

## Math 1 Unit 1 EOC Review

## Solving Equations (including Literal Equations)

- Get the variable <sup>(by itself)</sup> isolated to show what it equals to satisfy the equation or inequality
- Steps (each step only where necessary):
  1. Distribute
  2. Same Side Combine (like terms)
  3. Opposite Sides Cancel (a variable)
  4. Solve two-step equation

## Concept Questions:

1. Why do we use "opposite" operations to solve an equation?  
to undo the given operation
2. What does the solution to an equation represent?  
the value of the number that makes the equation true (equal on both sides)
3. What key words in a word problem can help determine the operations to set up an equation?  
sum, difference, times, quotient, Product, etc.

## Parts of Expressions

Coefficient - # multiplied by variable variable - a letter

Constant - plain number Exponent - the power of a base

In the expression  $5x^3 - 7x^2 + 4$ , name the: Term(s) -  $5x^3, -7x^2, 4$ Coefficient(s) -  $5, -7$  Variable(s) -  $x$  Constant(s) -  $4$  Exponent(s) -  $3, 2$ 

## Concept Question:

1. What is the difference between how terms are separated in expressions and how factors are separated?

↓  
separated  
by "+" "-"

↓  
separated  
by Parenthesis

## Function Intro

A function is a rule in which each input (usually  $x$ ) yields exactly one output (usually  $y$ ).

Domain - X-values Range - Y-values

When we evaluate functions, we substitute the independent variable and evaluate the expression. (X-value)

Example: Evaluate  $h(4)$  for  $h(t) = -4.9t^2 + 20t + 3$ .

$$-4.9(4)^2 + 20(4) + 3$$

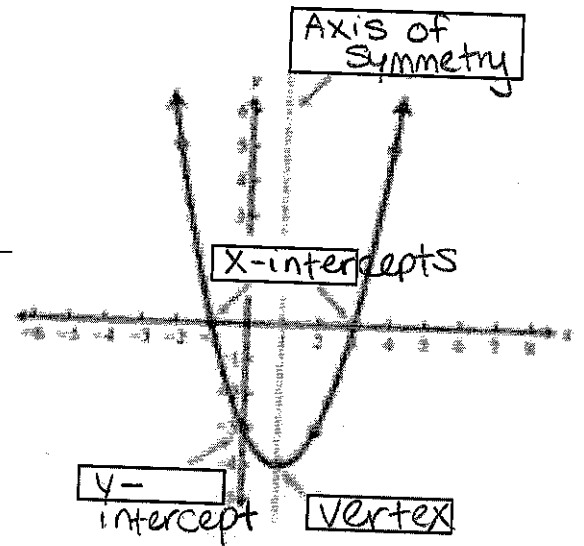
Concept Question: Write a mathematical relation that is NOT a function (has more than one  $y$  for an  $x$ ) and explain.  $(2,4), (3,7), (4,9), (2,-3), (5,2)$

## Key Features of Graphs

Intercepts: Points where a graph intersects the  $x$  or  $y$  axis.

Vertex: maximum or minimum point on a function

Axis of Symmetry: Line that cuts a function vertically in half



Concept Questions:

1. What is the  $x$ -value for every  $y$ -intercept? What is the  $y$ -value for every  $x$ -intercept? Why are these the case?  
zero zero They are crossing an axis

2. Does the graph of a line have a vertex? Why or why not?

No, lines do not have a point at which they change direction

↳ so no vertex

# Math 1 Unit 1 Sample Problems

5

6 Two boys, Shawn and Curtis, went for a walk. Shawn began walking 20 seconds earlier than Curtis.

- Shawn walked at a speed of 5 feet per second.  $m=5$   $b=100$
- Curtis walked at a speed of 6 feet per second.  $m=6$   $b=0$

For how many seconds had Shawn been walking at the moment when the two boys had walked exactly the same distance?

Shawn  
 $y = 5x + 100$

Curtis  
 $y = 6x$

$$\begin{array}{r} 5x + 100 = 6x \\ -5x \quad \quad -5x \\ \hline \end{array}$$

$$x = 100$$

100 seconds

14 A school purchases boxes of candy bars.

- Each box contains 50 candy bars.
- Each box costs \$30.

How much does the school have to charge for each candy bar to make a profit of \$10 per box?

- A \$0.40
- B \$0.50
- C \$0.80
- D \$1.25

$$\begin{array}{l} 50x - 30 = 10 \\ 50x = 40 \\ x = 0.80 \end{array}$$

15 Energy and mass are related by the formula  $E = mc^2$ .

- $m$  is the mass of the object.
- $c$  is the speed of light.

Which equation finds  $m$ , given  $E$  and  $c$ ?

- A  $m = E - c^2$
- B  $m = Ec^2$
- C  $m = \frac{c^2}{E}$
- D  $m = \frac{E}{c^2}$

$$\frac{E}{c^2} = \frac{mc^2}{c^2}$$

28

John mixed cashews and almonds.

- John bought 4 pounds of almonds for a total cost of \$22.
- The cost per pound for cashews is 60% more than the cost per pound for almonds.
- John bought enough cashews that, when he mixed them with the almonds, the mixture had a value of \$6.50 per pound.

Approximately what percent of the mixture, by weight, was cashews?

- A 20%
- B 25%
- C 30%**
- D 35%

	Amount	cost per pound	Total cost
Alm.	4	5.50	22
Cash	X	$5.50 + .6(5.50)$ 8.80	8.80X
Mix	4+X	6.50	6.50(4+X)

30 Collin noticed that various combinations of nickels and dimes could add up to \$0.65.

- Let x equal the number of nickels.
- Let y equal the number of dimes.

What is the domain where y is a function of x and the total value is \$0.65?

Domain  
↓  
x-values

- ~~A~~ {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13}
- ~~B~~ {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13}
- ~~C~~ {0, 1, 3, 5, 7, 9, 11, 13}
- D** {1, 3, 5, 7, 9, 11, 13}

Can't get  
\$0.65  
without at least  
1 nickel

Even # of nickels  
will not provide  
\$0.65

28

$$22 + 8.80x = 6.50(4+x)$$

$$22 + 8.80x = 26 + 6.50x$$

$$\begin{array}{r} -22 \quad -6.50x \\ \hline 2.30x = 4 \end{array}$$

$$\frac{2.30x}{2.30} = \frac{4}{2.30}$$

$$x = 1.74$$

$$\frac{1.74}{1.74+4} = .30$$

# Math 1 Unit 2 EOC Review

## Linear Equation

$$y = mx + b$$

(x, y) – Points on the line with x = x-coordinate and y = y-coordinate

m – Slope (or rate of change) – constant rate by which dependent variable increases or decreases as the independent variable increases

b – Y-Intercept – value of the equation when X=0

### Concept Questions:

1. In a linear function  $f(x) = mx + b$ , what are the terms, coefficients, variables, and constant? •

terms:  $mx, b$  coefficient:  $m$  variables:  $f(x), x$   
constant:  $b$

## Slope/Rate of Change

Rate of change =  $\frac{\text{Change in } Y}{\text{Change in } X}$  for any defined region. Give two points, use the formula  $\frac{y_2 - y_1}{x_2 - x_1}$

In a line, the rate of change (called slope) is constant.

