# Day 10. 7/12 Monday

# Word Problems-1 Finish pages 1-15 by 7/13



# **Translation Verbal Phrases to Algebraic Expressions**

- **EXERCISE 1** seven more than the quotient of a number and 2 is 10.
- **EXERCISE 2** One less than the product of four and a number is 11.
- **EXERCISE 3** Ten less than twice a number is 20.
- **EXERCISE 4** The product of 8 and the difference of n and 3 is 2n.
- EXERCISE 5 a number decreased by 20%
- **EXERCISE 6** number of cents in x quarters
- **EXERCISE 7** number of cents in 2x dimes
- **EXERCISE 8** two consecutive integers
- **EXERCISE 9** two consecutive odd integers



**PRACTICE 1** John is four years older than Frank; the sum of their ages is 36.

**PRACTICE 2** Bob has five times as much money as John. Together, they have \$60.00.

**PRACTICE 3** The second angle is thirty degrees more than the first.

**PRACTICE 4** Mark earns a base salary of \$400 plus a 6% commission on all his sales.

**PRACTICE 5** The cell phone bill has a base fee of \$30 per month plus twenty cents per minute.

**PRACTICE 6** What are the dimensions of a rectangle whose length is 4 more than twice the width and whose perimeter is 3 less than 7 times the width.

**QUESTION 1** Matthew's kite string is three times as long as Joseph's. If the strings were tied together, they would reach a tenth of a mile. How long is each in feet? (1 mile = 5280 feet.)

**QUESTION 2** The perimeter of a rectangle is 108 inches. It is twice as long as it is wide. Find the length & the width.

**QUESTION 3**Arnold solved a certain number of problems and Bob solved 2 more than twice as many. Together they solved 38. How many did each solve?

**QUESTION 4** If 2 is added to a certain number, the result is the same as would be obtained if twice that number were subtracted from 32. What is the number?



### Linear Model Word Problems - In Class Notes Linear model: The key word to this type of question is "constant (rate)".

**EXAMPLE** A person travels home from work at a constant speed. Ten minutes after leaving work he is 20 miles from home, and 20 minutes after leaving work he is 12 miles from home. If he continues to travel at the same speed, how long will it take him to arrive home from work?

### **Linear Model Word Problems - In Class Practice**

### 1

At the beginning of a trip, the tank of Chloe's car was filled with 12 gallons of gas. When she travels constantly on the highway 60 miles per hour, the car consumes 1 gallon of gas per 35 miles. If she traveled 5 hours and 15 minutes on the highway with a constant speed of 60 miles per hour, how many gallons of gas are left in the tank?

- A) 3
- B) 4
- C) 5
- D) 6

### 2

A rock climber is climbing up a 450 feet high cliff. By 9:30 AM. the climber reached 90 feet up the cliff and by 11:00 AM he has reached 210 feet up the cliff. If he climbs with a constant speed, by what time will he reach the top of the cliff?

- A) 1:45 PM
- B) 2:00 PM
- C) 2:15 PM
- D) 2:30 PM



### Linear Model Word Problems – Homework

### 3

In 2005 a house was purchased for \$280,000 and in 2013 it was sold at \$334,000. Assuming that the value of the house increased at a constant annual rate what will be the price of the house in the year 2018?

- A) \$354,250
- B) \$361,000
- C) \$367,750
- D) \$374,500

### 5

From 1990 to 2000 The population of city A rose from 12,000 to 28,000 and the population of city Brose from 18,000 to 24,000. If the population of the two cities increased at a constant rate, in what year was the population of both cities the same?

### 4

To join Eastlake Country Club one must pay d dollars for a one time membership fee and pay w dollars for a monthly fee. If the first month is free for the club, what is the total amount, y,

x months after a person joined the club, in terms of d, w, and x?

- A) y = wx 1 + d
- B) y = w(x-1) + d
- $C) \quad y = d(x-1) + w$
- D) y = dx 1 + w

### 6

An empty 1,200 gallon tank is filled with water at a rate of 6 gallons of water per minute. At the same time, another 1,200 gallon tank full of water is being drained at a rate of 9 gallons per minute. How many minutes will it take for the amount of water in both tanks to become the same?



# System of equations Word Problems - In Class Practice

**PRACTICE 1** At a museum, Minjun bought 3 student tickets and 2 adult tickets for \$29.00. At the same museum Samantha bought 5 student tickets and 4 adult tickets for \$54.00. How much does one student ticket and one adult ticket cost?

**PRACTICE 2**  $\Box$  On the second weekend of July, Nathan hiked 10 less than twice the number of miles that he hiked on the first weekend of July. In these two weeks he hiked a total of 38 miles. How many miles did he hike on the first weekend?



## **System of equations Word Problems – Homework**

1

Adam and Betty purchased a printer together for \$258. If Adam paid \$18 less than twice Betty, how much money did Adam pay for the printer?

- A) 172
- B) 166
- C) 158
- D) 146

### 2

There are 28 tables for customers at Mesa Grill Restaurant. The tables are either two-seat tables or four-seat tables. When all the tables are full, there will be 90 customers in the restaurant. How many two-seat tables are at the restaurant?

