Welcome to OSA Training 2015
Basic Math

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Curriculum

I. WHOLE NUMBERS
-Oder of Operations

II. DECIMALS
-Decimals to Percents to Fractions

III. PERCENTS
-Finding Percents (Three types of questions)
-Proportions
-Finding Percent Increase/Decrease

IV. POWERS, EXPONENTS
-Squares and Cubes
-Operations with Powers and Exponents

V. SCIENTIFIC NOTATION
-Large Numbers to Scientific Notation.
-Exponential Functions

VI. MEASUREMENTS
-Basic Formulas
-Area and Perimeter (Polygons)
-Circumference and Area (Circles)
-Angles Measures and Types

VII. GRAPHS
-Bar and Histogram Graphs
-Line Graphs
-Pie Charts
-Coordinate Graphs

VIII. WORD PROBLEMS
-Solving various types of Word Problems
-Two Variables Word Problems
-Using Algebraic Expressions to Solve Problems

Order of Operations

- Order of Operations: Tell us the sequence of operations when simplifying any expression.

  - *PEMDAS (parenthesis, exponents, multiplication, division, addition and subtraction)*

caveats:

- If only multiplication and division – work from left to right
- If only addition and subtraction – work from left to right

- Example:
- Tori computes the value of **8(100 − 10) + 2 x 2** in her head and got **1444**. Which part of *PEMDAS* did she violate? Explain.

Percents

- Def: In mathematics, a percentage is a number or ratio expressed as a fraction of 100. It is often denoted using the percent sign, "%", or the abbreviation "pct." For example, 45% is equal to 45/100, or 0.45.

Percent Formula

- In any percent problem, one of these three questions is asked:
  - Find the Part
  - Find the Whole
  - Find the %

$$\frac{part}{whole} = \frac{\%}{100}$$

Percent Examples

You are at a fancy restaurant with your significant other, your bill is $210 and you want to tip 20%. Is $20 enough?

How much is the tip?

(For more practice, see page 11 in your packet.)

Finding Percent Increase

Ann works as a staff analyst for $40K per year. If her salary is increased to $44K, then what is her percent increase in pay?

Analysis: When finding the percent increase, we take the absolute value of the difference and divide it by the original value. The resulting decimal is then converted to a percent.

Solution:

$$\left| \frac{44 - 40}{40} \right| = \frac{4}{40} = \frac{1}{10} = 0.1 = 10\%$$

Answer: The percent increase in Ann's pay is 10%.

Finding Percent Decrease

Department of Investigation hired 120 investigators in 2013. Of that group, 24 investigators transferred or resigned their positions. What is the percent decrease in investigators who were hired in 2013?

Analysis: When finding the percent decrease, we take the absolute value of the difference and divide it by the original value. The resulting decimal is then converted to a percent.

Solution: Absolute value of the difference is 24

$$\frac{24}{120} = \frac{2}{10} = 0.2 = 20\%$$

Answer: 20% of investigators hired in 2013 is [Retention rate is 80%.]

Decimals to Fractions to Percents

- Complete the table. Write each fraction in lowest terms and round each decimal to the nearest tenth.

Percents	Fractions	Decimals
90%	___	___
___	¼	___
___	___	0.55
___	2/3	___
150%	___	___

- To convert from percents to fractions, divide by 100 then reduce.

- To convert from to fractions to percents, multiply by 100 then simplify.

- To convert from percents to decimals, move decimal point two places to the left.

- To convert from fractions to decimals, first convert to percents, then decimals.

- Examples: See board

Powers and Exponents -Examples

5^3 means five multiplied by itself three times:

$5^3 = 5 \times 5 \times 5 = 25 \times 5 = 125$ ✓

three of them

3^4 means three multiplied by itself four times:

$3^4 = 3 \times 3 \times 3 \times 3 = 9 \times 9 = 81$ ✓

four of them

2^5 means two multiplied by itself five times:

$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 8 \times 4 = 32$ ✓

five of them

Powers and Exponents - Operations

- Multiplying Power you <u>ADD</u> exponents

  $3^2 \times 3^3 = 3^5 = 243$

- Dividing Powers you <u>SUBTRACT</u> the exponents

  $3^5 \div 3^3 = 3^2 = 9$

Scientific Notation

- A special way of writing numbers which are often very long.

