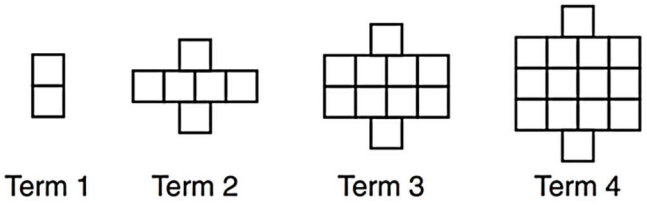
Name: _____ Date: _____

ALGEBRA I LIVE REVIEW PROBLEMS - 2018
eMATHinstruction

SEQUENCES

June 2015

22 A pattern of blocks is shown below.



If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the nth term?

I	II	III
$a_n = n + 4$	$a_1 = 2$ $a_n = a_{n-1} + 4$	$a_n = 4n - 2$

(1) I and II
(2) I and III
(3) II and III
(4) III, only

June 2014

21 A sunflower is 3 inches tall at week 0 and grows 2 inches each week. Which function(s) shown below can be used to determine the height, $f(n)$, of the sunflower in n weeks?

I. $f(n) = 2n + 3$
II. $f(n) = 2n + 3(n - 1)$
III. $f(n) = f(n - 1) + 2$ where $f(0) = 3$

(1) I and II
(2) II, only
(3) III, only
(4) I and III

January 2015

20 If a sequence is defined recursively by $f(0) = 2$ and $f(n + 1) = -2f(n) + 3$ for $n \geq 0$, then $f(2)$ is equal to

(1) 1

(2) -11

(3) 5

(4) 17

June 2017

18 Given the function $f(n)$ defined by the following:

$$f(1) = 2$$
$$f(n) = -5f(n - 1) + 2$$

Which set could represent the range of the function?

(1) {2, 4, 6, 8,...}

(2) {2, −8, 42, −208,...}

(3) {−8, −42, −208, 1042,...}

(4) {−10, 50, −250, 1250,...}

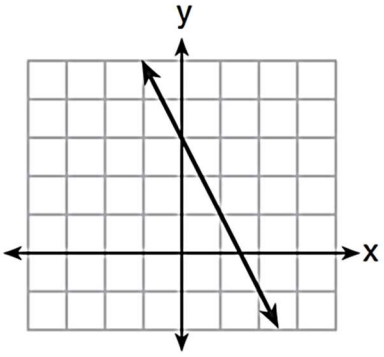
RATE OF CHANGE

August 2016

15 Which function has a constant rate of change equal to −3?

x	y
0	2
1	5
2	8
3	11

(1)



(3)

{(1,5), (2,2), (3,−5), (4,4)}

(2)

$2y = -6x + 10$

(4)

August 2014

14 The table below shows the average diameter of a pupil in a person's eye as he or she grows older.

Age (years)	Average Pupil Diameter (mm)
20	4.7
30	4.3
40	3.9
50	3.5
60	3.1
70	2.7
80	2.3

What is the average rate of change, in millimeters per year, of a person's pupil diameter from age 20 to age 80?

(1) 2.4
(2) 0.04
(3) -2.4
(4) -0.04

June 2016

35 An airplane leaves New York City and heads toward Los Angeles. As it climbs, the plane gradually increases its speed until it reaches cruising altitude, at which time it maintains a constant speed for several hours as long as it stays at cruising altitude. After flying for 32 minutes, the plane reaches cruising altitude and has flown 192 miles. After flying for a total of 92 minutes, the plane has flown a total of 762 miles.

Determine the speed of the plane, at cruising altitude, in miles per minute.

Write an equation to represent the number of miles the plane has flown, y, during x minutes at cruising altitude, only.

Assuming that the plane maintains its speed at cruising altitude, determine the total number of miles the plane has flown 2 hours into the flight.

LINEAR EQUATIONS AND EXPRESSIONS

June 2017

19 An equation is given below.

$$4(x - 7) = 0.3(x + 2) + 2.11$$

The solution to the equation is

(1) 8.3
(2) 8.7
(3) 3
(4) -3

August 2016

32 Solve the equation below for x in terms of a.

$$4(ax + 3) - 3ax = 25 + 3a$$

January 2015

31 A gardener is planting two types of trees:

Type A is three feet tall and grows at a rate of 15 inches per year.

