Student Name: _____

Missouri
DEPARTMENT OF ELEMENTARY & SECONDARY
EDUCATION™

End-of-Course Assessment

Algebra I

Algebra 1 Pre-Test

1. **What is the product of the following expression?**

   $$(3x + 6)^2$$

   A. $6x^2 + 12$

   B. $9x^2 + 36$

   C. $9x^2 + 18x + 36$

   D. $9x^2 + 36x + 36$

   (handwritten)
   $$(3x + 6)(3x + 6)$$
   $$3x(3x+6) + 6(3x+6)$$
   $$9x^2 + 18x + 18x + 36$$
   $$9x^2 + 36x + 36$$

2. **If the first Now = -9, which equation represents this sequence?**

   (handwritten: +5 +5 +5 +5)

   $$-9, -4, 1, 6, 11, ...$$

   A. $Next = Now - 5$

   B. $Next = Now + 5$ *(handwritten: It adds 5 each time)*

   C. $Next = 5 \cdot Now - 1$

   D. $Next = 5 \cdot Now + 1$

3. **The senior class at a local high school is raising money to purchase a new $1,350 lighting system for the school auditorium. To date, the senior class has raised $450. If the seniors plan to raise $90 per week for *x* weeks, which inequality can be used to determine how many weeks they will need to raise at least $1,350 ?**

   (handwritten)
   $$450 + 90x \geq 1350$$
   (handwritten labels: ← goal; what they have?; 90 per week; Has to make at least 1350)

   A. $450 - 90x \leq 1,350$

   B. $450 + 90x \leq 1,350$

   C. $90x - 450 \geq 1,350$

   D. $90x + 450 \geq 1,350$

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

4. The graph of $y = 2x - 4$ is shown below.
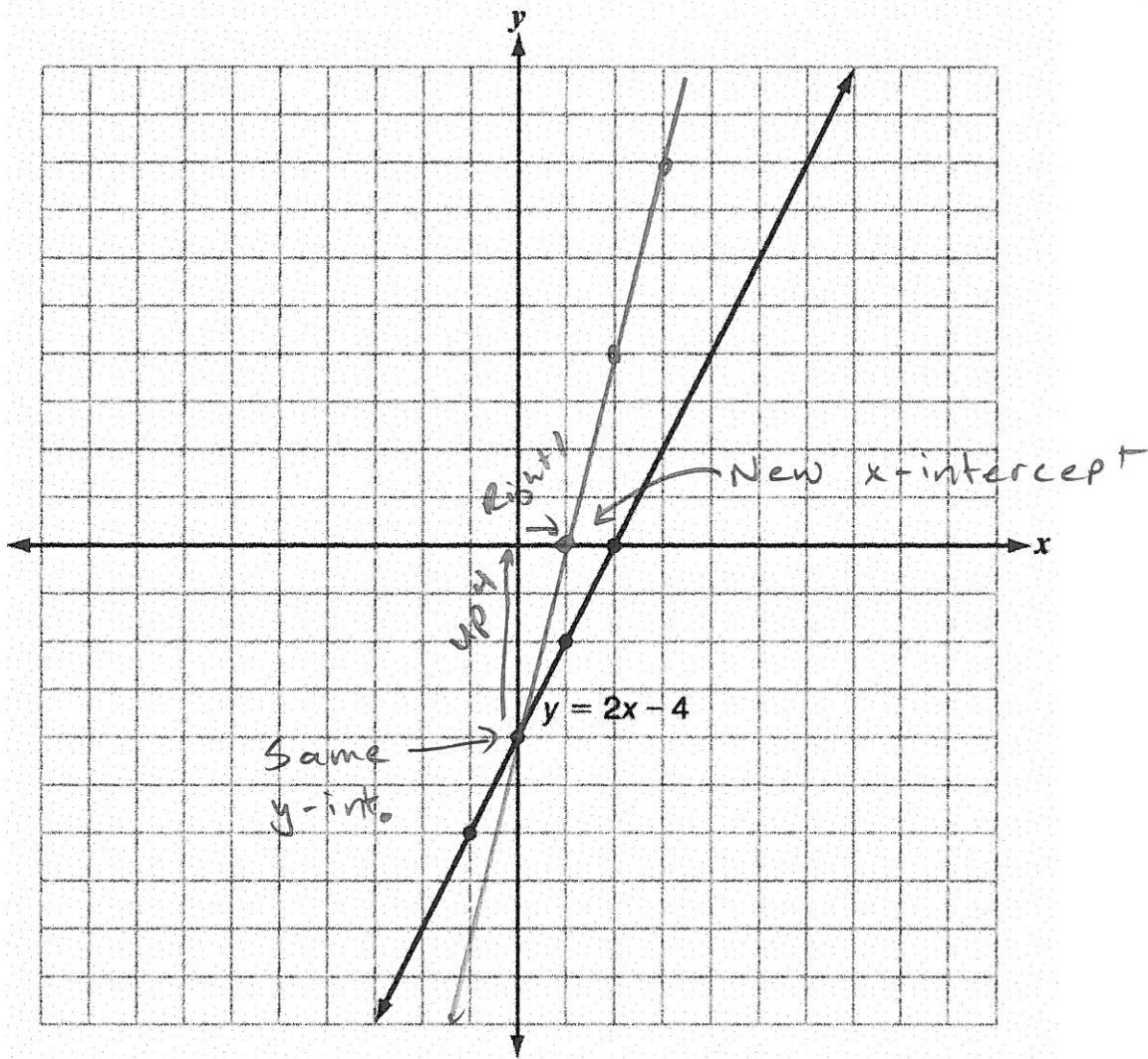
If the slope of the line is doubled, the new equation is $y = 4x - 4$. Which of these is a correct comparison of the two lines?

