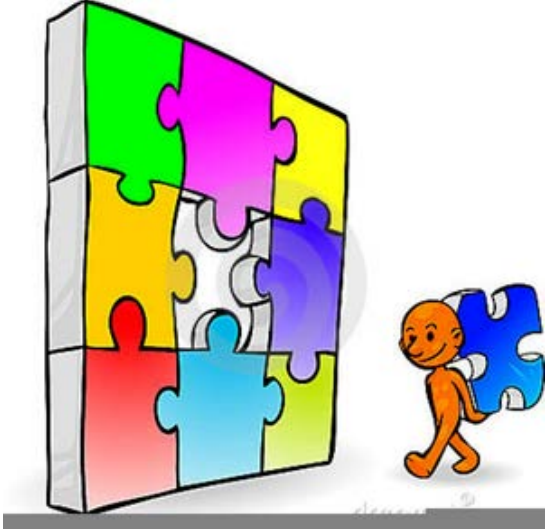


**PRAXIS CORE 5733 PRACTICE MATERIALS  
SOLUTIONS**



**I. Number and Quantity ~20 Questions 36% of Exam**

- Solve problems involving integers, decimals, and fractions
  - 7 EE B 3
- Solve problems involving ratios and proportions
  - 7 RP A 3
- Solve problems involving percent
  - 7 RP A 3
- Solve problems involving constant rates (e.g., miles per hour, gallons per mile, cubic feet per minute)
  - 7 RP A 1
- Demonstrate an understanding of place value, naming of decimal numbers, and ordering of numbers
  - 5 NBT A
- Demonstrate an understanding of the properties of whole numbers (e.g., factors, multiples, even and odd numbers, prime numbers, divisibility)
  - 4 OA A,B,C
- Identify counterexamples to statements using basic arithmetic
  - Part of number and quantity—no specific standard
- Solve real-life problems by identifying relevant numbers, information, or operations (including rounding)
  - 4 MD A
- Solve problems involving units, including unit conversion and measurements
  - 4 MD A

**ADDITIONAL TOPICS FOR NUMBER AND QUANTITY:**

- Place value.
- Commutative, associative, and distributive properties of numbers.
- Ratio and proportion: language, notation, difference between the two, real-world problems, problems involving ratios of 2 or 3 quantities.
- Relationships among fractions, decimals, per cents.
- Represent and use multiple representations among fractions, decimals, per cents, and integers.
- All operations with fractions and decimals.
- Constant rates of change.
- Relationships involving prime and composite numbers.
- GCD and LCM.
- Sort positive and negative integers and numbers in fraction or decimal form in increasing order and place them on a number line.
- Approximation of pi.
- Operations with simple square roots, e.g.  $\sqrt{5}$ ,  $\sqrt{20}$ ,  $\frac{\sqrt{50}}{2}$
- Operations with numbers that have integer exponents.
- Conversion of units, within and between, metric and U.S. standard.
- Counterexamples.
- Venn diagrams.
- Estimation and scaling.

1. Which number in the list is the greatest:  $\frac{3}{5}$  6% 0.611  $6.1 \times 10^{-2}$  ?

- a.  $\frac{3}{5}$
- b. 6%
- c. 0.611
- d.  $6.1 \times 10^{-2}$

If you change everything to a decimal  
 $\frac{3}{5} = .6$ ; 6% = .06;  $6.1 \times 10^{-2} = .061$

2. In the sequence of numbers below, 8 is the first number and every number after is 4 fewer than 2 times the preceding number. Find the next number in the list.

8, 12, 20, 36, ...

- a. 68
- b. 76
- c. 80
- d. 142

The rule is:  $2n - 4$ , where n is the preceding number  
 $2 \times 36 - 4 = 68$

3. If  $15x$  is between 11 and 12, which of the following could be a value of x?

- a.  $\frac{7}{8}$
- b.  $\frac{7}{9}$
- c.  $\frac{7}{10}$
- d.  $\frac{7}{11}$

Multiply each of the values by 15.  
 $15 \times \frac{7}{9} = 11.67$ ; which is between 11 and 12

4. Derek is purchasing lunch meat to make sandwiches for the class picnic. He knows that 300 people are attending the picnic. Derek estimates that for every 10 people at the picnic, 11 sandwiches are needed, and that 20 pounds of meat will make 90 sandwiches. How much lunch meat should Derek buy?

- a.  $73\frac{1}{3}$  pounds
- b.  $67\frac{2}{3}$  pounds
- c. 110 pounds
- d. 330 pounds

If for 300 people you will need 330 sandwiches then set up the proportion: 20 lbs of meat is to 90 sandwiches as x lbs of meat is to 330 sandwiches.  
 $\frac{20}{90} = \frac{x}{330}$ ;  $x = 73\frac{1}{3}$  pounds

5. A can of paint will cover 800 square feet. A painter is hired to paint 6 rooms. Each room has a surface area of 2,100 square feet. What is the fewest number of buckets of paint that must be used to paint all 6 rooms?

- a. 16 cans
- b. 17 cans
- c. 18 cans
- d. 120 cans

Total Surface Area = 6 rooms x 2100 sq. ft = 12600  
 $\frac{12600}{800} = 15.75$ ; 16 cans

6. When 6,327.59 is divided by 100, which digit of the resulting number is in the tenths' place?

- a. 2
- b. 5
- c. 7
- d. 9

When dividing by 10 or any power of 10 for every Zero move the decimal point one place to the left.

$$\frac{6327.59}{100} = 63.2759$$

7. The ratio of males to females in a school's eighth grade class is 5:6. If there are 132 students in the eighth-grade class, how many males are in the class?

- a. 12
- b. 22
- c. 24
- d. 60

If the ratio of males to females is 5:6 then the proportion of males is 5:11

$$\frac{5}{11} \times 132 = 60$$

8. Which value correctly satisfies this statement:  $\frac{2}{3} < \square < \frac{7}{9}$ ?

- a.  $\frac{1}{3}$
- b.  $\frac{1}{5}$
- c.  $\frac{1}{2}$
- d.  $\frac{7}{10}$

When comparing fractions, you can change to decimals, find common denominators or make a judgement based on the denominator. The larger the denominator the smaller the pieces, then look at the number of pieces that are taken and compare the size.

9. A bug travels 8.5 inches in 45 seconds. How far will it travel in 5 minutes?

- a. 42.5 inches
- b. 56.7 inches
- c. 75.2 inches
- d. 90.0 inches

Set up a proportion

$$\frac{8.5}{45} = \frac{x}{300}; x = 56.7 \text{ inches}$$

Make sure the units are all the same

10. A container holds 26.5 gallons of orange juice. How many one-quart containers will this fill?

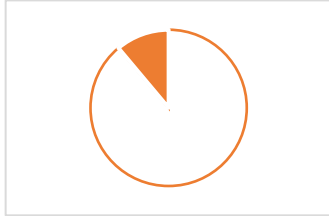
- a. 106 containers
- b. 100 containers
- c. 53 containers
- d. 30.5 containers

There are 4 quarts to a gallon;

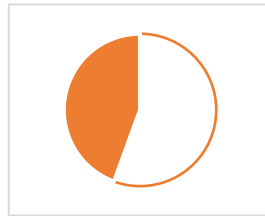
$$4 \times 26.5 = 106 \text{ containers or } \frac{4 \text{ quarts}}{1 \text{ gal}} = \frac{x \text{ quarts}}{26.5 \text{ gals}}$$

11. There are 45 students in a mathematics class, and 15 of them participate in the Math Club. Which of the shaded areas in the charts below represents the percentage of students who participate in the Math Club?

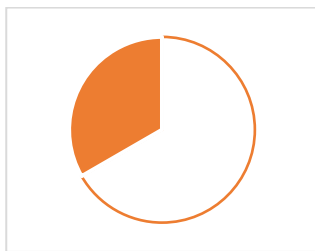
a.



c.



b.



d.



15 out of 45 is  $\frac{1}{3}$ ;

In comparing the shaded proportion of the circles (b) would represent

about  $\frac{1}{3}$  of the circle.

12. A car costs \$25,000 plus \$675.00 for title and tax fees. Frances pays \$2,500.00 as a down payment and takes out a three-year loan at 4% interest. What are her monthly payments?

