whole (W)	÷ by decimal (D)
	line up	×; then count	up	over, over, up
MEMORY CUE	$\begin{array}{r} . \\ \pm . \\ \hline . \end{array}$	$\begin{array}{r} . \\ \times . \\ \hline . \end{array}$	$W) \begin{array}{r} . \\ . \end{array}$	$D) \begin{array}{r} . \\ . \\ . \end{array}$
You may need to ... • Place a decimal point to the right of a whole number. • Fill empty places with zeros.				

COMPUTATION

TESTS FOR DIVISIBILITY

- A number is able to be divided by ...
- 2 if the last digit is even.
 - 4 if the last two digits can be divided by 4.
 - 8 if the last three digits can be divided by 8.
 - 5 if the last digit is 0 or 5.
 - 10 if the last digit is 0.
 - 3 if the **sum of the digits** can be divided by 3.
 - 6 if the number can be divided by 2 **and** by 3.
 - 9 if the **sum of the digits** can be divided by 9.

Simplify → reduce

STATISTICS

- Mean:** the average of a set of numbers
- Median:** the middle number of a set of numbers arranged in order
- Mode:** the number that appears the most often in a set of numbers
- Range:** the difference between the least and the greatest numbers in a set of numbers

PROBABILITY • CHANCE

PROBABILITY	Fraction of $\frac{\text{favorable outcomes}}{\text{possible outcomes}}$
CHANCE	Percent

EXPONENTS

exponent → 3^4 means: $3 \times 3 \times 3 \times 3 = 81$
 base → 3^4 reads: three to the fourth power

10^3 reads: ten to the third power (or ten cubed)
 5^2 reads: five squared

MULTIPLICATION AND DIVISION OF DECIMAL NUMBERS BY 10, 100, 1000

Shift the decimal point **one** place for **each zero**.

When **multiplying**, move the decimal to the **right**.
 Example: $3.257 \times 100 = 325.7$

When **dividing**, move the decimal to the **left**.
 Example: $3.257 \div 10 = 0.3257$

RATIO

Ratio is a way to describe a relationship between two numbers.

The ratio 3 to 4 can be written several ways:

- with the word "to" 3 to 4
- as a fraction $\frac{3}{4}$
- as a decimal number 0.75
- with a colon 3:4

Example: Ratio of boys to girls is 12 to 16.
 boys $\frac{12}{16}$ reduce to $\frac{3}{4}$
 girls 16

FINDING A PART (FRACTION OR PERCENT) WHEN THE WHOLE IS KNOWN (Alternate Method)

Set up an "is/of" proportion:

- $2/3$ of 600 is what number?

is $\frac{2}{3} = \frac{?}{600}$ $(600 \cdot 2) \div 3 = 400$
 of

- 30% of 20 is what number?

$\frac{30}{100} = \frac{3}{10}$ is $\frac{3}{10} = \frac{?}{20}$ $(20 \cdot 3) \div 10 = 6$
 of

Shortcut: Reduce the ratio before multiplying the numbers in the loop.

PROPORTION (RATE) PROBLEMS

EXAMPLE 1

If the number outside the loop is 1:

$\frac{30}{1} = \frac{x}{4}$

Cross multiply.

$30 \cdot 4 = x$
 $x = 120$

EXAMPLE 2

If the number outside the loop is **not** 1:

$\frac{3}{5} = \frac{6}{w}$

- Cross multiply.
- Divide by known factor.

$3w = 30$
 $30 \div 3 = 10$

NUMBERS

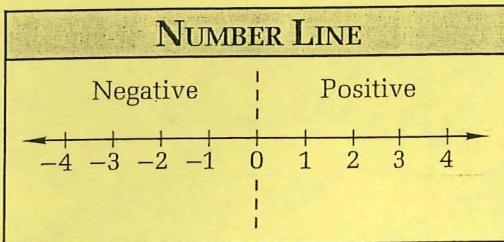
SPELLING NUMBERS	
WHOLE NUMBERS	FRACTIONS
11 eleven	$\frac{1}{2}$ one half
12 twelve	$\frac{2}{3}$ two thirds
13 thirteen	$\frac{3}{5}$ three fifths
14 fourteen	
15 fifteen	
21 twenty-one	
32 thirty-two	$\frac{94}{100}$ ninety-four hundredths
43 forty-three	
54 fifty-four	$\frac{49}{1000}$ forty-nine thousandths
65 sixty-five	
76 seventy-six	
87 eighty-seven	
98 ninety-eight	
123 one hundred twenty-three	0.1 one tenth
1234 one thousand, two hundred thirty-four	0.94 ninety-four hundredths
	0.049 forty-nine thousandths

PLACE VALUE	
Whole Numbers	Decimals
hundred millions	tenths
ten millions	hundredths
millions	thousandths
hundred thousands	
ten thousands	
thousands	
hundreds	
tens	
ones	
Millions	$\frac{1}{10}$
Thousands	$\frac{1}{100}$
Units (Ones)	$\frac{1}{1000}$
10^8 10^7 10^6	10^{-1} 10^{-2} 10^{-3}

PRIME NUMBERS
A prime number has exactly two factors, itself and 1.
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, ...