A. The x-intercept and y-intercept change.

B. The x-intercept and y-intercept stay the same.

C. The x-intercept changes, and the y-intercept is the same.

D. The x-intercept is the same, and the y-intercept changes.

5. Which of these shows the following expression factored completely?

$$6x^2 + 15x - 36$$ ← 3 goes into all of them

A. $(2x-3)(x+4)$

B. $(6x+9)(x-4)$

C. $3(2x-3)(x+4)$

D. $3(2x+3)(x-4)$

(handwritten work)

$3(2x^2 + 5x - 12)$ a·c = 2· -12

$3(2x^2 + 8x - 3x - 12)$ = -24

$3(2x(x+4) - 3(x+4))$ $8 \cdot -3 = -24$

$3(x+4)(2x-3)$ $8 + -3 = 5$

6. A computer technician charges a one-time fee of $50 plus an additional $20 per hour of labor. If an equation is created to determine the technician's total charge, what does the $50 represent?

A. slope

B. coefficient

C. x-intercept

D. y-intercept

(handwritten) one-time fee

7. What is the solution to the following equation?

$$10x^2 + x = 9x^2 + 2$$

A. $x = -1$ or $x = -2$

B. $x = -1$ or $x = 2$

C. $x = 1$ or $x = -2$

D. $x = 1$ or $x = 2$

(handwritten work)

$10x^2 + x = 9x^2 + 2$

$-9x^2 \qquad -9x^2$

$x^2 + x = 2$

$-2 \quad -2$

$x^2 + x - 2 = 0$

$(x+2)(x-1) = 0$

so

$x = -2$ or $x = 1$

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

8. Based on this scatter plot, which equation *could* be a line of best fit?

y-intercept of 110

decreasing slope
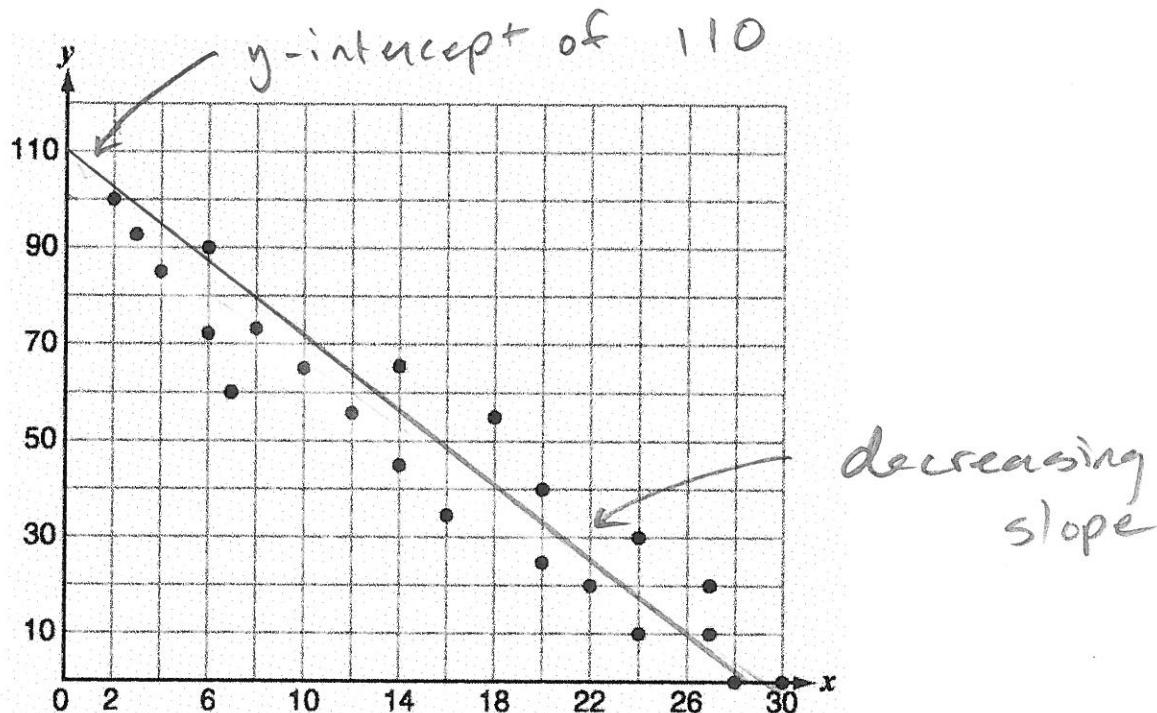
A. $y = -5x + 110$

B. $y = -5x + 85$

C. $y = 5x + 110$

D. $y = 5x + 85$

9. Which equation represents a nonlinear function?

A. $y = x^5$

B. $y = \frac{x}{5}$

C. $y = 5x$

D. $y = 5$

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

10. What is the product of the following expression?

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

A. $2x^3+x-5$

B. $2x^3+2x-10$

C. $2x^3+2x^2-5x$

D. $2x^3+2x^2-10x$

$2x \cdot x^2 + 2x \cdot x + 2x \cdot -5$

$2x^3 + 2x^2 - 10x$

11. The enrollment at High School R has been increasing by 20 students per year. Currently High School R has 200 students attending. High School T currently has 400 students, but its enrollment is decreasing in size by an average of 30 students per year. If the two schools continue their current enrollment trends over the next few years, how many years will it take the schools to have the same enrollment?

A. 4 years

B. 5 years

C. 10 years

D. 20 Years

$R = 200 + 20y$

$T = 400 - 30y$

$200 + 20y = 400 - 30y$
$-200 \quad +30y \quad -200 \quad +30y$

$\dfrac{50y}{50} = \dfrac{200}{50} \quad y = 4$

12. Students were asked to write a trinomial that could *not* be factored using integers.

Pat Wrote: $x^2+3x-10 \rightarrow (x+5)(x-2)$

Sam wrote: $x^2+x-12 \rightarrow (x+4)(x-3)$

Mel wrote: x^2+2x-1 ?

Lee wrote: $x^2+2x-3 \rightarrow (x+3)(x-1)$

Which student followed the given directions?

A. Pat

B. Sam

C. Mel

D. Lee

13. The population of a type of bacteria triples every minute. The chart below represents the population of bacteria after t minutes.

t	Bacteria Population
0	1
1	3
2	9
3	27
4	81
5	243

Which type of function represents the data?