### Concept Questions:

1. Why does a line have a constant slope but a parabola does not?

Line → the independent variable (x) is multiplied by same amount  
Parabola → rate of change increases as the independent variable increases or decreases

2. What are some clues in word problems that would help indicate the slope?

per, every, etc.

## Graphs of Linear Equations

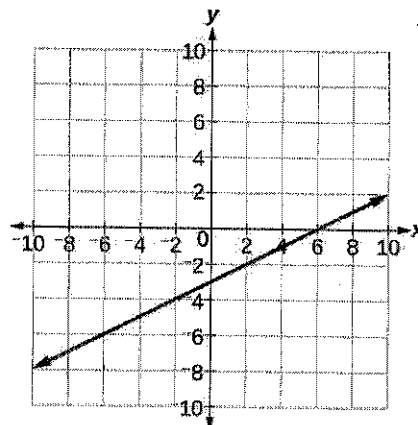
For the graph to the right:

x-intercept = 6 y-intercept = -3

Slope = 1/2 Equation =  $y = \frac{1}{2}x - 3$

Table of values:

x	-2	-1	0	3	6	9
y	-4	-3.5	-3	-1.5	0	1.5



### Concept Questions:

1. How can the x-intercept help determine the equation of the line?

Its coordinates are  $(x, 0)$  which can help find the slope

2. Write a word problem that could be solved using the graph above.

You owe a friend \$3 and you pay him back \$0.50 per day. How many days until you pay back the total?

## Arithmetic Sequences

Arithmetic Sequence - sequence of numbers that increase or decrease by a constant rate, called the Common difference.

Explicit Sequence:  $a_n = a_1 + (n-1)d$

$n =$  term #     $a_1 =$  1st term

$a_{n-1} =$  previous term value

Recursive Sequence:  $a_n = a_{n-1} + d$

$a_n =$  value of / nth term     $d =$  common difference

Conceptual Questions:

1. Could the function  $f(x) = 3x + 2$  be an arithmetic sequence? What would be  $a_1$  and  $d$ ?  
YES     $a_1 = 5$      $d = 3$

2. Why are arithmetic sequences and linear functions taught in the same unit?

Linear functions are examples of arithmetic sequences

## Scatter Plots/Correlation

Calculator Steps for Linear Regression/Plotting Scatter Plots/Getting Line of Best Fit:

1. Push STAT-EDIT-enter all (x, y) values into table (X in L1, Y in L2)
2. To get equation of best-fit line, STAT-CALC-LinReg (#4) r is the correlation coefficient
3. To graph scatterplot, 2<sup>nd</sup> - STAT PLOT - Plot1...On, then choose options

2<sup>nd</sup> 0  
"Diag.ON"  
Enter Enter

Concept Questions:

1. How can a linear regression (line of best fit) help solve problems?

Useful to make predictions based on an x or y value

2. If most of the points on a scatterplot are far from the line of best fit, what will the r value be close to? How do you know? Zero

The correlation coefficient illustrates how strongly related the data sets are to each other

# Math 1 Unit 2 Practice Problems

12

- 11 Suppose that the function  $f(x) = 2x + 12$  represents the cost to rent  $x$  movies a month from an internet movie club. Makayla now has \$10. How many more dollars does Makayla need to rent 7 movies next month?

$$f(x) = 2(7) + 12$$

$$\text{\$26}$$

Needs \$26  
Has \$10

\$16 more

- 18 Dennis compared the  $y$ -intercept of the graph of the function  $f(x) = 3x + 5$  to the  $y$ -intercept of the graph of the linear function that includes the points in the table below.

$x$	$g(x)$
-7	2
-5	3
-3	4
-1	5

0 5.5

$$\frac{f(x)}{b=5}$$

$$\frac{g(x)}{b=5.5}$$

What is the difference when the  $y$ -intercept of  $f(x)$  is subtracted from the  $y$ -intercept of  $g(x)$ ?

- A -11.0  
B -9.3  
C 0.5  
D 5.5

$$5.5 - 5$$

- 19 Cell phone Company Y charges a \$10 start-up fee plus \$0.10 per minute,  $x$ . Cell phone Company Z charges \$0.20 per minute,  $x$ , with no start-up fee. Which function represents the difference in cost between Company Y and Company Z?

- A  $f(x) = -0.10x - 10$   
B  $f(x) = -0.10x + 10$   
C  $f(x) = 10x - 0.10$   
D  $f(x) = 10x + 0.10$

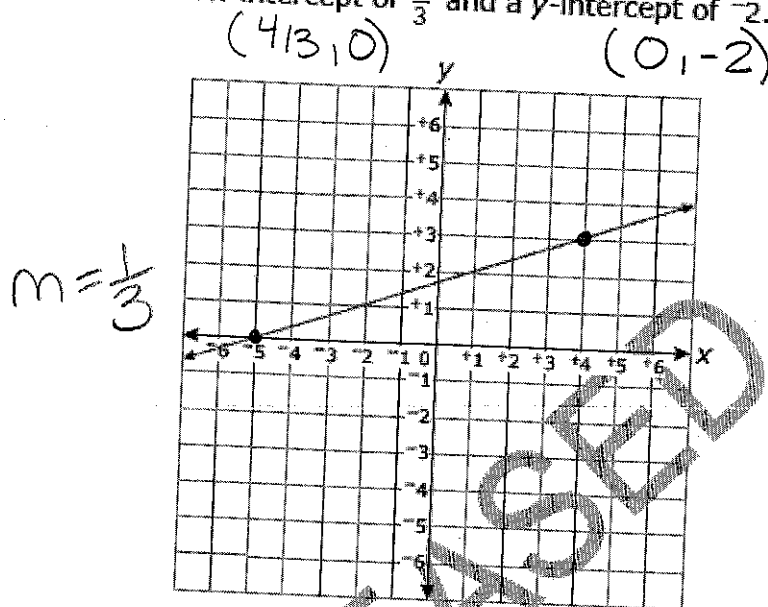
company Y  $f(x) = 0.10x + 10$

company Z  $f(x) = 0.20x$

$$(0.10x + 10) - (0.20x)$$

$$- 0.10x + 10$$

- 21 Mario compared the slope of the function graphed below to the slope of the linear function that has an  $x$ -intercept of  $\frac{4}{3}$  and a  $y$ -intercept of  $-2$ .



$$\frac{-2 - 0}{0 - 4\frac{1}{3}} = \frac{3}{2}$$

What is the slope of the function with the smaller slope?

A  $\frac{1}{5}$

B  $\frac{1}{3}$

C 3

D 5

- 22 The boiling point of water,  $T$  (measured in degrees), at altitude  $a$  (measured in feet) is modeled by the function  $T(a) = -0.0018a + 212$ . In terms of altitude and temperature, which statement describes the meaning of the slope?

