A*C*TAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

Released Item Booklet

Algebra
End-of-Course Examination

April 2007 Administration

Arkansas Department of Education

1. What is the value of t in the expression below?

$$\frac{5}{12}t - 12 = 48$$

   A. $t = 1$

   B. $t = 32$

   C. $t = 86.4$

 * D. $t = 144$

2. Which is the **correct** domain (d) and range (r) for the table below?

x	y
-1.5	2
3	-4.1
-3.7	-2.6

   A. $d = \{-1.5, -4.1, -2.6\}, r = \{2, 3, -3.7\}$

 * B. $d = \{-1.5, 3, -3.7\}, r = \{2, -4.1, -2.6\}$

   C. $d = \{2, -4.1, -2.6\}, r = \{-1.5, 3, -3.7\}$

   D. $d = \{2, -4.1, -3.7\}, r = \{-1.5, 3, -2.6\}$

3. Based on the table below, which statement **best** describes the data?

Cost of Renting Equipment at the Jet Ski Company

Time, x (in hours)	1	2	3	4	5	6
Rental Cost, y (in dollars)	45	60	75	90	105	120

 * A.   The data represent a linear function.

   B.   The data do not represent a function.

   C.   The data represent a quadratic function.

   D.   The data represent an exponential decay function.

4. What is the greatest common factor of the expressions $36x^8y^2$ and $18x^4y^3$?

   A. $2x^2y^2$

   B. $3x^4y$

   C. $9x^2y$

 * D. $18x^4y^2$

5. Jason measured the length of an eraser (y) and found it was 5 inches less than $\frac{3}{4}$ of the length of the pencil (x). Which equation represents this relationship?

 * A. $\frac{3}{4}x - 5 = y$

   B. $5y + \frac{3}{4} = x$

   C. $5 - \frac{3}{4}x = y$

   D. $\frac{3}{4} - 5x = y$

6. Which ordered pair satisfies both equations below for x and y?

$$x + y = 5$$
$$x - y = 3$$

   A. $(-1, -4)$

   B. $(-2, -3)$

   C. $(3, 2)$

 * D. $(4, 1)$

7. Frank Dewey, John Smith, and Bill Howe manage three different used-car lots. The inventory of each brand of truck, van, and car is shown in the matrices below.

| | **Dewey** | | | | **Smith** | | | | **Howe** | | |
	Trucks	Vans	Cars		Trucks	Vans	Cars		Trucks	Vans	Cars
Brand A	10	12	14	Brand A	6	7	10	Brand A	6	12	14
Brand B	5	10	15	Brand B	10	12	14	Brand B	12	12	12
Brand C	3	6	9	Brand C	6	5	4	Brand C	10	8	6

If they combined their businesses, how many trucks would they have altogether?

A.   18

B.   22

C.   27

* D.   68

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8. What is the domain of an ordered pair on the graph below?
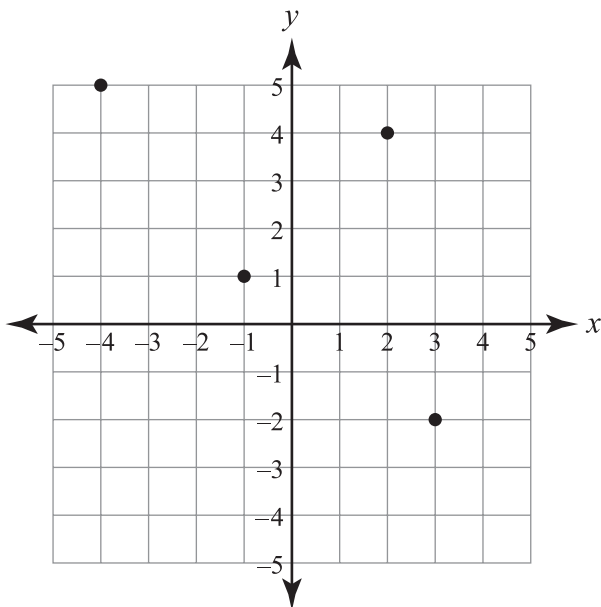
* A.   −4

B.   −2

C.   1

D.   4

9. Which inequality represents the statement below?

The product of a number and −3, decreased by 4, is greater than or equal to 17.

A. $3n - 4 \geq 17$

* B. $-3n - 4 \geq 17$

C. $-3n - 4 \leq 17$

D. $3n - 4 \leq 17$

10. Which transformation would map the graph of $y = 3x^2 + 4$ to the graph of $y = 3x^2 - 3$?

A.   a vertical shift upward

* B.   a vertical shift downward

C.   a horizontal shift to the left

D.   a horizontal shift to the right

3

11. Jordan has 3 paint colors in stock for painting houses. He keeps a record of his paint supply by the color and size of the paint can. The matrix below indicates his current paint supply.

Jordan's Paint Supply

	Half Gallon	Gallon
White	12	20
Blue	4	12
Brown	8	16

He needs to increase his entire paint supply by 25%. Which matrix represents Jordan's increased paint supply?

A.

Jordan's Paint Supply

	Half Gallon	Gallon
White	9	15
Blue	3	9
Brown	6	12

B.

Jordan's Paint Supply

	Half Gallon	Gallon
White	3	5
Blue	1	3
Brown	2	4

* C.

Jordan's Paint Supply

	Half Gallon	Gallon
White	15	25
Blue	5	15
Brown	10	20

D.

Jordan's Paint Supply

	Half Gallon	Gallon
White	37	45
Blue	29	37
Brown	33	41

12. Which graph shows the **correct** solution set to the inequality below?

$$2(x + 3) \geq -(x - 12)$$

* A.

B.

C.

