

Organization of Staff Analysts



TRAINING COURSE FOR THE ANALYST EXAM

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MATH



Welcome to OSA Training 2015

Basic Math

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Curriculum

I. WHOLE NUMBERS

-Order 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

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

V. SCIENTIFIC NOTATION

-Large Numbers to Scientific Notation.

-Exponential Functions



Order of Operations

- Order of Operations: Tell us the sequence of operations when simplifying any expression.
 - **PEMDAS (parenthesis, exponents, multiplication, division, addition and subtraction)**

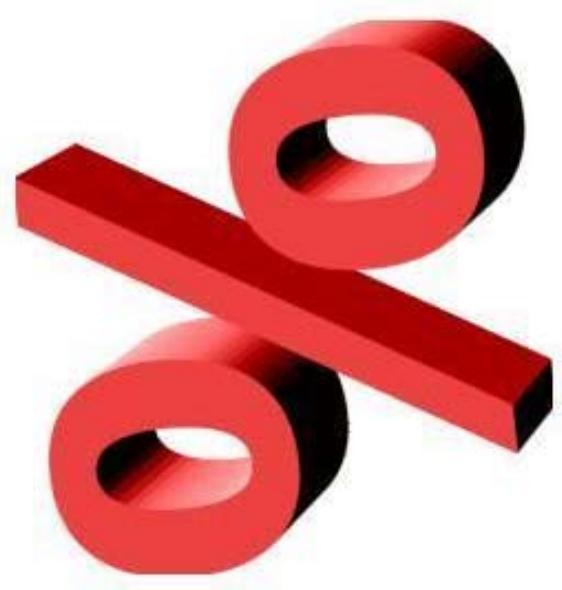
caveats:

- 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 $8(100 - 10) + 2 \times 2$ 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:

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

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:

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

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 left by 2014. [Retention rate is 80%.]

Decimals to Fractions to Percents

- To convert from percents to fractions, divide by 100 then reduce.
 - To convert from 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
- | Percents | Fractions | Decimals |
|----------|-----------|----------|
| 90% | _____ | _____ |
| _____ | 1/4 | _____ |
| _____ | _____ | 0.55 |
| _____ | 2/3 | _____ |
| 150% | _____ | _____ |

Powers and Exponents - Examples

5^3 means five multiplied by itself three times:

$$5^3 = \underbrace{5 \times 5 \times 5}_{\text{three of them}} = 25 \times 5 = 125$$

3^4 means three multiplied by itself four times:

$$3^4 = \underbrace{3 \times 3 \times 3 \times 3}_{\text{four of them}} = 9 \times 9 = 81$$

2^5 means two multiplied by itself five times:

$$2^5 = \underbrace{2 \times 2 \times 2 \times 2 \times 2}_{\text{five of them}} = 8 \times 4 = 32$$

Powers and Exponents - Operations

- Multiplying Power you ADD exponents
 $3^2 \times 3^3 = 3^5 = 243$
- Dividing Powers you SUBTRACT 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.

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

◦ 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

- 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?

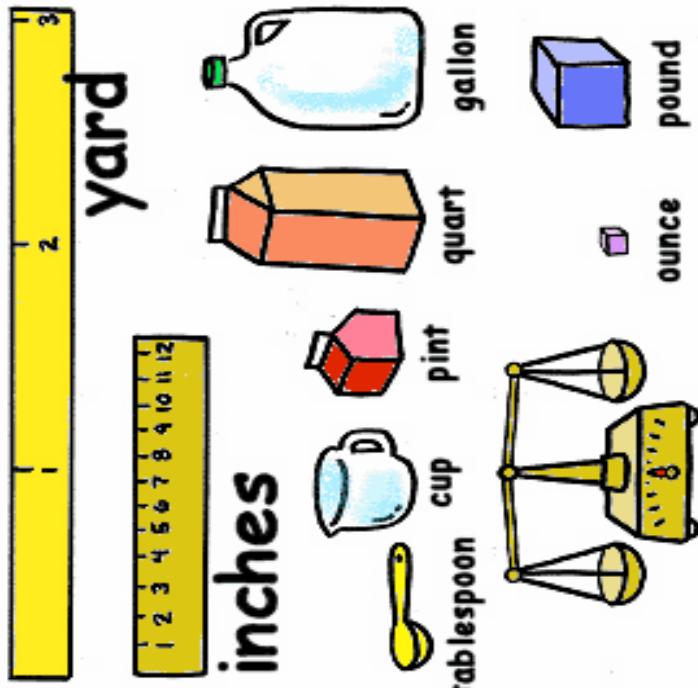
- 1) $V = \$12,500 (0.55)^5$
- 2) $V = \$12,500 (0.955)^5$
- 3) $V = \$12,500 (1.045)^5$
- 4) $V = \$12,500 (1.45)^5$

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



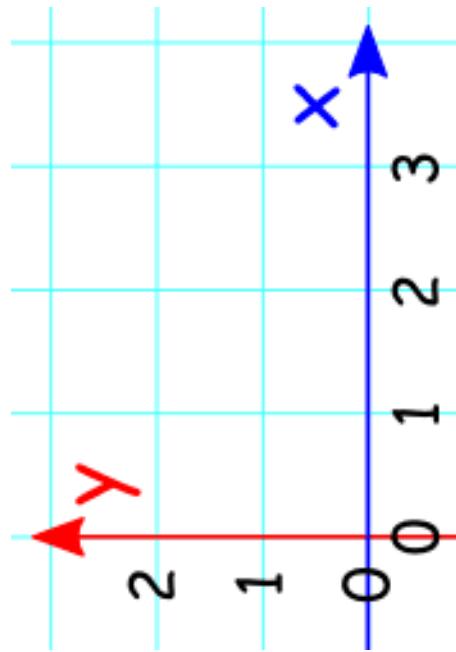
- Length
 - 1 foot = 12 inches
 - 1 yard = 3 feet
 - 1 mile = 1760 yards
 - 1 mile = 5280 feet
- Volume
 - 8 ounces = 1 cup
 - 2 cups = 1 pint
 - 2 pints = 1 quart
 - 4 quarts = 1 gallon
- Time
 - 1 hour = 60 minutes
 - 1 minute = 60 seconds
- Weight
 - 16 ounces = 1 pound

Checking for Understanding

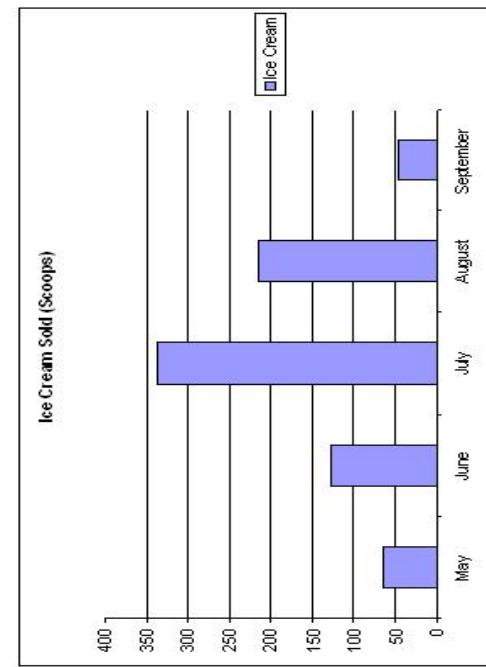
- 1) How many cups are in 1 gallon? _____
- 3) How many pints are in 1 gallon? _____
- 2) How many ounces are in 1 quart? _____
- 4) How many second are in 1 hour? _____
- 5) How many feet are in 1 mile? _____
- 6) How many inches are in 1 yard? _____
- 7) How many ounces are in 2 pounds? _____