A The boiling point increases by 18 degrees as the altitude increases by 1,000 feet.

B The boiling point increases by 1.8 degrees as the altitude increases by 1,000 feet.

C The boiling point decreases by 18 degrees as the altitude increases by 1,000 feet.

D The boiling point decreases by 1.8 degrees as the altitude increases by 1,000 feet.

convert  
decimal  
to  
fraction

$$\rightarrow \frac{18}{10,000} \div 10 \rightarrow \frac{1.8}{1,000}$$



- 26 The table below shows the distance a car has traveled.

<b>Minutes</b>	25	50	75	100	125
<b>Distance Traveled (in miles)</b>	20	40	60	80	100

$$\frac{20 \text{ mi}}{25 \text{ min}} = \frac{4 \text{ mi}}{5 \text{ min}}$$

What is the meaning of the slope of the linear model for the data?

- A The car travels 5 miles every minute.
- B The car travels 4 miles every minute.
- C The car travels 4 miles every 5 minutes.
- D The car travels 5 miles every 4 minutes.

- 29 Lucy and Barbara began saving money the same week. The table below shows the models for the amount of money Lucy and Barbara had saved after  $x$  weeks.

<b>Lucy's Savings</b>	$f(x) = 10x + 5$
<b>Barbara's Savings</b>	$g(x) = 7.5x + 25$

After how many weeks will Lucy and Barbara have the same amount of money saved?

- A 1.1 weeks
- B 1.7 weeks
- C 8 weeks
- D 12 weeks

$$\begin{aligned} 10x + 5 &= 7.5x + 25 \\ -7.5x &\quad -7.5x \\ \hline 2.5x + 5 &= 25 \\ -5 &\quad -5 \\ \hline 2.5x &= 20 \\ \frac{2.5x}{2.5} &= \frac{20}{2.5} \quad x = 8 \end{aligned}$$

- 31 The table below shows the cost of a pizza based on the number of toppings.

<b>Number of Toppings (<math>n</math>)</b>	<b>Cost (<math>C</math>)</b>
1	\$12
2	\$13.50
3	\$15
4	\$16.50

$$\begin{aligned} m &= 1.50 \\ b &= 10.50 \end{aligned}$$

Which function represents the cost of a pizza with  $n$  toppings?

- A  $C(n) = 12 + 1.5(n - 1)$
- B  $C(n) = 1.5n + 12$
- C  $C(n) = 12 + n$
- D  $C(n) = 12n$

32 There were originally 4 trees in an orchard. Each year the owner planted the same number of trees. In the 29th year, there were 178 trees in the orchard. Which function,  $t(n)$ , can be used to determine the number of trees in the orchard in any year,  $n$ ?

A  $t(n) = \frac{178}{29}n + 4$

B  $t(n) = \frac{178}{29}n - 4$

C  $t(n) = 6n + 4$

D  $t(n) = 29n - 4$

$178 - 4 = 174$

↑  
Already there  
(y-intercept)

$\frac{174}{29} = 6$  trees per year

35 The sequence below shows the total number of days Francisco had used his gym membership at the end of weeks 1, 2, 3, and 4.

4, 9, 14, 19, ...

Assuming the pattern continued, which function could be used to find the total number of days Francisco had used his gym membership at the end of week  $n$ ?

A  $f(n) = n + 5$

B  $f(n) = 5n - 1$

C  $f(n) = 5n + 4$

D  $f(n) = n^2$

$a_1 = 4$   $d = 5$   
 $f(n) = d(n-1) + a_1$   
 $f(n) = 5(n-1) + 4$   
 $f(n) = 5n - 5 + 4$   
 $f(n) = 5n - 1$

explicit formula

37 The table below shows the shoe size and age of 7 boys.

Name	Shoe Size (x)	Age (y)
Tyrone	6	9
Marcel	6	11
Patrick	7	15
Bobby	8	11
Dylan	9	15
Mike	10	16
Jonathan	12	17

-1.85  
 .15  
 3.02  
 -2.11  
 .77  
 .64  
 -.61

Residual

Approximately what percent of the boys' ages is more than 1 year different from the age predicted by the line of best fit for the data?

A 14%

B 29%

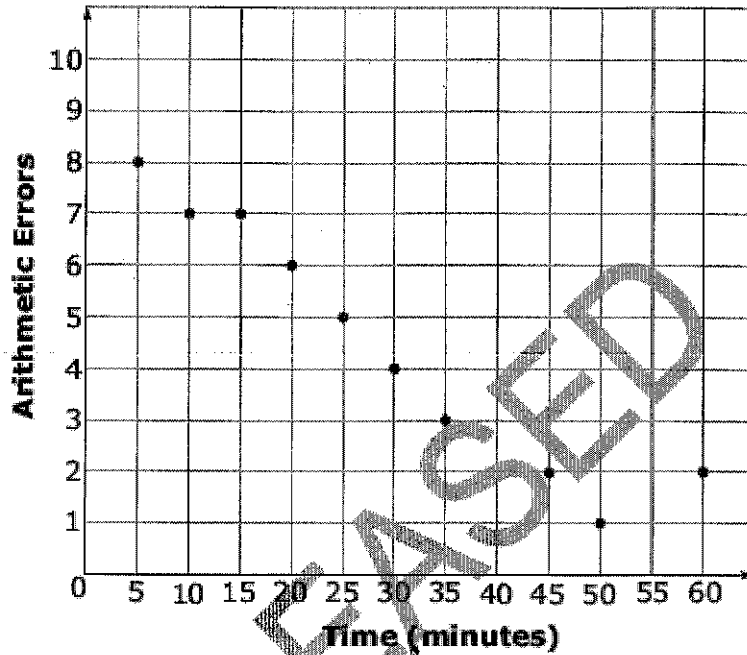
C 43%

D 57%

2 out of 7

$\frac{2}{7} = 0.286$   
 29%

- 38 The scatterplot below shows the number of arithmetic errors 10 students made on a quiz and the amount of time the students took to complete the quiz.



5, 8  
10, 7  
15, 7  
20, 6  
25, 5  
30, 4  
35, 3  
45, 2  
50, 1  
60, 2

Which describes the relationship between the number of arithmetic errors the students made and the amount of time the students took to complete the quiz?

- A There is a strong positive relationship between the variables.
- B There is a strong negative relationship between the variables.
- C There is a weak positive relationship between the variables.
- D There is a weak negative relationship between the variables.

$$r = -0.96$$

# Math 1 Unit 3 EOC Review

## Midpoint and Distance Formulas

$$\frac{\text{distance}}{\text{formula}} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\frac{\text{Midpoint}}{\text{formula}} = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Concept Questions:

1. How is the distance formula the same as the Pythagorean Theorem?

The points can be used to draw a right triangle  $(x_2 - x_1)$  and  $(y_2 - y_1)$ . Find the length of the legs. The distance represents the hypotenuse

2. Why do we divide by 2 to compute the midpoint?

It is the average of the coordinates

## Parallel and Perpendicular Slopes

Parallel lines - Never intersect, have Same slope

Perpendicular lines - Intersect at a right angle, have opposite reciprocal slopes

(For a perpendicular line, flip the fraction, flip the sign)

Concept Question:

1. If a triangle has two sides with opposite reciprocal slopes, what kind of triangle is it? How do you know?

Right triangle because 2 sides are perpendicular

## Graphing Inequalities

To graph inequalities, first graph the line that represents the bound for the inequality.