A) 11

B) 13

C) 15

D) 17

### 3

In a basketball, a field goal is either 2 or 3 points. In a college basketball tournament, Jim made 73 more 2-point field goals than 3-point field goals. If he scored a total of 216 goals in the tournament how many 3-point field goals did he make?

- A) 12
- B) 14
- C) 16
- D) 18

### 4

In a car dealership, all of the vehicles are either a sedan or a SUV. If 36 sedans are sold and 36 SUVs are added, there will be an equal number of sedans and SUVs. If 8 SUVs are sold and 8 sedans are added, there will be twice as many sedans as SUVs. How many sedans were at the dealership before any vehicle was sold?

- A) 132
- B) 144
- C) 156
- D) 168

5

At a coffee shop, a 16 ounce bag of coffee is on sale at \$5.25 less than the regular price. The cost of 4 bags of coffee at regular price is the same as the cost of 6 bags of coffee at sale price. Let r be the regular price of coffee and s be the sale price of coffee. Which of the following systems of equations can be used to find the values of variables r and s?

A) 
$$\begin{cases} s = r - 16 \\ r = 6s \end{cases}$$
  
B) 
$$\begin{cases} s = r - 5.25 \\ 4r = 16 \end{cases}$$
  
C) 
$$\begin{cases} s = r - 5.25 \\ 4r = 6s \end{cases}$$

D) 
$$\begin{cases} s = r + 5.25\\ 4r = 6s \end{cases}$$



# Inequalities word problems – In Class Practice

- At least means:
- At most means:

**PRACTICE 1** Clara has \$500 in a savings account at the beginning of the summer. She wants to have at least \$200 in her account by the end of summer. She withdraws (takes out) \$25 a week for her cell phone bill. Write an inequality that represents Clara's account in n weeks.

**PRACTICE 2**  $\Box$  Apex Car Rental charges a flat fee of \$40.00 per day plus \$0.54 per mile to rent a car. Jason Car Rental charges a flat fee of \$65.00 per day plus \$0.36 per mile to rent a car. If a car is rented for three days, at least how many miles would you have to drive, to the nearest mile, to make the Jason Car Rental company the better option?

**PRACTICE 3**  $\square$  A 38-inch long wire is cut into two pieces. The longer piece has to be at least 3 inches longer than twice the shorter piece. What is the maximum length of the shorter piece, to the nearest inch?



# **Inequalities Word Problems - Homework**

1

Tom wants to rent a truck for two days and pay no more than \$300. How far can he drive the truck if the truck rental cost \$49 a day plus \$0.40 a mile?

- A) 490
- B) 505
- C) 520
- D) 535

### 2

Tim has 140 paperback and hard cover copies in his book shelf. If the hard cover copies do not exceed one sixth the number of paperback copies, what is the minimum number of paperback copies in Tim's book shelf?

- A) 114
- B) 116
- C) 118
- D) 120

### 3

The number of students in a geometry class is four fifths the number of students in a Spanish class. The total number of students in both classes does not exceed 54. What is the greatest possible number of students in the Spanish class?

- A) 30
- B) 32
- C) 34
- D) 36

### 4

At a sporting goods store, Jay paid \$172 for a pair of shoes and a pair of pants. The pants cost less than two thirds of what the shoes cost. What is the minimum price of the shoes to the nearest dollar?

### 5

Ty earns \$14 an hour working on weekdays and \$21 an hour working on weekends. If he wants to make at least \$600 by working a total of 36 hours in a week, to the nearest hour, at least how many hours does he need work on the weekends?



# Word problems Quiz – Homework

### Questions 1 - 3 refer to the following information.

The manager of an apartment building needs an electrician to repair the power generator for the building. The table below shows the fixed amount for a time service call and hourly charges for two different companies.

Company	Fixed amount for a service call	Hourly Rate
А	\$40	\$55
В	\$75	\$48

1

Which of the following equations gives the total cost, y, of repairing the power generator in terms of the total number of hours, x, from company A?

- A) y = 48x + 75
- B) y = 75x + 48
- C) y = 40x + 55
- D) y = 55x + 40

### 2

For what number of hours, x, will the total cost of repairing the generator for company B be less than or equal to the total cost of repairing the generator for company A?

A) 
$$x \ge \frac{5}{2}$$
  
B)  $x \le \frac{5}{2}$   
C)  $x \ge 5$   
D)  $x \le 5$ 

3

Company B's total cost, y, is the fixed amount for a service call plus the hourly rates. If the relationship between Company B's total cost, y, and the number of hours, x, is graphed in the xy-plane, what does the slope of the line represent?

- A) Fixed amount for a service call
- B) Hourly Rate
- C) Total amount for one day
- D) Total amount for repairing the power generator

### 4

Apex Car Rental company charges a flat fee of \$40.00 per day plus \$0.75 per mile to rent a car. Jason Car Rental company charges a flat fee of \$64.00 per day plus \$0.60 per mile to rent a car. If a car is rented for three days, at how many miles would the rental charges of the two companies be the same?