Graphs

- Diagram showing a relationship between two variable quantities

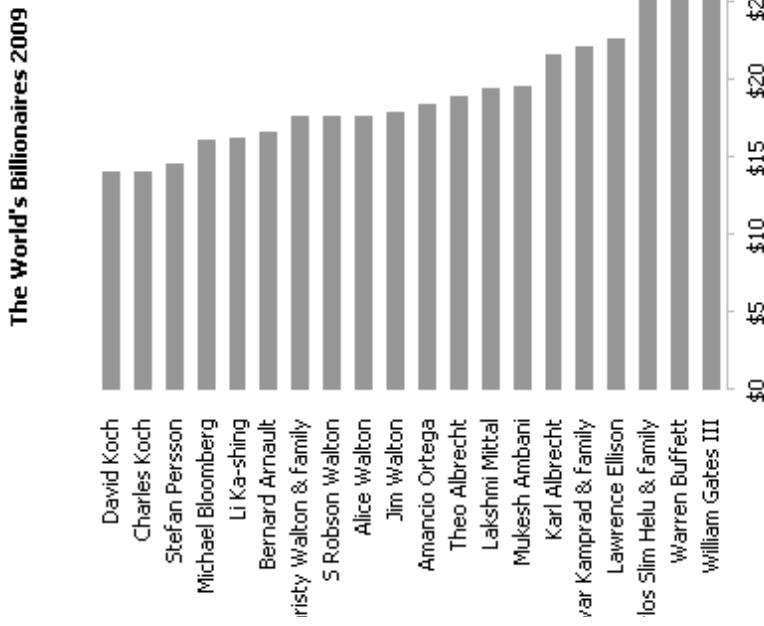


- Y-axis: dependent variable
- X-axis: independent variable



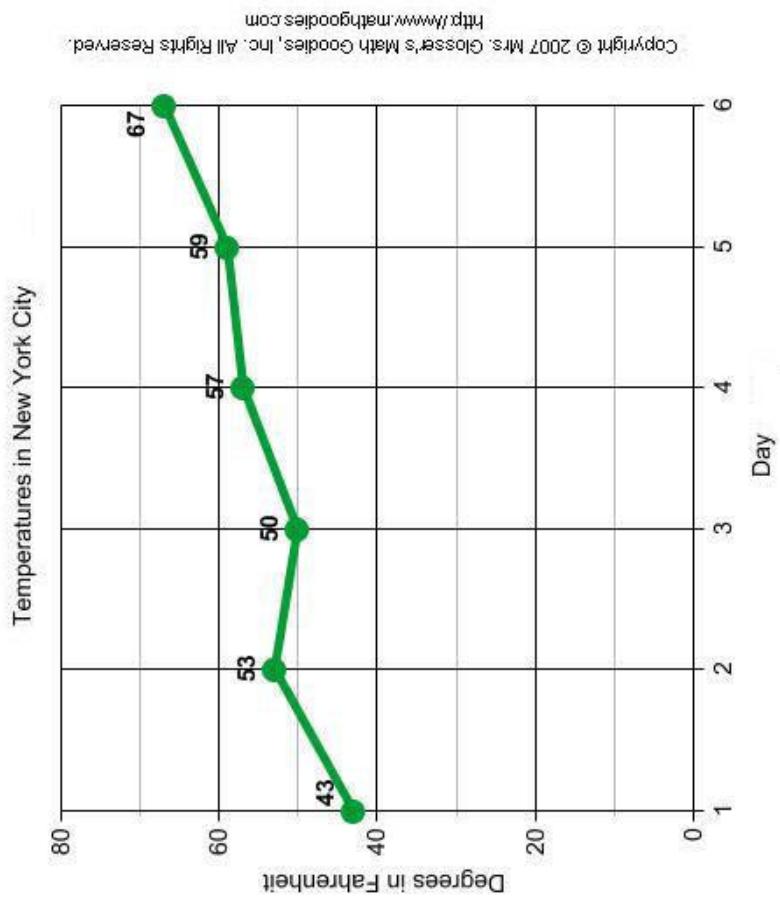
Bar Graphs

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



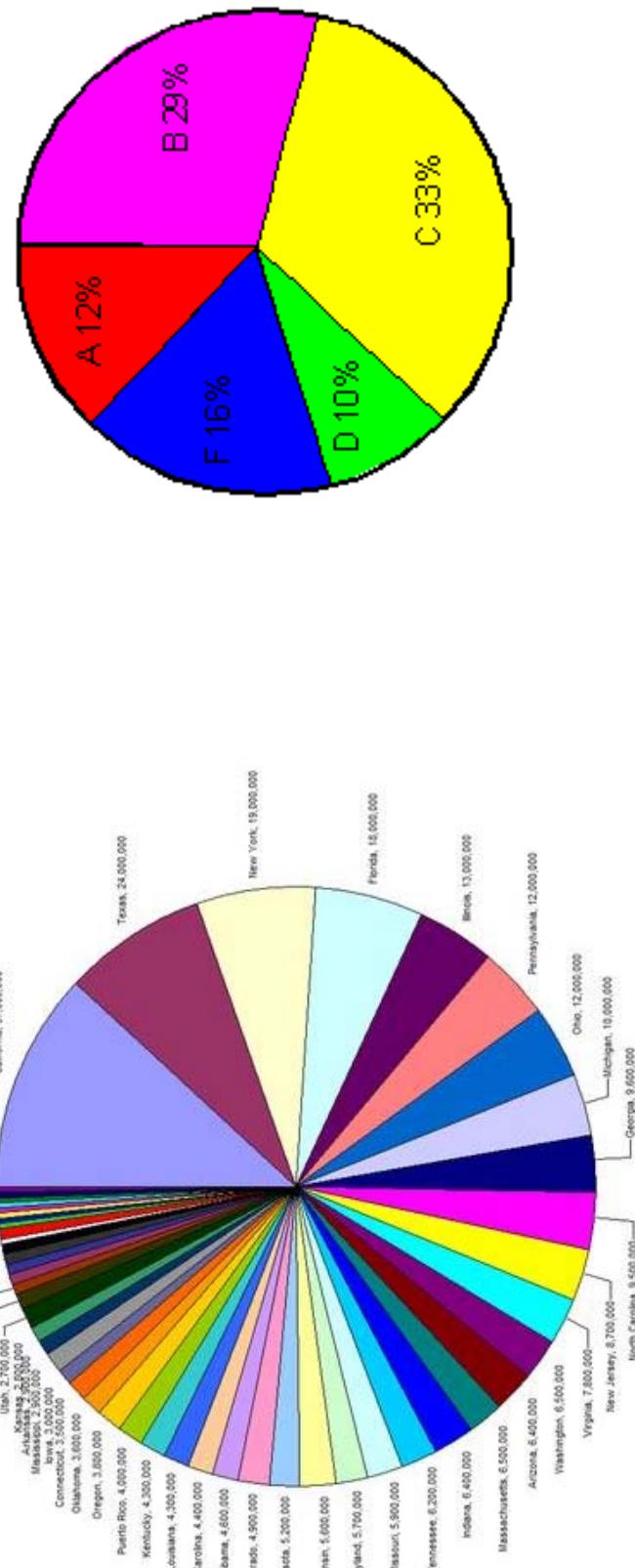
Line Graphs

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



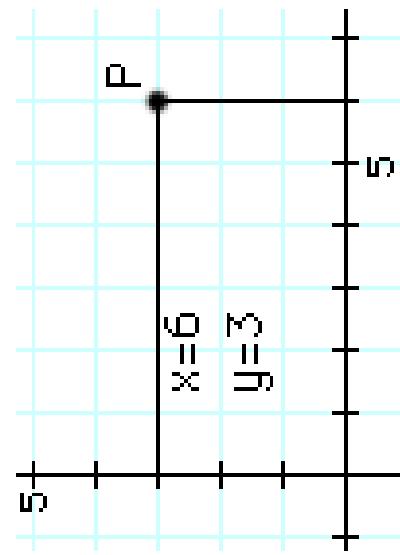
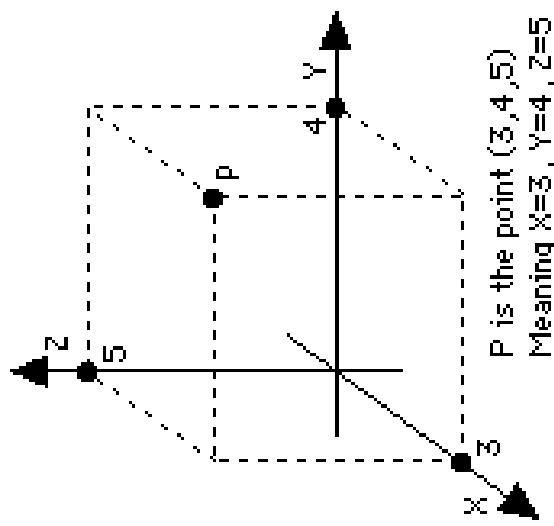
Pie charts

- Circular chart, divided into sectors illustrating numerical proportion



Coordinate Graphs

- Describe position along the axis



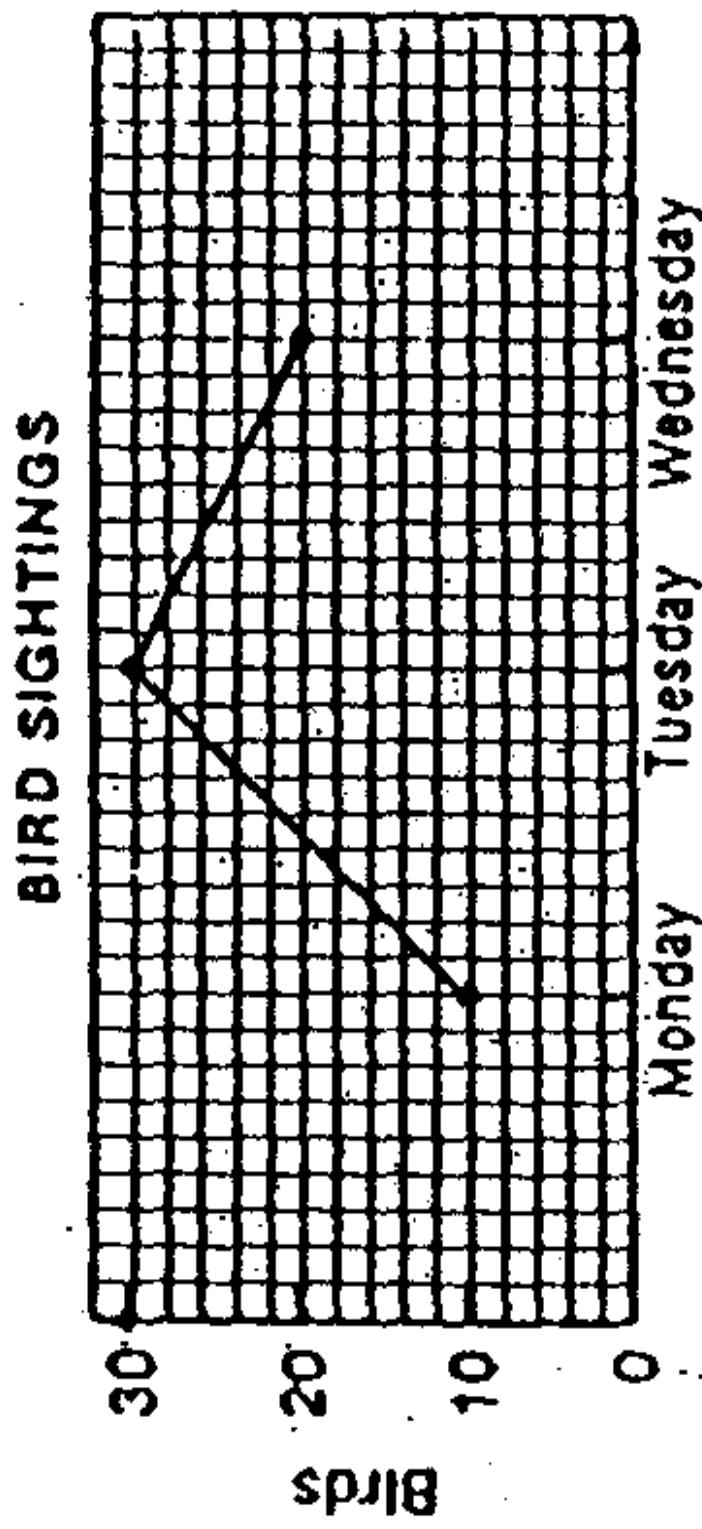
Word Problems (page 13)

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



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.