A. linear

B. quadratic

C. exponential

D. absolute value

14. Simplify: $\left(\dfrac{2x^3}{x}\right)^5$

$\dfrac{2x^3}{x} \cdot \dfrac{2x^3}{x} \cdot \dfrac{2x^3}{x} \cdot \dfrac{2x^3}{x} \cdot \dfrac{2x^3}{x}$

A. $10x^{10}$

B. $10x^{14}$

C. $32x^{10}$

D. $32x^{14}$

$\dfrac{32x^{3 \cdot 5}}{x^5} = \dfrac{32x^{15}}{x^5}$

$= 32x^{15-5}$

$= 32x^{10}$

15. A scatterplot is shown on the graph below.
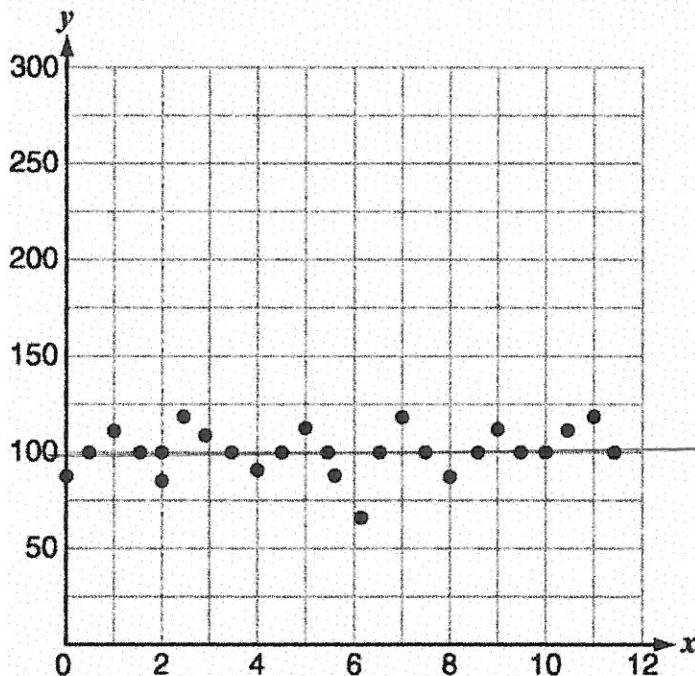
Which of these could be a line of best fit?

A. $y = x + 100$

B. $y = x - 100$

C. $x = 100$

D. $y = 100$

$y = 100$ w/ no slope

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

16. **The areas of the two figures shown below are equal.**

8x

$x = 3$

5x + 1
$5(3) + 1 = 16$ $16 \cdot 3 = 48$

x + 1
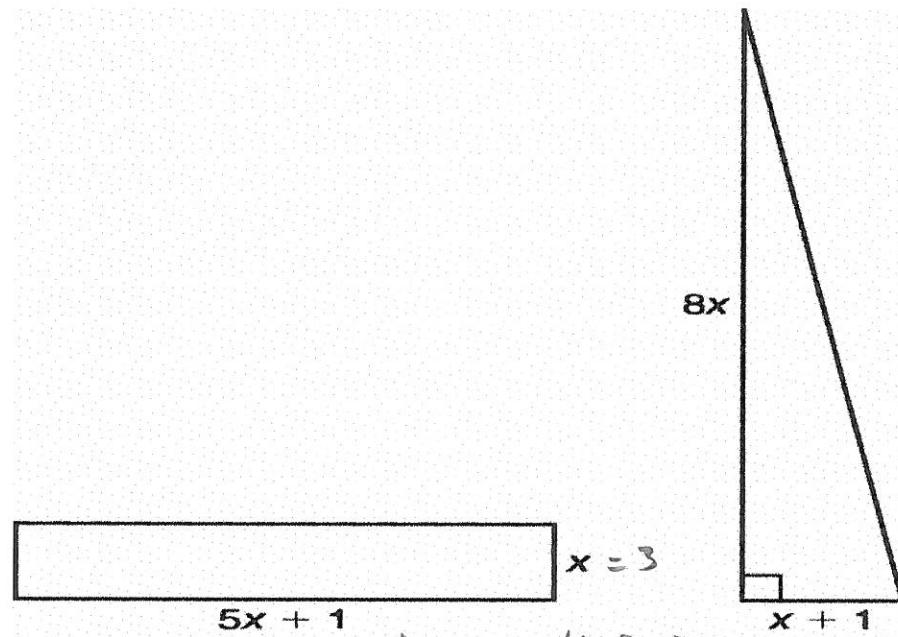
What is the area of the rectangle, in square units?