- A) 480
- B) 450
- C) 420
- D) 380

5

It took Sara a total of 42 minutes to jog from home to the park and back again, by the same path. If she averaged 8 miles per hour going to the park and 6 miles per hour coming back, what is the distance from her home to the park?

A) 2.4 miles

- B) 2.8 miles
- C) 3.2 miles
- D) 3.6 miles



Carl drove from his home to the beach at an average speed of 50 mph and returned home along the same route at an average speed of 30 mph. His total driving time for the trip was 2 hours. Solving which of the following systems of equations yields, x, the time it took for Carl to drive to the beach and, y, the time spent for the return trip?

- A) x = y + 250x = 30y
- B) x + y = 230x = 50y
- C) x + y = 250x = 30y
- D) y = x + 230x = 50y

### 7

To join Ace Gym, one must pay a \$180 membership fee plus dues of \$35 per month. To join Best Gym, one must pay a \$300 membership fee plus dues of \$23 per month. At how many months would the total cost of either gym be the same?

- A) 7
- B) 8
- C) 9
- D) 10

### 8

At a county fair the admission is \$8.00 and each ride costs \$1.25. If you go to the fair with \$20.00, what is the maximum number of rides you can go on?

- A) 8
- B) 9
- C) 10
- D) 11

### 9

A car averages 18 miles per gallon of gas for city driving and 27 miles per gallon of gas for highway driving. What is the total number of gallons of gas needed to drive 6x miles in the city and 18xmiles on the highway?

- A) *x*
- B) 2xC) 3.5x
- D) 4.5*x*

### 10

One section of a grocery store display only water bottles. The water bottles are in either 6-bottle packages or 8-bottle packages. Let x represent the number of 6-bottle packages and y represent the number of 8-bottle packages. The total number of packages displayed are 270 and the total number of bottles are 1,860. To find the values of variables x and y, which of the following systems of equations can be used?

A)  $\begin{cases} x + y = 1,860\\ 6x + 8y = 270 \end{cases}$ B)  $\begin{cases} 6x + 8y = 1,860\\ x + y = 270 \end{cases}$ 

C) 
$$\begin{cases} 8x + 6y = 1,860 \\ x + y = 270 \end{cases}$$

D) 
$$\begin{cases} x + y = 1,860\\ 8x + 6y = 270 \end{cases}$$



# **Solutions Word Problems Homework**

**EXAMPLE** 
How much water must be added to 12L of a 10% solution of salt to reduce to a 6% solution?

**PRACTICE 1**  $\square$  A pharmacist has 4 quarts of a 15% solution of iodine. How much water must he add to reduce it to a 10% solution?

**PRACTICE 2** 
How much water must be added to 30 L of a 75% solution of acid to reduce it to a 15% solution?

**PRACTICE 3** 
CHALLENGING One solution is 10% acid and another is 4% acid. How many liters of each should be mixed to obtain 150 L of a solution that is 6% acid?



## Homework due 7/13

Please go to the following link, finish all practice questions, and send the pictures. <u>https://www.khanacademy.org/mission/sat/practice/math</u>

hese skills focus on linear eq	uations, their graphs, and their appli	cations.	How-to examples
Solving linear equations a	nd linear inequalities	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Interpreting linear function	ns	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Linear equation word prob	lems	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Linear inequality word pro	blems	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Graphing linear equations		Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Linear function word prob	lems	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Systems of linear inequalit	ies word problems	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Solving systems of linear e	quations	Practice	<ul><li>Basic example</li><li>Harder example</li></ul>
Systems of linear equation	s word problems	Practice	Basic example Harder example





Jim has a triangular shelf system that attaches to his showerhead. The total height of the system is 18 inches, and there are three parallel shelves as shown above. What is the maximum height, in inches, of a shampoo bottle that can stand upright on the middle shelf?



In the triangle above, the sine of  $x^{\circ}$  is 0.6. What is the cosine of  $y^{\circ}$  ?

18

17

$$x^3 - 5x^2 + 2x - 10 = 0$$

For what real value of x is the equation above true?

19

# -3x + 4y = 206x + 3y = 15

If (x, y) is the solution to the system of equations above, what is the value of x ?

20

The mesosphere is the layer of Earth's atmosphere between 50 kilometers and 85 kilometers above Earth's surface. At a distance of 50 kilometers from Earth's surface, the temperature in the mesosphere is  $-5^{\circ}$  Celsius, and at a distance of 80 kilometers from Earth's surface, the temperature in the mesosphere is  $-80^{\circ}$  Celsius. For every additional 10 kilometers from Earth's surface, the temperature in the mesosphere decreases by  $k^{\circ}$  Celsius, where k is a constant. What is the value of k ?



A partially filled pool contains 600 gallons of water. A hose is turned on, and water flows into the pool at the rate of 8 gallons per minute. How many gallons of water will be in the pool after 70 minutes?