If the inequality is  $<$  or  $>$ , use a dotted line. If the inequality is  $\leq$  or  $\geq$ , use a solid line.

Then, shade above if  $y >$  or  $\geq$  the expression, shade below if  $y <$  or  $\leq$  the expression.

Concept Question:

1. How many solutions are there for an inequality? Why?

Infinite

2. To solve a system of two inequalities by graphing, how can you tell which region represents the solution?

The overlap of the shaded regions

# Solving Systems of Equations

System of Equations - 2 equations with the same solution(s)

Methods to solve:

Graphing	Substitution	Elimination
- Graph both equations - The solution to the system is the <u>intersection</u> of the two graphs.	- Solve one equation for a variable - <u>plug in</u> the expression for the variable in the other equation - Solve the equation for the first variable, then <u>plug in</u> again to solve for the second variable	- Multiply one or both equations if necessary to get <u>opposite or identical</u> terms - Add or subtract the two equations (Same terms <u>subt.</u> , Opposite terms <u>add</u> ) - Solve the "answer" equation for the first variable, then <u>plug in</u> to solve for the second variable

Systems that are parallel lines have 0 solutions, while systems with the same line have  $\infty$  solutions.

Examples:  $y = -2x + 8$

$y = x - 1$        $(3, 2)$

Graph by hand, on calc or set equal to each other

$7x + 6y = -9$        $(3, -5)$   
 $y = -2x + 1$

$7x + 6(-2x + 1) = -9$   
 $7x - 12x + 6 = -9$   
 $-5x = -15$   
 $x = 3$

$y = -2(3) + 1$        $y = -5$

$2x + 4y = 36$   
 $+ 3x - 4y = -6$   


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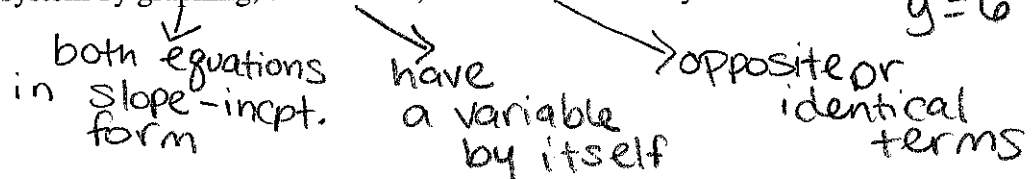
 $5x = 30$

$x = 6$   
 $2(6) + 4y = 36$   
 $12 + 4y = 36$   
 $4y = 24$   
 $y = 6$

$(6, 6)$

Concept Question:

1. When is it easiest to solve a system by graphing, substitution, or elimination? Why?



## Geometric Shapes Review

Quadrilateral: Polygon with 4 sides

Parallelogram: Quadrilateral with opposite sides parallel AND congruent

Rectangle: Quadrilateral with four right angles, opposite sides congruent and parallel

Square: Quadrilateral with all sides congruent, opposite sides parallel, and all right angles

Rhombus: Quadrilateral with all sides congruent and opposite sides parallel

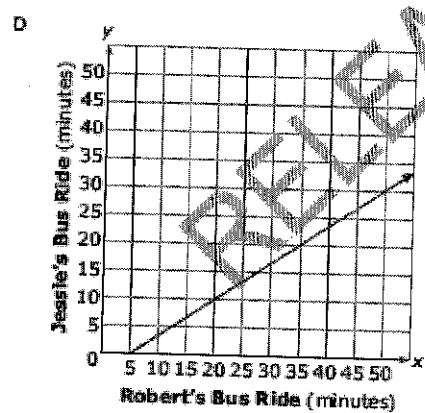
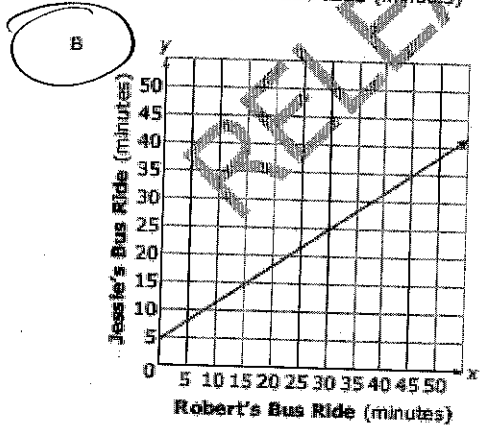
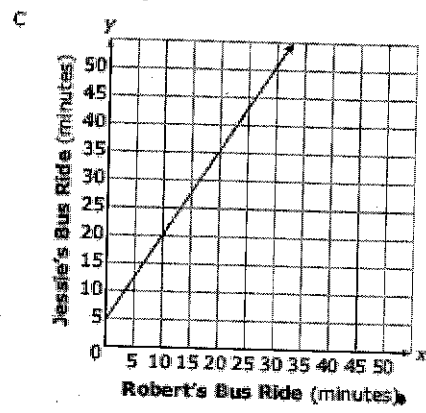
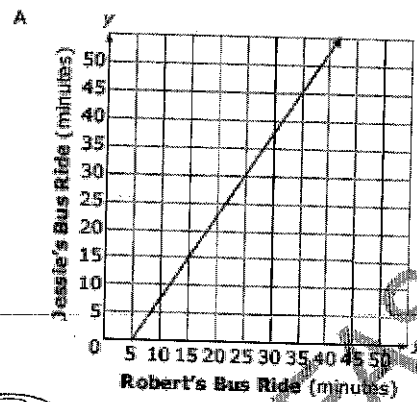
Trapezoid: Quadrilateral with one pair of parallel sides

8

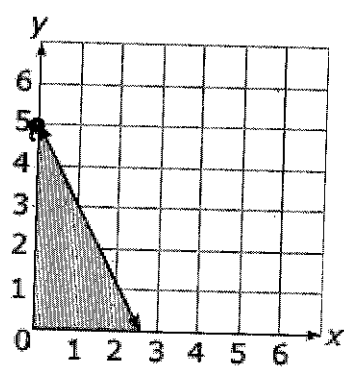
# Math 1 Unit 3 Practice Problems

1.  $y$   
 Jessie's bus ride to school is 5 minutes more than  $\frac{2}{3}$  the time of Robert's bus ride.  
 Which graph shows the possible times of Jessie's and Robert's bus rides?

$$y = \frac{2}{3}x + 5$$



2. What scenario could be modeled by the graph below?



$$m = -2 \quad b = 5 \quad y \leq -2x + 5$$

- A The number of pounds of apples,  $y$ , minus two times the number of pounds of oranges,  $x$ , is at most 5.  $y - 2x \leq 5$
- B The number of pounds of apples,  $y$ , minus half the number of pounds of oranges,  $x$ , is at most 5.  $y - \frac{1}{2}x \leq 5$
- C The number of pounds of apples,  $y$ , plus two times the number of pounds of oranges,  $x$ , is at most 5.  $y + 2x \leq 5$
- D The number of pounds of apples,  $y$ , plus half the number of pounds of oranges,  $x$ , is at most 5.  $y + \frac{1}{2}x \leq 5$

7. The math club sells candy bars and drinks during football games.

- 60 candy bars and 110 drinks will sell for \$265.
- 120 candy bars and 90 drinks will sell for \$270.