Question 1

In a class of 78 students 41 are taking French, 22 are taking German. Of the students taking French or German, 9 are taking both courses. How many students are not enrolled in either course?

- A. 6
- B. 15
- C. 24
- D. 33
- E. 54

Question 2

$$2^{30} + 2^{30} + 2^{30} + 2^{30} =$$

- A. 8^{120}
- B. 8^{30}
- C. 2^{32}
- D. 2^{30}
- E. 2^{26}

Question 3

Jo's collection contains US, Indian and British stamps. If the ratio of US to Indian stamps is 5 to 2 and the ratio of Indian to British stamps is 5 to 1, what is the ratio of US to British stamps?

- A. 5 : 1
- B. 10 : 5
- C. 15 : 2
- D. 20 : 2
- E. 25 : 2

Question 4 The distance from town A to town B is five miles. C is six miles from B. Which of the following could be the distance from A to C?

I 11

II 1

III 7

- A. I only
- B. II only
- C. I and II only
- D. II and III only
- E. I, II, or III.

Question 5

A car averages 27 miles per gallon. If gas costs \$4.04 per gallon, which of the following is closest to how much the gas would cost for this car to travel 2,727 typical miles?

1. A. \$ 44.44
2. B. \$109.08
3. C. \$118.80
4. D. \$408.04
5. E. \$444.40

Question 6

What is the greatest common factor of 42, 126, and 210 ?

1. F. 2
2. G. 6
3. H. 14
4. J. 21
5. K. 42

Question 7

Sales for a business were 3 million dollars more the second year than the first, and sales for the third year were double the sales for the second year. If sales for the third year were 38 million dollars, what were sales, in millions of dollars, for the first year?

1. A. 16
2. B. 17.5
3. C. 20.5
4. D. 22
5. E. 35

Question 8

The five members of a band are getting new outfits. Shirts cost \$12 each, pants cost \$29 each, and boots cost \$49 a pair. What is the total cost of the new outfits for all of the members?

- A \$90
B \$95
C \$450
D \$500

Question 9

You must lay out a seating plan for a small office. The office is 10 ft by 16 ft. The Agency guideline is 100 square feet for an Associate Staff analyst (with desk and chair and cabinets) and 49 square feet for a clerical assistant. Following the Agency guidelines, what is the maximum number of staff that can be accommodated in the office?

- a) One
- b) Two
- c) Three
- d) Four, with crowding

Question 10

Assume the Department of Citywide Administrative Services is giving an Associate Staff Analyst Open Competitive Exam and 5,712 candidates have filed to take the exam.

The Board of Education has offered the use of 32 classrooms at Roosevelt High School, 54 classrooms at Julia Richmond High School, 60 classrooms at the Music and Art High School and 78 classrooms at Murray Bergstrom High School for the exam. DCAS is limited to 36 candidates per classroom. What is the smallest number of schools that DCAS could use to avoid overcrowding. (You may ignore geographical convenience to the candidates.)

- a) 4
- b) 3
- c) 2
- d) It depends.

Question 11

The City used to pay civil servants once a month, years ago. By the 1960's the City had gone generally to biweekly payments. As a result, twenty-six biweekly pay checks are issued most years, but there are a number of days left over not covered by the pay checks.

In a non-leap year, how many days are not covered by the twenty-six paychecks?

- a) 1
- b) 2
- c) 7
- d) 14

Questions 12 – 14

John's hours are from 9:15 AM until 5:15 PM with duty free (unpaid) hour for Lunch. John worked overtime on Monday through Friday for two weeks straight. The first week he finished work at 6:30, 6:15, 6:15, 7:15 and 6:15 PM. The second week the work was more extensive and he worked until 7:30, 7:30, 7:15, 7:15 and 7:15 PM.

- 12) As a City employee, John's union contract calls for credit to be given in quarter hour segments after the first hour of overtime. How many hours did John work over time in the first week?
- a) 6 b) 6 $\frac{1}{4}$ c) 6 $\frac{1}{2}$ d) 6.15
- 13) How many hours did John work in the second week?
- a) 10 b) 10.30 c) 10 $\frac{1}{2}$ d) 11
- 14) John's union contract calls for time and one half after forty hours per week of work. John earns \$20 per hour. How much does John earn for overtime for the whole two weeks worked.
- a) Can't be computed. b) 102.50 c) 325.00 d) 402.50

Question 15

You are an Administrative Staff Analyst (Managerial) and you are demoted from your \$90,000 job. Your gross salary drops by 20%. Soon, however, your Agency recognizes your true value and offers to promote you with a 20% raise. If you accept, your new salary is _____. (Ignore union contractual longevity monies.)

- a) \$90,000 b) \$108,000 c) \$86,400 d) \$72,000

Question 16 - 21

DIRECTIONS : Questions 23 to 27 inclusive are based on the data given below. These data show the performance rates of the employees in a particular division for a period of six months.

<u>Employee</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>April</u>	<u>May</u>	<u>June</u>
A	96	53	64	48	76	72
B	84	58	69	56	67	79
C	73	68	71	54	59	62
D	98	74	79	66	86	74
E	89	78	67	74	75	77

23. According to the data given above, the average monthly performance for a worker is, MOST NEARLY,
 A. 66 B. 69 C. 72 D. 75
24. According to the data given above, the mean monthly performance for the division is, MOST NEARLY,
 A. 350 B. 358 C. 387 D. 429
25. According to the data given above, the employee who shows the least month-to-month variation in performance is
 A. A B. B C. C D. D
26. According to the data given above, the employee who shows the GREATEST range in performance is
 A. A B. B C. C D. D
27. According to the data given above, the median employee with respect to performance for the six-month period is
 A. A B. B C. C D. D
28. If the rate of a representative sample of workers in performing an element of work is plotted on a graph prior to the establishment of standards, the graph will often approximate a normal curve. In such a case, the percentage of workers whose time is more than two standard deviations above the mean is APPROXIMATELY
 A. 2 1/2% B. 5% C. 10% D. 25%

Answer Key

Question	Answer
1	C
2	C
3	E
4	E
5	D
6	K
7	A
8	C
9	C
10	B
11	A
12	B
13	C
14	D
15	C
23	C
24	B
25	C
26	A
27	B
28	A

16-22

Presentation

Slide	Questions (Slide title)	Answer
13	Scientific Notation	4
15	Exp. Functions (growth)	3
16	Exp. Functions (decay)	2
	Word Problem (page 13) Bird sightings graph	
27		60
28	Word Problem (page 24)	C

Example 1: Jack bowled four games for a total score of 500. What was his average score for a game?

Step 1: Find and underline or circle what the question is asking.

What was his average score for a game?

Step 2: Focus on and pull out important information.

four games for a total score of 500.

Step 3: Set up the work that is needed.

$$500 \div 4$$

(The total divided by the number of games gives the average.)

Step 4: Do the necessary work or computation carefully.

$$(85 + 90 + 95) \div 3 =$$

(The total divided by the number of scores gives the average.)

Step 3: Set up the work that is needed.

$$\underline{\underline{(85 + 90 + 95)}} \div 3 = 270 \div 3 = 90$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

Jack's average score for a game is 125.

Step 6: Check to make sure that your answer is reasonable.

Since four games of 125 total 500, your answer is reasonable and correct.

Example 2: Judy scored 85, 90, and 95 on her last three algebra tests. What was her average score for these tests?

Step 1: Find and underline or circle what the question is asking.

What was her average score for these tests?

Step 2: Focus on and pull out important information.

85, 90, and 95 on three tests

Step 3: Set up the work that is needed.

$$(85 + 90 + 95) \div 3 =$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

Judy's average test score for these tests was 90.

Step 6: Check to make sure that your answer is reasonable.

Since her scores were 85, 90, and 95, the average should be halfway between 85 and 95. So 90 is a reasonable answer.

Example 3:
cereal at \$4
soup at \$1

Step 1: Find and underline or circle what the question is asking.
How change will Frances get from a \$20 bill?

Step 2: Focus on and pull out important information.

two boxes at \$4 each
three bottles at \$2 each
two cans at \$1 each
\$20 bill used

Step 3: Set up the work that is needed.

$$2 \times 4 =$$

$$3 \times 2 =$$

$$2 \times 1 =$$

$$\$20 - ? =$$

Step 4: Do the necessary work or computation carefully.

$$2 \times 4 = 8$$

$$3 \times 2 = 6$$

$$2 \times 1 = 2$$

$$8 + 6 + 2 = 16$$

$$20 - 16 = 4$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

Sarah can save \$125 by paying cash.

Step 6: Check to make sure that your answer is reasonable.

Total payments of \$30 each is \$300 plus a \$100 down payment gives \$400. This is \$125 more than \$275, so the answer is reasonable.

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

Frances will get \$4 change.