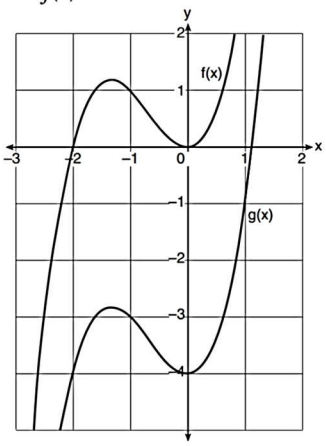
Type B is four feet tall and grows at a rate of 10 inches per year.

Algebraically determine exactly how many years it will take for these trees to be the same height.

TRANSFORMATIONS

June 2016

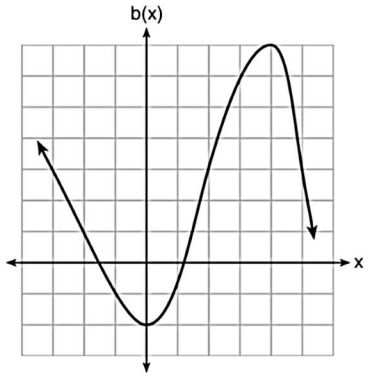
32 In the diagram below, $f(x) = x^3 + 2x^2$ is graphed. Also graphed is $g(x)$, the result of a translation of $f(x)$.



Determine an equation of $g(x)$. Explain your reasoning.

August 2016

26 Richard is asked to transform the graph of $b(x)$ below.



The graph of $b(x)$ is transformed using the equation $h(x) = b(x - 2) - 3$. Describe how the graph of $b(x)$ changed to form the graph of $h(x)$.

June 2017

32 Describe the effect that each transformation below has on the function $f(x) = |x|$, where $a > 0$.

$g(x) = |x - a|$

$h(x) = |x| - a$

January 2015

12 How does the graph of $f(x) = 3(x - 2)^2 + 1$ compare to the graph of $g(x) = x^2$?

(1) The graph of $f(x)$ is wider than the graph of $g(x)$, and its vertex is moved to the left 2 units and up 1 unit.

(2) The graph of $f(x)$ is narrower than the graph of $g(x)$, and its vertex is moved to the right 2 units and up 1 unit.

(3) The graph of $f(x)$ is narrower than the graph of $g(x)$, and its vertex is moved to the left 2 units and up 1 unit.

(4) The graph of $f(x)$ is wider than the graph of $g(x)$, and its vertex is moved to the right 2 units and up 1 unit.

COMPLETING THE SQUARE

June 2014

8 Which equation has the same solution as $x^2 - 6x - 12 = 0$?

(1) $(x + 3)^2 = 21$

(2) $(x - 3)^2 = 21$

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

(4) $(x - 3)^2 = 3$

June 2017

22 What are the solutions to the equation $x^2 - 8x = 10$?

(1) $4 \pm \sqrt{10}$

(2) $4 \pm \sqrt{26}$

(3) $-4 \pm \sqrt{10}$

(4) $-4 \pm \sqrt{26}$

June 2016

16 Which equation and ordered pair represent the correct vertex form and vertex for $j(x) = x^2 - 12x + 7$?

(1) $j(x) = (x - 6)^2 + 43$, (6,43)

(2) $j(x) = (x - 6)^2 + 43$, (−6,43)

(3) $j(x) = (x - 6)^2 - 29$, (6,−29)

(4) $j(x) = (x - 6)^2 - 29$, (−6,−29)

January 2015

36 a) Given the function $f(x) = -x^2 + 8x + 9$, state whether the vertex represents a maximum or minimum point for the function. Explain your answer.

b) Rewrite $f(x)$ in vertex form by completing the square.

EXPONENTIAL FUNCTIONS

August 2014

26 Rhonda deposited \$3000 in an account in the Merrick National Bank, earning 4.2% interest, compounded annually. She made no deposits or withdrawals. Write an equation that can be used to find B, her account balance after t years.

June 2017

28 The value, $v(t)$, of a car depreciates according to the function $v(t) = P(.85)^t$, where P is the purchase price of the car and t is the time, in years, since the car was purchased. State the percent that the value of the car *decreases* by each year. Justify your answer.

June 2015

36 An application developer released a new app to be downloaded. The table below gives the number of downloads for the first four weeks after the launch of the app.

Number of Weeks	1	2	3	4
Number of Downloads	120	180	270	405

Write an exponential equation that models these data.