- a. \$650.00
- b. \$669.50
- c. **\$721.00**
- d. \$722.50

Principal of the loan:  $\$25,000 + \$675 - \$2,500 = \$23,175$   
 $I = P \cdot R \cdot T: \$23,175 \cdot .04 \cdot 3 = \$2,781$   
 $(\$23,175 + \$2,781) / 36 = \$721.00$

13. The table gives the number of cars sold at a dealership from 2002-2006. What was the percent increase in sales from 2004 to 2005?

Year	Number of Cars Sold
2002	1430
2003	1300
2004	1580
2005	1817
2006	1900

- a. **15%**
- b. 18%
- c. 28%
- d. 32%

Percent of Increase/Decrease = Change/the original amt  
 $(1817 - 1580) / 1580 = .15 = 15\%$

14. At a breakfast buffet, 93 people chose coffee, 47 chose juice, and 25 people chose to have both. Each person at the buffet chose at least one beverage. How many people visited the buffet?

# who chose coffee + # who chose juice - # who chose both (counted twice)

$$93 + 47 - 25 = 115$$

15. 2.5 meters is how many kilometers?

- a. 0.0025 km.
- b. 0.25 km.
- c. 2,500 km.
- d. none of the above

A meter is .001 of a kilometer

$$2.5 * .001 = .0025$$

16. Scientific notation for a number is  $16.2 \times 10^{-3}$ . What is the standard form?

- a. 0.000162
- b. 0.0162
- c. 0.0486
- d. 4.860

$$16.2 * \frac{1}{1000} = .0162$$

17. The table shows the percentage of categories chosen, in terms of national origin of food, as favorites in a poll of club members. If 500 members were polled, how many more chose Mexican than Greek and Japanese combined?

Favorite Food	% Chosen
Italian	17
Mexican	24
Indian	5
Greek	8
Chinese	17
Japanese	14
Other	15

- a. 4
- b. 10
- c. 24
- d. 120

# who chose Greek & Japanese  $8\% + 14\% = 22\%$   
 $.22$  of 500 = 110  
 # who chose Mexican  $.24$  of 500 = 120  
 $120 - 110 = 10$

18. On a test, students were asked to supply an expression equivalent to the ratio 8:6. Which of the following students is/are correct?

**Student A:  $\frac{4}{3}$       Student B: 6:8      Student C:  $\frac{3}{2}$       Student D:  $\frac{8}{6}$**

- a. Student B
- b. Student D
- c. Students A and D**
- d. Students A, B, and D

8:6 can be simplified to 4:6  
Another way to write 8:6 is 8/6

19. Jamal plans a bike trip of 840 miles. He averages 160 miles per day. On what day does he arrive at his destination?

- a. 4<sup>th</sup> day
- b. 5<sup>th</sup> day
- c. 6<sup>th</sup> day**
- d. 7<sup>th</sup> day

$\frac{840}{160} = 5.25$  which would be on the 6<sup>th</sup> day

20. Which number is a counterexample to the statement that odd three-digit numbers are always prime?

- a. 101
- b. 113
- c. 129**
- d. 137

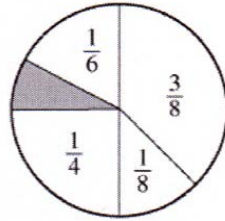
129 is divisible by 3 which contradicts the definition of a prime number.

21. A carper installer can install carpet at a rate of 12 yd<sup>2</sup>/hr. Approximately how long will it take her to install carpet in a 18.5 ft x 20 ft room and a 10 ft x 17 ft hall?

- a. 4.00 hours
- b. 5.00 hours**
- c. 6.00 hours
- d. 6.50 hours

Total area:  $18.5 \times 20 + 10 \times 17 = 540$  square feet  
The rate is in square yards convert sq.ft to sq.yds  
 $9 \text{ sq.ft} = 1 \text{ sq.yd.}$      $540 \text{ sq.ft} / 9 \text{ sq.yds} = 60 \text{ sq. yds}$ ; Rate of 12 sq.yds to 1 hour  
 $\frac{12}{1} = \frac{60}{x}$      $x = 5 \text{ hours}$

22. The circular region shown below is divided into five sectors. Four of the sectors are labeled with the fraction of the circle that the sector represents. What fraction is represented by the shaded sector?



- a.  $5/12$
- b.  $3/16$
- c.  $1/12$
- d.  $1/24$

Notice that the right side of the circle is equal to  $\frac{1}{2}$ ;

then the left is also  $\frac{1}{2}$

$$\frac{1}{2} - \left(\frac{1}{6} + \frac{1}{4}\right) = \frac{1}{12}$$

23. In a recipe for making large cookies,  $\frac{2}{5}$  of a cup of flour is needed for each cookie. If only  $4 \frac{4}{5}$  cups of flour are available, what is the maximum number of cookies that can be made?

cookies

If  $\frac{2}{5}$  of a cup of flour is needed for one cookie, then how many  $\frac{2}{5}$  cups are in  $4 \frac{4}{5}$

$$4 \frac{4}{5} \div \frac{2}{5} = 12 \quad \text{or} \quad \frac{2}{5} = \frac{4 \frac{4}{5}}{x} \quad x = 12 \text{ cookies}$$

24.  $\frac{2}{9}$  is less than which of these?

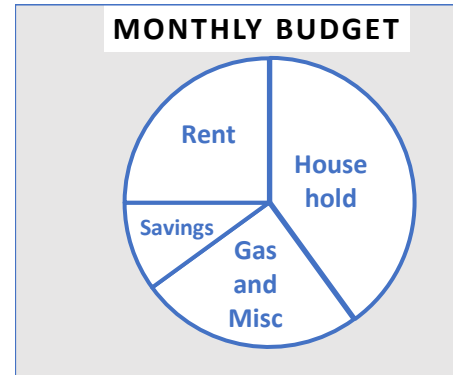
- a.  $\frac{1}{7}$
- b.  $\frac{4}{19}$
- c.  $\frac{1}{5}$
- d.  $\frac{2}{11}$
- e.  $\frac{3}{8}$

When comparing fractions, you can change to decimals, find common denominators or make a judgement based on the denominator. The larger the denominator the smaller the pieces, then look at the number of pieces that are taken and compare the size.



25. If you have \$5,200 budgeted for the month, according to the budget shown, approximately how much will you spend on rent?

- a. \$520
- b. \$1300
- c. \$2080
- d. \$2600



Rent represents  $\frac{1}{4}$  of the Monthly Budget (based on the sector)

$\frac{1}{4}$  of \$5200 = \$1300

SOLUTIONS: Number and Quantity

1. c
2. a
3. b
4. a
5. a
6. a
7. d
8. d
9. b
10. a
11. b
12. c
13. a
14. 115 people
15. a
16. b
17. b
18. c
19. c
20. c
21. b
22. c
23. 12 cookies
24. e
25. b

**II Data Interpretation and Representation,  
Statistics, and Probability ~18 Questions 32% of Exam**

- Work with data and data representations to solve problems
  - 3 MD B and S-ID A B
- Solve problems involving measures of central tendency (e.g., mean, median) and spread (e.g., range, standard deviation)
  - 6 SP B 5c
- Use data from a random sample to draw inferences about characteristics of a population
  - 7 SP A and S-IC
- Identify positive and negative linear relationships in scatterplots
  - 8 SP A 1
- Use a linear model for a data set to make predictions
  - 8 SP B 3
- Differentiate between correlation and causation
  - S-ID C 9
- Compute simple probabilities, and use probabilities to solve problems
  - 7 SP C




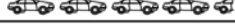
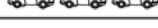
**ADDITIONAL TOPICS FOR DATA INTERPRETATION AND REPRESENTATION, STATISTICS, AND PROBABILITY:**



- Recognize the effect on mean, median, mode of a data set by adding a constant to all data or multiplying all data by a positive constant.
- Choose an appropriate graph based on a given set of data.
- Interpret diagrams of data sets (tables, charts, histograms, line-graphs, bar graphs, circle graphs, scatterplots, stem-and-leaf plots, pictographs, number lines, boxplots).
- Use counting techniques.
- Interpret a line of best fit for a given context.
- Compute probabilities of independent events.
- Justify conclusions about correlation or causation.
- Identify outliers.


1. What is the range of all integers greater than 40 and less than 99 that are multiples of 3 ?

- A. 54
- B. 56
- C. 57
- D. 59
- E. 60

Range = Largest value – smallest value  
 $96 - 42 = 54$

Salesperson	Number of Cars Sold
I	
II	
III	
IV	
V	

Each  represents half the number of cars represented by .