Step 6: Check to make sure that your answer is reasonable.

Since the total expenses were \$16, then \$4 change from a \$20 bill is reasonable.

of
of
it?

for \$275 cash or for
payments of \$30 each.
cash for the television?

Step 1: Find and underline or circle what the question is asking.
How much money can Sarah save by paying cash for the television?

Step 2: Focus on and pull out important information.

cash \$275
\$100 down plus ten payments of \$30

Step 3: Set up the work that is needed.

$$100 + (10 \times 30) =$$

$$? - 275 =$$

Step 4: Do the necessary work or computation carefully.

$$100 + (10 \times 30) = 100 + 300$$

$$= 400$$

$$400 - 275 = 125$$

Example 5: If apples sell for \$3.25 per dozen, how many apples can Maria buy for \$13.00?

Step 1: *Find and underline or circle what the question is asking.*

how many apples can Maria buy for \$13.00?

Step 2: *Focus on and pull out important information.*

\$3.25 per dozen
\$13.00

Step 3: *Set up the work that is needed.*

$$13.00 \div 3.25 = ? \text{ dozen}$$

= 7 dozen

Step 4: *Do the necessary work or computation carefully.*

$$\begin{aligned} 13.00 \div 3.25 &= 4 \text{ dozen} \\ &= 4 \times 12 \\ &= 48 \end{aligned}$$

Step 5: *Put your answer into a sentence to make sure that you answered the question being asked.*

Maria can buy 48 apples for \$13.00.

Step 6: *Check to make sure that your answer is reasonable.*

Since Maria could buy 12 apples for about \$3, then it is reasonable that she could buy 48 apples for about \$12.

Example 6: Sequoia Junior High School has a student enrollment of 2000. If 30% of the students are seventh graders, how many seventh graders are enrolled at the school?

Step 1: *Find and underline or circle what the question is asking.*

how many seventh graders are enrolled at the school?

Step 2: *Focus on and pull out important information.*

2000 students
30% are seventh graders

Step 3: *Set up the work that is needed.*

$$30\% \text{ of } 2000 =$$

Step 4: *Do the necessary work or computation carefully.*

$$\begin{aligned} 30\% \text{ of } 2000 &= .30 \times 2000 \\ &= 600 \end{aligned}$$

Step 5: *Put your answer into a sentence to make sure that you answered the question being asked.*

There are 600 seventh graders enrolled at Sequoia Junior High.

Step 6: *Check to make sure that your answer is reasonable.*

Since 30% of 1000 is 300, then 30% of 2000 is 600.

The answer is reasonable.

Example 8: Each week, John spends \$50 of his income on entertainment. If John earns \$200 a week, what percent of his income is spent on entertainment?

Step 1: Find and underline or circle what the question is asking.

how many of his free throws make?

Step 2: Focus on and pull out important information.

makes 75%
shoots eighty free throws

Step 3: Set up the work that is needed.

$$75\% \text{ of } 80 =$$

Step 4: Do the necessary work or computation carefully:

$$75\% \text{ of } 80 = \frac{1}{4} \times 80$$

$$= 60$$

$$\frac{60}{200} = \frac{1}{4}$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.
Jim makes sixty free throws.

Step 4: Do the necessary work or computation carefully.

$$= 25\%$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

John spends 25% of his income on entertainment.

Step

reasonable.

be forty,

Step 6: Check to make sure that your answer is reasonable.

Since 50 is half, or 50%, of 100, then 50 would reasonably be 25% of 200.

Example 9: The Gomez family spends 30% of their income for food. If the family spent \$6000 for food last year, what was the family income for last year?

Step 1: Find and underline what the question is asking.

what was the family income for last year?

Step 2: Focus on and pull out important information.

30% of income for food

6000 spend for food last year

Step 3: Set up the work that is needed.

30% of income = 6000

$30\%x = 6000$

Step 4: Do the necessary work or computation carefully.

$30\%x = 6000$

$30x = 6000$

$\frac{30x}{30} = \frac{6000}{30}$

$\frac{30x}{30} = \frac{6000}{30}$

$x = 20,000$.

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

The Gomez family income for last year was \$20,000.

Step 6: Check to make sure that your answer is reasonable.

Since 30% of the family income is spent for food, and 30% of \$20,000 is \$6,000, then the answer is reasonable.

Example 10: A miniature piano keyboard is $16\frac{1}{2}$ inches wide. If each key is $1\frac{1}{2}$ inch wide, how many keys are there?

Step 1: Find and underline or circle what the question is asking.

how many keys are there?

Step 2: Focus on and pull out important information.

$16\frac{1}{2}$ inches wide

$1\frac{1}{2}$ inch keys

Step 3: Set up the work that is needed.

$16\frac{1}{2} + 1\frac{1}{2} =$ or $16.5 + 1.5 =$

Step 4: Do the necessary work or computation carefully.

$$16\frac{1}{2} + 1\frac{1}{2} = \frac{33}{2} + \frac{3}{2}$$

$$= \frac{33}{2} \times \frac{2}{2}$$

$$= \frac{33}{2} \times \frac{2}{2}$$

$$= 11$$

Or

$$\frac{16.5}{1.5} = \frac{165}{15}$$

$$= 11$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

There are eleven keys on the miniature keyboard.

Step 6: Check to make sure that your answer is reasonable.

Since 16 divided by 1 is 16, and 16 divided by 2 is 8, the answer of 11 is reasonable.

Example 11: The low temperature on Big Bear mountain was 30 degrees on Monday, 20 degrees on Tuesday, -10 degrees on Wednesday, and 15 degrees on Thursday. If you total the changes in low temperature from each day to the next, what is the total number of degrees change?

Step 1: Find and underline or circle what the question is asking.

what is the total number of degrees

Step 2: Focus on and pull out important information.

30 on Monday
20 on Tuesday
-10 on Wednesday
15 on Thursday

Step 3: Set up the work that is needed.

$$\begin{aligned}30 + 20 &= \\20 + -10 &= \\-10 + 15 &= \end{aligned}$$

Step 4: Do the necessary work or computation carefully.

$$\begin{aligned}30 + 20 &= 50 \\20 + -10 &= 10 \\-10 + 15 &= 5\end{aligned}$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

The Silverado Flash will travel 1455 miles in 15 hours.

Step 6: Check to make sure that your answer is reasonable.

At 100 miles per hour for 15 hours, the Silverado Flash would have traveled 1500 miles. So the answer of 1455 miles is reasonable.

Example 12: The Silverado Flash, a solar-powered land vehicle, travels at a maximum speed of 97 miles per hour. At this rate, how far will the Silverado Flash travel in 15 hours?

An important formula to remember is $d = rt$, or distance equals rate times time.

Step 1: Find and underline or circle what the question is asking.

how far will the Silverado Flash travel in 15 hours?

Step 2: Focus on and pull out important information.

97 miles per hour
15 hours

Step 3: Set up the work that is needed.

$$\text{distance} = \text{rate} \times \text{time}$$

$$d = 97 \times 15$$

Step 4: Do the necessary work or computation carefully.

$$d = 97 \times 15$$

$$= 1455$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

The Silverado Flash will travel 1455 miles in 15 hours.

Step 6: Check to make sure that your answer is reasonable.

Example 13: The low temperature on Big Bear mountain was 30 degrees on Monday, 20 degrees on Tuesday, -10 degrees on Wednesday, and 15 degrees on Thursday. Since the low temperature dropped 10, dropped 30, and rose 25, the total of 65 is correct and reasonable.

Example 13: Asaf can run around the track, 440 yards, in 65 seconds. At this same rate, how far could Asaf run in 195 seconds?

Step 1: Find and underline or circle what the question is asking? how far could Asaf run in 195 seconds?

Step 2: Focus on and pull out important information.

440 yards in 65 seconds

195 seconds

Step 3: Set up the work that is needed.

You could set up the proportion

$$\frac{440 \text{ yards}}{65 \text{ seconds}} = \frac{x \text{ yards}}{195 \text{ seconds}}$$

Or simply divide 195 by 65 and multiply by 440.

$$195 + 65 = ? \text{ times } 440$$

Step 4: Do the necessary work or computation carefully.

$$\frac{440}{65} = \frac{x}{195}$$

Since

$$3 \times 65 = 195$$

$$3 \times 440 = 1320$$

Cross multiplying would also work but would be more time consuming.

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

Asaf could run 1320 yards in 195 seconds.

Step 6: Check to make sure that your answer is reasonable.

If Asaf ran 400
195 seconds is
or 1200, would

a reasonable answer.

Example 1
week later
Using this
the pond?

Step 1: Find and underline or circle what the question is asking? how many frogs would she approximate are in the pond?

Step 2: Focus on and pull out important information.

100 tagged

5 out of 20 tagged

Step 3: Set up the work that is needed.

You could set up the proportion

$$\frac{5 \text{ tagged}}{20 \text{ total}} = \frac{100 \text{ tagged}}{x}$$

Step 4: Do the necessary work or computation carefully.

$$\frac{5}{20} = \frac{100}{x}$$

$$5x = 2000$$

$$5 \quad 5$$

$$\cancel{5x} = \frac{2000}{\cancel{5}}$$

$$x = 400$$

Step 5: Put your answer into a sentence to make sure that you answered the question being asked.

She would approximate that there are 400 frogs in the pond.

Step 6: Check to make sure that your answer is reasonable.

Since she tagged 100, and 5 out of 20, or 1 out of 4, came out tagged, then it is reasonable to have a total of 400 frogs in the pond.

Example 15: Jolia has \$300 in the bank, she works at a bakery and makes \$40 per day. If she deposits all of her earnings in the bank and does not make any withdrawals, how many days of work will it take for her to have \$740 in the bank?

