

## Chapter 1: Algebraic Translations

# Common Relationships

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Total Cost = Unit Price x Quantity

Profit = Revenue – Cost

Total Earnings = Wage Rate x Hours

Miles = Miles Per Hour x # Hours

Miles = Miles per Gallon x # Gallons

## Constraints

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Often make data sufficiency and problem solving questions easier if you recognize them. Things like # of votes, must be whole numbers etc. Cars, people, etc.

## Chapter 2: Rate & Work

Rate x Time = Distance

Rate x Time = Work

RT=D

RT=W

## Use RT=D Charts

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Set up RTD charts for rate (and RTW for work) problems

-Be careful of stopwatch time vs clock time.

-Try and use one variable (ie: Harvey = T time, and Molly was 50 % more time faster, then Molly is 1.5 T

## Relative Rates

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-Towards each other: Two people decrease the distance between them at a rate of  $5+6 = 11$  mph

-Away from each other: Two cars increase the distance between them at a rate of  $5+6 = 11$ mph

-Chasing Each other: Person X and person Y decrease the distance at  $5-6 = 1$  mph

Three possible scenarios for relative rates.

-Very rarely, will you get a problem in which the path is a circle, and you can chase or collide. Remember that practice problem?

## Average Rates (don't just add then divide)

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-Think about it: Same distance, but at different rates... The average will be closer to the slower rate, because you spend more time at that rate!

-In order to find the average, **you will need to first find the total combined time for the trips and the total combined distance for the trips.** (You sometimes may need to make up this distance)

## Basic Work Problems

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-Be sure that time is the denominator for the rate... always.

-Rate and time are reciprocals of each other when the work done is 1.

## Working Together: Add the Rates

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If two or more workers are doing the job, you can add the rates together.

## Working Against Each other: Subtract

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If one thing is undoing the work of another, then subtract the rates

## Population Problems

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Make a chart and fill in as you know the information.

| Time elapsed  | Population |
|---------------|------------|
| 10 min ago    | 350        |
| <b>Now</b>    | <b>900</b> |
| In 10 minutes | 1800       |
| In 20 minutes | 3600       |

### Chapter 3: Statistics

## Average Formula

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$$a = (s/n)$$

$$an = s$$

-Can set up like an RTD table if you would like

## Weighted Averages

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WA= (weight)(data point) + (weight)(data point) all over the sum of the weights

-Note that weighted averages of two values will fall closer to whichever value is weighted more heavily.

## Weighted Averages & Data Sufficiency

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You do not necessarily need concrete values for the weights in a weighted average problem... Having just the *ratios* of the weights will allow you to find a weighted average.

### Differentials

*A mixture of lean beef (10% fat) and a mixture of super-lean is (3% fat) has a fat content of 8% fat. What is the ratio of lean to super-lean beef?*

WHAT DO WE KNOW?

-Lean ground beef has a +2% differential to the total fat content

-Super-lean has a -5% differential to the total fat content

We have (Lean)(2) + (Super-lean)(-5) = 0

(because we want to make the differentials cancel out)

$$5(2) + 2(-5) = 10 - 10 = 0$$

Thus, 5 parts lean to 2 parts super-lean, or 5:2 is the ratios/weights

## Median (the Middle Number)

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Set with odd amount of numbers: actual middle value contained in the set

Set with even amount of numbers: average of the two middle values

## Standard Deviation

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Describes the spread of the data by relating it to the mean... "How far from the average the data points typically fall"

-Key here, is the more spread out the numbers are, the larger the standard deviation.

**Variance is the square of the standard deviation ( $SD^2$ ).**

### Chapter 4: Consecutive Integers

Consecutive Integers, but also keep in mind: consecutive primes!

## Evenly Spaced Sets

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Evenly Spaced Sets: Constant Increments  
Consecutive Multiples: All the values are multiples of the increment  
Consecutive Integers: Increments of 1

### Defining Evenly Spaced Sets

- 1) First & Last Numbers
- 2) Increment
- 3) Number of items in the set

## Properties of Evenly Spaced Sets

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- 1) The average is equal to the median
- 2) The mean and median are equal to the average of the first and last terms
- 3) Sum of the elements equals the average x the number of items ( $s=an$ )

## Counting Integers (+1 and done)

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Last – first +1, because you need to account for that inclusive first value.

