

Word Problems

Organizing Information

First step is to determine the type of problem.

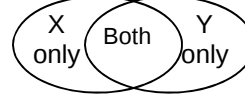
If overlapping groups – Venn diagram. If complementary groups – Matrix Box. If min/max – consider limits.

Venn Diagrams

Pay close attention to the specific wording.

1. On the outside, label totals for each set.
2. On the inside, only write numbers not double-counted
3. Do not forget to consider the value of "neither"
4. Understand the basic Venn equation: $\text{Total} = \text{Set 1} + \text{Set 2} - \text{Both} + \text{Neither}$

X (total) Total Y (total)



Matrix Box

1. Understand when to use them: for complementary groups.
2. Be careful not to confuse percentages with actual numbers.
3. Make sure you enter the data correctly.
10% of the **silver** widgets are blue vs. 10% of **all** widgets are blue

	Silver	Gold	Total
Blue	5%		20%
Black			80%
Total	50%		100%

Min/Max Problems

Figure out whether to minimize or maximize. Always do the math!

Average and Mixture Problems

Digest the problem carefully.

Try to apply the mapping strategy first; be careful to properly assess the ratio (parts vs. total)

If the numbers are messy or the setup is difficult, use algebra to solve the multiple equations.

If more than two elements are averaged, use algebra.

Be prepared for lots of weighted averages in Data Sufficiency

Remember that you generally have more information than you think.

Weighted Average

Always consider totals divided by totals.

If women average 170 cm, men avg. 184 cm, and weighted avg. is 180 cm, what is ratio of men to women?

$$180 = \frac{170W + 184M}{W + M}$$

Shortcut: $\frac{170}{10} \quad \frac{180}{0} \quad \frac{184}{4}$

Ratio = $\frac{M}{W} = \frac{10}{4} = \frac{5}{2}$

Conversion problems

Use the units of measure to set up the problem. Cancel out common factors.

Work/Rate Problems

Q = quantity R = rate T = time $Q = R \times T$ $R = Q/T$ $T = Q/R$

1. Always convert times to rates [Note: if multiple productive units, $Q = n \cdot R \cdot T$]
2. Rates are additive $R_A + R_B = R_{A+B \text{ together}}$
3. Use $Q = R \times T$ to solve (plug the information into the formula to solve for the unknown)
4. Reset equations when conditions change $Q_A = R_A \times T_A$ $Q_B = R_B \times T_B$ $Q_{A+B} = R_{A+B} \times T_{A+B}$

Distance Rate Problems

Use understanding of rate equation: Distance = Rate • Time

When possible, use logic to solve more efficiently.

Rate of catch-up is **difference** of the individual rates: Catch-up rate = $R_{A-B} = R_A - R_B$

Rate of approach is **sum** of the individual rates: Rate of approach = $R_{A+B} = R_A + R_B$

If catching up or approaching, use **relative** rate and distance.

Loans and Interest Rates

Bi weekly: every other week **Semi monthly:** twice a month

P_f = final principal b = beginning principal i = interest rate per period n = number of periods

Simple interest: $P_f = b(1 + i \cdot n)$ Compounded interest: $P_f = b(1 + i)^n$