Step 1: *Find and underline or circle what the question is asking.* How many days of work will it take for her to have \$740 in the bank?

Step 2: *Focus on and pull out important information.*

\$300 in the bank
\$40 per day
\$740 total

Step 3: *Set up the work that is needed.*

Let d stand for the number of days. Then $40d$ is the amount of money earned in d days, and $40d + 300$ is the amount of money she would have in the bank at the end of d days. So $40d + 300 = 740$

Step 4: *Do the necessary work or computation carefully.*

$$\begin{array}{r} 40d + 300 = 740 \\ - 300 \quad -300 \\ \hline 40d \quad = 440 \\ 40d \quad = 440 \\ 40 \quad \quad 40 \\ 40 \quad = 440 \\ 40 \quad \quad 40 \\ \hline d = 11 \end{array}$$

Step 5: *Put your answer into a sentence to make sure that you answered the question being asked.*
Jolia would have to work eleven days to have \$740 in the bank.

Step 6: *Check to make sure that your answer is reasonable.*

At \$40 per day, if she worked eleven days, she would have \$440. Add this to the \$300 she already had, and the total of \$740 in the bank.

Example 16: A train is 50 miles from Seattle. It is traveling away from Seattle at a speed of 60 miles per hour. In how many hours will the train be 290 miles from Seattle?

Step 1: *Find and underline or circle what the question is asking.* In how many hours will the train be 290 miles from Seattle?

Step 2: *Focus on and pull out important information.*

50 miles from Seattle
60 miles per hour
290 miles

Step 3: *Set up the work that is needed.*

Let h stand for the number of hours. Then $60h$ is the distance traveled in h hours, and $60h + 50$ is the distance from Seattle in h hours. So $60h + 50 = 290$

- 1) 15 is 25% of ____.
- 2) 9 is 50% of ____.
- 3) 120 is 75% of ____.
- 4) 7 is 140% of ____.
- 5) .8 is 25% of ____.
- 6) 4 is 40% of ____.
- 7) 150 is 20% of ____.
- 8) 360 is 150% of ____.
- 9) 33 is 66% of ____.
- 10) 8 is 8% of ____.
- 11) ____ is 50% of 80.
- 12) ____ is 15% of 60.
- 13) ____ is 25% of 30.
- 14) ____ is 20% of 96.
- 15) ____ is 12% of 80.
- 16) ____ is 25% of 30.6.
- 17) 62.5 is ____ % of 50.
- 18) 15 is ____ % of 75.
- 19) 135 is ____ % of 180.
- 20) 90 is ____ % of 60.
- 21) 39 is ____ % of 48.
- 22) .5 is 125% of ____.
- 23) 1.28 is 25% of ____.
- 24) 54 is 90% of ____.
- 25) 80 is 100% of ____.
- 26) 1.5 is 5% of ____.
- 27) 25 is ____ % of 125.
- 28) 13 is ____ % of 52.
- 29) 60 is ____ % of 60.
- 30) 6.3 is ____ % of 75.
- 31) 5 is ____ % of 4.
- 32) 12.5 is ____ % of 100.
- 33) ____ is 5% of 980.
- 34) 27.3 is ____ % of 60.
- 35) 120 is ____ % of 60.
- 36) 1.1 is ____ % of 100.
- 37) 36 is ____ % of 60.

- 1) $\frac{25}{100} = \frac{15}{X}$
 $25X = 1500$
 $X = 60$
- 11) $\frac{50}{100} = \frac{X}{80}$
 $100x = 4000$
 $X = 40$
- 21) $\frac{X}{100} = \frac{39}{48}$
 $48x = 3900$
 $X = 81.25$
- 31) $\frac{X}{100} = \frac{5}{4}$
 $4x = 500$
 $X = 125$
- 2) $\frac{50}{100} = \frac{9}{X}$
 $50x = 900$
 $X = 18$
- 12) $\frac{15}{100} = \frac{X}{60}$
 $100x = 900$
 $X = 9$
- 22) $\frac{125}{100} = \frac{5}{X}$
 $125x = 50$
 $X = .4$
- 32) $\frac{X}{100} = \frac{12.5}{100}$
 $100x = 1250$
 $X = 12.5$
- 3) $\frac{75}{100} = \frac{120}{X}$
 $75x = 1200$
 $X = 160$
- 13) $\frac{25}{100} = \frac{X}{30}$
 $100x = 750$
 $X = 7.5$
- 23) $\frac{25}{100} = \frac{1.28}{X}$
 $25x = 128$
 $X = 5.12$
- 33) $\frac{5}{100} = \frac{X}{980}$
 $100x = 4900$
 $X = 49$
- 4) $\frac{140}{100} = \frac{7}{X}$
 $140x = 700$
 $X = 5$
- 14) $\frac{20}{100} = \frac{X}{96}$
 $100x = 1920$
 $X = 19.2$
- 24) $\frac{90}{100} = \frac{54}{X}$
 $90x = 5400$
 $X = 60$
- 34) $\frac{X}{100} = \frac{27.3}{60}$
 $60x = 2730$
 $X = 45.5$
- 5) $\frac{25}{100} = \frac{.8}{X}$
 $25x = 80$
 $X = 3.2$
- 15) $\frac{12}{100} = \frac{X}{80}$
 $100x = 960$
 $X = 9.6$
- 25) $\frac{100}{100} = \frac{80}{X}$
 $100x = 8000$
 $X = 80$
- 35) $\frac{X}{100} = \frac{120}{60}$
 $60x = 1200$
 $X = 200$
- 6) $\frac{40}{100} = \frac{4}{X}$
 $40x = 400$
 $X = 10$
- 16) $\frac{25}{100} = \frac{X}{30.6}$
 $100x = 765$
 $X = 7.65$
- 26) $\frac{5}{100} = \frac{1.5}{X}$
 $5x = 150$
 $X = 30$
- 36) $\frac{X}{100} = \frac{1.1}{100}$
 $100x = 110$
 $X = 1.1$
- 7) $\frac{20}{100} = \frac{150}{X}$
 $20x = 15000$
 $X = 750$
- 17) $\frac{X}{100} = \frac{62.5}{50}$
 $50x = 6250$
 $X = 125$
- 27) $\frac{X}{100} = \frac{25}{125}$
 $125x = 2500$
 $X = 20$
- 37) $\frac{X}{100} = \frac{36}{60}$
 $60x = 3600$
 $X = 60$
- 8) $\frac{150}{100} = \frac{360}{X}$
 $150x = 36000$
 $X = 240$
- 18) $\frac{X}{100} = \frac{15}{75}$
 $75x = 1500$
 $X = 20$
- 28) $\frac{X}{100} = \frac{13}{52}$
 $52x = 1300$
 $X = 25$
- 9) $\frac{66}{100} = \frac{33}{X}$
 $66x = 3300$
 $X = 50$
- 19) $\frac{X}{100} = \frac{135}{180}$
 $180x = 13500$
 $X = 75$
- 29) $\frac{X}{100} = \frac{60}{60}$
 $60x = 6000$
 $X = 100$
- 10) $\frac{8}{100} = \frac{8}{X}$
 $8x = 800$
 $X = 100$
- 20) $\frac{X}{100} = \frac{90}{60}$
 $60x = 9000$
 $X = 150$
- 30) $\frac{X}{100} = \frac{6.3}{75}$
 $75x = 630$
 $X = 8.4$

Choose the correct answers. Write A, B, C, or D.

Solve. pages 10-11

pages 126-127

31. Is trying to activities at \$.50 each.

\$7.20 for a box of 24. What profit is made on each box?

- A \$12.00 C \$5.20 A \$28.85 C \$39.85
B \$4.80 D not given B \$19.85 D not given

32. How many boxes must be sold to raise \$120.00?

- A 25 C 240 A 20
B 40 D not given B 8
C \$2 80 D not given

BIRD SIGHTINGS



33. If another school in to sell the each, what is the for each box?

- C \$2 80
D not given

Incover &
Answer

34. Fir now

35. A 65
B 60
C 45
D not given

36. 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?

- A 65
B 60
C 45
D not given

37. What was the average number of birds seen on each of these days?

- A 20
B 13
C 13
D not given

38. If the goal of the club is to observe 100 different birds for the week, what total will be needed for Thursday and Friday?

- A 44, 43
B 28, 27
C 21, 42
D not given
pages 102-103

C 0
D not given

Questions 23-27.

DIRECTIONS : Questions 23 to 27 inclusive are based on the data given below. These data show the performance rates of the employees in a particular division for a period of six months.

Employee	Jan.	Feb.	Mar.	April	May	June
A	96	53	64	48	76	72
B	84	58	69	56	67	79
C	73	68	71	54	59	62
D	98	74	79	66	86	74
E	89	78	67	74	75	77

23. According to the data given above, the average monthly performance for a worker is, MOST NEARLY,
A. 66 B. 69 C. 72 D. 75
24. According to the data given above, the mean monthly performance for the division is, MOST NEARLY,
A. 350 B. 358 C. 387 D. 429
25. According to the data given above, the employee who shows the least month-to-month variation in performance is
A. A B. B C. C D. D
26. According to the data given above, the employee who shows the GREATEST range in performance is
A. A B. B C. C D. D
27. According to the data given above, the median employee with respect to performance for the six-month period is
A. A B. B C. C D. D
28. If the rate of a representative sample of workers in performing an element of work is plotted on a graph prior to the establishment of standards, the graph will often approximate a normal curve. In such a case, the percentage of workers whose time is more than two standard deviations above the mean is APPROXIMATELY
A. 2 1/2% B. 5% C. 10% D. 25%

23. C
24. B
25. C

26. A
27. B
28. A

MATH

The management study of employee absence due to sickness is an effective tool in planning. Answer questions 8 through 10 solely on the data given below.