### 33

The *pes*, a Roman measure of length, is approximately equal to 11.65 inches. It is also equivalent to 16 smaller Roman units called digits. Based on these relationships, 75 Roman digits is equivalent to how many <u>feet</u>, to the nearest hundredth? (12 inches = 1 foot)

#### 32

The normal systolic blood pressure *P*, in millimeters of mercury, for an adult male *x* years old can be modeled by the equation  $P = \frac{x + 220}{2}$ . According to the model, for every increase of 1 year in age, by how many millimeters of mercury will the normal systolic blood pressure for an adult male increase?

#### 34

In a study of bat migration habits, 240 male bats and 160 female bats have been tagged. If 100 more female bats are tagged, how many more male bats must be tagged so that  $\frac{3}{5}$  of the total number of bats in the study are male?



# Day 11. 7/14 Wednesday

# Word Problems-2 Finish pages 16-22 by 7/15



# **Cost/profit word Problems - In Class Notes**

- Total value = number of items × value per item
- Profit = selling cost buying cost

**EXAMPLE**  $\Box$  A music store owner purchased x CDs for \$6.50 each. He sold all but 19 of them for \$12.00 each. If he made a profit of \$564.00, what is the value of x ?

**PRACTICE 1** Jiyoung has 20 coins consisting of quarters and dimes. If she has a total of \$3.05, how many dimes does she have?

**PRACTICE 2** Stephanie and Ian together earned \$109.50 this week. Stephanie worked 7 hrs and Ian worked 9.5 hrs. If each had worked three hours more, their combined pay would have been \$150. What is the hourly rate for each?

**PRACTICE 3** 
Ricky got a job in IT at a starting salary of \$28,000. Minjun got a job as a RN nurse at a starting salary of \$24,000. Ricky will receive an annual increase of \$600 and Minjun's annual increase will be 10% each year. In how many years will their salaries be equal?

**PRACTICE 4**  $\Box$  Clara bought x candies at a price of 80 cents each. If she sells all but 20 candies at a price of \$1.50 and makes a profit of \$19, what's x?

**PRACTICE 5**  $\Box$  the cost of a long-distance call is \$2 for first 5 minutes and 20 cents for each additional minute. What's the equation of the cost for making x minutes call?



# **Distance, rate, time Word Problems - In Class Notes**



### • Average speed=

Ex) What is the velocity of a car (in miles per hour) if it goes 40 miles in 35 minutes?

Most Common Word Problems:

- A. The distances are equal, or
- B. The sum of the distances equal a number
- Overtake: At the moment one person overtakes another, they have traveled the same distance.

**PRACTICE 1** Derrick starts out in his car traveling 30 mph. Four hours later, Cedrick starts out from the same point at 60 mph to overtake Derrick. In how many hours will he catch him?

**PRACTICE 2** A motorboat starts out and travels 9 miles an hour. In 3 hours another motorboat traveling 18 miles/hour starts out to overtake the first one. In how many hours will the second boat overtake the first?



# • Opposite Directions: Total distance traveled is the sum of the individual distances traveled.

**PRACTICE 4** Two trains start from the same station at the same time and travel in opposite directions. One train travels at an average rate of 40 mph, the other at 65 mph. In how many hours will they be 315 miles apart?

**PRACTICE 5** Two automobiles start from the same place and travel in opposite directions, one averaging 45 miles per hour and the other 30 miles per hour. In how many hours will they be 900 miles apart?

**PRACTICE 6** Two men, A and B, start toward each other at the same time from points 510 miles apart. If they travel 40 and 45 miles an hour respectively, in how many hours will they meet?

• Round Trip: The distance going = distance returning.

**PRACTICE 7** $\square$  Selina traveled 20miles at a speed of 15 miles per hour. If she returns along the same path and the entire trip takes 2 hours, at what speed did she return?

**PRACTICE 8** Lucas drove from his home to school at a speed of 50 mph and returned home along the same route at a speed of 30mph. If his total driving time for the trip was 40 minutes, how many minutes did it take him to drive from his home to school?



# Work problems – Homework



**EXAMPLE** Selina can build a dog house in 5hours and Kevin can build the same dog house in 10hours. How long does it take it for both to build the dog house at the same time?

**PRACTICE 1** In Nathan can paint the living room in 4 hours and James can paint it in 6 hours. How long will it take the two of them to paint the living room if they work together?

**PRACTICE 2**  $\Box$  Selina can mow the lawn in 2hours. If she mows the lawn with the help of her friend, Michelle, they can mow the lawn in 1hour and 20 minutes. How long would it take Michelle working alone to mow the lawn?



# **Revolution word problems – Homework**

**EXAMPLE** If a wheel is spinning at 120 revolutions per minute, how many revolutions will it make in t second?

**PRACTICE 1**  $\Box$  If a wheel with a radius of 0.7 ft makes 150 revolutions, how many feet in distance does it travel?

