Understanding Numbers

- **Whole Numbers** "positive" only — examples: 0, 1, 2, 3, 4, ...
- **Integers**: positive or negative whole #s
  examples: ..., -33, -17, -5, -1, 0, 1, 3, 9, 15, ...
- **Rational Numbers**: #s that can be written as a fraction, a decimal or repeating decimal

  Examples: $\frac{7}{8}$, $\frac{-4}{5}$, $\frac{1}{3}$ or $0.333\ldots = 0.\overline{3}$, 0.25
- **Irrational Numbers**: #s that cannot be written as a fraction or repeating decimal (never ending)

  Examples: $\pi \Rightarrow 3.14159\ldots$
  $\sqrt{2} \Rightarrow 1.41421\ldots$
- **Prime Numbers**: # with only 2 factors; 1 & itself.

  Examples: 2 (1, 2), 3 (1, 3), 5 (1, 5), 7 (1, 7), 11 (1, 11), 13 (1, 13), 17 (1, 17), ...
- **Composite Numbers**: #s with more than 2 factors (i.e. can be made by combining other #s)

  Examples: 24 → 2, 12 → 2, 6 → 2, 3

  so 24 is made from $2 \times 2 \times 2 \times 3$ 4 factors

GCF:

24 : $2 \times 2 \times 2 \times 3$

30 → 3, 10 → 2, 5

GCF

Greatest Common Factor (GCF) is the largest factor common b/w 2 #s

Operations

- Addition (+) → Sum
- Subtraction (−) → Difference
- Multiplication ($\times$, 5x, $\cdot$, (3)(4)) → Product
- Division ($\div$, $\frac{3}{4}$, 3/4, $7\overline{)12}$) → Quotient
- Square Roots ($\sqrt{24}$) → a # which produces a specified quantity when multiplied by itself
  ex: $\sqrt{9} = 3$, $3 \times 3 = 9$
- Exponents / Powers (3^4)
  - Repeated multiplication
    $3^4 = 3 \times 3 \times 3 \times 3$
  - Common Powers
    - $\square^2$ = Squared (Think Area)
    - $\square^3$ = Cubed (Think Volume)

Note: Squareroot undoes squaring and vise versa

$4^2 = 16$, $\sqrt{16} = 4$, $\sqrt{4^2} = 4$

Inequalities

- Equal too ($=$)
- Not Equal too ($\neq$)
- Greater than ($>$)
- Greater than or equal too ($\geq$)
- Less than ($<$)
- Less than or Equal too ($\leq$)

Decimals ⇄ Percents ⇄ Fractions

★ All used to represent parts of wholes

Place ~~Value~~ Value:

Million, ten thousand, Hundred, Tenths, Thousandths

1,2 3 4,5 6 7 . 8 9 1

Hundred thousand, thousand, tens, ones, Hundredths

★ Convert a # into a % you ×100%

★ Convert a % into a # you ÷100%

Example: $\frac{7}{8} = 0.875 \xrightarrow{\times 100\%} 87.5\%$

$47\% \xrightarrow{\div 100} 0.47$ or $\frac{47}{100}$

Rules for Operations with Fractions

★ Adding ⇄ Subtracting: you MUST have a common denominator (i.e. same denominator)

Recall Numerator / Denominator

example: $\frac{3}{4} + \frac{1}{6}$ multiples of 4 = 4, 8, (12), 16, ... ; 6 = 6, (12), 18 — change to 12

Mixed Number: $3\frac{2}{7}$ (3 = whole, 2/7 = part)

$= \frac{3}{4}\left(\frac{\times 3}{\times 3}\right) + \frac{1}{6}\left(\frac{\times 2}{\times 2}\right)$

Improper fraction: $\frac{23}{7}$ ← larger than D

$= \frac{9}{12} + \frac{2}{12} = \frac{9+2}{12} = \frac{11}{12}$

Example: $3\frac{1}{2} - 1\frac{1}{4}$ — you should switch ex. $\frac{13}{7}$ mixed # to an improper fraction N > D

$3 \times 2 = 6 + 1 = 7$; $1 \times 4 = 4 + 1 = 5$

$\therefore \frac{\cdot 2\times 7}{\cdot\cdot 2\times 2} - \frac{5}{4} = \frac{14}{4} - \frac{5}{4} = \frac{9}{4} \Rightarrow 2\frac{1}{4}$

★ Multiplying: multiply Numerator to Numerator : Denominator to Denominator (i.e. straight across)

Example: $\frac{5}{6} \times \frac{3}{4} = \frac{5\times3}{6\times4} = \frac{15}{24} \Rightarrow \frac{5}{8}$ in reduced to lowest terms (use factors)

15 = 3 × 5

24 = 2 × 12 = 2 × 2 × 6 = 2 × 2 × 2 × 3

$\Rightarrow \frac{\cancel{3}\times5}{2\times2\times2\times\cancel{3}} = \frac{5}{8}$

Example: Mixed #'s ⇒ convert into an improper fraction 1st.

$2\frac{3}{5} \times 4\frac{1}{4} \Rightarrow \frac{13}{5} \times \frac{17}{4} = \frac{13\times17}{5\times4} = \frac{221}{20}$

$= 11\frac{1}{20}$

★ Dividing: flip the 2nd term (i.e. reciprocal) and change the ÷ into ×

Example: $\frac{3}{8} \div \frac{2}{4}$ Flip

$= \frac{3}{\cancel{8}_2} \times \frac{\cancel{4}^1}{2}$ do multiplication as normal.

* can reduce if here it possible

$= \frac{3}{2} \times \frac{1}{\cancel{2}} = \frac{3}{4}$

Example: Mixed #'s same as multiplication change into an improper fraction 1st

$1\frac{3}{5} \div 2\frac{5}{6} \Rightarrow \frac{8}{5} \div \frac{17}{6} = \frac{8}{5} \times \frac{6}{17}$

(1×5)+3 = 8 ; (2×6)+5 = 17

$= \frac{8\times6}{5\times17} = \frac{48}{85}$