ODD/EVEN
Odd numbers: 1, 3, 5, 7, 9, ...
Even numbers: 0, 2, 4, 6, 8, ...

LESS THAN/GREATER THAN
15 < 50 50 > 15
little < big big > little



PROPERTIES OF OPERATIONS	
PROPERTY	EXAMPLE
Commutative Property of Addition	$2 + 3 = 5$ $3 + 2 = 5$
Commutative Property of Multiplication	$4 \times 5 = 20$ $5 \times 4 = 20$
Identity Property of Addition	$y + 0 = y$
Identity Property of Multiplication	$y \times 1 = y$
Associative Property of Addition	$(a + b) + c = a + (b + c)$
Associative Property of Multiplication	$(a \times b) \times c = a \times (b \times c)$
Property of Zero for Multiplication	$k \times 0 = 0$
Distributive Property of Multiplication	$a(b + c) = ab + ac$ $a(b - c) = ab - ac$

ROMAN NUMERALS							
Numeral	I	V	X	L	C	D	M
Value	1	5	10	50	100	500	1000

Add the values [VIII = 8] unless a numeral of smaller value is written in front of a numeral of greater value [IV = 4].

FRACTIONS • DECIMALS • PERCENTS

FRACTION FAMILIES EQUIVALENT FRACTIONS											
$\frac{0}{2}$				$\frac{1}{2}$						$\frac{2}{2}$	
$\frac{0}{3}$			$\frac{1}{3}$			$\frac{2}{3}$				$\frac{3}{3}$	
$\frac{0}{4}$		$\frac{1}{4}$		$\frac{2}{4}$		$\frac{3}{4}$				$\frac{4}{4}$	
$\frac{0}{5}$		$\frac{1}{5}$		$\frac{2}{5}$		$\frac{3}{5}$		$\frac{4}{5}$		$\frac{5}{5}$	
$\frac{0}{6}$	$\frac{1}{6}$		$\frac{2}{6}$		$\frac{3}{6}$		$\frac{4}{6}$		$\frac{5}{6}$	$\frac{6}{6}$	
$\frac{0}{8}$	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{4}{8}$	$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$		$\frac{8}{8}$	
$\frac{0}{9}$	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$	$\frac{4}{9}$	$\frac{5}{9}$	$\frac{6}{9}$	$\frac{7}{9}$	$\frac{8}{9}$	$\frac{9}{9}$	$\frac{9}{9}$	
$\frac{0}{10}$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$	$\frac{5}{10}$	$\frac{6}{10}$	$\frac{7}{10}$	$\frac{8}{10}$	$\frac{9}{10}$	$\frac{10}{10}$	
$\frac{0}{12}$	$\frac{1}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{4}{12}$	$\frac{5}{12}$	$\frac{6}{12}$	$\frac{7}{12}$	$\frac{8}{12}$	$\frac{9}{12}$	$\frac{10}{12}$	$\frac{11}{12}$
											$\frac{12}{12}$

FRACTION TERMS	
Fraction	$\frac{\text{Numerator}}{\text{Denominator}}$
Equal fractions	\longleftrightarrow Equivalent fractions
Mixed number	Whole number and a fraction: $3\frac{1}{2}$
Reciprocal	"Flip" the fraction (reverse numerator and denominator): $\frac{2}{3} \} \frac{3}{2}$

MIXED NUMBERS AND IMPROPER FRACTIONS	
	$= \frac{13}{4}$
	$3\frac{1}{4} = \frac{13}{4}$


FRACTION-DECIMAL-PERCENT EQUIVALENTS									
$\frac{1}{2}$	$\frac{2}{5}$	$\frac{3}{8}$	$\frac{1}{3}$	$\frac{3}{10}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{8}$ 0.125 12½%	$\frac{1}{10}$ 0.1 10%
0.5	0.4	0.375	0.3̄	0.3	0.25	0.2 20%	0.16̄ 16⅔%		
50%	40%	37½%	33⅓%	30%	25%				
50%	60%	62½%	66⅔%	70%	75%	80%	83⅓%	87½%	90%
0.5	0.6	0.625	0.6̄	0.7	0.75	0.8	0.83̄	0.875	0.9
$\frac{1}{2}$	$\frac{3}{5}$	$\frac{5}{8}$	$\frac{2}{3}$	$\frac{7}{10}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{5}{6}$	$\frac{7}{8}$	$\frac{9}{10}$

GEOMETRY

PERIMETER, AREA, VOLUME


Perimeter is the distance around a figure. (Fence)
Label *units*.

$P \rightarrow$ add all sides



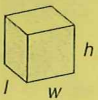
Area is the enclosed surface of the figure. (Lawn)
Label *square units*. Keyword is "cover."

$A = l \times w$

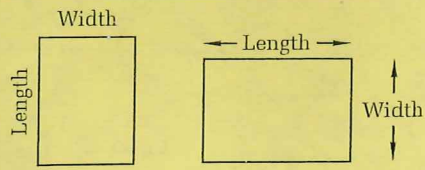


Volume is the amount of space a figure occupies.
Label *cubic units*.