2. During a 5-day sale at a certain car dealership, 5 salespeople sold a total of 140 cars. The pictograph above represents the number of cars sold by each salesperson. How many cars does each  represent?

- A. 6
- B. 8
- C. 10
- D. 12
- E. 14

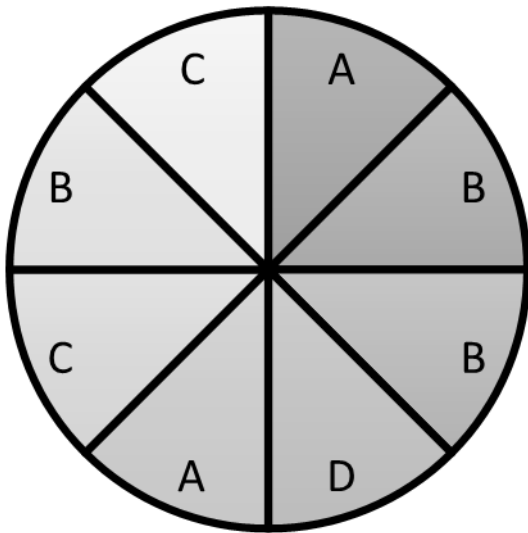
There are, a total of 17.5 cars  
 $140/17.5 = 8$

3. Results from a survey conducted in a certain grocery store showed that 3 out of 5 people preferred crispy-flakes cereal to crunchy-flakes cereal. Based on this survey, if a total of 2,500 customers bought one of these two cereals, how many most likely purchased crunchy-flakes cereal?

- A. 1,000
- B. 1,300
- C. 1,500
- D. 1,600
- E. 2,000

If 3 out of 5 prefer crispy-flakes cereal then  
 2 out of 5 prefer crunchy-flakes cereal (The total survey is  $2/5 + 3/5 = 1$ )  
 $(2/5)$  of 2500 = 1000

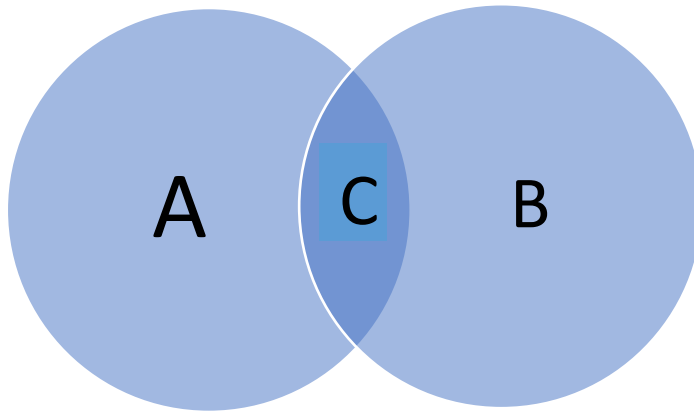
4. What is the probability of the spinner shown below stopping on the letter C?



- A.  $1/8$
- B.  $1/4$**
- C.  $3/4$
- D. 2

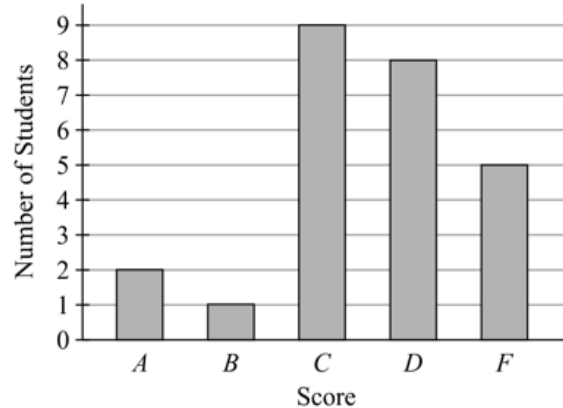
There are 8 sections of which 2 are labeled C  
 $2 \text{ out } 8 (2/8) = 1/4$

5. In the Venn Diagram below, circle A represents the integers from 3 to 13 inclusive, and circle B represents the integers from 5 to 15 inclusive. How many integers are represented in region C of the diagram?



- A. 2
- B. 8
- C. 9**
- D. 10

A {3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13}  
B {5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}  
They intersect C {5, 6, 7, 8, 9, 10, 11, 12, 13}



6. The figure above shows the frequency distribution of the letter grades received by the students in a class for a recent test. What fraction of the students in the class scored either a *B* or a *C*?

- A.  $2/25$
- B.  $1/5$
- C.  $8/25$
- D.  $9/25$
- E.  $2/5$

$B = 1/25$  and  $C = 9/25$  for a total of  $10/25 = 2/5$

7. In a parking lot there are only white cars, green cars, and red cars. If one car is selected at random from the lot, the probability that the selected car would be a green car is  $1/6$ , and the probability that it would be a red car is  $1/8$ . What is the probability that it would be a white car?

- A.  $1/7$
- B.  $7/12$
- C.  $2/3$
- D.  $17/24$
- E.  $5/6$

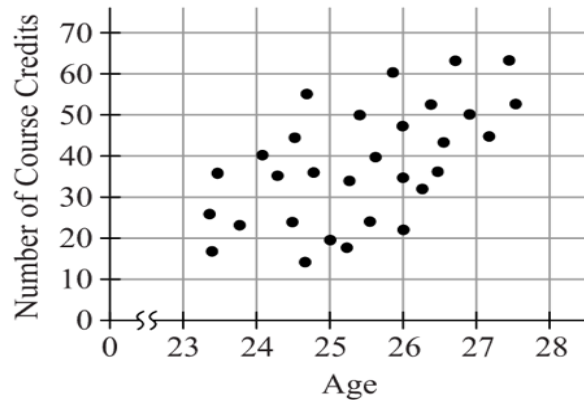
The sum of the probabilities of the sample space = 1  
 $P(\text{green}) = 1/6$ ;  $P(\text{red}) = 1/8$   
 $P(\text{white}) = 1 - (1/6 + 1/8) = 17/24$

8. There are 10 cars in a parking lot. Nine of the cars are 2,3,4,5,6,7,8,9, and 10 years old. If the average age of the cars is 6 years old, how old is the 10<sup>th</sup> car?

- A. 3 years old
- B. 4 years old
- C. 5 years old
- D. 6 years old**

$$\text{Average} = \frac{\sum x}{n}$$

$$6 = \frac{2+3+4+5+6+7+8+9+10+x}{10}$$



9. In the scatterplot above, each point represents the age, in years, and number of completed course credits for a group of 30 graduate students at a certain university. Of the students who have fewer than 40 completed course credits, what fraction are older than 24?

Give your answer as a fraction. —

There are 14 who had fewer than 40 credits and older than 24. So 14/30 (7/15)

10. Which of the following can have more than one value for a given set of data?

- A. Median
- B. Mode**
- C. Mean
- D. None of the above

Mode is the value that occurs most frequently; there can be more than one.

11. Mary goes to High School at Chilton High. School hours are 7:30A - 3P. Mary goes to lunch at 11A. At random there is a fire drill during the day, what would the probability be that the fire drill will begin before lunch?.

- A. 46.7%**
- B. 4.67%
- C. 47%
- D. 46%

There are a total of 450 minutes from 7:30A to 3P  
 There 210 minutes from 7:30A to 11A.  
 $P(\text{before } 11) = 210/450 = .4666 = 46.7\%$

12. Calls to a certain local rescue squad are categorized as accident, fire, medical, and other. Of the 240 calls last month,  $\frac{1}{8}$  of the calls were categorized as accident,  $\frac{1}{2}$  of the calls were fire,  $\frac{1}{4}$  of the calls were medical, and the remaining calls were other. Which of the following bar graphs best represents last month's calls?