  □ Expressed as a number (between 1 and 10) times a power of 10.

  □ Note: Some Calculators use "E" .

  For example:

  1.093E 8 means 1.093×10^8.

  In standard notation this number is 109,300,000

Scientific notation	Expanded form
1×10^{-9}	0.000000001
1×10^{-6}	0.000001
1×10^{-3}	0.001
1×10^{-2}	0.01
1×10^{0}	1
1×10^{3}	1,000
1×10^{6}	1,000,000
1×10^{9}	1,000,000,000

Scientific Notation

- In 1995, the federal government paid off one-third of its debt. If the original amount of the debt was $4,920,000,000,000 which expression represents the amount that was not paid off?

1) 1.64×10^4

2) 1.64×10^{12}

3) 3.28×10^8

4) 3.28×10^{12}

Exponential Functions

Formula: $y = a \cdot b^x$ where

y is the balance

a is the original amount

b is the growth/decay factor

x is the amount of time or number of cycles

Exponential Functions (Growth)

Example

Irena opened a retirement account with $36,500. Her account grew at a rate of 7% per year compounded annually. She made no deposits or withdrawals on the account. At the end of 20 years, what was the account worth, to the *nearest dollar?*

1) $87,600
2) $130,786
3) $141,243
4) $1,483,444,463

Exponential Functions (Decay)

Example

A car depreciates (loses value) at a rate of 4.5% annually. Greg purchased a car for $12,500. Which equation can be used to determine the value of the car, V, after 5 years?

1) $V = \$12,500\ (0.55)^{5}$

2) $V = \$12,500\ (0.955)^{5}$

3) $V = \$12,500\ (1.045)^{5}$

4) $V = \$12,500\ (1.45)^{5}$

Measurements

Definition: Dimensions, quantity, or capacity as ascertained by comparison with a standard.

Most Common Measurements:

- Mass and Weight
- Distance and Length
- Capacity and Volume
- Temperature
- Time
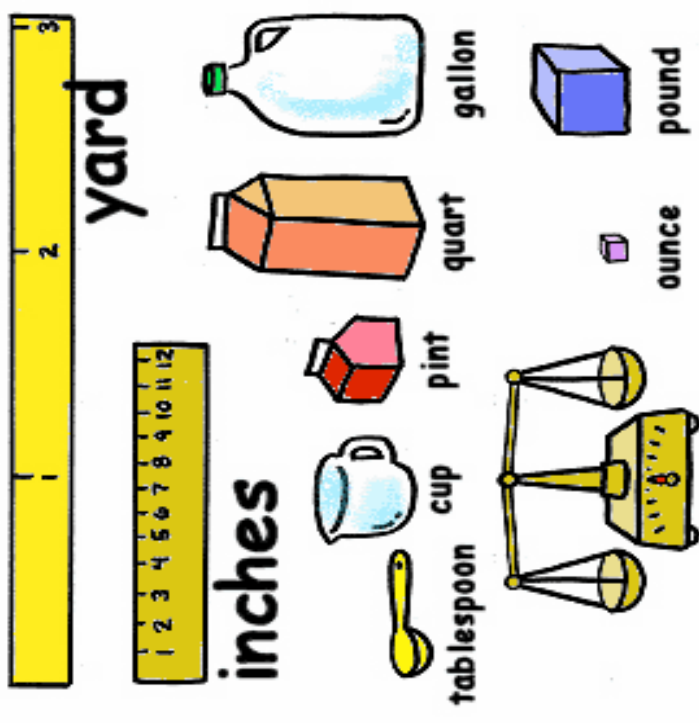
Basic U.S. Measurement Conversions