How much does each candy bar sell for?

\$ 0.75

(Note: Express the answer in dollars.cents.)

$$\begin{array}{r} -2 \quad (60x + 110y = 265) \\ 120x + 90y = 270 \\ \hline \end{array}$$

$$-120x - 220y = -530$$

$$+ 120x + 90y = 270$$

$$\hline -130y = -260$$

$$y = 2$$

$$60x + 110(2) = 265$$

$$60x + 220 = 265$$

$$60x = 45$$

$$x = 0.75$$

10. Two times Antonio's age plus three times Sarah's age equals 34. Sarah's age is also five times Antonio's age. How old is Sarah?

$$2x + 3y = 34$$

$$y = 5x$$

$$2x + 3(5x) = 34$$

$$2x + 15x = 34$$

$$17x = 34$$

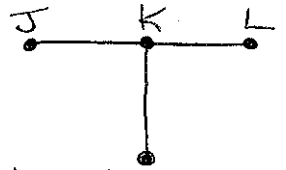
$$x = 2$$

$$y = 5(2)$$

$$y = 10$$

10.4 yrs old

23. A line segment has endpoints  $J(2, 4)$  and  $L(6, 8)$ . The point  $K$  is the midpoint of  $\overline{JL}$ . What is an equation of a line perpendicular to  $\overline{JL}$  and passing through  $K$ ?



A  $y = -x + 10$

B  $y = -x - 10$

C  $y = x + 2$

D  $y = x - 2$

Midpoint of  $\overline{JL}$

$$\left(\frac{2+6}{2}, \frac{4+8}{2}\right) = (4, 6)$$

Slope of  $\overline{JL}$

$$\frac{8-4}{6-2} = \frac{4}{4} = 1$$

Perpendicular line

$$m = -1 \quad (4, 6)$$

$$y - 6 = -1(x - 4)$$

$$y - 6 = -x + 4$$

$$y = -x + 10$$

24. A triangle has vertices at  $(1, 3)$ ,  $(2, -3)$ , and  $(-1, -1)$ . What is the **approximate** perimeter of the triangle?

A 10

B 14

C 15

D 16

AB  $d = \sqrt{(2-1)^2 + (-3-3)^2}$

$$\sqrt{1^2 + 6^2}$$

$$\sqrt{1+36}$$

$$\sqrt{37}$$

BC  $d = \sqrt{(-1-2)^2 + (-1+3)^2}$

$$\sqrt{-3^2 + 2^2}$$

$$\sqrt{9+4}$$

$$\sqrt{13}$$

AC  $d = \sqrt{(-1-1)^2 + (-1-3)^2}$

$$\sqrt{-2^2 + -4^2}$$

$$\sqrt{4+16}$$

$$\sqrt{20}$$

$$\sqrt{37} + \sqrt{13} + \sqrt{20}$$

Find the length of each side

33. The vertices of quadrilateral  $EFGH$  are  $E(-7, 3)$ ,  $F(-4, 6)$ ,  $G(5, -3)$ , and  $H(2, -6)$ . What kind of quadrilateral is  $EFGH$ ?

A trapezoid

B square

C rectangle that is not a square

$a^2 + b^2 = c^2$  D rhombus that is not a square

$$3^2 + 3^2 = c^2$$

$$9 + 9 = c^2$$

$$c = \sqrt{18}$$

$$9^2 + 9^2 = c^2$$

$$81 + 81 = c^2$$

$$c = \sqrt{162}$$

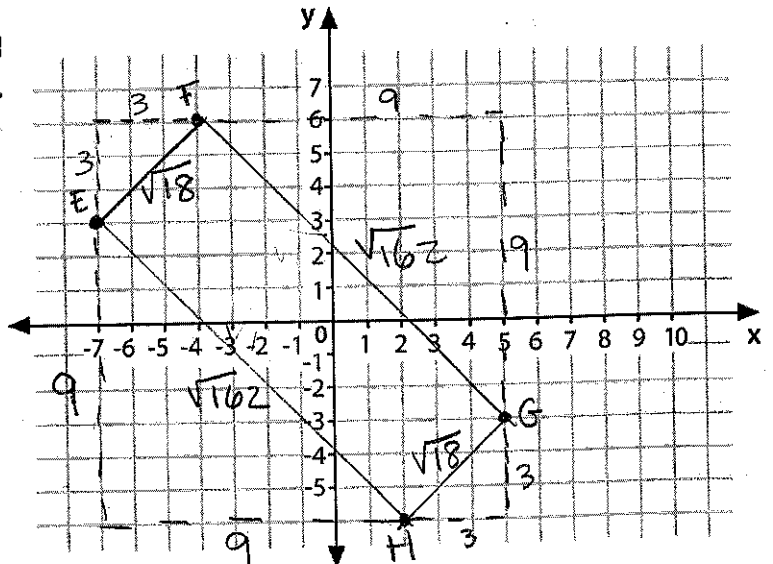
EF & HG

same slope  
same length

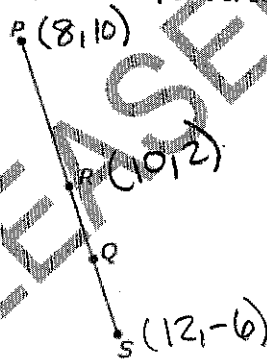
EH & FG

same slope  
same length

FG - opp. rec. slopes  
EH - opp. rec. slopes  
EF & HG  
EH & FG



34 R is the midpoint of segment PS. Q is the midpoint of segment RS.



$$R = \left( \frac{8+12}{2}, \frac{10+(-6)}{2} \right) = (10, 2)$$

$$Q = \left( \frac{10+12}{2}, \frac{2+(-6)}{2} \right)$$

$$(11, -2)$$

P is located at (8, 10), and S is located at (12, -6). What are the coordinates of Q?

- A (4, 2)
- B (2, -8)
- C (11, -2)
- D (10, 2)



# Math 1 Unit 4 EOC Review

## Exponential Function Form

$$y = ab^x \text{ (Growth or Decay)}$$

$$y = \underline{\text{Value of the function}} \quad a = \underline{\text{initial value}}$$

$$b = \underline{\text{growth/decay factor}} \quad x = \underline{\text{time}}$$

When the rate is given as a percent, convert it to a decimal and write as  $\underline{r+1}$  for growth and  $\underline{1-r}$  for decay.