A. 38

B. 48

C. 96

D. 130

$$x(5x+1) = \frac{8x(x+1)}{2}$$

$$x(5x+1) = 4x(x+1)$$

$$5x^2 + x = 4x^2 + 4x$$
$$-4x^2 \qquad\qquad -4x^2$$

$$x^2 + x = 4x$$
$$-4x \qquad -4x$$

$$x^2 - 3x = 0$$

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

$$x = 0 \text{ or } x = 3$$

17. Beth and Jacob are graphing two equations on a coordinate grid.

Beth has graphed the equation $y = x^2 + 1$

$y = x^2 + 1$

shift up of 2

(0, 1)
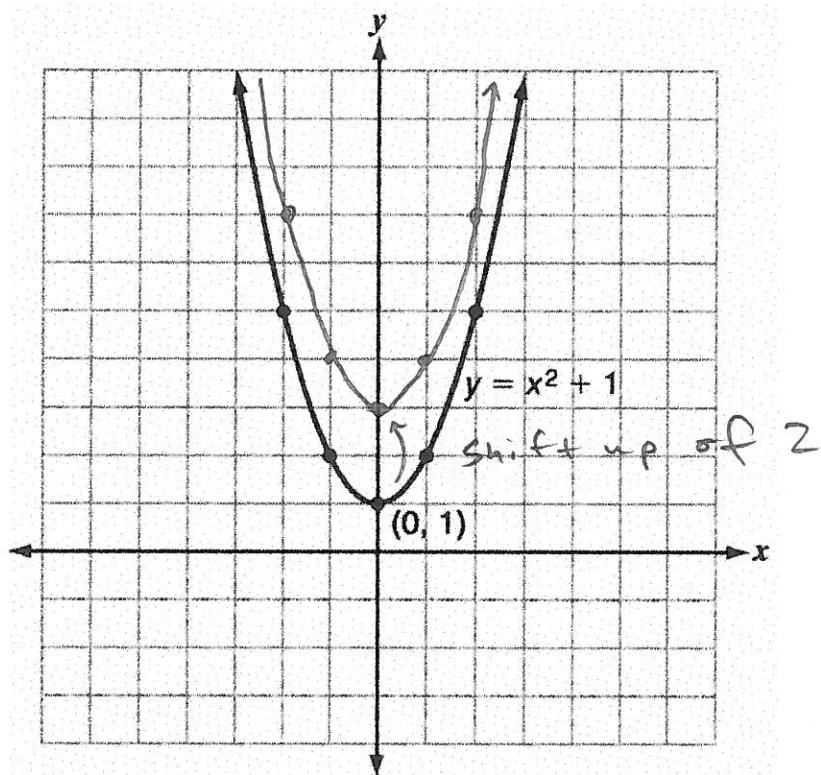
If Jacob graphs $y = x^2 + 3$, where will his graph be in relation to the graph Beth made?

This is 2 more than $x^2 + 1$

A. 2 Units up

B. 3 Units up

C. 2 units to the left

D. 3 units to the right

18. **Which pattern is *different* from the others?**

A. $f(x) = 3x + 1$

x	y
-5	-14 ✓
4	12 ✗
12	36
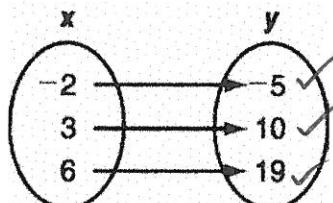
B.

$3(-5) + 1 = -14$
$3(4) + 1 = 13$

C.

x	y
-2	→ 5 ✓
3	→ 10 ✓
6	→ 19 ✓

$3(-2) + 1 = -5$
$3(3) + 1 = 10$
$3(6) + 1 = 19$
so $y = 3x + 1$
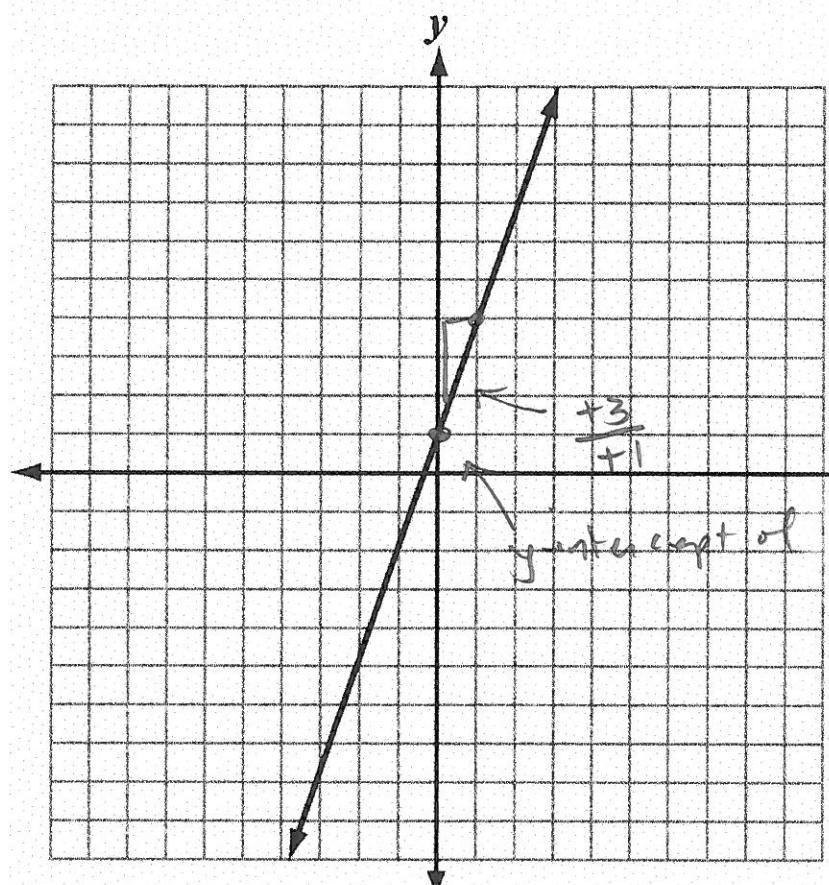
$\frac{+3}{+1}$

y-intercept of 1

so

$y = 3x + 1$

D.

19. What are the *x*-intercepts of the following equation?

$$y = x^2 + 3x + 2$$

A. $(-2, 0)$ and $(-1, 0)$

B. $(-2, 0)$ and $(1, 0)$

C. $(2, 0)$ and $(-1, 0)$

D. $(2, 0)$ and $(1, 0)$

Handwritten annotations:

y is 0 at x-intercept

$$0 = (x+1)(x+2)$$

This is 0 when $x = -1$

This is 0 when $x = -2$

$(-1, 0)$ & $(-2, 0)$

20. Which expression represents the output of the *n*th term?

Input	1	2	3	4	5	n
Output	1	3	5	7	9	

Handwritten: +2 +2 +2 +2, -2, 0, -1

A. $n + 2$

B. $n + 11$

C. $2n + 1$

D. $2n - 1$

Handwritten annotations:

slope of 2 & y-int of -1

$$y = 2x - 1$$

21. What is the solution for the system of equations?

$$y = 2x - 3$$
$$4x - 3y = 31$$

A. $(-11, -25)$

B. $(-11, -19)$

C. $(11, 19)$

D. $(14, 25)$

Handwritten annotations:

Substitute

$$4x - 3(2x - 3) = 31$$
$$4x - 6x + 9 = 31$$
$$-2x + 9 = 31$$
$$-9 \quad -9$$
$$\frac{-2x}{-2} = \frac{22}{-2}$$
$$x = -11$$
$$y = 2(-11) - 3$$
$$y = -25$$

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

22. A group of students surveyed classmates about how far each student travels to school each day, in miles. Ten students' responses were selected at random.