**PRACTICE 2** 
□ If a wheel makes 1000 degrees, how many revolutions does it make?

**PRACTICE 3**  $\Box$  If a wheel with a radius x meters makes 1000 meters, how many revolutions did it make? (Find the answer in terms of x)



## **Cost, distance Word problems - Homework**

-

	Distance to Finish Line (meters)
Jason	-8t + 200
Mary	-7.5t + 200

Jason and Mary are running on a 200 meter track. The expressions in the table above show the distance to the finish line t seconds after they started the race. How many meters will Mary have left to finish the race when Jason is on the finish line?

- A) 10.5 meters
- B) 11.5 meters
- C) 12.5 meters
- D) 13.5 meters

### 2

At a bagel shop the first 6 bagels purchased cost 55 cents apiece, and additional bagels cost c cents apiece. If a customer paid \$5.70 for 12 bagels, what is the value of c?

- A) 25
- B) 30
- C) 35
- D) 40

### 3

Manny bought c candies at a price of 70 cents each. He sold all but k candies at a price of \$1.25, and made a profit of p dollars. Which of the following represents p in terms of c and k?

- A) p = 1.25(c-k) 0.7c
- B) p = 1.25c 0.7k
- C) p = 1.25c 0.7(c k)
- D) p = 1.25(c-k) 0.7k

### 4

David used  $\frac{1}{10}$  of his monthly salary for groceries

and  $\frac{3}{18}$  of his remaining money for his car

payment. He also paid twice as much money for rent as for his car payment. If David has \$1,620 left after paying for groceries, car payment, and rent, how much is his monthly salary?

A) \$3,240

B) \$3,320

- C) \$3,480
- D) \$3,600

5

In a school election, 680 students voted for one of two candidates for president. If the winner received 120 more votes than the loser, how many votes did the winner receive?

### 6

If a gas tank contains 15 liters of gas and is  $\frac{3}{8}$  full,

how many additional liters of gas are needed to fill up the tank?



# Day 12. 7/16 Friday Homework due 7/18

# 3



# 3

### 1

Which of the following expressions is equal to 0 for some value of x ?

- A) |x-1| 1
- B) |x+1| + 1
- C) |1 x| + 1
- D) |x-1| + 1

### 3

# $\frac{x}{y} = 6$ 4(y+1) = x

If (x, y) is the solution to the system of equations above, what is the value of y ?

A) 2B) 4

C) 12

D) 24

### 2

$$f(x) = \frac{3}{2}x + b$$

In the function above, b is a constant. If f(6) = 7, what is the value of f(-2) ?

- A) -5
- B) -2
- C) 1
- D) 7

### 4

If f(x) = -2x + 5, what is f(-3x) equal to?

- A) -6x 5
- B) 6x + 5
- C) 6*x* 5
- D)  $6x^2 15x$



3(2x+1)(4x+1)

Which of the following is equivalent to the expression above?

- A) 45*x*
- B)  $24x^2 + 3$
- C)  $24x^2 + 18x + 3$
- D)  $18x^2 + 6$

#### 6

If  $\frac{a-b}{b} = \frac{3}{7}$ , which of the following must also be true?

- A)  $\frac{a}{b} = -\frac{4}{7}$
- B)  $\frac{a}{b} = \frac{10}{7}$

$$C) \quad \frac{a+b}{b} = \frac{10}{7}$$

$$D) \quad \frac{a-2b}{b} = -\frac{11}{7}$$

7

While preparing to run a marathon, Amelia created a training schedule in which the distance of her longest run every week increased by a constant amount. If Amelia's training schedule requires that her longest run in week 4 is a distance of 8 miles and her longest run in week 16 is a distance of 26 miles, which of the following best describes how the distance Amelia runs changes between week 4 and week 16 of her training schedule?

- A) Amelia increases the distance of her longest run by 0.5 miles each week.
- B) Amelia increases the distance of her longest run by 2 miles each week.
- C) Amelia increases the distance of her longest run by 2 miles every 3 weeks.
- D) Amelia increases the distance of her longest run by 1.5 miles each week.



Which of the following equations represents a line that is parallel to the line with equation  $v = -3x + 4^{2}$ 

$$y = -3x + 4 \leq$$

- A) 6x + 2y = 15
- B) 3x y = 7C) 2x - 3y = 6
- $(0) \quad 2\pi \quad 0 = 0$
- D) x + 3y = 1

### 10

If 
$$\frac{t+5}{t-5} = 10$$
, what is the value of t ?  
A)  $\frac{45}{11}$   
B) 5  
C)  $\frac{11}{2}$   
D)  $\frac{55}{9}$ 

#### 9

### $\sqrt{x-a} = x-4$

If a = 2, what is the solution set of the equation above?

- A)  $\{3, 6\}$
- B) {2}
- C) {3}
- D) {6}

### 11

# x = 2y + 5y = (2x - 3)(x + 9)

How many ordered pairs (x, y) satisfy the system of equations shown above?

- A) 0
- B) 1
- C) 2
- D) Infinitely many



Ken and Paul each ordered a sandwich at a restaurant. The price of Ken's sandwich was x dollars, and the price of Paul's sandwich was \$1 more than the price of Ken's sandwich. If Ken and Paul split the cost of the sandwiches evenly and each paid a 20% tip, which of the following expressions represents the amount, in dollars, each of them paid? (Assume there is no sales tax.)