- Length
  - 1 foot = 12 inches
  - 1 yard = 3 feet
  - 1 mile = 1760 yards
  - 1 mile = 5280 feet

- Time
  - 1 hour = 60 minutes
  - 1 minute = 60 seconds

- Volume
  - 8 ounces = 1 cup
  - 2 cups = 1 pint
  - 2 pints = 1 quart
  - 4 quarts = 1 gallon

- Weight
  - 16 ounces = 1 pound

Checking for Understanding

1) How many cups are in 1 gallon? _____

3) How many pints are in 1 gallon? _____

2) How many ounces are in 1 quart? _____

4) How many second are in 1 hour? _____

5) How many feet are in 1 mile? _____

6) How many inches are in 1 yard? _____

7) How many ounces are in 2 pounds? _____

Graphs

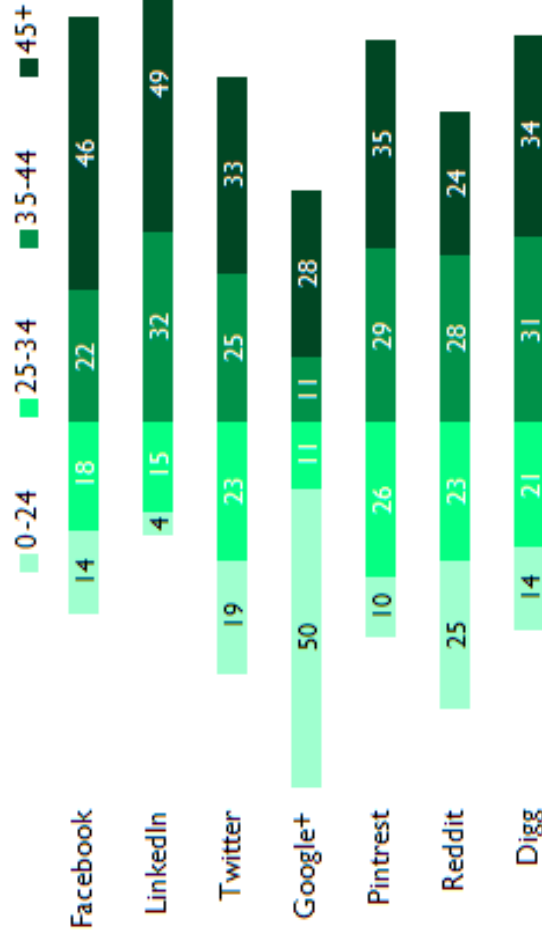- Diagram showing a relationship between two variable quantities
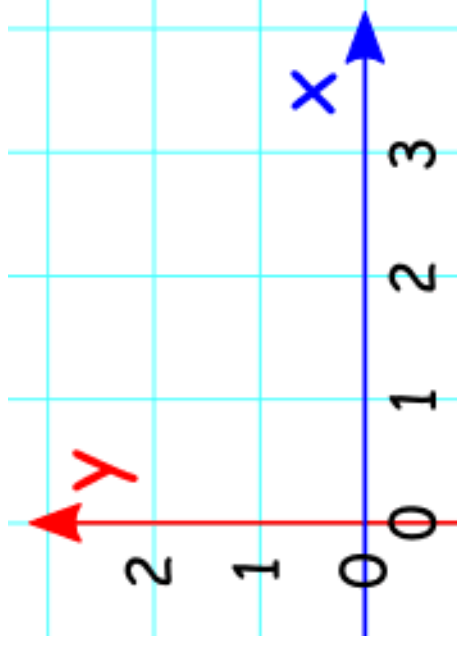
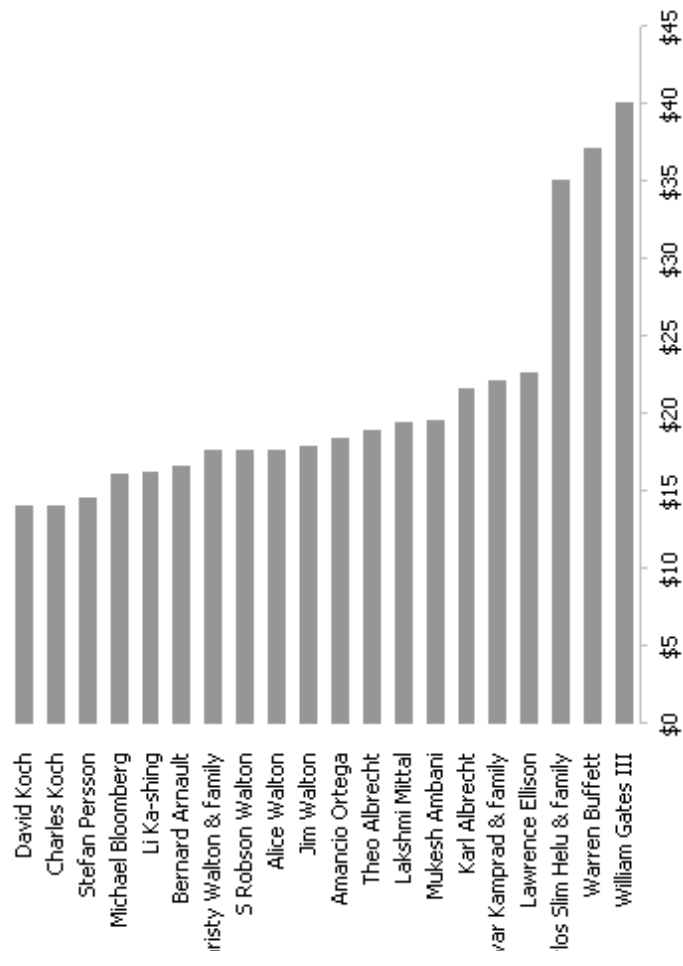- Y-axis: dependent variable
- X-axis: independent variable
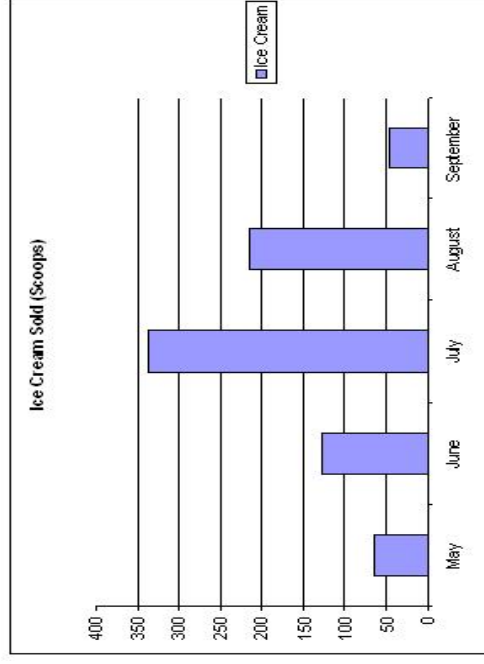
Bar Graphs