43, 20, 15, 12, 17, 8, 20, 6, 9, 12

The student who lives 43 miles from school decides to transfer to a closer school. Once this number is removed from the set above, by how much does the median change?

6, 8, 9, 12, 12 | 15, 17, 20, 20, 43

Median of 13.5

A. 0

B. 1.5

C. 3

6, 8, 9, 12, (12), 15, 17, 20, 20

D. 4.5

New Median of 12

13.5 - 12 = (1.5)

23. Given two equations of lines:

$y = -\frac{1}{4}x + 2$ and $-2y = \frac{1}{2}x - 4$

→ Solve for y:

$\frac{-2y}{-2} = \frac{\frac{1}{2}x}{-2} - \frac{4}{-2}$

$y = -\frac{1}{4}x + 2$

How do the lines compare? They are the same!

A. They are different lines with the same slope.

B. They are different lines with the same y-intercept.

C. They are the same line, both with a slope of 1/2 and a y-intercept of -4

D. They are the same line, both with a slope of - 1/4 and a y-intercept of 2.

24. If the first Now = 5, what formula can be used to find the terms of this pattern?

$5, -10, 20, -40, 80 \dots$

(handwritten: $\cdot -2$ over each arrow between terms)

A. Next=Now−15

B. Next=(−2)·Now

C. Next=2·Now

D. Next=(−4)·Now+10

(handwritten: Multiply by -2 each time)

25. Which is the simplified form of this expression?

$$(2x+3)(x-6)-2x^2+3x+30$$

A. $4x^2 - 6x + 12$

B. $-2x^2 + 6x + 27$

C. $-6x - 12$

D. $-6x + 12$

(handwritten work:)

Multiply first

$x(2x+3) - 6(2x+3)$

$2x^2 + 3x - 12x - 18$

$2x^2 - 9x - 18$

Then combine like terms

$2x^2 - 9x - 18 - 2x^2 + 3x + 30$

$-6x + 12$

26. Which system of inequalities describes the graph?
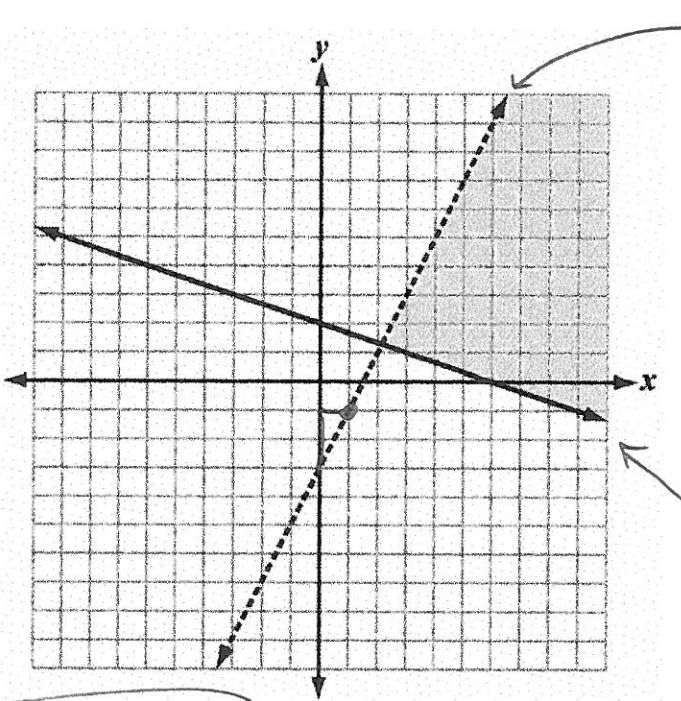
y-int of -3
and slope of 2
shaded Down,
dotted line:

$y < 2x - 3$

y-int of 2, slope
of $-\frac{1}{3}$, shaded up
with solid line

$y \geq -\frac{1}{3}x + 2$

A. $y < 2x - 3$

$y \geq -\frac{1}{3}x + 2$

B. $y \leq 2x - 3$

$y > -\frac{1}{3}x + 2$

C. $y > 2x - 3$

$y \leq -\frac{1}{3}x + 2$

D. $y \geq 2x - 3$

$y < -\frac{1}{3}x + 2$

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

27. **What are the _x_-intercepts of the parabola?**

(−1, 0)