- A) 0.2x + 0.2
- B) 0.5x + 0.1
- C) 1.2x + 0.6
- D) 2.4x + 1.2

13



The functions *f* and *g*, defined by  $f(x) = 8x^2 - 2$ and  $g(x) = -8x^2 + 2$ , are graphed in the *xy*-plane above. The graphs of *f* and *g* intersect at the points (*k*, 0) and (-*k*, 0). What is the value of *k* ?

- A)  $\frac{1}{4}$
- B)  $\frac{1}{2}$
- C) 1
- D) 2

### 14

$$\frac{8-i}{3-2i}$$

If the expression above is rewritten in the form a + bi, where *a* and *b* are real numbers, what is the value of *a* ? (Note:  $i = \sqrt{-1}$ )



15

$$x^2 - \frac{k}{2}x = 2p$$

In the quadratic equation above, k and p are constants. What are the solutions for x ?

A) 
$$x = \frac{k}{4} \pm \frac{\sqrt{k^2 + 2p}}{4}$$
  
B)  $x = \frac{k}{4} \pm \frac{\sqrt{k^2 + 32p}}{4}$   
C)  $x = \frac{k}{2} \pm \frac{\sqrt{k^2 + 32p}}{2}$   
D)  $x = \frac{k}{2} \pm \frac{\sqrt{k^2 + 32p}}{4}$ 





# 4

### 1

The monthly membership fee for an online television and movie service is \$9.80. The cost of viewing television shows online is included in the membership fee, but there is an additional fee of \$1.50 to rent each movie online. For one month, Jill's membership and movie rental fees were \$12.80. How many movies did Jill rent online that month?

- A) 1
- B) 2
- C) 3
- D) 4

### 2

One of the requirements for becoming a court reporter is the ability to type 225 words per minute. Donald can currently type 180 words per minute, and believes that with practice he can increase his typing speed by 5 words per minute each month. Which of the following represents the number of words per minute that Donald believes he will be able to type m months from now?

- A) 5 + 180m
- B) 225 + 5m
- C) 180 + 5*m*
- D) 180 5m

### 3

If a 3-pound pizza is sliced in half and each half is sliced into thirds, what is the weight, in ounces, of each of the slices? (1 pound = 16 ounces)

A) 4

- B) 6
- C) 8D) 16

4

Nick surveyed a random sample of the freshman class of his high school to determine whether the Fall Festival should be held in October or November. Of the 90 students surveyed, 25.6% preferred October. Based on this information, about how many students in the entire 225-person class would be expected to prefer having the Fall Festival in October?

- A) 50
- B) 60
- C) 75
- D) 80



The density of an object is equal to the mass of the object divided by the volume of the object. What is the volume, in milliliters, of an object with a mass of 24 grams and a density of 3 grams per milliliter?

- A) 0.125
- B) 8
- C) 21
- D) 72

### 6

Last week Raul worked 11 more hours than Angelica. If they worked a combined total of 59 hours, how many hours did Angelica work last week?

- A) 24
- B) 35
- C) 40
- D) 48

### Movies with Greatest Ticket Sales in 2012

MPAA	Type of movie				
rating	Action	Animated	Comedy	Drama	Total
PG	2	7	0	2	11
PG-13	10	0	4	8	22
R	6	0	5	6	17
Total	18	7	9	16	50

The table above represents the 50 movies that had the greatest ticket sales in 2012, categorized by movie type and Motion Picture Association of America (MPAA) rating. What proportion of the movies are comedies with a PG-13 rating?

- A)  $\frac{2}{25}$
- B)  $\frac{9}{50}$
- C)  $\frac{2}{11}$
- D)  $\frac{11}{25}$

8

Line  $\ell$  in the *xy*-plane contains points from each of Quadrants II, III, and IV, but no points from Quadrant I. Which of the following must be true?

- A) The slope of line  $\ell$  is undefined.
- B) The slope of line  $\ell$  is zero.
- C) The slope of line  $\ell$  is positive.
- D) The slope of line  $\ell$  is negative.



		Age, in years				
Region	18 to 24	25 to 44	45 to 64	65 to 74	75 and older	Total
Northeast	2,713	8,159	10,986	3,342	2,775	27,975
Midwest	3,453	11,237	13,865	4,221	3,350	36,126
South	5,210	18,072	21,346	7,272	4,969	56,869
West	3,390	10,428	11,598	3,785	2,986	32,187
Total	14,766	47,896	57,795	18,620	14,080	153,157

### Number of Registered Voters in the United States in 2012, in Thousands

The table above shows the number of registered voters in 2012, in thousands, in four geographic regions and five age groups. Based on the table, if a registered voter who was 18 to 44 years old in 2012 is chosen at random, which of the following is closest to the probability that the registered voter was from the Midwest region?