## Concept questions:

1. Why do we use  $1 \pm r$  for the  $b$  value when  $r$  is given as a percent?

Because the "1" is the starting point so it's added if it's growing and subtracted if it's decaying

2. Why is the rate of change for an exponential function NOT constant as it is for a linear function?

Because it is based on the time and time does not remain the same

3. Which increases faster - exponential functions or linear functions? Why?

Exponential functions  $\rightarrow$  the value depends on a non-constant value of time

## Rewriting Exponents

$$\text{Exponent Rules: } x^a \cdot x^b = \underline{x^{a+b}} \quad \frac{x^a}{x^b} = \underline{x^{a-b}} \quad (x^a)^b = \underline{x^{ab}}$$

$$x^{-a} = \underline{\frac{1}{x^a}} \quad \sqrt{x^a} = \underline{x^{\frac{a}{2}}}$$

## Concept Questions:

1. Why does the power rule  $(x^a)^b = x^{ab}$  apply for exponents with common bases?

$$(x^2)^3 = x^2 \cdot x^2 \cdot x^2 = (x \cdot x)(x \cdot x)(x \cdot x) = x^6$$

2. Why does taking the square root of an exponent divide the exponent by 2?

$$\sqrt{x^a} = (x^a)^{\frac{1}{2}} = x^{\frac{a}{2}}$$

## Geometric Sequences

Geometric Sequence – sequence of numbers that multiplies by the same number to compute the next term. The number multiplied is called the common ratio.

Explicit Sequence:  $a_n = a_1(r)^{n-1}$

Recursive Sequence:  $a_n = ra_{n-1}$

$n =$  term #    $a_1 =$  1st term    $a_n =$   $n^{\text{th}}$  term    $r =$  common ratio  
 $a_{n-1} =$  previous term

Conceptual Questions:

1. Could the function  $f(x) = 3(2)^x$  be an ~~arithmetic~~ <sup>geometric</sup> sequence? What would be  $a_1$  and  $r$ ?

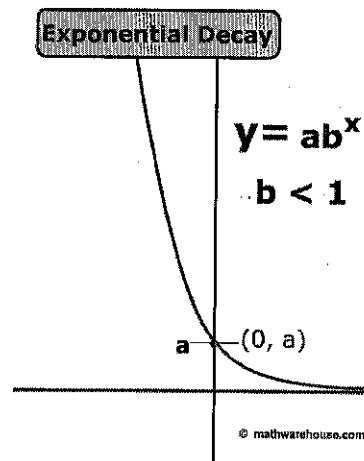
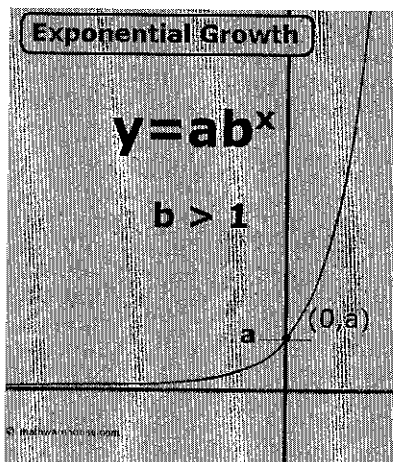
YES, it multiplies times a common factor  $r=2$   $a_1=6$

2. Why are geometric sequences and exponential functions taught in the same unit?

Both are multiplying by a common factor  
(common ratio or rate of change)

## Exponential Graphs

Exponential functions are positive, with the parent function either increasing to infinity or decreasing to the x-axis.



Concept Questions:

1. Why is the  $a$  value the y-intercept of the parent function for exponential functions?  
when  $x=0$  the  $b^0$  factor  $= 1$  so  $a(1) = a$

$$y = ab^0 \rightarrow y = a(1) \\ y = a$$

2. Why does a  $b$  value between 0 and 1 decrease?

Function gets smaller as it multiplies by a number between 0 and 1

3. Why does an exponential parent function not have negative values?

Multiplying a positive times a positive factor always gives a positive answer

# Math 1 Unit 4 Practice Problems

3

$$y = 2x$$

$$y = x + 200$$

13 Katie and Jennifer are playing a game.

- Katie and Jennifer each started with 100 points.
- At the end of each turn, Katie's points doubled.
- At the end of each turn, Jennifer's points increased by 200.

	K	J
0	100	100
1	200	300
2	400	500
3	800	700
4	1600	900
5	3200	1100
6	6400	1300
7	12800	1500

At the start of which turn will Katie first have more points than Jennifer?

End of 3rd → Start of the 4th

17 The table below shows the average weight of a type of plankton after several weeks.

Time (weeks)	Weight (ounces)
8	0.04
9	0.07
10	0.14
11	0.25
12	0.49

$$\frac{0.49 - 0.04}{12 - 8} = \frac{0.45}{4} = 0.1125$$

What is the average rate of change in weight of the plankton from week 8 to week 12?

- A 0.0265 ounce per week
- B 0.0375 ounce per week
- C 0.055 ounce per week
- D 0.1125 ounce per week

20 Monica did an experiment to compare two methods of warming an object. The results are shown in the table below.

Time (Hours)	Method 1 Temperature (°F)	Method 2 Temperature (°F)
0	0	1.5
1	5	3
2	11	6
3	15	12
4	19	24
5	25	48

Which statement **best** describes her results?

- A The temperature using both methods changed at a constant rate.
- B The temperature using both methods changed exponentially.
- C The temperature using Method 2 changed at a constant rate.
- D The temperature using Method 2 changed exponentially.

times 2 each hour

# Math 1 Unit 5 EOC Review

## Polynomial Operations

Multiplying: Distribute terms times EVERY other term

To distribute exponents, write the polynomial in parentheses and multiply out

Adding or subtracting: combine like terms

Remember, you can NOT operate with variables in the calculator!