### Counting integers of Consecutive Multiples

(Last – First) divided by Increment, then add 1.

## The Sum of Consecutive Integers

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*What is the sum of all integers from 20 to 100 inclusive?*

- 1) Find the average or middle (average of first and last number)
- 2) Find number of terms (last – first) then + 1
- 3) Multiple the average (middle) by number of terms

In short:  $s=an$

### Keep these in mind for Data Sufficiency problems

- Average of odd number of integers is an integer
- Average of even will never be an integer

REMEMBER: THIS IS CONSECUTIVE INTEGERS, **NOT** EVENLY SPACED SETS

### Chapter 5: Overlapping Sets

## The Double-Set Matrix

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If there are two categories (or decisions) use the double-set matrix.

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|       | A | Not A | Total                 |
|-------|---|-------|-----------------------|
| B     |   |       |                       |
| Not B |   |       |                       |
| Total |   |       | <i>Impt total box</i> |

Remember the set up: A, NOT A | B, NOT B

“Prob 1 right, Prob 1 NOT right | Prob 2 right, Prob 2 NOT right”

“Men, NOT Men (or Men, Women) | Employed, Unemployed” (<--- Start to see the “not” come out)

## Overlapping Sets and Percents

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-Pick smart numbers (common denominators), or 100 for percent problems.

Careful: if any actual quantities appear, the totals are determined, and you cant assign numbers like this.

### Overlapping Sets and Algebraic Representation

Use a variable and some algebra (page 88 for details)

## Two Sets, 3 Choices: Same Matrix

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Just add a row (A, Not A, Maybe) vs (Male, Female)

## Three Sets: Ok, Venn Diagram Time

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Solve inside out.

Don't forget to subtract our properly (see page 91)

### Chapter 6: Word Problem Strategies

#### Weighted Averages

-Remember: Closer to the one with more weight

#### Replacing Variables with Numbers (Variables in Answer Choices)

- 1) Identify Unknowns, Replace with Numbers
- 2) Use those numbers to calculate and find a value
- 3) Plug in the same numbers to answer choices and compare

#### Backsolving

- 1) Find equation
- 2) Plug in answer choices
- 3) Solve, to see if true

It usually makes sense to start with answer choice C

## Using Charts to Organize

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|          | Price per Tix | Quantity | Revenue |
|----------|---------------|----------|---------|
| Standard |               |          |         |
| VIP      |               |          |         |

### *Chapters 7 and 8: Grouping & Other Problems, More Consecutive Integers*

Please check chapter 7 for important grouping concept

#### **Consecutive Integers part II**

The product of k consecutive integers is always divisible by k! (k factorial)

**Find the sum of any five consecutive integers:**

For any set of consecutive integers with **odd** number of items, the sum is always a multiple of the number of terms.

For any set of consecutive integers with **even** number of items, the sum is NEVER a multiple of the number of items.

## More

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### **Group Problems Involving “Both/Neither”**

Mixed group formula:

$$\text{Group}_1 + \text{Group}_2 + \text{Neither} - \text{Both} = \text{Total}$$

## Hidden Quadratics

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$$2ab + 10a = 50 - 2b^2$$

$$ab + 5a = 25 - b^2 \quad (\text{divide both sides by 2})$$

$$a(b+5) = 25 - b^2 \quad (\text{factor the left})$$

$$a(b+5) = (5-b)(5+b) \quad (\text{factor the right})$$

$$a = 5-b \quad (\text{divide both sides by } b+5, \text{ which we can do because we know } b \neq -5 \text{ and we are not dividing by 0})$$

$$a + b = 5 \quad (\text{add } b \text{ to both sides})$$

Since  $(a+b) = 5$ ,  $(a+b)^2 = 25$  and 25 has three factors: 1, 5, 25. The correct answer is B.