Number of days absent per worker (sickness)	1	2	3	4	5	6	7	8 or over
--	---	---	---	---	---	---	---	--------------

Number of workers	76	23	6	3	1	0	1	0
-------------------	----	----	---	---	---	---	---	---

Total number of Workers: 400

Period covered: Jan 1, 1988- Dec 31, 1988

8. The total number of worker days lost due to illness in 1988 was
A. 110 B. 137 C. 144 D. 164
9. What percent of the workers had 4 or more days absence due to illness during 1988?
A. .25% B. 2.5% C. 1.25% D. 12.5%
10. Of the 400 workers studied, the number who lost no days due to sickness in 1988 was
A. 190 B. 236 C. 290 D. 346

The following chart show the differences between the rates of production of employees in Department D in 1978 and 1988. Answer questions 14 through 16 solely on the basis of the information given in the chart.

<u>Number of Employee Producing Work Units Within Range of 1978</u>	<u>Number of Work Units Produced</u>	<u>Number of Employee Producing Work Units Within Range in 1988</u>
7	500 - 1000	4
14	1001 - 1500	11
26	1501 - 2000	28
22	2001 - 2500	36
17	2501 - 3000	39
10	3001 - 3500	23
4	3501 - 4000	9

14. Assuming that within each range of work units produced, the average production was at the mid point of that range (e.g., category 500 - 1000 = 750), then the average number of work units produced per employee in 1978 fell into the range
- A. 1001 - 1500 B. 1501 - 2000 C. 2001 - 2500 D. 2501 - 3000
15. The ratio of the number of employees producing more than 2000 work units in 1978 to the number of employees producing more than 2000 work units in 1988?
- A. 1:2 B. 2:3 C. 3:4 D. 4:5
16. In Department D, which of the following were greater in 1988 than in 1978?
- 1 Total number of employees
2 Total number of work units produced
3 Number of employees producing 2000 or fewer work units
- A. 1, 2 and 3
B. 1 and 2, but not 3
C. 1 and 3, but not 2
D. 2 and 3, but not 1
17. Assume the following:

Unit S's production fluctuated substantially from one year to another. In 1969, Unit S's production was 100% greater than in 1968. In 1970, Unit S's production was 25% less than in 1969. In 1971, Unit S's production was 10% greater than in 1970.

On the basis of this information, it is correct to conclude that Unit S's production in 1971 exceeded Unit S's production in 1968 by
- A. 65% B. 85% C. 95% D. 135%
18. Agency "X" is moving into a new building. It has 1500 employees presently on its staff and does not contemplate much variance from this level. The new building contains 100 available offices each with a maximum capacity of 30 employees. It has been decided that only 2/3 of the maximum capacity of each office will be utilized. The total number of offices that will be occupied by Agency "X" is
- A. 30 B. 66 C. 75 D. 90

19. One typist completes a form letter every 5 minutes and another typist completes one every 6 minutes. If the two typists start together, how many minutes later will they again start typing new letters simultaneously and how many letters will they have completed by that time?

- A. 11 minutes - 30 letters
- B. 12 minutes - 24 letters
- C. 24 minutes - 12 letters
- D. 30 minutes - 11 letters

20. During one week a typist produces 10 fewer pages per hour of work than they usually do. If it ordinarily takes them six hours to produce a 300-page report, how many hours longer will that same 300-page report take them during the week when they produce more slowly?

- A. 1 1/2 hours longer
- B. 1 2/3 hours longer
- C. 2 hours longer
- D. 2 3/4 hours longer

21. Of the following, the biggest disadvantage in allowing a free flow of communications in an agency is that such a free flow

- A. decreases creativity
- B. increases the use of the "grapevine"
- C. lengthens the chain of command
- D. reduces the executive's power to direct the flow of information.

22. A downward flow of authority in an organization is one example of

- A. horizontal communications
- B. informal communications
- C. circular communications
- D. vertical communications.

23. Workers who belong to a cohesive group are generally thought to

- A. have more job related anxieties than those who do not
- B. be less well adjusted than those who do not
- C. derive little satisfaction from the group
- D. conform to group norms more closely than those in non cohesive groups.

8. D

18. C

9. C

14. C

19. D

10. C

15. A

20. A

11. C

16. B

21. D

12. D

17. A

22. D

23. D

2004-2005 5TH GRADE**ANSWERS****SOLUTIONS**

1. $(100+100)+(200+100)+(300+100) = 100+200+300+300$.

C

2. Two-dozen truckloads of dirt = $2 \times 12 = 24$ truckloads. Two fewer than that is $24 - 2 = 22$ truckloads.

- A) 10 B) 12 C) 20 D) 22

3. $27 \div 3 = 9$, and $9 = 3 \times 3$.

- A) 3 B) 6 C) 9 D) 27

4. For each coin that lands tails up, two land heads up. Make a list. Look for a sum of 9: 1t, 2h; 2t, 4h; 3t, 6h. Finally, $3+6 = 9$.

- A) 3 C) 5 D) 6

5. 19 tens – 19 ones = $(19 \times 10) - (19 \times 1) = 190 - 19 = 171$

- A) 1871 B) 342 C) 171 D) 9

6. $4 \times 8 \times 12 = 4 \times (4 \times 2) \times 12 = (4 \times 4) \times (2 \times 12) = 16 \times 24$.

- A) 32 B) 24 C) 20 D) 16

What's up?

7. My neck, which grows 5 cm in 10 days, grows $10 \times 5 = 50$ cm in $10 \times 10 = 100$ days.

- A) 5 B) 10 C) 25 D) 100

8. $(33+44+55+66) \div 11 = 3+4+5+6 = 18$.

- A) 18 B) 11 C) 9 D) 7

9. Even numbers divisible by 3 are divisible by 6.

- C) 366 D) 466

- C

10. Pete got \$3.60 in change, so 4 frozen pizzas cost Pete \$20.00 – \$3.60 = \$16.40. One frozen pizza cost Pete $\$16.40 \div 4 = \4.10 .

- A C) \$6.25 D) \$9

- C) \$6.25 D) \$9

- B) 9 C) 5 D) 3

11. $(48 \times 2) + (48 \times 3) + (48 \times 4) = 48 \times (2 + 3 + 4) = 48 \times 9$.

- B

Go on to the next page ►►►

2004-2005 5TH GRADE CONTEST SOLUTIONS**Answers**

12. The ratio $(4 \text{ side-lengths}) \div (2 \text{ side-lengths}) = 4 \div 2 = 2$.

- A) 1 B) 2 C) 4 D) 8

13. Four years ago, Tom was 8. Six years ago, he was 6. The average of 8 and 6 is 7.

- A) 11 B) 7 C) 5 D) 4

14. 12 hours before noon is 12 midnight. 12 minutes before 12 midnight is 11:48 PM. I was wandering around at 11:48 PM.

- A) 11:48 A.M. B) 12:12 A.M.

- C) 11:48 P.M. D) 12:12 P.M.

15. Two million = $2,000,000 = 2,000 \times 1000$.
 A) 200×100 B) 200×1000 C) 2000×1000 D) $20,000 \times 10$

- A) 9998 B) 9999

- C) 10,000

- D) 10,998

16. The greatest 3-digit number is 999, and the greatest 4-digit number is 9999. Their sum is $999 + 9999 = 10,998$.

- A) 9998

- B) 9999

- C) 10,000

- D) 10,998

17. The ape ate 6 bananas daily. It ate $5 \times 6 = 30$ bananas in 5 days.

- A) 20

- B) 24

- C) 30

- D) 120

18. Every side of the triangle is 6 cm long. The triangle's perimeter is $6+6+6 = 18$ cm.

- A) 2

- B) 6

- C) 18

- D) 36

19. First 6 months take about $6 \times 30 = 180$ days, so day 199 falls in month July.

- A) May

- B) June

- C) July

- D) August

Go on to the next page ►►►

5

Answers

12.

13.

14.

15.

16.

17.

18.

19.

20.

21.

5

2004-2005 6TH CONTEST

Answers

30. There are 90 2-digit numbers starting with 10 and ending with 99. Exactly half of them have an even digit-sum.
 A) 45 B) 48 C) 50 D) 52

31. $80 \text{ km in } 60 \text{ min.} = 8 \text{ km in } 6 \text{ min.} = 24 \text{ km in } 18 \text{ min.}$
 A) 20 B) 24 C) 28 D) 30

32. $2^{2005} = 2^1 \times 2^{2004} = 2^{2004} + 2^{2004}$.
 A) 1 B) 2 C) 2004 D) 2^{2004}

33. The sum is $2+3+5+7+(1+1)+(1+3)+(1+7)+(1+9) = 41$.
 A) 77 B) 76 C) 41 D) 40

34. If 4 pears weigh as much as 6 peaches, and 6 peaches weigh as much as 90 grapes, then 4 pears weigh as much as 90 grapes.
 A) 4 B) 6 C) 8 D) 12

35. The perimeter of the square is 32. A side has length 8, and the area is 64. Half of the square is shaded, so the shaded area is 32.
 A) 4 B) 8 C) 16 D) 32

36. $(51 - 1) + (52 - 2) + \dots + (99 - 49) + (100 - 50) = 50 + 50 + \dots + 50 + 1 = 50 \times 50 = 2500$.
 A) 2000 B) 2500 C) 2550 D) 5000

37. I spent \$360 for 110 services, 100 with a smile, 10 without. The 10 without a smile cost as much as 20 with a smile. It costs \$360 for 120 services with a smile, or \$3 for one service with a smile.
 A) \$3.00 B) \$3.15 C) \$3.30 D) \$3.45

38. In 24 hours, the hour hand goes around the clock 2 times, the minute hand 24 times, and the second hand $60 \times 24 = 1440$ times.
 A) 144 B) 1440 C) 1466 D) 86400

39. Try $2 \times 3 \times 5 = 60$, which is divisible by 2×3 , 2×5 , 3×5 , & $2 \times 3 \times 5$. The product of 3 primes is always divisible by 4 non-primes > 1 .
 A) 1 B) 2 C) 3 D) 4

40. Keep adding consecutive integers until you reach 120¢: $1¢ + 2¢ + 3¢ + \dots + 14¢ + 15¢ = 120¢$, so I am 15 years old.
 A) 10 B) 12 C) 15 D) 20

30. A

31. B

32. D

33. C

34. A

35. D

37. A

38. C

39. D

40. C



The end of the contest 6

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 Steven R. Conrad, Daniel Flegler, and Jeannine Kolbush, contest authors

A

A) 10

A) 60 B) 45

B) 30

A) 4

10.