(5, 0)
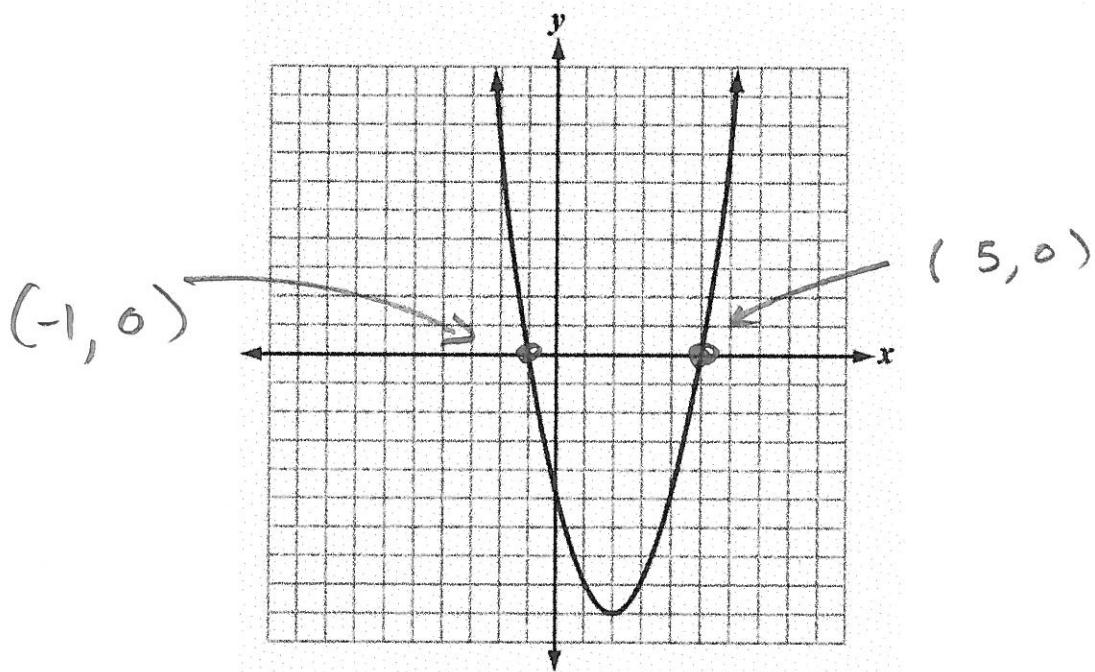
A. $(0, -1)$ and $(0, 5)$

B. $(2, 0)$ and $(-9, 0)$

C. $(-1, 0)$ and $(5, 0)$

D. $(0, -5)$ and $(-5, 0)$

28. **Which equation represents a linear function?**

A. $y = x + 1$

B. $xy = 1$

C. $y = x^2$

D. $x = \frac{1}{y}$

$y = mx + b$ is linear, yo!

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

29. What is the *y*-coordinate in the solution for the system of linear equations below?

$4 \cdot \quad$ -3x + 2y = 6

$3 \cdot \quad$ 4x - y = 2

Eliminate x's to solve for y

$-12x + 8y = 24$

$+ \quad 12x - 3y = 6$

$$\frac{5y}{5} = \frac{30}{5}$$

$$y = 6$$

A. -6

B. 1

C. 2

D. 6 ⟵ circled

30. Which equation describes the line of best fit for the scatterplot below?
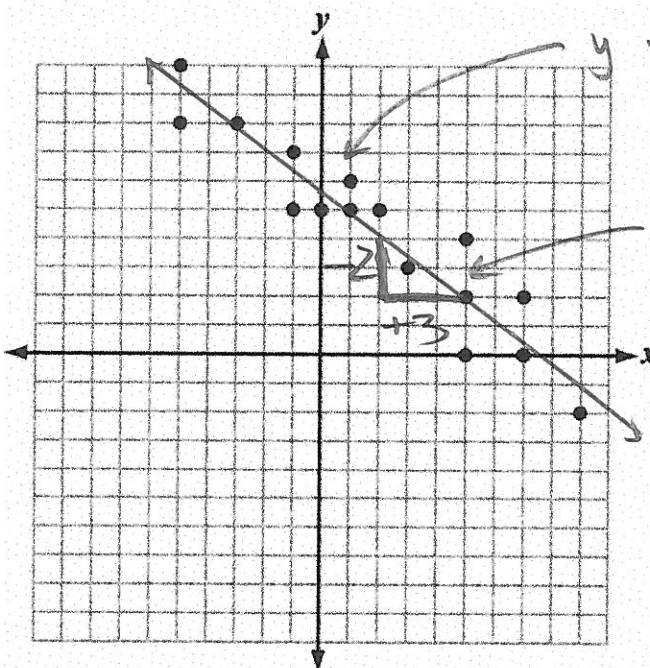
y-intercept between 5 + 6

slope of -2/3

$$y = 5 - 2/3 x$$

A. $y = -\frac{2}{3}x + 4$

B. $y = -\frac{2}{3}x + 5$ ⟵ circled

C. $y = -\frac{3}{2}x + 4$

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

31. **What is the simplified form of the expression?**

$$\frac{4x^3y^3}{8x^5y^2} = \frac{y^{3-2}}{2x^{5-3}} = \frac{y}{2x^2}$$

A. $\dfrac{y}{2x^2}$

B. $\dfrac{2y}{x^2}$

C. $2x^2y$

D. $2x^8y^5$

32. **Sam and Candy begin at the same place and drive in opposite directions at constant rates. Sam drives 15 miles per hour faster than Candy. After 2 hours, they are 230 miles apart. If Candy's car gets 20 miles per gallon, how many gallons of gas did she use?**

A. 5.0 gallons

B. 5.8 gallons

C. 6.5 gallons

D. 11.5 gallons

hand-written work:

hours   Candy's speed

$2 \cdot x + 2(x+15) = 230$

Sam's speed

$2x + 2x + 30 = 230$

$4x + 30 = 230$

$-30 \qquad -30$

$\dfrac{4x}{4} = \dfrac{200}{4}$

$x = 50$

$2 \cdot x = 2 \cdot 50 = 100 \text{ miles}$

$100 \text{ miles} \cdot \dfrac{1 \text{ gallons}}{20 \text{ miles}} = 5 \text{ gallons}$