Example 1:  $(2x - 3)^2$   $(2x-3)(2x-3)$

$$4x^2 - 6x - 6x + 9$$

$$4x^2 - 12x + 9$$

Concept Questions:

1. What is the difference between  $2x + 2x$  and  $2x(2x)$ ?

$$\begin{array}{r} 2x + 2x \\ 4x \end{array}$$

$$\begin{array}{r} 2x(2x) \\ 4x^2 \end{array}$$

2. Write two polynomials that you can NOT multiply using the "FOIL" trick, and explain why not.

$$(x+3)(x^2+3x+2)$$

There are too many terms

## Factoring

GCF

$$10x^2 - 5x$$

$$\boxed{5x(2x-1)}$$

$$x^2 + bx + c$$

$$x^2 - 9x - 22$$

$$(x^2 - 11x)(2x - 22)$$

$$x(x-11) 2(x-11)$$

$$\boxed{(x+2)(x-11)}$$

$$ax^2 + bx + c$$

$$3x^2 - 13x - 10$$

$$(3x^2 - 15x)(2x - 10)$$

$$3x(x-5) 2(x-5)$$

$$\boxed{(3x+2)(x-5)}$$

Perfect Squares

$$x^2 - 49$$

$$\boxed{(x-7)(x+7)}$$

$$5x^3 + 500x$$

$$5x(x^2 + 100)$$

↓  
cant factor any further

Concept Questions:

1. Why is  $a^2 - b^2$  NOT the same as  $(a-b)^2$ ?

$$(a-b)^2 = (a-b)(a-b) = a^2 - ab - ab + b^2$$

$$a^2 - 2ab + b^2$$

middle terms aren't opposites

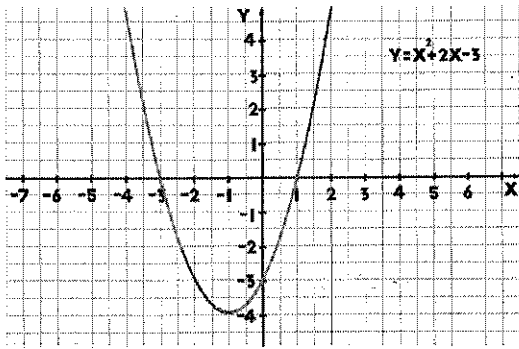
2. Why can we NOT just find two numbers that add to  $b$  and multiply to  $c$  to factor a trinomial with  $a > 1$ ?

when the first term ( $ax$ ) distributes

it will not equal the  $b$ -value

## Quadratic Graphs

The shape of the graph of a quadratic function (with degree, or highest exponent, of 2) is a parabola



$$f(x) = ax^2 + bx + c$$

$$f(x) = x^2 + 2x - 3$$

X-Intercepts

$$\{-3, 1\}$$

Y-Intercept

$$-3$$

Open Up or Down

$$a > 0 - \text{UP}$$

$$a < 0 - \text{down}$$

Vertex

$$(-1, -4)$$

Axis of Symmetry

$$x = -1$$

$$x = -\frac{b}{2a}$$

Concept Questions:

1. Why is the y-intercept equal to the  $c$  value?

when  $x=0$  the other terms ( $ax^2, bx$ ) = zero so  $y=c$

2. Why are the x-intercepts the same as the solutions equal to 0?

Because the equation = zero so  $y=0$

Solving by Factoring

To solve a quadratic by factoring, set the expression equal to 0, factor, and solve factors (set equal to zero)

You will get 2 solutions when solving a quadratic equation.

If both solutions are the same, the solution is a double root, and the vertex is on the x-axis.

Example:  $x^2 - 5x = 14$

$$x^2 - 5x - 14 = 0$$

$$(x^2 - 7x) + (2x - 14)$$

$$x(x-7) + 2(x-7)$$

$$(x+2)(x-7)$$

$$x+2=0 \quad x-7=0$$

$$\boxed{x=-2} \quad \boxed{x=7}$$

Concept Questions:

1. Why is it necessary to set the quadratic equal to 0 before solving?

Because in order to set the factors equal to zero to solve them, the equation must be set equal to zero

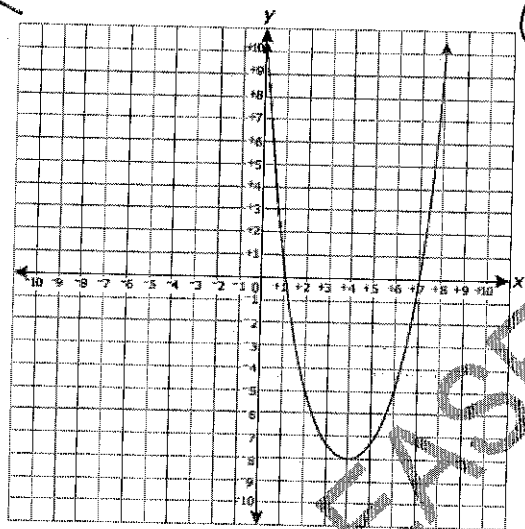
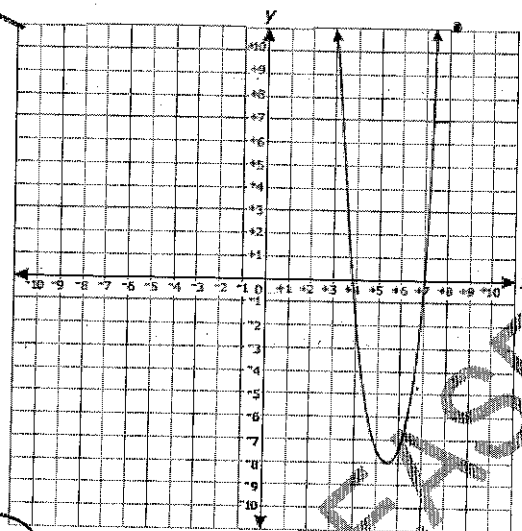
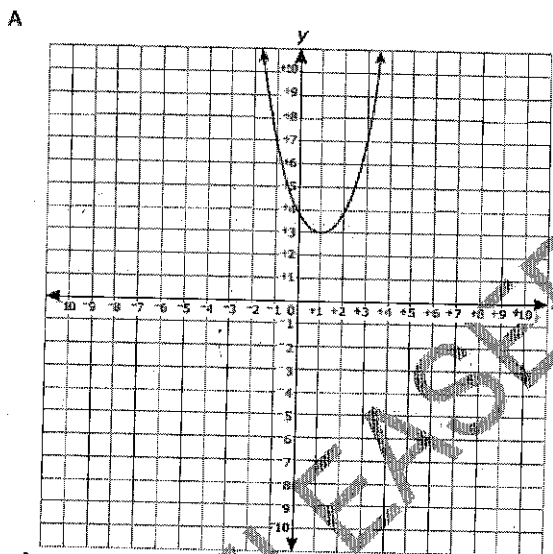
# Math 1 Unit 5 Practice Problems

3 Which expression is equivalent to  $t^2 - 36$ ?

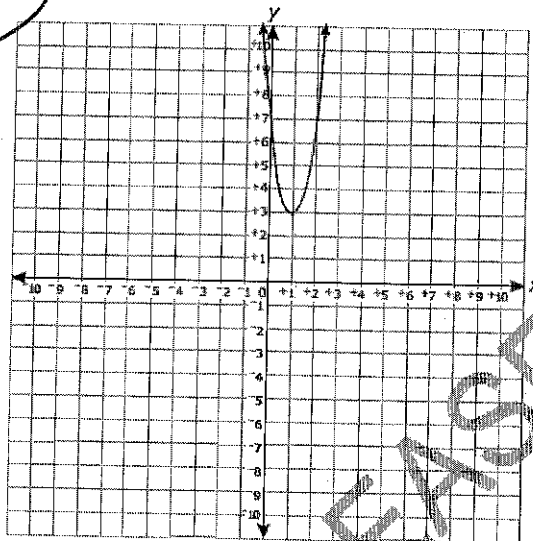
- A  $(t - 6)(t - 6)$        $(t + 6)(t - 6)$
- B  $(t + 6)(t - 6)$**
- C  $(t - 12)(t - 3)$
- D  $(t - 12)(t + 3)$