A) 0.10

9

B) 0.25

C) 0.40

D) 0.75



### Questions 10 and 11 refer to the following information.



A curator at a wildlife society created the scatterplot above to examine the relationship between the gestation period and life expectancy of 10 species of animals.

### 10

What is the life expectancy, in years, of the animal that has the longest gestation period?

- A) 3
- B) 4
- C) 8
- D) 10

### 11

Of the labeled points, which represents the animal for which the ratio of life expectancy to gestation period is greatest?

- A) *A*
- B) *B*
- C) *C*
- D) *D*

12

In the *xy*-plane, the graph of function f has *x*-intercepts at -3, -1, and 1. Which of the following could define f?

- A) f(x) = (x-3)(x-1)(x+1)
- B)  $f(x) = (x-3)(x-1)^2$
- C) f(x) = (x-1)(x+1)(x+3)
- D)  $f(x) = (x+1)^2(x+3)$



The population of mosquitoes in a swamp is estimated over the course of twenty weeks, as shown in the table.

Time (weeks)	Population
0	100
5	1,000
10	10,000
15	100,000
20	1,000,000

Which of the following best describes the relationship between time and the estimated population of mosquitoes during the twenty weeks?

- A) Increasing linear
- B) Decreasing linear
- C) Exponential growth
- D) Exponential decay

14

$$1,000 \left(1 + \frac{r}{1,200}\right)^{12}$$

The expression above gives the amount of money, in dollars, generated in a year by a \$1,000 deposit in a bank account that pays an annual interest rate of r%, compounded monthly. Which of the following expressions shows how much additional money is generated at an interest rate of 5% than at an interest rate of 3% ?

A) 
$$1,000 \left(1 + \frac{5-3}{1,200}\right)^{12}$$

B) 
$$1,000 \left( 1 + \frac{\frac{5}{3}}{1,200} \right)^{12}$$

C) 
$$\frac{1,000\left(1+\frac{5}{1,200}\right)^{12}}{1,000\left(1+\frac{3}{1,200}\right)^{12}}$$

D) 
$$1,000 \left(1 + \frac{5}{1,200}\right)^{12} - 1,000 \left(1 + \frac{3}{1,200}\right)^{12}$$



Which of the following scatterplots shows a relationship that is appropriately modeled with the equation  $y = ax^b$ , where *a* is positive and *b* is negative?



### Questions 16 and 17 refer to the following information.

Mr. Martinson is building a concrete patio in his backyard and deciding where to buy the materials and rent the tools needed for the project. The table below shows the materials' cost and daily rental costs for three different stores.

Store	Materials' Cost, <i>M</i> (dollars)	Rental cost of wheelbarrow, <i>W</i> (dollars per day)	Rental cost of concrete mixer, <i>K</i> (dollars per day)
Α	750	15	65
В	600	25	80
С	700	20	70

The total cost, *y*, for buying the materials and renting the tools in terms of the number of days, *x*, is given by y = M + (W + K)x.

#### 16

For what number of days, *x*, will the total cost of buying the materials and renting the tools from Store B be less than or equal to the total cost of buying the materials and renting the tools from Store A ?

- A)  $x \le 6$
- B)  $x \ge 6$
- C)  $x \le 7.3$
- D)  $x \ge 7.3$



If the relationship between the total cost, *y*, of buying the materials and renting the tools at Store C and the number of days, *x*, for which the tools are rented is graphed in the *xy*-plane, what does the slope of the line represent?

- A) The total cost of the project
- B) The total cost of the materials
- C) The total daily cost of the project
- D) The total daily rental costs of the tools

### 18

Jim has identical drinking glasses each in the shape of a right circular cylinder with internal diameter of 3 inches. He pours milk from a gallon jug into each glass until it is full. If the height of milk in each glass is about 6 inches, what is the largest number of full milk glasses that he can pour from one gallon of milk? (Note: There are 231 cubic inches in 1 gallon.)

- A) 2
- B) 4

C) 5

D) 6

### 19

If  $3p - 2 \ge 1$ , what is the least possible value of 3p + 2?

A) 5

- B) 3
- C) 2
- D) 1



The mass of living organisms in a lake is defined to be the biomass of the lake. If the biomass in a lake doubles each year, which of the following graphs could model the biomass in the lake as a function of time? (Note: In each graph below, *O* represents (0, 0).)



0

2



### Questions 21 and 22 refer to the following information.



The bar graph above shows renewable energy consumption in quadrillions of British thermal units (Btu) in the United States, by energy source, for several energy sources in the years 2000 and 2010.

### 21

In a scatterplot of this data, where renewable energy consumption in the year 2000 is plotted along the *x*-axis and renewable energy consumption in the year 2010 is plotted along the *y*-axis for each of the given energy sources, how many data points would be above the line y = x?

A) 1

B) 2

C) 3

D) 4



Of the following, which best approximates the percent decrease in consumption of wood power in the United States from 2000 to 2010 ?

- A) 6%
- B) 11%
- C) 21%
- D) 26%

### 23

The tables below give the distribution of high temperatures in degrees Fahrenheit (°F) for City A and City B over the same 21 days in March.