- Use rectangular bars to show how large a value is
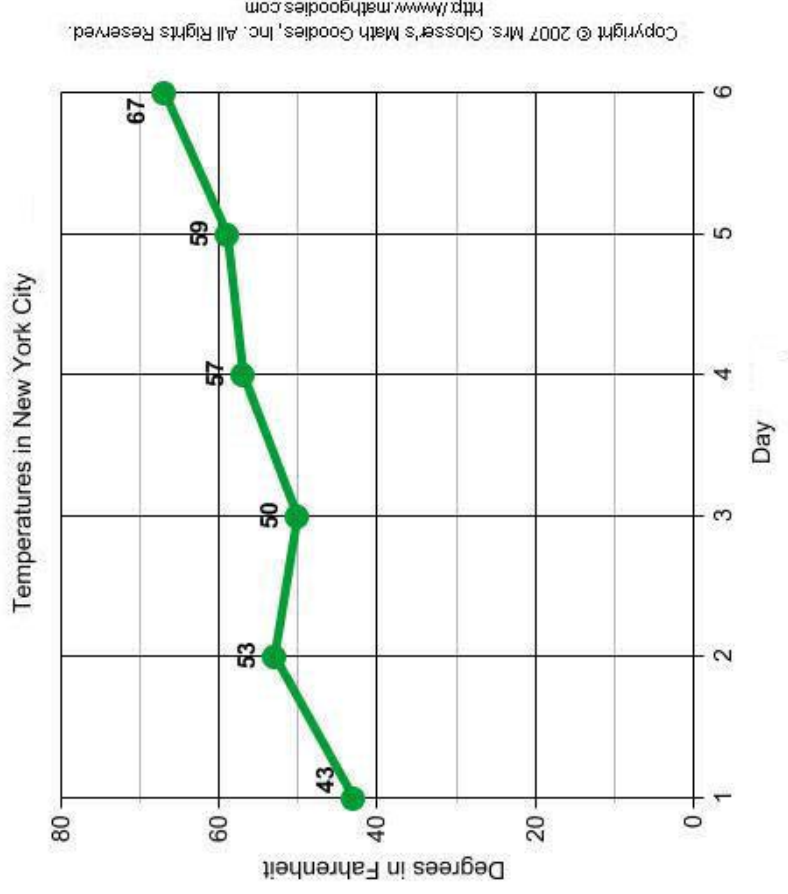 - Amounts
  - Characteristics
  - Times and Frequency


The World's Billionaires 2009

Legend: 0-24 | 25-34 | 35-44 | 45+

	0-24	25-34	35-44	45+
Facebook	14	18	22	46
LinkedIn	4	15	32	49
Twitter	19	23	25	33
Google+	50	11	11	28
Pintrest	10	26	29	35
Reddit	25	23	28	24
Digg	14	21	31	34

Line Graphs

- Use points connected by lines to show changes in value over time

Temperatures in New York City
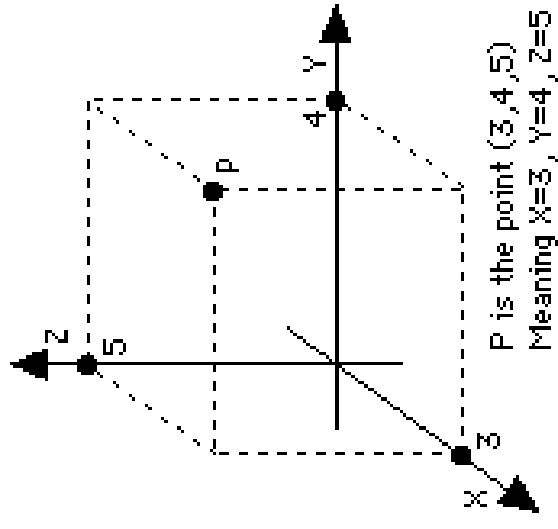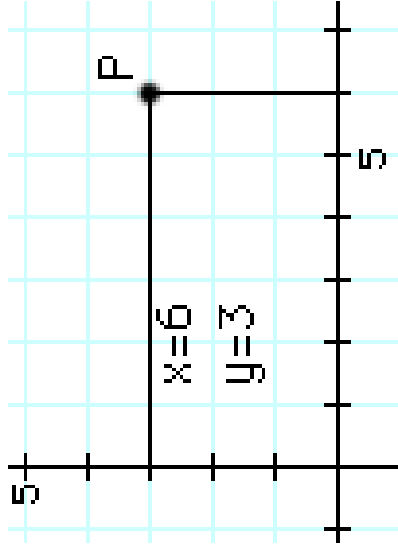
Degrees in Fahrenheit