4 Which is the graph of the function  $f(x) = 4x^2 - 8x + 7$ ?

A.O.S.  $\frac{-b}{2a} = \frac{8}{2(4)} = \frac{8}{8} = 1$       vertex  $y$   
 $y = 4(1)^2 - 8(1) + 7$   
 $4 - 8 + 7$   
 $y = 3$   
 $(1, 3)$   
 y-intercept  
 $4(0)^2 - 8(0) + 7$   
 $7$



**D**



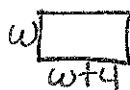
5 The floor of a rectangular cage has a length 4 feet greater than its width,  $w$ . James will increase both dimensions of the floor by 2 feet. Which equation represents the new area,  $N$ , of the floor of the cage?

A  $N = w^2 + 4w$

B  $N = w^2 + 6w$

C  $N = w^2 + 6w + 8$

**D  $N = w^2 + 8w + 12$**



$(w+2)(w+6)$   
 $w^2 + 8w + 12$

- 8 What is the smallest of 3 consecutive positive integers if the product of the smaller two integers is 5 less than 5 times the largest integer?

X  
X+1  
X+2

$$\begin{aligned} X(X+1) &= 5(X+2) - 5 \\ X^2 + X &= 5X + 10 - 5 \\ X^2 + X &= 5X + 5 \\ \underline{-5X - 5 \quad -5X \quad -5} \\ X^2 - 4X - 5 &= 0 \end{aligned}$$

$$\begin{aligned} X^2 - 4X - 5 \\ (X^2 - 5X) + (X - 5) \\ X(X-5) + 1(X-5) \\ (X+1)(X-5) \\ X = -1 \quad X = 5 \end{aligned}$$

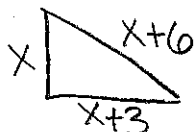
5

- 9 The function  $f(t) = -5t^2 + 20t + 60$  models the approximate height of an object  $t$  seconds after it is launched. How many seconds does it take the object to hit the ground? → root → FACTOR

$$\begin{aligned} -5t^2 + 20t + 60 & \quad t(t-6)2(t-6) \\ -5(t^2 - 4t - 12) & \quad (t+2)(t-6) \\ (t^2 - 6t)(t+2-12) & \quad t = -2 \quad t = 6 \end{aligned}$$

6 sec

- 12 The larger leg of a right triangle is 3 cm longer than its smaller leg. The hypotenuse is 6 cm longer than the smaller leg. How many centimeters long is the smaller leg?



$$\begin{aligned} (X)^2 + (X+3)^2 &= (X+6)^2 \\ X^2 + X^2 + 6X + 9 &= X^2 + 12X + 36 \\ 2X^2 + 6X + 9 &= X^2 + 12X + 36 \\ \underline{-X^2 - 12X - 36} & \quad -X^2 - 12X - 36 \end{aligned}$$

$$\begin{aligned} X^2 - 6X - 27 &= 0 \\ (X^2 - 9X) + (3X - 27) \\ X(X-9) + 3(X-9) \\ (X+3)(X-9) \end{aligned}$$

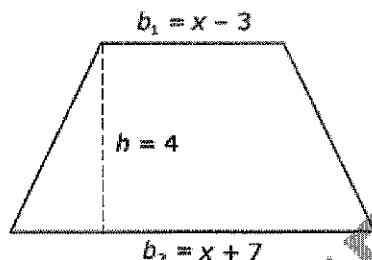
9 cm

- 16 Suppose that the equation  $V = 20.8x^2 - 458.3x + 3,500$  represents the value of a car from 1964 to 2002. What year did the car have the least value? (x = 0 in 1964)

$$X = -3 \quad X = 9$$

- A 1965 | \$3062.50  
B 1970 | \$1499.00  
C 1975 | \$975.50  
D 1980 | \$1492.00

- 27 The area of a trapezoid is found using the formula  $A = \frac{1}{2}h(b_1 + b_2)$ , where  $A$  is the area,  $h$  is the height, and  $b_1$  and  $b_2$  are the lengths of the bases.



$$\begin{aligned} 2 \times \frac{(x-3 + x+7)}{2} \\ 2(2x+4) \\ 4x+8 \end{aligned}$$

What is the area of the above trapezoid?

- A  $A = 4x + 2$   
B  $A = 4x + 8$   
C  $A = 2x^2 + 4x - 21$   
D  $A = 2x^2 + 8x - 42$

EASED

# Math 1 Unit 6 EOC Review

## Representations of Data

Very large quantities of data can be seen much easier using a box plot or histogram than a dot plot.

We can create these using our calculators to easily interpret the data.

Histograms are preferable for showing actual values within the data.

Box plots are preferable for showing the spread of the data.

Concept question:

1. Why are dot plots not preferable for a survey of an entire high school with 2000 students?  
2,000 dots would be difficult to count/analyze

## Measures of Central Tendency (Mean, Median, IQ Range, SD)

Mean -  $\bar{x}$  (average)

Median - MED (Middle value or average of 2 middle values)

Interquartile Range -  $Q_3 - Q_1$  (the range of the middle 50% of the data)

Standard Deviation - Measure of spread of the data

Concept Question:  $\sigma x$

1. Explain the potential relationship between the IQR and standard deviation for a box plot with very short whiskers and long boxes.

N/A

## Outlier Effects

Outlier - Extremely small or large data value

An outlier generally has a larger effect on the mean and std deviation of a data set than the median and IQR.

Concept Question:

1. Why does an outlier not greatly affect a median, but it can have a great effect on a mean?

The middle of a data set may not change based upon an outlier.

The average, or the mean will get pulled in the direction of the outlier.



# Math 1 Unit 6 Practice Problems

2

25 The table below shows the area of several states.

State	Area (thousands of square miles)
Connecticut	6
Georgia	59
Maryland	12
Massachusetts	11
New Hampshire	9
New York	54
North Carolina	54
Pennsylvania	46

Delaware has an area of 2,000 square miles. Which is true if Delaware is included in the data set?

- A The mean increases.
- B The range decreases.
- C The interquartile range decreases. *44/46.5*
- D The standard deviation increases. *22.18/22.86*

36 The number of points scored by a basketball player in the first eight games of a season are shown below.

15, 35, 18, 30, 25, 21, 32, 16

What would happen to the data distribution if she scored 24, 22, 27, and 28 points in her next four games?

- A The data distribution would become less peaked and more widely spread.
- B The data distribution would become less peaked and less widely spread.
- C The data distribution would become more peaked and less widely spread.
- D The data distribution would become more peaked and more widely spread.

*compare the histograms on the calculator*