12. The only positive divisor of 100 that is a multiple of 100 is 100.
A) 1 B) 10 C) 25 D) 100

A) 44

A) 1:1

A) even B) odd

Go on to the next page ►► 6

2

Go on to the next page ►►

6

3

SOLUTIONS

7TH GRADE CONTEST SOLUTIONS

Answers

- C) 7
C) 3
3. The sum is 180° . The 3rd angle must be $180^\circ - (20^\circ + 40^\circ) = 120^\circ$.
C) 90°

4. $3456 \times 0.001 = 3.456$. This rounds up to 3.5.
C
2
D

16. As shown, 2 squares with a common side form a rectangle. C
B) A hexagon
C) A rectangle
D) A

17. Each of the 9 numbers in the first sum is 1 more than the number in the same position in the second sum.
A) 9
B) 10
C) 90
D) 100

18. Uncle Bookworm eats 2 books a week, or
D
C
3
D

19. The largest odd factor of 81 is 81.
A) 3
B) 9
C) 27
D) 81

20. $(\frac{2}{3})^3 = \frac{2 \times 2 \times 2}{3 \times 3 \times 3} = \frac{8}{27}$.
A) 2
B) $\frac{6}{9}$
C) $\frac{8}{3}$
D) $\frac{8}{27}$

21. To seat the most students, put the students in seats 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, and 25. That's 13 seated students.
A) 11
B) 12
C) 13
D) 24

22. The smallest multiple of 10 that's greater than $9 \times 9 = 81$ is 90.
A) $9 \times 9 + 10$
B) 9.1×9.1
C) 9×10
D) 10×10

23. $\frac{6}{5} - \frac{5}{6} = \frac{36}{30} - \frac{25}{30} = \frac{11}{30}$.
A) $\frac{1}{5}$
B) $\frac{1}{6}$
C) $\frac{1}{30}$
D) $\frac{11}{30}$

24. The rear wheel's diameter is 6 cm more than the front wheel's. The rear wheel's circumference is $(d+6) \times \pi$ cm, which is 6π cm more than the front wheel's.
= $\boxed{3}$
B

25. All sides of a regular polygon have equal lengths.
A) 3π
B) 6π
C) 9π
D) 36π

26. My age could be 8 and yours could be 16. When you divide 16 by 5, the remainder is 1.
A) 1
B) 2
C) 3
D) 4

27. If a rectangle's perimeter is 30 cm, and its area is 56 cm^2 , then the longer side's length is 8 cm, and the shorter side's length is 7 cm.
B) 5
C) 20
D) 26

28. Try some numbers. One set that works is 12 and 13. (The sum always exceeds the difference by twice the smaller number.)
A) 0
B) 6
C) 12
D) 48

16. C
17. A
18. D
19. D
20. D
21. C
22. C
23. D
24. B
25. B
26. A
27. C
28. C

2004-2005 8TH GRADE CONTEST SOLUTIONS

Answers

8TH GRADE

Ans.

1. Subtract 1000 from each: 110–020. A) 102 B) 101 C) 90 D) 20 1. D

2. Each side of the square has $4 \div 4 = 1$. The square's area = 2. A

**THE
IS**

3. $300 \div 200 = 3/2 = 1 \times (3/2) = 1 \div (2/3)$.
A) $\frac{1}{3}$ B) $\frac{1}{2}$ C) $\frac{2}{3}$ D) $\frac{3}{2}$

4. Five-fourths = $5/4$, which is
A) $\frac{4}{5}$ B) $1\frac{1}{4}$

5. $(2005 - 2005) - 2004 = -2004$. A) 1 B) -2004 C) -2005 D) -2006 5. B

6. 120 seconds = 2 minutes, so the time is 12:02 A.M.
A) 12:02 P.M. B) 12:02 A.M. C) 2 P.M. D) 2 A.M.

7. $24 \div 4 \times 2 + 4 = [(24 \div 4) \times 2] + 4 = (6 \times 2) + 4 = 12 + 4 = 16$.

8. $\frac{1}{2} \times 4 = 2$, so its reciprocal is $\frac{1}{2} = 2 \times \frac{1}{4}$.
A) $2 \times \frac{1}{4}$ B) $\frac{1}{2} \times 4$ C) $\frac{1}{2} \times \frac{1}{4}$ D) 2×4

9. $1.000 - 0.995 = 0.005$; $1.000 - 0.990 = 0.010$;
 $1.010 - 1.000 = 0.010$; $1.100 - 1.000 = 0.100$.

- A) 0.995 B) 0.99 C) 1.01 D) 1.1

- not a prime, so the sum is $2+3+5+7 = 17$.
16 C) 17 D) 18

11. $2 \times \frac{1}{2} \times 4 \times \frac{1}{4} \times 6 \times \frac{1}{6} = (2 \times \frac{1}{2}) \times (4 \times \frac{1}{4}) \times (6 \times \frac{1}{6}) = 1 \times 1 \times 1 = 1$.
C) 12

12. The sum of the measures of each possible pair of angles is 120° , so each angle is 60° . Therefore, triangle T must be equiangular.
C) obtuse D) equiangular

13. B

- B) 4 C) 5 D) 6

14. D

- A) 7 B) $(-1)^2 = 1$ C) $(-2)^2 = 4$ D) $(-3)^2 = 9$

15. C

- B) 999.9 C) 99.99 D) 0.9999

16. B

- A) $\frac{1}{8}$ B) $\frac{1}{2}$ C) 2 D) 8

17. C

- A) 2% B) 4% C) 25% D) 50%

18. D

- A) 0.3 \times 0.4 = 0.12. B) 12% C) 120% D) 12000% 18. A

19. D

- A) 30 B) 24 C) 12 D) 10

20. C

- A) 0.2 B) 0.3 C) $\frac{2}{5}$ D) $\frac{3}{5}$

21. B

- A) I had 4 pennies; need 3 coins = 45¢, so I

- need 1 quarter, 2 coins = 20¢ are 2 dimes.

- A) 0 B) 1 C) 2 D) 7

22. C

- A) 0.221 m B) 2.21 m C) 22.1 m D) 221 m

23. B

- A) There are four even factors of 222. They are 2, 6, 74, and 222.

- C) 3

- D) 6

24. D

- A) 49.00 B) 49.50 C) 49.75

25. B

- A) 20 B) 25 C) 40 D) 50

26. D

- A) If $2/3$ cup of fish food feeds 8 goldfish,

- then $1/3$ cup feeds 4 fish, and $1/4$ cup

- feeds 12 fish. Thus, 4 cups feed 48 fish.

- A) 12 B) 24 C) 36 D) 48

27. C

- A) The square of an odd number is always odd.

- B) prime C) odd D) even

- C) even D) zero

- B) –

28. C

- A) Since the reciprocal of $\frac{1}{x^3}$ is x^3 , $4x = x^3$. The value $x = 2$ works.

- B) $\frac{1}{2}$ C) 2 D) 8

29. –

SOLUTIONS

Ans.

8TH GRADE

16.

Arithmetic Word Problems

Answer the first two questions based on the information below:

Over the course of a week you coded and recorded 201 reports on Monday, 207 reports on Tuesday, 356 on Wednesday, 72 on Thursday (when you went home early) and 413 on Friday. A total of 1,057 reports had come in altogether. How many did you code and report and how many were left for the next week?

- 1) Done: a) 948 b) 1,048 c) 1,047 d) 947
- 2) Left: a) 1,057 b) 9 c) 10 d) None
- 3) You must lay out a seating plan for a small office. The office is 10 ft by 16 ft. The Agency guideline is 100 square feet for an Associate Staff analyst (with desk and chair and cabinets) and 49 square feet for a clerical assistant. Following the Agency guidelines, what is the maximum number of staff that can be accommodated in the office?
a) One b) Two c) Three d) Four, with crowding
- 4) 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
- 5) Assume the Department of Citywide Administrative Services is giving an Associate Staff Analyst Open Competitive Exam and 5,712 candidates have filed to take the exam.

The Board of Education has offered the use of 32 classrooms at Roosevelt High School, 54 classrooms at Julia Richmond High School, 60 classrooms at the Music and Art High School and 78 classrooms at Murray Bergstrom High School for the exam. DCAS is limited to 36 candidates per classroom. What is the smallest number of schools that DCAS could use to avoid overcrowding. (You may ignore geographical convenience to the candidates.)

- a) 4 b) 3 c) 2 d) It depends.

- 6) In the 19th century British school masters used to ask students, "If a herring and a half cost a penny and a half, how many can you get for one shilling?" Please note that at the time there were 240 pennies, or twenty shillings, in one British pound.
- a) 1 ½ b) 6 c) 12 d) 20

- 7) The City used to pay civil servants once a month, years ago. By the 1960's the City had gone generally to biweekly payments. As a result, twenty-six biweekly pay checks are issued most years, but there are a number of days left over not covered by the pay checks.