Use this model to predict how many downloads the developer would expect in the 26th week if this trend continues. Round your answer to the *nearest download*.

Would it be reasonable to use this model to predict the number of downloads past one year? Explain your reasoning.

June 2015

10 What are the zeros of the function $f(x) = x^2 - 13x - 30$?

(1) -10 and 3
(2) 10 and -3
(3) -15 and 2
(4) 15 and -2

January 2015

22 When factored completely, the expression $p^4 - 81$ is equivalent to

(1) $(p^2 + 9)(p^2 - 9)$
(2) $(p^2 - 9)(p^2 - 9)$
(3) $(p^2 + 9)(p + 3)(p - 3)$
(4) $(p + 3)(p - 3)(p + 3)(p - 3)$

June 2014

31 Factor the expression $x^4 + 6x^2 - 7$ completely.

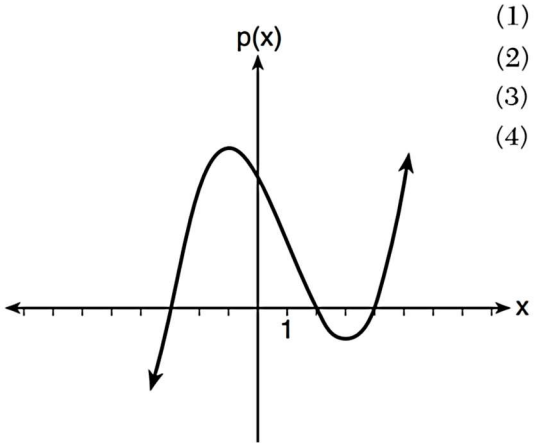
August 2017

19 The zeros of the function $f(x) = 2x^3 + 12x - 10x^2$ are

(1) $\{2, 3\}$
(2) $\{-1, 6\}$
(3) $\{0, 2, 3\}$
(4) $\{0, -1, 6\}$

August 2016

23 Based on the graph below, which expression is a possible factorization of $p(x)$?



(1) $(x + 3)(x - 2)(x - 4)$
(2) $(x - 3)(x + 2)(x + 4)$
(3) $(x + 3)(x - 5)(x - 2)(x - 4)$
(4) $(x - 3)(x + 5)(x + 2)(x + 4)$

THE QUADRATIC FORMULA

June 2014

10 What are the roots of the equation $x^2 + 4x - 16 = 0$?

(1) $2 \pm 2\sqrt{5}$
(2) $-2 \pm 2\sqrt{5}$
(3) $2 \pm 4\sqrt{5}$
(4) $-2 \pm 4\sqrt{5}$

January 2015

29 Solve the equation $4x^2 - 12x = 7$ algebraically for x.

MORE WORK WITH QUADRATIC EQUATIONS

August 2014

9 Sam and Jeremy have ages that are consecutive odd integers. The product of their ages is 783. Which equation could be used to find Jeremy's age, j, if he is the younger man?

(1) $j^2 + 2 = 783$
(2) $j^2 - 2 = 783$
(3) $j^2 + 2j = 783$
(4) $j^2 - 2j = 783$

June 2014

23 The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. The radius, r, of the cone may be expressed as

(1) $\sqrt{\frac{3V}{\pi h}}$
(2) $\sqrt{\frac{V}{3\pi h}}$
(3) $3\sqrt{\frac{V}{\pi h}}$
(4) $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

August 2014

18 The zeros of the function $f(x) = (x + 2)^2 - 25$ are

(1) -2 and 5
(2) -3 and 7
(3) -5 and 2
(4) -7 and 3

January 2018

14 What are the solutions to the equation $3(x - 4)^2 = 27$?

(1) 1 and 7
(2) -1 and -7
(3) $4 \pm \sqrt{24}$
(4) $-4 \pm \sqrt{24}$

January 2016

36 A contractor has 48 meters of fencing that he is going to use as the perimeter of a rectangular garden. The length of one side of the garden is represented by x, and the area of the garden is 108 square meters.

Determine, algebraically, the dimensions of the garden in meters.

SYSTEMS OF EQUATIONS

August 2016

22 A system of equations is given below.

$$x + 2y = 5$$
$$2x + y = 4$$

Which system of equations does *not* have the same solution?