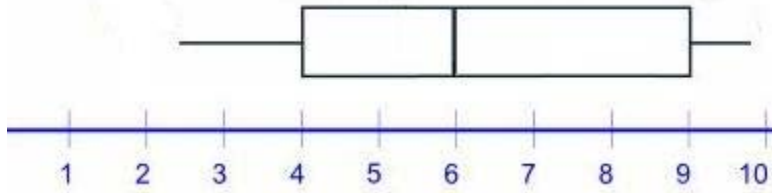
In analyzing the graphs based on the number of call and the probability of the categorized call

$\frac{1}{8}$  of 240 = 30;  $\frac{1}{2}$  of 240 = 120;  $\frac{1}{4}$  of 240 = 60

Then other is  $240 - (30 + 120 + 60) = 30$

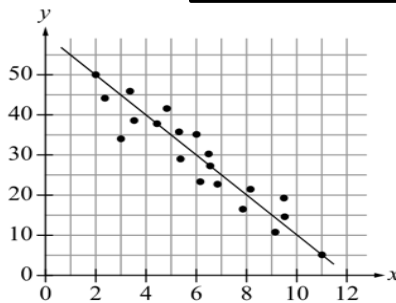


13. What is the IQR for the boxplot shown below?



- A. 2
- B. 3
- C. 5**
- D. 7.5

$IQR = Q_3 - Q_1;$   
 $Q_3 = 9, Q_1 = 4 \quad 9 - 4 = 5$



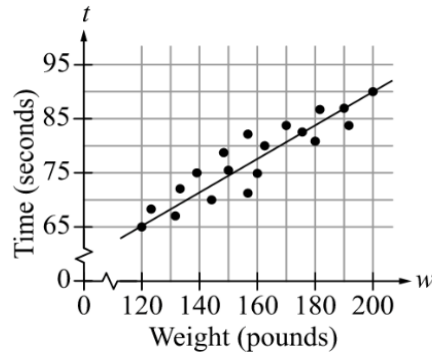
14. The scatterplot above shows 20 data points as well as a line of best fit for the data. Which of the following is the equation of the line of best fit?

Response	Number of Responses
Yes	340
No	98
No Comment	62

- A.  $y=140-9x$
- B.  $y=100-8x$
- C.  $y=60-5x$**
- D.  $y=43+x$
- E.  $y=56+6x$

Two points on the line are (2, 50) and (11, 5)  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 50}{11 - 2} = -5;$   
 Using  $y = b + mx$ ; and one of the points  
 $50 = (-5)2 + b \quad b = 60$   
 $v = 60 - 5x$

15. To find out how popular a particular television show is, a random sample of 500 viewers of the show’s first episode was asked, “Are you likely to watch this show again?” Based on the responses shown in the table above, approximately how many viewers in the estimated television audience of 1.2 million who watched the first episode are likely to watch the show again?



- A. 750,000
- B. 794,000
- C. 816,000**
- D. 828,000
- E. 845,000

Yes response is 340 then the Probability of Yes (340/500)

Number of viewers =  $(300/500) * 1,200,000 = 816,00$

16. Nineteen people ran 400 meters. Each point on the scatterplot above represents a person’s time (in seconds) to complete the run and the weight (in pounds) of that person. The scatterplot also shows a line of best fit for the data. According to the graph, each increase of 8 pounds in a runner’s weight tends to increase the runner’s time by approximately how many seconds?

- A. 2.0
- B. 2.5**
- C. 3.0
- D. 3.5
- E. 4.0

The slope of a line **represents** the change in y-value per unit change in x-value. Slope may be thought of as a rate of change

Finding the rate of change using the points of the line (120, 65) and (200, 90) =  $25/80$  which is  $2.5/8$ ; 2.5 seconds increase for every 8 lbs.

17. A fair die is rolled and a fair coin is tossed. What is the probability that the die shows an even number and the coin shows tails?

- A.  $1/2$
- B.  $1/4$
- C.  $1/6$
- D.  $1/12$

Probability of independent events: outcome of the first does not affect the outcome of the second then the  
 $P(a \text{ and } b) = P(a) * P(b)$   
 $P(\text{Even Number}) = 1/2; P(\text{Tail}) = 1/2$   
 $1/2 * 1/2 = 1/4$

18. A mathematics teacher determines that the median score for the most recent test was 80 percent. Which of the following is the most accurate interpretation of the result?

- A. Half the students scored below 80 percent
- B. The average score on the test was 80 percent.
- C. The most common score on the test is 80 percent.
- D. The highest score on the test was 80 percent.

Median is the middle value after the data has been ranked in order of magnitude (50% of the data values are smaller and 50% are larger)













19. A gym trunk contains 60 balls. 15 of these are soccer balls and the rest are a mixture of volleyballs and basketballs. If one ball is taken at random, the probability of drawing a basketball is  $4/15$ . How many of the balls are volleyballs?

- A. 15
- B. 16
- C. 29
- D. 31



Sum of the probability of the events of the sample space is equal to 1.  
 $P(\text{Soccer Ball}) = 15/60; P(\text{basketball}) = 4/15 = (16/60)$   
Then  $P(\text{volleyball}) = 1 - (15/60 + 16/60) = 29/60$   
there are 29 volleyballs

20. The pictograph below shows the results of a customer satisfaction survey by region. Each of the four regions has one salesperson. Salespeople each receive bonuses based on the amount of positive feedback they receive. If the salespeople from all four regions received \$540.00 in bonuses in total, how much bonus money does the company pay each individual salesperson per satisfied customer?

Each  represents feedback from 10 customers.

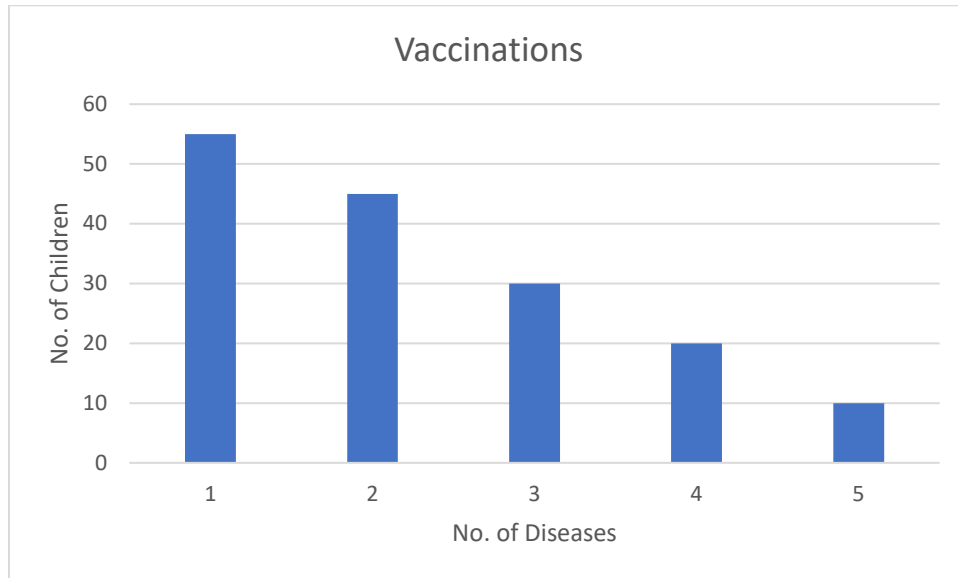
Region 1	   
Region 2	  
Region 3	 
Region 4	  

- A. \$4.00
- B. \$4.50**
- C. \$5.00
- D. \$5.40

There are 12 ; if each  represents 10; there are 120 customers (12\*10)

so each would get  $\frac{\$540}{120} = \$4.50$

21. In Metric Elementary School, parents are advised to have their children vaccinated against 5 childhood diseases. According to the chart below, how many children were vaccinated against at least three diseases?



- A. 30
- B. 50
- C. 60
- D. 130

At least 3 means 3 or more.  
 30 children had 3; 20 children had 4; 10 children had 5  
 $30 + 20 + 10 = 60$

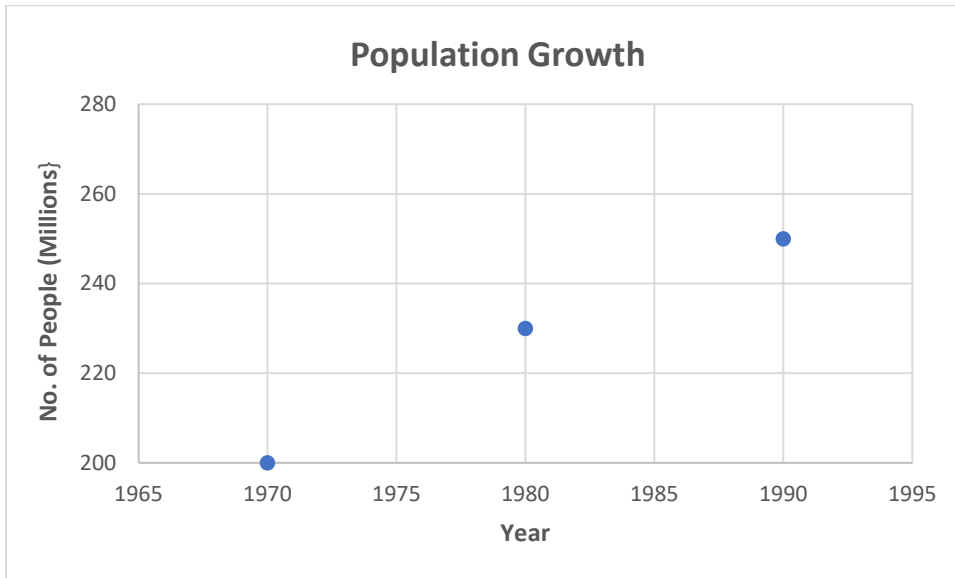
22. Suppose a study of speeding violations and drivers who use cell phones produced the following fictional data:

	Speeding Violations in the Last Year	No Speeding Violations in the Last Year
Car Cell Phone User	25	280
Not a Car Cell Phone User	45	405

Find the probability that a person chosen at random is a car cell phone user or had no speeding violations in the last year. Express your answer as a percent

Probability of  $P(a) \text{ or } P(b) = P(a) + P(b) - P(a \cap b)$   
 $P(\text{car cell phone}) = 305/755$ ;  $P(\text{no speeding violation}) = 685/755$   
 (The 280 is counted twice)  $P(a \cap b)$   
 $\text{Probability} = 305/755 + 685/755 - 280/755 = 710/755 = .94 = 94\%$

23. The graph below shows the approximate population of the U.S. from 1970-1990. Assuming the growth continued in the same manner, what would be a reasonable estimate for the population of the U.S. in 2010? Note that the axes do not start at zero.



- A. 250 million people
- B. 260 million people
- C. 270 million people
- D. 290 million people

Looking at the graph it appears that the rate of increase is about 2million/per in 20 years; then the population will increase about 40 million over 20 years.  
 250 million + 40 million = 290

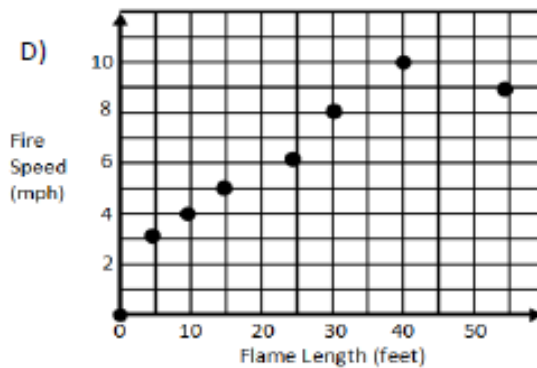
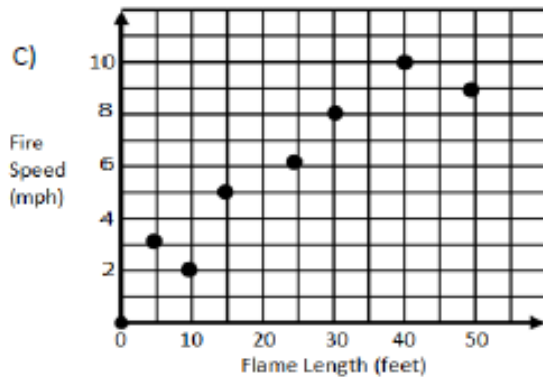
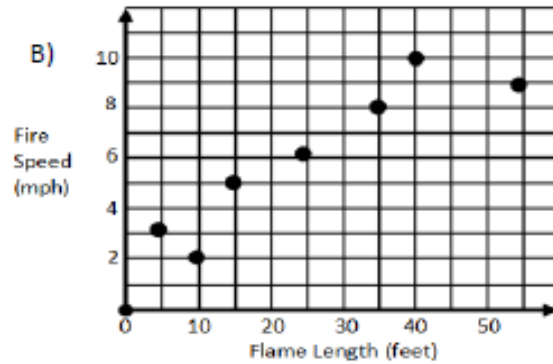
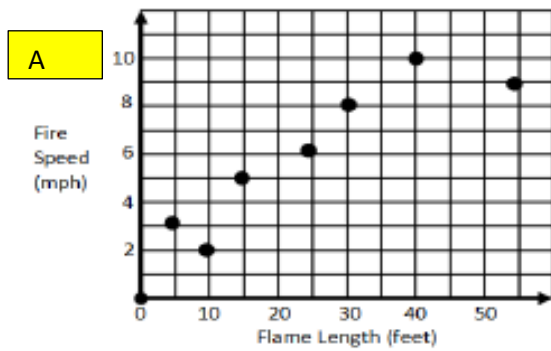
24. There are 3 red, 1 blue and 2 yellow marbles in a bag. Once a marble is selected it is replaced. Find the probability of selecting three red marbles in three tries.

- A. 1/5
- B. 1/20
- C. 1/15
- D. 1/8

$P(\text{of selecting a red marble}) = \frac{3}{6} = \frac{1}{2}$   
 The events are independent  
 $\frac{1}{2} * \frac{1}{2} * \frac{1}{2} = \frac{1}{8}$

25. Which scatter plot best represents the data given in the table?

Flame Length	Fire Speed (mph)
10	2
40	10
15	5
5	3
55	9
30	8
25	6



Looking at the points on the graph notice that

- Graph B does not have the point (30, 8)
- Graph C does not have the point (55, 9)
- Graph D the point (10, 2) is plotted at (10, 4)

SOLUTIONS: DATA AND STATISTICS

1. A
2. B
3. A
4. B
5. C
6. E
7. D
8. D
9. 7/15
10. B
11. A
12. A
13. C
14. C
15. C
16. B
17. B
18. A
19. C
20. B
21. C
22. 94%
23. D
24. D
25. A



**III Algebra and Geometry ~18 Questions 32% of Exam****ALGEBRA**

- Demonstrate an understanding of the properties (commutative, associative, and distributive) of the basic operations (addition, subtraction, multiplication, and division) without needing to know the names of the properties
  - 3 OA B and 7 NS A
- Demonstrate the ability to follow an arithmetic or algebraic procedure (e.g., using a step-by-step procedure, using a simple flowchart, applying a simple recurrence sequence) by carrying it out or analyzing it
  - F-BF A 1a
- Use properties of operations to identify or generate equivalent algebraic expressions (e.g., multiplication of whole numbers gives the same result as repeated addition, multiplication by 0.1 gives the same result as division by 10)
  - 7 EE A
- Write an equation or expression that models a real-life or mathematical problem
  - 5 OA A and 7 NS A 3
- Solve word problems, including problems involving linear relationships and problems that can be represented by Venn diagrams
  - 8 SP A 3; part of probability and statistics
- Solve linear equations in one variable algebraically
  - 8 EE C 7
- Solve simple quadratic equations (e.g.,  $x^2 = 49$  )
  - A-REI Bb

**GEOMETRY**

- Utilize basic properties of common two-dimensional shapes to solve problems
  - 5 G B
- Utilize facts about angles to solve problems
  - 7 G B 5
- Utilize facts about congruency and similarity of geometric figures to solve problems
  - 8 G A 2,4
- Use the formulas for the area and circumference of a circle to solve problems
  - 7 G B 4
- Use the formulas for the perimeter and area of a triangle and a rectangle and the formula for the volume of a rectangular prism (box) to solve problems
  - 5 MD C 5 b,c

**DISCUSSION AREAS FOR ALGEBRA AND GEOMETRY:**

- Difference between an algebraic expression and an algebraic equation.
- Find  $x$  in terms of  $y$  in a given problem.
- Demonstrate the similarities between operations with real numbers and with algebraic representations.
- Describe common mistakes students make applying the order of operations.
- Simplify algebraic expressions, e.g.  $2(x + 1) - 3(x - 2)$  or  $\frac{2x^2}{6x}$ .
- Plot a line in the  $xy$  plane, e.g.  $2x + 3y = 4$ .
- Determine slope of a line.
- Given the equation of a line, find another line with the same slope.
- Explain slope using tables, graphs, linear equations.
- Find the intercepts of a line.
- Given a linear equation, write steps needed to solve the equation, e.g.

$$\frac{1}{3}x + 1\frac{2}{3}x = \frac{5}{6}$$

- Solve simple quadratic equations.
- Plot the solution set to an equation or inequality on the number line.
- Given two points, find the equation of a line in slope-intercept form.
- Given the equation of a line in point-slope form, write the equation of a line in slope-intercept form.
- Classify triangles by their sides.
- Use a Venn diagram to classify special quadrilaterals.
- General characteristics that distinguish parallelograms, rectangles, squares, rhombuses, trapezoids.
- Identify congruent angles when two parallel lines are crossed by a transversal.
- Determine measures of angles formed by intersecting lines.
- Identify when triangles are congruent to find missing corresponding sides or angles.
- Characteristics of similar figures.
- Relationship between sides and areas of similar figures.
- Triangle inequality property relationship among the sides of a triangle.
- Find missing sides or angles of equilateral or isosceles triangles.
- Identify the measurement needed to find the area of a triangle and calculate the area.
- Properties of circles including radius, diameter, sector, central angle.
- Find the radius of a circle given the circumference.
- Properties of tangent lines (perpendicular to segments).
- Difference between inscribed and central angles of a circle.