Day

67 59 57 50 53 43

Pie charts

- Circular chart, divided into sectors illustrating numerical proportion
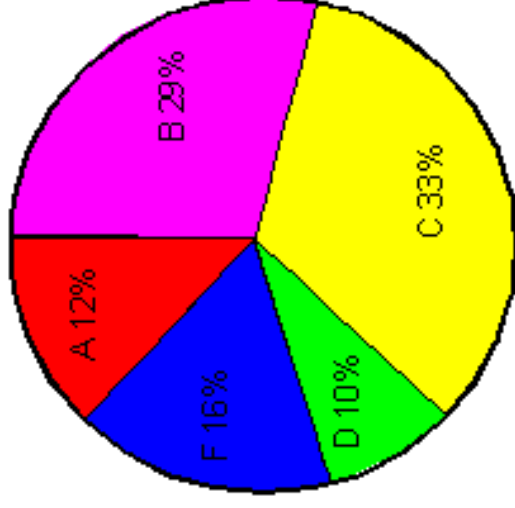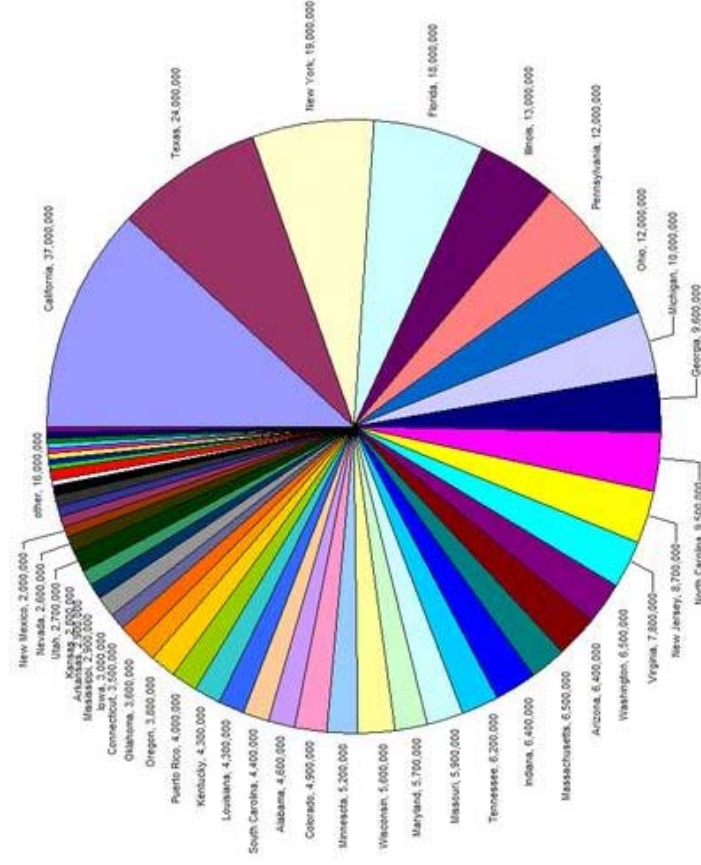
Coordinate Graphs

- Describe position along the axis

P is the point (3,4,5)
Meaning X=3, Y=4, Z=5

x=6
y=3

P

Word Problems (page13)