(1) $3x + 6y = 15$
$2x + y = 4$

(2) $4x + 8y = 20$
$2x + y = 4$

(3) $x + 2y = 5$
$6x + 3y = 12$

(4) $x + 2y = 5$
$4x + 2y = 12$

January 2018

15 A system of equations is shown below.

Equation A: $5x + 9y = 12$
Equation B: $4x - 3y = 8$

Which method eliminates one of the variables?

(1) Multiply equation A by $-\frac{1}{3}$ and add the result to equation B.

(2) Multiply equation B by 3 and add the result to equation A.

(3) Multiply equation A by 2 and equation B by -6 and add the results together.

(4) Multiply equation B by 5 and equation A by 4 and add the results together.

January 2017

34 Two friends went to a restaurant and ordered one plain pizza and two sodas. Their bill totaled \$15.95. Later that day, five friends went to the same restaurant. They ordered three plain pizzas and each person had one soda. Their bill totaled \$45.90.

Write and solve a system of equations to determine the price of one plain pizza. [Only an algebraic solution can receive full credit.]

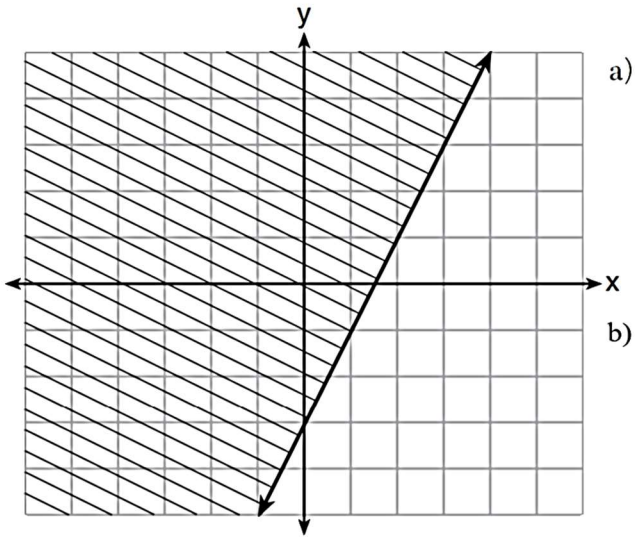
INEQUALITIES

June 2014

27 Given $2x + ax - 7 > -12$, determine the largest integer value of a when $x = -1$.

January 2015

34 The graph of an inequality is shown below.



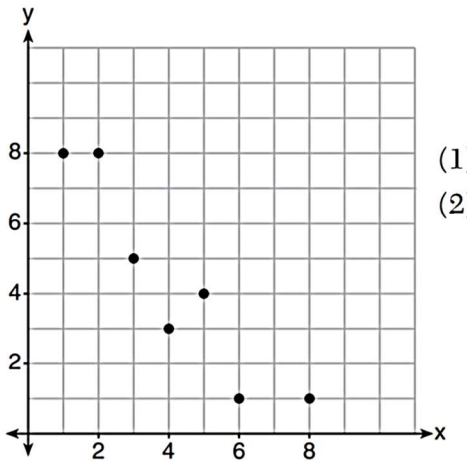
a) Write the inequality represented by the graph.

b) On the same set of axes, graph the inequality $x+2y<4$.

c) The two inequalities graphed on the set of axes form a system. Oscar thinks that the point (2,1) is in the solution set for this system of inequalities. Determine and state whether you agree with Oscar. Explain your reasoning.

June 2014

11 What is the correlation coefficient of the linear fit of the data shown below, to the *nearest hundredth*?



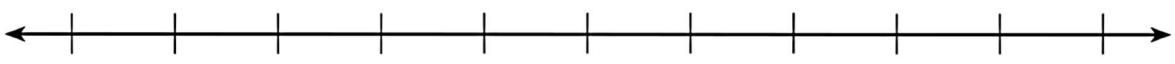
(1) 1.00
(2) 0.93
(3) −0.93
(4) −1.00

June 2014

32 Robin collected data on the number of hours she watched television on Sunday through Thursday nights for a period of 3 weeks. The data are shown in the table below.

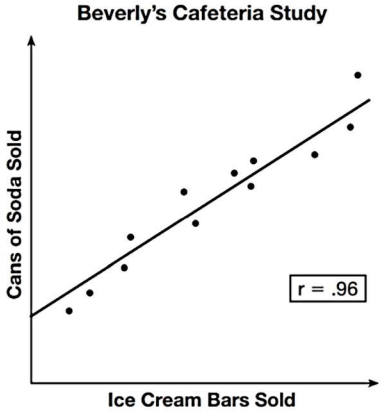
	Sun	Mon	Tues	Wed	Thurs
Week 1	4	3	3.5	2	2
Week 2	4.5	5	2.5	3	1.5
Week 3	4	3	1	1.5	2.5

Using an appropriate scale on the number line below, construct a box plot for the 15 values.