33. The graph o $y=x^2$ is shown below.

$y = x^2$

shifted up 2 units
(0,2)
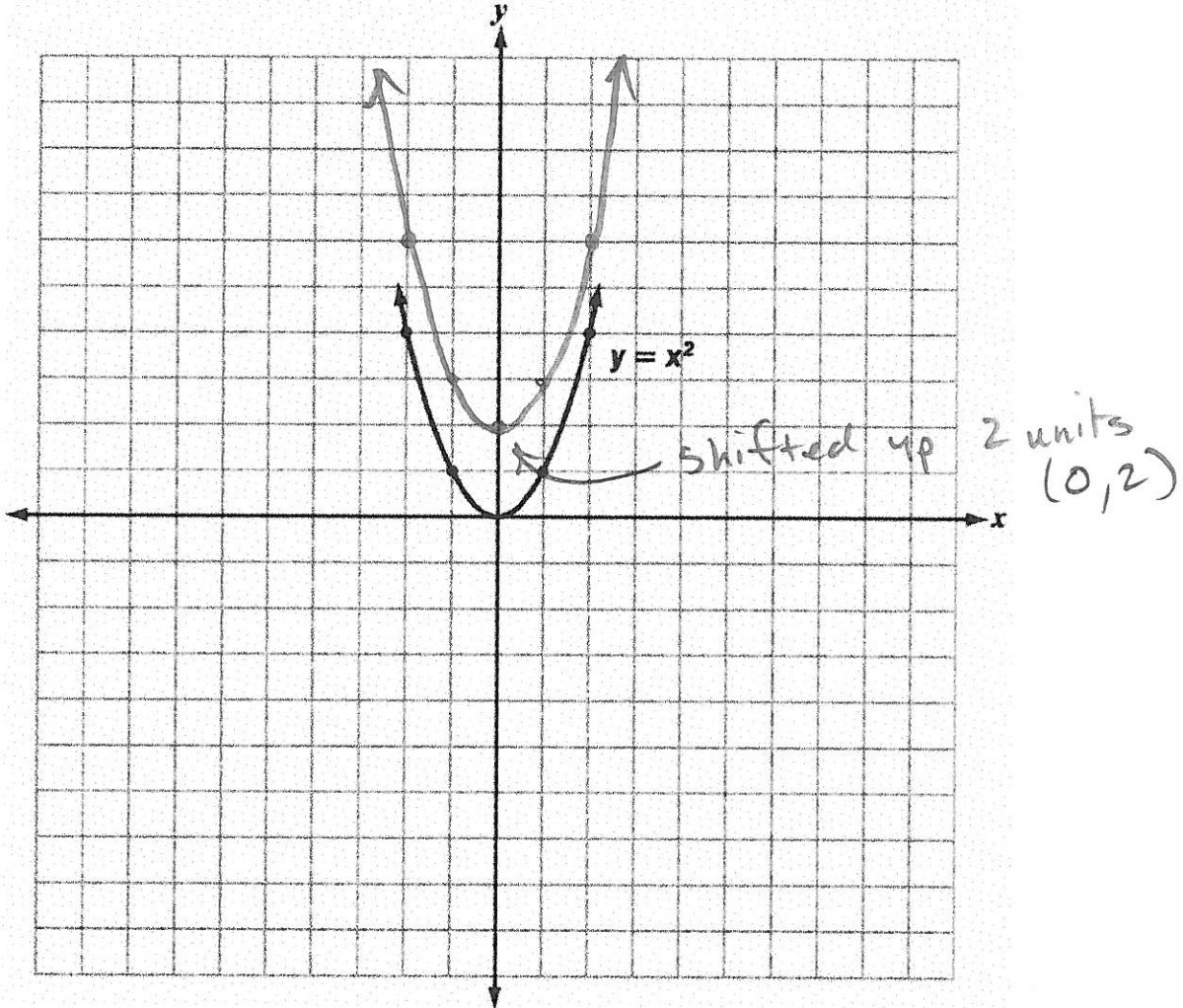
If the graphed function is translated to $y=x^2+2$, which ordered pair would represent the new *y*-intercept?

A. (0, 2)

B. (2, 0)

C. (-2, 0)

D. (0, -2)

Please note: This document may contain minor spacing and formatting inconsistencies due to conversion of items from online presentation to PDF format.

34. Sandy has a total of 35 coins in her money jar. If Sandy's jar contains only nickels and dimes and the value of all the coins is $2.50, how many nickels does Sandy have?

Eliminate d to find n

A. 5

B. 15

C. 20

D. 30

$$-.10 \begin{vmatrix} n + d = 35 \\ .05n + .10d = 2.50 \end{vmatrix}$$

$$-0.10n - 0.10d = -3.5$$
$$.05n + 0.10d = 2.5$$

$$\dfrac{-0.05n}{-0.05} = \dfrac{-1}{-0.05}$$

$$n = 20$$

35. A line is represented by the equation $3x + 2y = 4$. What is another way to represent the same line?

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

B. $y = \frac{3}{2}x + 2$

C. $y = \frac{3}{2}x + 4$

D. $y = -\frac{3}{2}x + 4$

$$3x + 2y = 4$$
$$-3x \qquad -3x$$

$$\frac{2y}{2} = \frac{-3x}{2} + \frac{4}{2}$$

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

36. Two linear functions are represented by the set of ordered pairs and the graph below.

$$\{(-4, -6), (-2, -2), (2, 6), (4, 10)\}$$
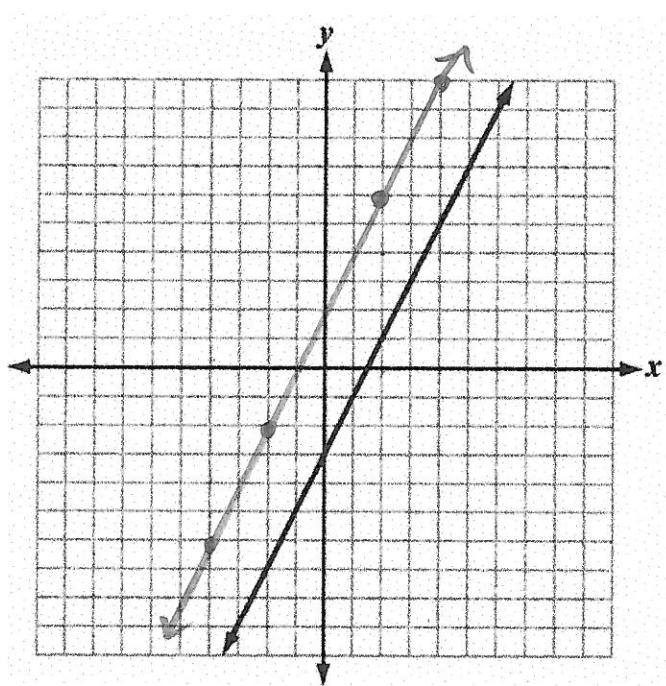
Which statement describes the relationship between the functions?