In a non-leap year, how many days are not covered by the twenty-six paychecks?

- a) 1 b) 2 c) 7 d) 14
- 8) Since the City pays biweekly, and days are "left over" each year, there will be some years when the first day of the year is pay day, and the last day of the year is pay day. During such a year how many biweekly pay days will occur?
- a) 12 b) 26 c) 27 d) 25
- 9) Annual salaries are actually paid using calendar days to compute biweekly rate of pay. If a worker is earning \$73,000 annually, his or her regular biweekly gross salary (not including overtime) is \$2,800.

At the start of a fiscal leap year of 366 days the biweekly salary _____.

- a) stays the same b) gets a raise c) drops to \$2,792.35 d) drops to \$2,792
- 10) The Organization of Staff Analysts dues rate is .007 of a member's salary. Which of the five choices below is NOT equivalent to .007 of salary.
- a) 7/1000 b) .07% c) .7% d) seven one thousandths
- 11) As an Analyst at the Department of Design and Construction you have been sent out to measure the space available in a work site. The site is odd, with only three sides. Two sides form a right angle and measure three meters and four meters respectively. The third side's measurement is so hard to take due to obstacles that you use the formula $a^2 + b^2 = c^2$ to get an answer. The length of the third side is _____.

- a) 25 meters b) 25 yards c) 5 meters d) 15 feet

Answer the next three questions based on the information below:

John's hours are from 9:15 AM until 5:15 PM with duty free (unpaid) hour for Lunch. John worked overtime on Monday through Friday for two weeks straight. The first week he finished work at 6:30, 6:15, 6:15, 7:15 and 6:15 PM. The second week the work was more extensive and he worked until 7:30, 7:30, 7:15, 7:15 and 7:15 PM.

- 12) As a City employee, John's union contract calls for credit to be given in quarter hour segments after the first hour of overtime. How many hours did John work over time in the first week?
- a) 6 b) 6 $\frac{1}{4}$ c) 6 $\frac{1}{2}$ d) 6.15
- 13) How many hours did John work in the second week?
- a) 10 b) 10.30 c) 10 $\frac{1}{2}$ d) 1
- 14) John's union contract calls for time and one half after forty hours per week of work. John earns \$20 per hour. How much does John earn for overtime for the whole two weeks worked.
- a) Can't be computed. b) 102.50 c) 325.00 d) 402.50

Answer the next four questions based on the information below:

s

as follows:

16,15,17,17,13,4,5
18,18,21,17,17,8,6
17,16,18,17,19,8,17
11,14,17,17,17,8,9
17

- 15) What is the **mean** for the month?

a) 12 b) 14 c) 16 d) 17

- 16) What is the **median** for the month?

a) 12 b) 14 c) 16 d) 17

17) What is the mode for the month?

- a) 18 b) 14 c) 16 d) 17

18) What month is being recorded?

- a) January b) February c) March d) April

19) Mary worked part time for the City. Her hours worked in a single week were $3\frac{1}{4}$, $2\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{1}{4}$ and $3\frac{1}{4}$. How many hours did she work?

- a) 14 b) $12\frac{7}{4}$ c) $13\frac{3}{4}$ d) $13\frac{1}{2}$

20) As an Associate Staff Analyst at the Department of Health you are collecting data on flu shots given in Senior Centers. In Center A, 240 out of 300 seniors were vaccinated. Center B vaccinated 180 out of 240 and Center C gave shots to 90 out of 150 seniors. In your report, what is the fraction of all three centers' seniors who were inoculated? (Reduce to the lowest common denominator.)

- a) $510/690$ b) $17/23$ c) $255/345$ d) $\frac{3}{4}$

21) Unemployment insurance pays up to \$430 a week in benefits (twenty-five dollars of that is due to the temporary Obama stimulus.) If an Associate Staff Analyst earning \$73,000 per year is laid off, what percentage of his or her weekly gross does the UIB grant cover? (Round to the nearest percent.)

- a) 30% b) 50% c) 31% d) 22%

22)

ag
ps
to
d
your
raise.

. (Ignore union contractual longevity
monies.)

- a) \$90,000 b) \$108,000 c) \$86,400 d) \$72,000

itted provisional employees to avoid
for a new employee to join the current
s salary. The cost to the City is estimated
d savings to the City of a \$50,000 a year
employee not joining the pension plan (per year)?

- a) \$14,500 b) \$11,500 c) \$7,250 d) \$5,750

- 24) An Analyst at the Mayor's Office of Film and Television told her boss that the work on providing licenses was 44.7% complete. How much was left to complete?
- a) Less than half. b) 56.3% c) 55.3% d) 57.3%
- 25) Half of your coworkers took off today. Nine tenths of the rest are at lunch. Mazie, your coworker and you are the only Analysts available and the phones won't stop ringing. Each of your coworkers has a desk phone and so do you. How many coworkers do you have at the office today?
- a) 10 b) 20 c) 40 d) 19
- 26) As an Analyst at the Department of Consumer Affairs you are evaluating products for a consumer friendly newsletter. "Skippy" Peanut Butter is on sale in an 18 oz jar for \$1.98, or a 28 oz jar for \$3.08, or a 48 oz king size jar for \$5.28. The best buy is the _____. (Keep in mind that cost is a major factor, but not the only one.)
- a) 18 oz jar b) 28oz jar c) 48 oz jar d) cannot be determined
- 27) As an Associate Staff Analyst for the Department of Corrections you will need to purchase, per month, for the facility, an average of six retail size Mars bars per inmate. Since the bars cost 36 cents each and the facility holds 1,800 inmates with purchasing privileges, how many boxes of 36 bars do you need to order per month?
- a) 1,296 b) 10,800 c) 300 d) one for the Chief Warden will do.
- 28) As a Staff Analyst at the New York City System you are expected to be able to calculate pensions is "down". A candidate for retirement at age 62 is in T service and is due 2% per year of service times the number of years times the average of the last three years of service. The candidate earned \$58,000 three years ago, \$61,000 two years ago and \$64,000 last year. Leaving aside details, excess annuity etc., a "ball park" estimate of the probable retirement allowance would be...
- a) \$7,320 b) \$10,166.62 c) \$25, 600 d) \$24,400
- 29) As an Analyst for the Department of Transportation you have set up a car Counting sensor array on Pine Street. Between midnight and 5:30 AM a total of 165 vehicles passed along the street. The average number vehicle passing per hour is:
- a) unable to be determined b) 81 c) 110 d) 30

- 30) At FISA (The Financial Information Services Agency) only 1/3 of the ordered computers had been installed and 2/3 of those installed did not work. What fraction of the newly ordered computers were available to help the Analysts provide answers to emails seeking information?
- a) 1/3 b) 2/6 c) 1/9 d) 1/12
- 31) As an Associate Staff Analyst doing training at the Parks Department you teach 52 Park Rangers one week, 37 managers the next, 12 pruners and six cutters the following week and you close out the month with a week of instruction delivered to a mixture of 38 workers in clerical and administrative positions.
- How many staff did you instruct?
- a) 38 b) 112 c) 50 d) 145

Answer Key:

- | | | | |
|----------------|-------|-------|-------|
| 1. * no answer | 11. c | 21. c | 31. d |
| 2. b | 12. b | 22. c | |
| 3. c | 13. c | 23. a | |
| 4. c | 14. d | 24. c | |
| 5. b | 15. b | 25. a | |
| 6. c | 16. d | 26. d | |
| 7. a | 17. d | 27. c | |
| 8. c | 18. b | 28. d | |
| 9. c | 19. a | 29. d | |
| 10. b | 20. b | 30. c | |

BASIC MATH TIPS

- **Rounding Decimals:** The method for rounding decimals is almost identical to the method used for rounding whole numbers. Follow these steps to round off a decimal.
 1. Underline the place value to which you're rounding.
 2. Look to the immediate right (one place) of your underlined place value.
 3. Identify the number (the one to the right). If it is 5 or higher, round your underlined place value up 1 and drop all the numbers to the right of your underlined number. If the number (the one to the right) is 4 or less, leave your underlined place value as it is and drop all the numbers to the right of your underlined number.
- **Adding and Subtracting Decimals:** To add or subtract decimals, just line up the decimal points and then add or subtract in the same manner you would add or subtract whole numbers.
- **Multiplying Decimals:** multiply as usual. Then count the total number of digits above the line which are to the right of all decimal points. Place your decimal point in your answer so there us the same number of digits to the right of it as there was above the line.
- **Dividing Decimals:** is the same as dividing other numbers, except that if the divisor (the number you are dividing by) has a decimal, move it to the right as many places as necessary until it is a whole number. Then move the decimal point in the dividend (the number being divided into) the same number of places. Sometimes you may have to add zeros to the dividend (the number inside the division sign).
- **Changing fractions to decimals:** To change a fraction to a decimal, simply do what the operation says. In other words $13/20$ means 13 divided by 20. Insert decimal points and zeros accordingly.
- **Changing decimals to percents:** To change decimals to percents,
 1. Move the decimal point two places to the right.
 2. Insert a percent sign.
- **Changing percents to decimals:** To change percents to decimals,
 1. Eliminate the percent sign.
 2. Move the decimal point two places to the left.
(Sometimes, adding zeros is necessary).
- **Changing fractions to percents:** To change fraction to percents,
 1. Change to a decimal.
 2. Change the decimal to a percent.
- **Changing percents to fractions:** To change percents to fractions,
 1. Drop the percent sign.
 2. Write over one hundred.
 3. Reduce if necessary.