1. What is the value of the expression  $\frac{x^2}{2} + xy^3$  when  $x = 4$  and  $y = -2$ ?

- A. -28
- B. -24
- C. -20
- D. -16

When  $x = 4$  and  $y = -2$ , the expression becomes  $\frac{4^2}{2} + (4)((-2)^3)$

$$= \frac{16}{2} + (4)(-8)$$

$$= 8 + (-32)$$

$$= -24.$$

2.  $(5m^3 + 2m^2 - m) + (m^2 + 4m - 2) =$

- A.  $5m^3 + 3m^2 - 5m + 2$
- B.  $5m^3 + 2m^2 - 5m - 2$
- C.  $5m^3 + 2m^2 + 3m + 2$
- D.  $5m^3 + 3m^2 + 3m - 2$

Only like terms may be combined. We combine like terms by adding or subtracting the coefficient of the term and keeping the variables and their exponents the same. For this problem, we can combine:  $2m^2$  and  $m^2$ . We can also combine  $-m$  and  $+4m$ . Note that the signs are important. The result is:

$$5m^3 + 3m^2 + 3m - 2$$

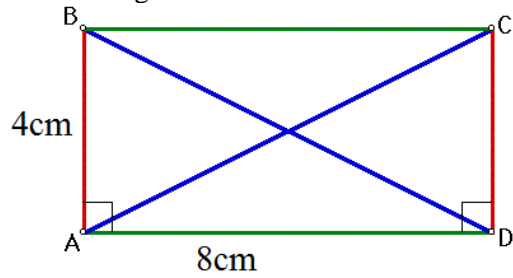
3. Kim rented a moving truck. The total cost included a one-time fee of \$40.00 and \$0.75 for each mile driven. Which equation represents the total cost,  $t$ , in dollars of renting a truck that was driven for  $n$  miles?

- A.  $t = 40 + 0.75n$
- B.  $t = 40 + \frac{0.75}{n}$
- C.  $t = 0.75 + 40n$
- D.  $t = 0.75 + \frac{40}{n}$

Total cost includes a fee of \$40.00. Each mile driven costs \$0.75 so  $n$  miles would cost \$0.75 $n$ . The total cost is the sum of these: .

$$t = 40 + 0.75n$$

4. The rectangle above is four centimeters high and 8 centimeters wide. What is the approximate length of each diagonal?



- A. 7 cm.
- B. 9 cm.**
- C. 10 cm.
- D. 12 cm.

The diagonals of the rectangle form right triangles. Consider triangle ACD with sides of 4 cm. and 8 cm. Using the Pythagorean theorem to find the diagonal (hypotenuse of the triangle), we get:  $8^2 + 4^2 = (CD)^2$ .  
 $80 = (CD)^2$   
Taking the square root of both sides, CD is approximately 9 cm.

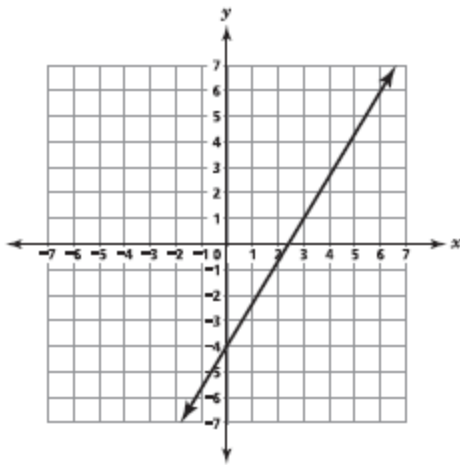
5.

Three forms of a straight line:

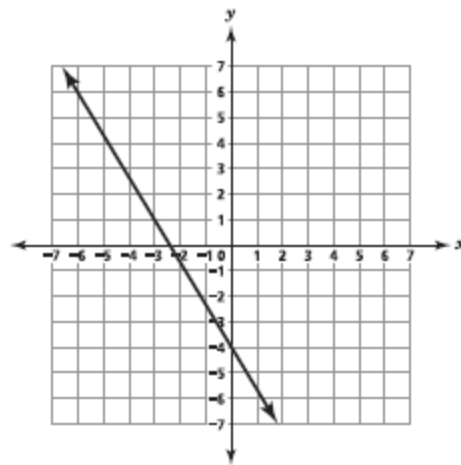
Point -intercept form:  $y = mx + b$  Point-slope form :  $y - y_1 = m(x - x_1)$  Standard form:  $Ax + By = C$

One way to solve this problem is to change the form of the equation of the line:  $5x - 3y = 12$  is solved for  $y$  to become:  $y = \frac{5}{3}x - 4$ . This tells us that the slope is positive and the  $y$ -intercept is at  $(0, -4)$ . The only possibility is graph A.

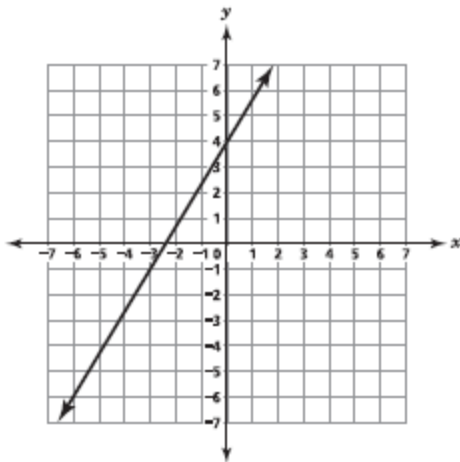
Which graph best represents the equation  $5x - 3y = 12$ ?



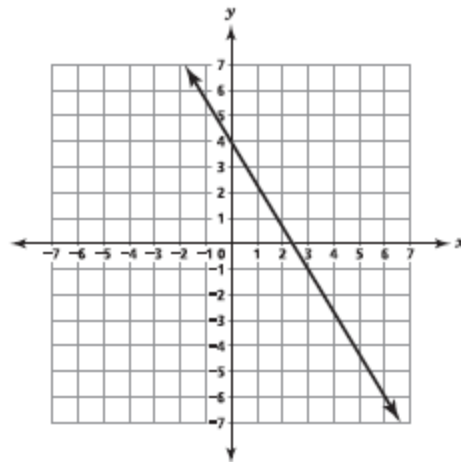
**A**



**C**



**B**



**D**

6. The distance in miles,  $y$ , a bicyclist is from home after riding  $x$  hours is represented by the equation  $y = 8x + 7$ . What does the slope represent in this equation?

- A. The number of hours it takes to ride 15 miles.
- B. The distance the bicyclist is from home when  $x = 0$ .
- C. The steepness of the hill the bicyclist is climbing.
- D. The speed of the bicyclist.

The slope of a line **represents** the change in  $y$ -value per unit change in  $x$ -value. **Slope** is the 'steepness' of the line, also commonly known as rise over run. Slope may be thought of as a rate of change

7. Which values of  $x$  satisfy the equation  $x^2 + x - 12 = 0$  ?

- A.  $x = -6$  and  $x = 2$
- B.  $x = -4$  and  $x = 3$
- C.  $x = -3$  and  $x = 4$
- D.  $x = -2$  and  $x = 6$

To solve quadratic equations by factoring, we *must* always have the equation set equal to zero first. The Zero Factor Principle tells me that at least one of the factors must be equal to zero. Since at least one of the factors must be zero, then I can set *each* of the factors equal to zero. Not all quadratic equations are able to be factored.

$$x^2 + x + 12 = 0$$

$$(x + 4)(x - 3) = 0$$

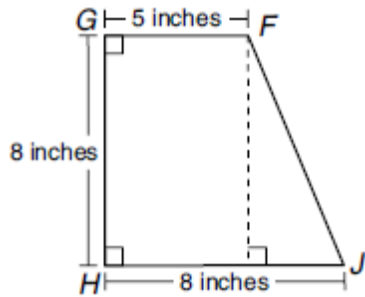
$$(x + 4) = 0 \text{ or } (x - 3) = 0 \text{ gives } x = -4 \text{ or } x = 3$$

8. If A and B are complimentary angles and the measure of angle A is  $x$ , which equation can be used to find the measure of angle B?