City	~ A
( 11)	V A
On	y 1 L

Temperature (°F)	Frequency
80	3
79	14
78	2
77	1
76	1

City	$_{7} \mathbf{R}$
on	YЪ

Temperature (°F)	Frequency
80	6
79	3
78	2
77	4
76	6

Which of the following is true about the data shown for these 21 days?

- A) The standard deviation of temperatures in City A is larger.
- B) The standard deviation of temperatures in City B is larger.
- C) The standard deviation of temperatures in City A is the same as that of City B.
- D) The standard deviation of temperatures in these cities cannot be calculated with the data provided.





In the circle above, segment *AB* is a diameter. If the length of arc  $\widehat{ADB}$  is  $8\pi$ , what is the length of the radius of the circle?

- A) 2
- B) 4
- C) 8
- D) 16

$$f(x) = 2x^{3} + 6x^{2} + 4x$$
$$g(x) = x^{2} + 3x + 2$$

The polynomials f(x) and g(x) are defined above. Which of the following polynomials is divisible by 2x + 3?

A) h(x) = f(x) + g(x)B) p(x) = f(x) + 3g(x)C) r(x) = 2f(x) + 3g(x)D) s(x) = 3f(x) + 2g(x)

26

Let *x* and *y* be numbers such that -y < x < y. Which of the following must be true?

- I. x < y
- II. x > 0
- III. y > 0
- A) I only
- B) I and II only
- C) I and III only
- D) I, II, and III



The relative housing cost for a US city is defined to be the ratio  $\frac{\text{average housing cost for the city}}{\text{national average housing cost}}$ , expressed as a percent.



The scatterplot above shows the relative housing cost and the population density for several large US cities in the year 2005. The line of best fit is also shown and has equation y = 0.0125x + 61. Which of the following best explains how the number 61 in the equation relates to the scatterplot?

- A) In 2005, the lowest housing cost in the United States was about \$61 per month.
- B) In 2005, the lowest housing cost in the United States was about 61% of the highest housing cost.
- C) In 2005, even in cities with low population densities, housing costs were never below 61% of the national average.
- D) In 2005, even in cities with low population densities, housing costs were likely at least 61% of the national average.



$$f(x) = (x+6)(x-4)$$

Which of the following is an equivalent form of the function f above in which the minimum value of f appears as a constant or coefficient?

- $f(x) = x^2 24$
- B)  $f(x) = x^2 + 2x 24$
- C)  $f(x) = (x-1)^2 21$
- D)  $f(x) = (x+1)^2 25$

#### 29

If x is the average (arithmetic mean) of m and 9, y is the average of 2m and 15, and z is the average of 3m and 18, what is the average of x, y, and z in terms of m?

- A) *m* + 6
- B) *m* + 7
- C) 2m + 14
- D) 3m + 21

#### Skip31-34

### 35

 $q = \frac{1}{2}nv^2$ 

The dynamic pressure q generated by a fluid moving with velocity v can be found using the formula above, where n is the constant density of the fluid. An aeronautical engineer uses the formula to find the dynamic pressure of a fluid moving with velocity vand the same fluid moving with velocity 1.5v. What is the ratio of the dynamic pressure of the faster fluid to the dynamic pressure of the slower fluid?



The function  $f(x) = x^3 - x^2 - x - \frac{11}{4}$  is graphed in the *xy*-plane above. If *k* is a constant such that the equation f(x) = k has three real solutions, which of the following could be the value of *k* ?

A) 2
B) 0
C) -2
D) -3

36



Note: Figure not drawn to scale.

In the figure above, the circle has center *O* and has radius 10. If the length of arc  $\widehat{AB}$  (shown in bold) is between 5 and 6, what is one possible <u>integer</u> value of *x* ?



## Questions 37 and 38 refer to the following information.

The stock price of one share in a certain company is worth \$360 today. A stock analyst believes that the stock will lose 28 percent of its value each week for the next three weeks. The analyst uses the equation  $V = 360(r)^t$ to model the value, *V*, of the stock after *t* weeks.

### 37

What value should the analyst use for r ?

### 38

To the nearest dollar, what does the analyst believe the value of the stock will be at the end of three weeks? (Note: Disregard the \$ sign when gridding your answer.)

Math Test No Calculator Answers			Math Test Calculator Answers			
	1 A	11 C	1 B	11 A	21 C	31 1160
	2 A	12 C	2 C	12 C	22 B	32 1/2 or 0.5
	3 A	13 B	3 C	13 C	23 B	33 4.55
	4 B	14 A	4 B	14 D	24 C	34 150
	5 C	15 B	5 B	15 B	25 B	35 9/4 or 2.25
	6 B	16 9	6 A	16 A	26 C	36 29, 30, 31, 32, 33, or 34
	7 D	17 3/5 or 0.6	7 A	17 D	27 D	37 0.72
	8 A	18 5	8 D	18 C	28 D	38 134
	9 D	19 0	9 B	19 A	29 B	
	10 D	20 25	10 A	20 C	30 D	