June 2015

16 Beverly did a study this past spring using data she collected from a cafeteria. She recorded data weekly for ice cream sales and soda sales. Beverly found the line of best fit and the correlation coefficient, as shown in the diagram below.



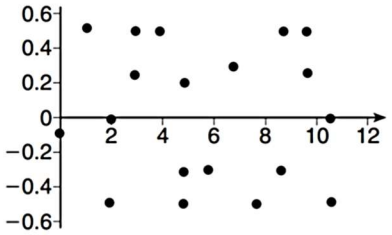
Given this information, which statement(s) can correctly be concluded?

I. Eating more ice cream causes a person to become thirsty.
II. Drinking more soda causes a person to become hungry.
III. There is a strong correlation between ice cream sales and soda sales.

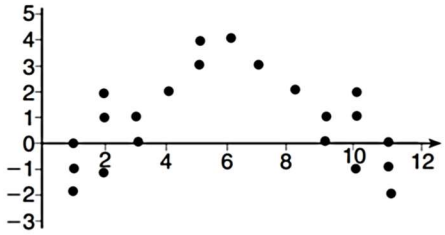
(1) I, only
(2) III, only
(3) I and III
(4) II and III

June 2015

31 The residual plots from two different sets of bivariate data are graphed below.



Graph A



Graph B

Explain, using evidence from graph *A* and graph *B*, which graph indicates that the model for the data is a good fit.

January 2016

35 Erica, the manager at Stellarbeans, collected data on the daily high temperature and revenue from coffee sales. Data from nine days this past fall are shown in the table below.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
High Temperature, t	54	50	62	67	70	58	52	46	48
Coffee Sales, f(t)	$2900	$3080	$2500	$2380	$2200	$2700	$3000	$3620	$3720

State the linear regression function, $f(t)$, that estimates the day's coffee sales with a high temperature of t. Round all values to the *nearest integer*.

State the correlation coefficient, r, of the data to the *nearest hundredth*. Does r indicate a strong linear relationship between the variables? Explain your reasoning.

PIECEWISE FUNCTIONS

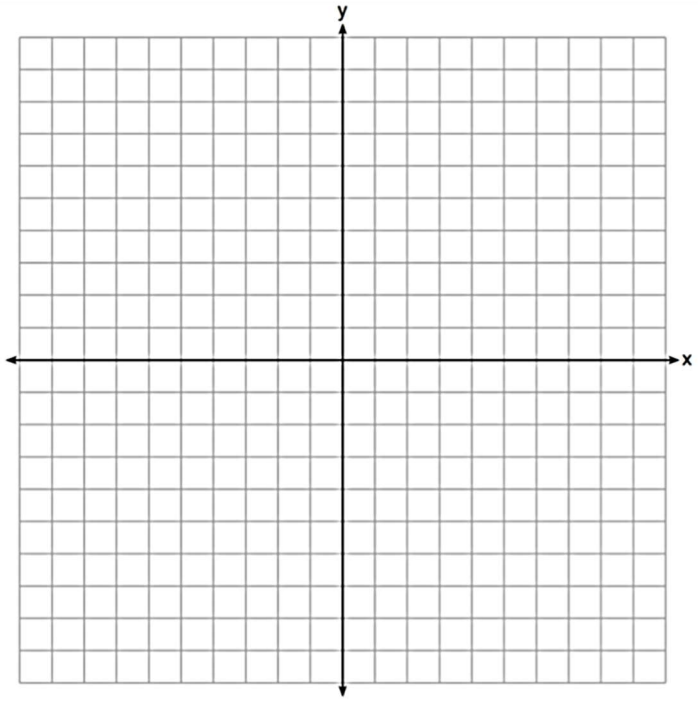
June 2016

36 On the set of axes below, graph

$$g(x) = \frac{1}{2}x + 1$$

and

$$f(x) = \begin{cases} 2x + 1, & x \leq -1 \\ 2 - x^2, & x > -1 \end{cases}$$



How many values of x satisfy the equation $f(x) = g(x)$? Explain your answer, using evidence from your graphs.