- A.  $y = 90 + x$
- B.  $y = 90 - x$
- C.  $y = 180 - x$
- D.  $y = 180 + x$

Complementary angles must add up to  $90^\circ$ . If angle A is called  $x$ , then its complement may be called  $y$ .  
 $x + y = 90$ . Solving for  $y$ , we find  $y = 90 - x$ .

9. The total area of trapezoid FGJJ is 52 square inches. What is the approximate length of  $\overline{FJ}$ ?



- A. 8.0 in.
- B. 8.5 in.**
- C. 11.0 in.
- D. 11.5 in.

We know that the dotted line is 8 inches. We also know that the length of the smaller line segment from the right angle to J must be 3 inches. FJ forms the hypotenuse of a right triangle. By using the Pythagorean, we find:

$$8^2 + 3^2 = ((FJ))^2$$

$$64 + 9 = 73 = ((FJ))^2$$

Estimating, the answer must be between 8 and 9.

Taking the square root of both sides, FJ is approximately 8.5 inches.

10. Which property of addition is shown?  $(g + h) + j = g + (h + j)$

- A. Commutative Property of Addition
- B. Distributive Property
- C. Associative Property of Addition**
- D. Identity Property

If  $a$ ,  $b$  and  $c$  are real numbers, variables or algebraic expressions:

Commutative Property of Addition  $a + b = b + a$

Commutative Property of Multiplication  $a \cdot b = b \cdot a$

Associative Property of Addition  $a + (b + c) = (a + b) + c$

Associative Property of Multiplication  $a \cdot (b \cdot c) = (a \cdot b) \cdot c$

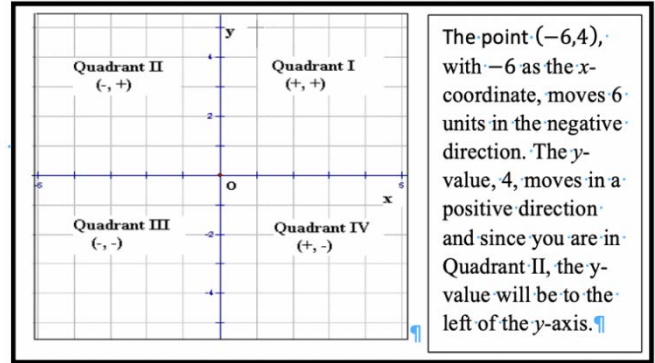
Distributive Property  $a \cdot (b + c) = a \cdot b + a \cdot c$

Additive Identity Property  $a + 0 = a$

Multiplicative Identity Property  $a \cdot 1 = a$

11. For the point  $(-6,4)$ , 4 is located where?

- A. To the left of the y-axis.
- B. To the right of the y-axis.
- C. On the y-axis.
- D. On the x-axis.



12. David wanted to go on an amusement park ride. A sign posted at the entrance read “You must be greater than 42 inches tall and no more than 57 inches tall for this ride.” Which inequality would model the height,  $x$ , required for this amusement park ride?

- A.  $42 < x \leq 57$
- B.  $42 > x \geq 57$
- C.  $42 > x$  or  $x \geq 57$
- D.  $42 < x$  or  $x \leq 57$

Let  $x$  equal the height. Greater than 42 inches means  $x > 42$ . **No more than** means up to and including 57 inches so  $x \leq 57$ . Both conditions must be satisfied:  $42 < x \leq 57$ .

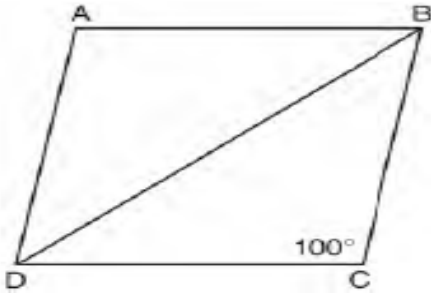
Examples: (suppose  $k$  is some number):

$x$  is at least  $k$   $x \geq k$

$x$  is at most  $k$   $x \leq k$



13. In rhombus ABCD, the measure of angle C is  $100^\circ$ . What is the measure of angle DBC?



- A.  $40^\circ$
- B.  $45^\circ$
- C.  $50^\circ$
- D.  $80^\circ$

Opposite interior **angles of a rhombus** are congruent. The four interior **angles of a rhombus** always add up to 360. A **rhombus** may be defined as a parallelogram with four equal sides.

If a **parallelogram** is a **rhombus**, each **diagonal bisects a pair of opposite angles**.

Since angle  $C=100^\circ$ , angle A must also equal  $100^\circ$ . That means angle B + angle D must add to  $160^\circ$  and so each measures  $80^\circ$ . The diagonal bisects the opposite angles, so angle DBC must equal  $40^\circ$ .

14. The formula for the volume of a cone is  $V = \frac{1}{3}\pi r^2 h$ . Solve the equation for  $h$  in terms of  $V$ ,  $r$ , and  $\pi$ .

$$V = \frac{1}{3}\pi r^2 h$$

$$3V = \pi r^2 h \quad (\text{Mul. Both sides by } 3)$$

$$\frac{3V}{\pi r^2} = h \quad (\text{Div. both sides by } \pi r^2)$$

15. Find the value of  $x$ .

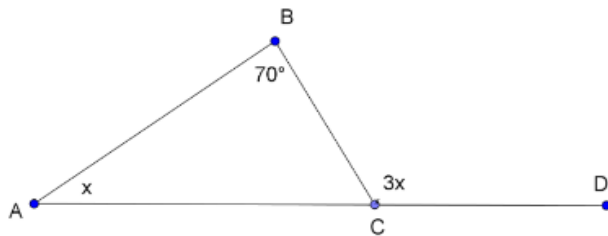


- A. 6.5
- B. 7
- C. 14
- D. 26

**Vertical angles** are **angles** that are opposite each other when two lines intersect each other. The two pairs of opposite **angles** are equal to each other. So, we can set these angles equal to each other and solve:

$$3x + 2 = 4x - 5 \text{ to get } x = 7.$$

16. Find the measure of  $\angle ACB$ .



- A.  $35^\circ$
- B.  $70^\circ$
- C.  $75^\circ$**
- D. Not enough information

We know that  $3x$  plus the unknown angle in the triangle must equal  $180^\circ$ . Call this unknown angle  $y$ . Then  $y + 3x = 180$  so  $y = 180 - 3x$ .

The sum of the angles of the triangle =  $180^\circ$ :  
 $70 + x + (180 - 3x) = 180$ .

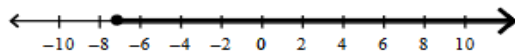
Solving, we get  $-2x = -70$  so  $x = 35$ .

The problem asks for  $\angle ACB$ . We now know  $x = 35$ .  $70^\circ + 35^\circ = 105^\circ$ .

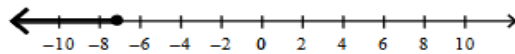
$\angle ACB = 180^\circ - 105^\circ = 75^\circ$ .

17. Which of the following represents the solution to  $3t - 12 \leq -9$ ?

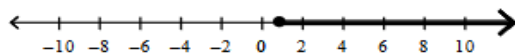
A.  $t \geq -7$



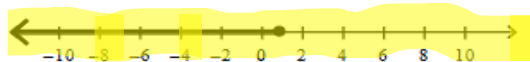
B.  $t \leq -7$



C.  $t \geq 1$



D.  $t \leq 1$



You may add or subtract the same number on both sides of the inequality and the inequality does not change.

When we multiply or divide an inequality by a positive integer, the inequality does not change.

When we multiply or divide an inequality by a negative integer, the sign of the inequality will be reversed.

Solving:  $3t - 12 \leq -9$

$3t \leq 3$  so  $t \leq 1$

18. Which choice is equivalent to the expression  $\frac{(a^3b)^4}{b^2}$  ?

- A.  $a^7b^2$   
 B.  $\frac{a^3}{b^2}$   
 C.  $\frac{a^{12}}{b^2}$   
 D.  $a^{12}b^2$

Assume  $a$  and  $b$  are nonzero real numbers and  $n$  and  $m$  are integers.