Adams Junior High School is trying to raise money for student activities. Students will sell oranges at $.50 each. The cost to the school is $7.20 for a box of 24. What profit is made on each box?
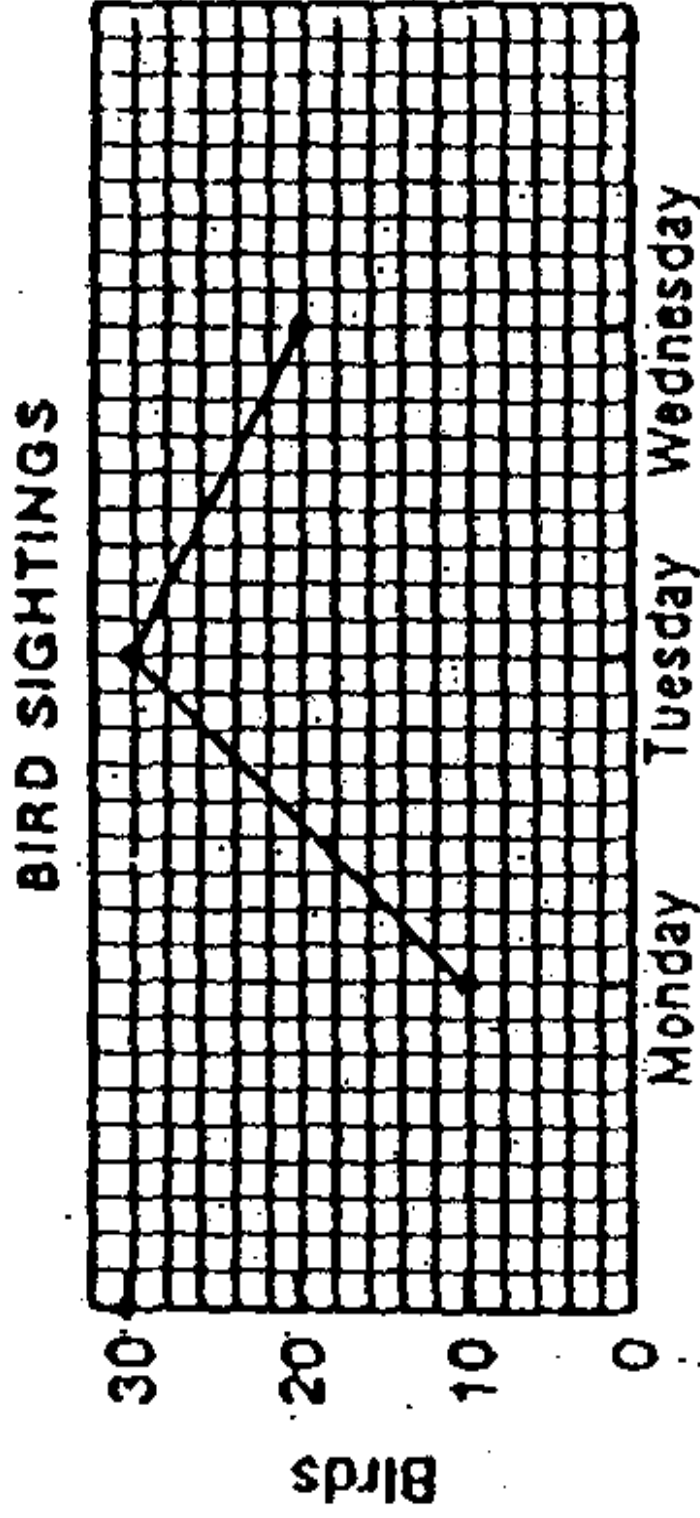
A $12.00

B) $4.80

C $5.20

D not given

Word Problem (page 13)

Use the graph below for 38–40, pages 158–159

BIRD SIGHTINGS

38. The ornithology club went to the wildlife preserve to see how many kinds of birds they could observe. How many birds in all were seen on Monday, Tuesday, and Wednesday?

Word Problem (page 24)

The Mayor needs a count of homeless persons receiving shelter in Bushwick. 674 individual persons in need of shelter came to the Bushwick Armory seeking admission and were accommodated but sixty-three families with an average of four members per family were re-directed to a family shelter in Crown Heights. A further set of homeless persons were transported to Bushwick after hours; twelve from the parks patrol, twenty-seven by van from the subway patrol and six late transfers from another shelter. How many were sheltered at the Bushwick Armory?

a) 674   b) 252   c) 719   d) 971

Practice Questions

• Take out your handouts

• Even numbers will be done in class.

• Odd numbers are left for you the students to practice with at home.

• Feel free to get email addresses from your instructor before you leave if you would like confirmation on your homework answers.