A. The lines are parallel.

B. The lines are the same.

C. The lines are perpendicular.

D. The lines are intersecting but not perpendicular.

37. What is the equation of the function represented by this table of values?

y-intercept (handwritten, with arrow pointing to the 3 in the table)

x	-2	-1	0	1	2
y	$\dfrac{3}{25}$	$\dfrac{3}{5}$	3	15	75

·5 ·5 ·5 (handwritten) *y = 3·5^x* (handwritten)

A. $y = 5x + 3$

B. $y = 12x + 3$

C. $y = 3 \cdot 5^x$ (circled)

D. $y = 5 \cdot 3^x$

38. Alex noticed a relationship between the amount of television he watched each week and his test scores.

Effect of TV on Test Scores

y = 100 − 5x (handwritten)

−5 / +1 (handwritten near graph)

y = 100 − 5(10) (handwritten)

y = 50 (handwritten)
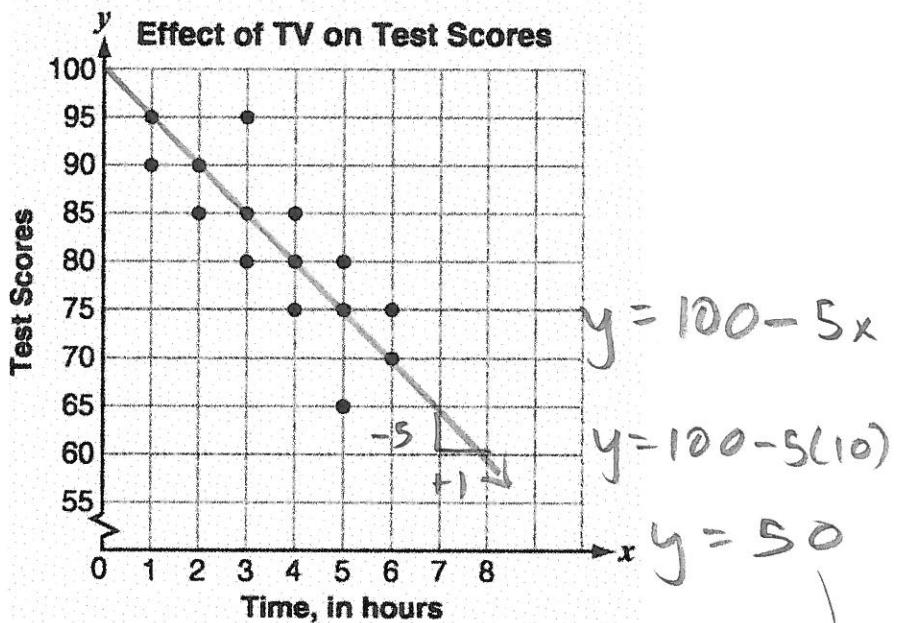
If this pattern continues, what will he likely score on a test after watching 10 hours of TV?

A.   41

B.   48 (circled)   *closest* (handwritten)

C.   54

D.   58

39. What is the solution to the following inequality?

1/3 (6 − x) ≥ -2

A. $x \geq 0$

B. $x \leq 0$

C. $x \geq 12$

D. $x \leq 12$

(handwritten:)
$2 - \frac{1}{3}x \geq -\frac{2}{2}$
$-2 \qquad -2$
$-3\left(-\frac{1}{3}x\right) \geq (-4) - 3$
switch the sign
$x \leq 12$

40. The director of a play must decide how much to charge per ticket. If tickets cost *c* dollars each, a total of (75 − 5c) people will attend the play. Which ticket price will generate the most income?

A. $1.00

B. $7.50

C. $15.00

D. $20.50

(handwritten:)
$0 = (75 - 5c) \cdot c$

$75 - 5c = 0$

$\frac{75}{5} = \frac{5c}{5}$

$15 = c$

Look for the vertex. Vertex is ½ between roots

Halfway between 0 and 15 is 7.5

Student Name:_____

Missouri
DEPARTMENT OF ELEMENTARY & SECONDARY
EDUCATION ™
End-of-Course Assessment
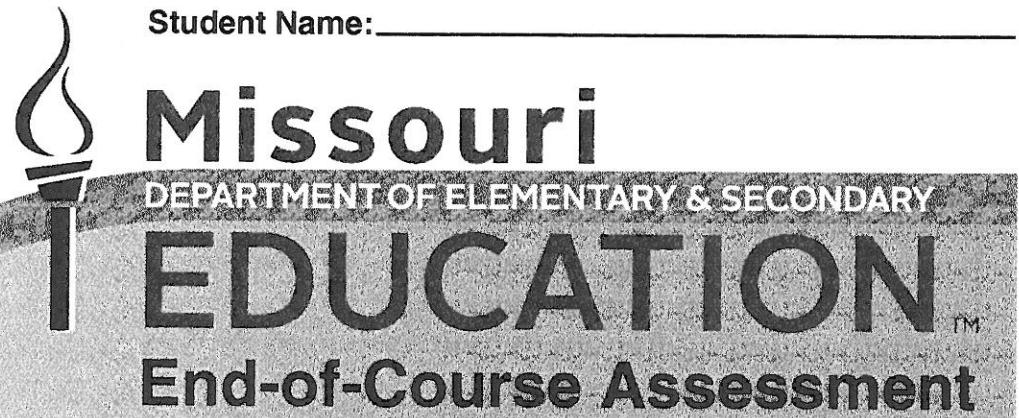
Algebra I

**Algebra 1 Pre-Test
Performance Task**

- Design another box that Joe could use that would cost less than $60.00 to ship and would have the same volume as the box shown above. If each dimension must be a whole number, what are the dimensions of the new box?

l = __16__ in.

w = __15__ in.

h = __12__ in.

$V = 20 \cdot 24 \cdot 6$ Volume

$V = 2880$

$2880 = l \cdot w \cdot h$

$60 > 3 + 1.20(l + w + h)$

l	w	h	$l \cdot w \cdot h$	$3 + 1.20(l + w + h)$	
4	4	180	2880	228.60	← Too big! Make sides more alike
32	15	6	2880	66.60	← Too big! closer together
16	15	12	2880	$54.60	

One example of many that would work