Some exponent rules:

1.  $a^n \cdot a^m = a^{n+m}$
2.  $a^n / a^m = a^{n-m}$
3.  $(b^n)^m = b^{n \cdot m}$
4.  $b^{-n} = 1 / b^n$
5.  $b^0 = 1$  if  $b$  is not equal to zero.

To simplify the numerator of the expression, use rule 3 to get  $a^{12}b^4$ .

Then use rule 2 to simplify  $\frac{(a^{12}b^4)}{b^2}$ . Result:  $a^{12}b^2$

19. What is wrong with using this expression to find the slope between  $(a,b)$  and  $(c,d)$ :

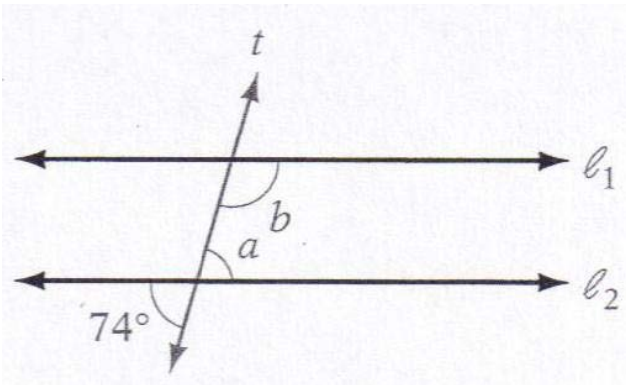
$$m = \frac{b - a}{d - c}$$

- A.  $b$  is a  $y$  value,  $a$  is a  $y$  value  
 B.  $b$  is a  $x$  value,  $a$  is a  $y$  value  
 C.  $a$  is an  $x$  value  
 D.  $b$  is a  $y$ -value,  $a$  is an  $x$ -value

The formula for slope is  $m = \frac{y_2 - y_1}{x_2 - x_1}$

The first coordinate of the point is an  $x$ -coordinate and the second is the  $y$ -coordinate. For the points given above, the slope formula is:  $m = \frac{d-b}{c-a}$  or  $m = \frac{b-d}{a-c}$ . Either is correct. You may designate either point as  $(x_2, y_2)$ . In the given solution, the numerator subtracts an  $x$ - and  $y$ -coordinate.

20. Find the measure of angle  $b$ .



- A.  $74^\circ$
- B.  $106^\circ$
- C.  $148^\circ$
- D.  $164^\circ$

When a **transversal** intersects two lines, those lines are parallel if and only if interior **angles on the same side** of the **transversal** and exterior **angles on the same side** of the **transversal** are supplementary (sum to  $180^\circ$ ).

**Vertical angles** are **angles** that are opposite each other when two lines intersect each other. The two pairs of opposite **angles** are equal to each other. The two pairs of neighboring **angles** are supplementary, meaning they add up to 180 **degrees**.

Angle  $a$  is a vertical angle to the  $74^\circ$  angle and so it, too, is  $74^\circ$ . Since angles  $a$  and  $b$  are on the same side of the transversal, they must sum to  $180^\circ$ . Angle  $b$  must equal  $106^\circ$ .

21. What is the product of the additive inverse and the multiplicative inverse of  $1/4$ ?

- A. -4
- B.  $-1/4$
- C. -1
- D.  $1/16$

The **additive inverse** of a number  $a$  is the number that, when added to  $a$ , yields zero. So, the additive inverse of  $1/4$  is  $-1/4$ .

The **multiplicative inverse** or reciprocal for a number  $x$ , denoted by  $1/x$  or  $x^{-1}$ , is a number which when multiplied by  $x$  yields the **multiplicative** identity, 1. So, the multiplicative inverse of  $1/4$  is 4.

The product:  $(-1/4)(4) = -1$ .

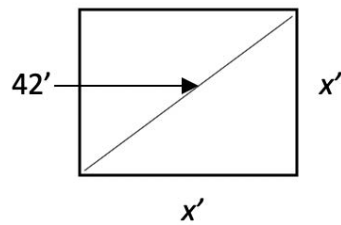
22. A positive integer is multiplied by 5; then 4 is subtracted from the result, and that result is divided by 7. Which of the following steps reverses that procedure?

- A. Divide the final number by 7, add 4, and multiply by 5.
- B. Divide the final number by 7, subtract 4, and multiply by 5.
- C. Multiply the final number by 7, add 4, and multiply by 5.
- D. Multiply the final number by 7, add 4, and divide by 5.**

Call the positive integer  $n$ .  
 Multiplied by 5:  $5n$   
 4 is subtracted from this result:  $5n-4$   
 That result is divided by 7:  $\frac{(5n-4)}{7}$   
 Think about what you need to do to get back to  $n$ . Multiply by 7:  
 $\frac{(5n-4)}{7}(7) = 5n - 4$   
 Add 4 to this expression:  
 $5n - 4 + 4 = 5n$  because  $-4 + 4 = 0$   
 Divide:  $\frac{5n}{5} = n$ .

23. A square garden has a diagonal path from one corner to another. If the path is about 42 feet long, what is the approximate length of each side of the garden?

- A. 6 ft.
- B. 21 ft.
- C. 30 ft.**
- D. 63 ft.



If the garden is a square, each side is equal, and you can call each side " $x$ ". These sides and the diagonal form a right triangle. Using the Pythagorean theorem:

$$x^2 + x^2 = 42^2$$

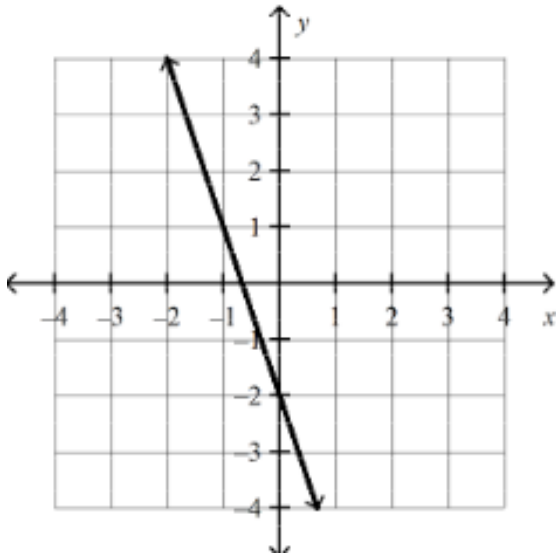
$$2x^2 = 1764$$

$$x^2 = 882$$

Taking the square root of both sides:  $x = \pm 29.7$  (approx.)

Only the positive answer can be considered as a measurement.

24. Which linear equation represents the graph?



A.  $y = -3x - 2$

B.  $y = 3x + 2$

C.  $y = -\frac{1}{3}x + 2$

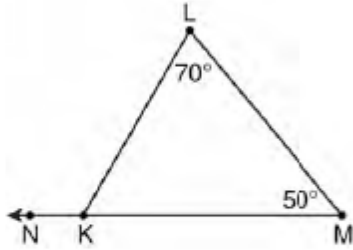
D.  $y = \frac{1}{3}x - 2$

The first thing to notice is that the graph must have a negative slope (falls to the right), so that eliminates choices B and D. If you notice that the  $y$ -intercept on the graph (where  $x=0$ ) is the point  $(0, -2)$ , it makes sense that choice A is the solution. To check, you could verify the slope of the line by choosing two points on the line --  $(0, -2)$  and  $(-1, 1)$ , for instance and calculating the slope:  $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$= \frac{1 - (-2)}{-1 - 0} = -3$$

So  $y = -3x - 2$

25. In the diagram of triangle KLM below, the measure of angle L =  $70^\circ$ , the measure of angle M =  $50^\circ$ , and  $\overline{MK}$  is extended through N. What is the measure of angle LKN?



- A.  $60^\circ$
- B.  $120^\circ$
- C.  $180^\circ$
- D.  $300^\circ$

Important things to remember: The sum of the angles in a triangle is  $180^\circ$ . Therefore, angle LKM must equal  $60^\circ$ . The sum of two angles that form a straight line (supplementary angles) is also  $180^\circ$ . This means that if angle LKM =  $60^\circ$ , angle LKN must equal  $120^\circ$ .

SOLUTIONS: ALGEBRA AND GEOMETRY

1. B
2. D
3. A
4. B
5. A
6. C
7. B
8. B
9. B
10. C
11. A
12. A
13. A
14.  $h = \frac{3V}{\pi r^2}$
15. B
16. C
17. D
18. D
19. D
20. B
21. C
22. D
23. C
24. A
25. B