$V = l \times w \times h$




LENGTH AND WIDTH



Length \rightarrow longer side
Width \rightarrow shorter side

TYPES OF ANGLES

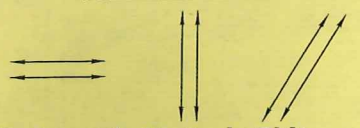
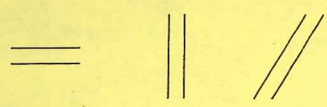
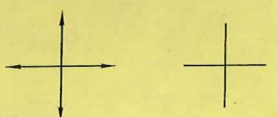



Obtuse Acute Right Straight

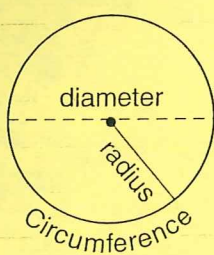
ANGLES

TYPE	MEASURE
Right angle	90°
Obtuse angle	more than 90° , less than 180°
Acute angle	less than 90°
Straight angle	180°
Full circle	360°

TYPES OF LINES

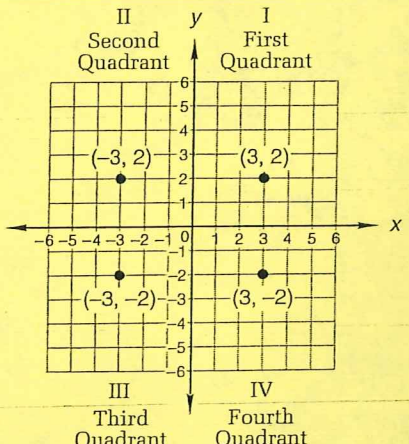
PARALLEL LINES	PARALLEL SEGMENTS
 Horizontal Vertical Oblique	 Horizontal Vertical Oblique
INTERSECTING PERPENDICULAR	INTERSECTING OBLIQUE
 Lines Segments	 Lines Segments

CIRCLE









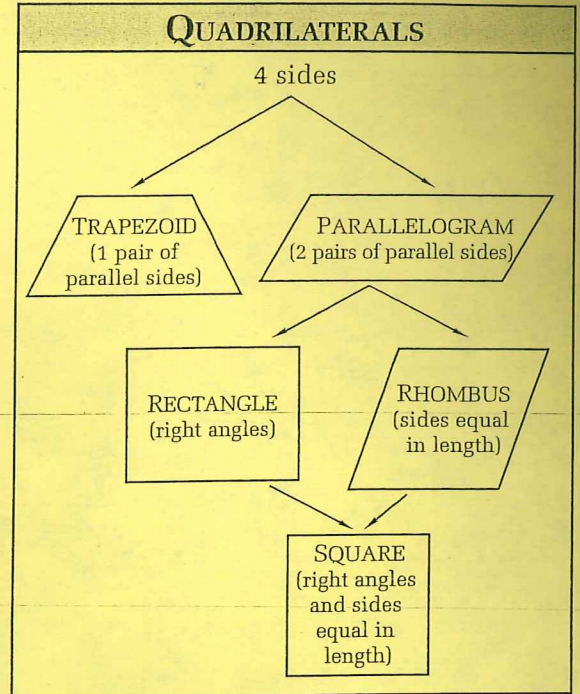
$d = 2r$
 $r = \frac{1}{2}d$






RECTANGULAR COORDINATES



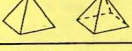
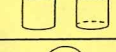




GEOMETRY

CLASSIFYING QUADRILATERALS		
A quadrilateral is any four-sided polygon.		
NAME	CHARACTERISTIC	SHAPE
Trapezium	No sides parallel	
Trapezoid	One pair of parallel sides	
Parallelogram	Two pairs of parallel sides	
Rhombus	Parallelogram with equal sides	
Rectangle	Parallelogram with right angles	
Square	Rectangle with equal sides	

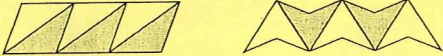







COMMON POLYGONS		
NAME	NUMBER OF SIDES	SHAPE
Triangle	3	
Quadrilateral	4	
Pentagon	5	
Hexagon	6	
Octagon	8	

GEOMETRIC SOLIDS	
NAME	SHAPE
Cube	
Rectangular solid	
Pyramid	
Cylinder	
Sphere	
Cone	

TESSELLATIONS

A **tessellation** is the repeated use of shapes to fill a flat surface without gaps or overlaps.
 Use transformations to align the sides of the shapes.
 Not all polygons tessellate (fill a flat surface).
 Every triangle and every quadrilateral will fill a flat surface.



CLASSIFYING TRIANGLES					
BY SIDES			BY ANGLES		
TYPE	CHARACTERISTIC	EXAMPLE	TYPE	CHARACTERISTIC	EXAMPLE
Equilateral triangle	Three sides of equal length		Acute triangle	All acute angles	
Isosceles triangle	Two sides of equal length		Right triangle	One right angle	
Scalene triangle	Three sides of unequal length		Obtuse triangle	One obtuse angle	