D.
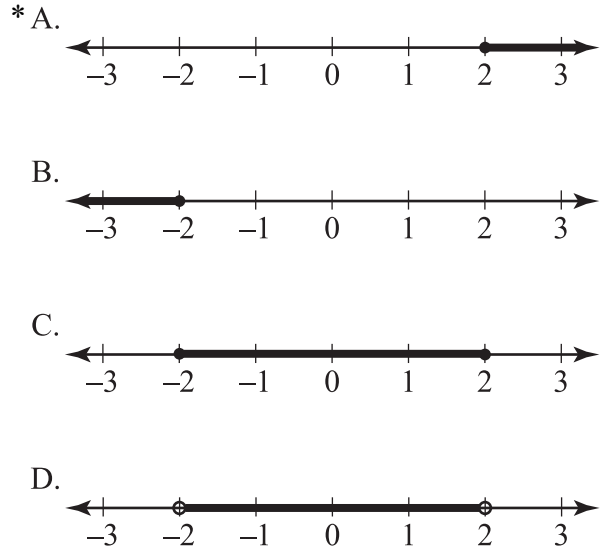
13. According to the graph shown below, at what rate is the object falling?

Falling Object
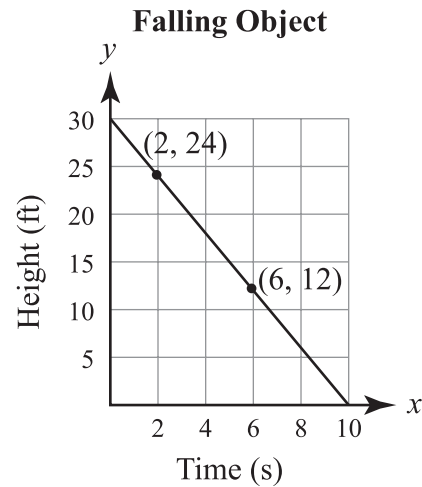
A.   2 feet per second

* B.   3 feet per second

C.   4 feet per second

D.   5 feet per second

4

14. At his job, Andre earns $7.00 an hour plus a commission of 10% of his total sales. If h represents the number of hours worked, and s represents the total sales, which expression shows Andre's total earnings?

    A. $7.00 + h + 0.10s$

    B. $7.00(h + 0.10s)$

    C. $0.10(7.00h + s)$

  * D. $7.00h + 0.10s$

15. The total daily sales at a video store are shown in the expression below, where x is the number of tapes sold.

$$21x - 3x^2$$

Which shows this expression completely factored?

  * A. $3x(7 - x)$

    B. $3x^2(7 - x)$

    C. $x(21 - 3x)$

    D. $(x - 3)(7 - x)$

16. The formula for finding the perimeter of a rectangle is $P = 2l + 2w$. Which equation solves for w in terms of l and P?

    A. $w = \dfrac{P}{2l}$

    B. $w = \dfrac{P + 2l}{2}$

  * C. $w = \dfrac{P - 2l}{2}$

    D. $w = 2(P - 2l)$

17. Given the matrices below, what is the solution to $2A + 3B$?

$$A = \begin{bmatrix} 1 & 4 \\ 6 & 0 \end{bmatrix} \qquad B = \begin{bmatrix} -2 & 4 \\ 3 & -5 \end{bmatrix}$$

    A. $\begin{bmatrix} 8 & 20 \\ 21 & 15 \end{bmatrix}$

  * B. $\begin{bmatrix} -4 & 20 \\ 21 & -15 \end{bmatrix}$

    C. $\begin{bmatrix} -1 & 8 \\ 9 & -5 \end{bmatrix}$

    D. $\begin{bmatrix} -4 & 21 \\ 20 & -15 \end{bmatrix}$

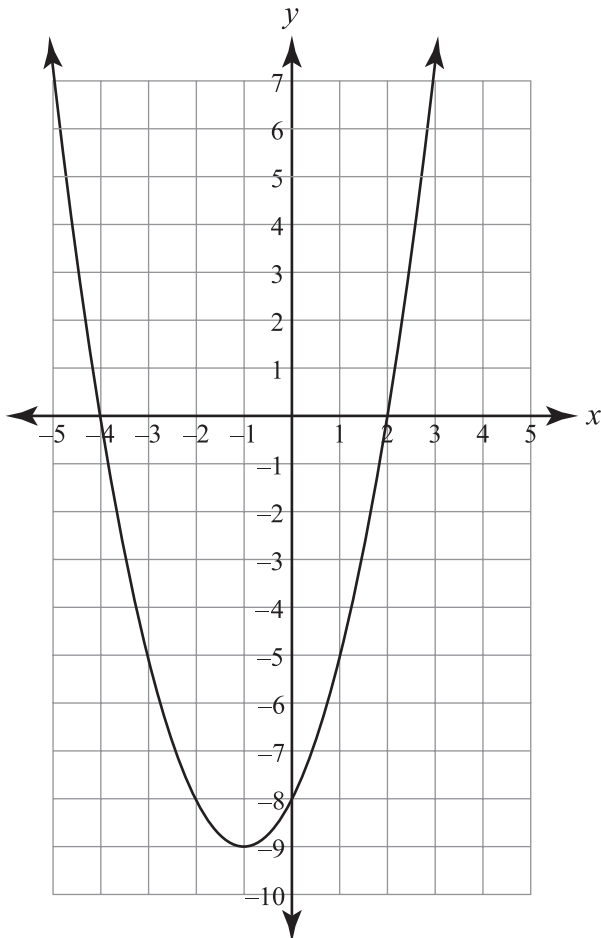**18.** Which properly evaluates the function below by its given values?

$$f(x) = 6x - 4; \text{ for } x = 0, 1, 2, 3$$

  * A. $\{-4, 2, 8, 14\}$

    B. $\{4, 10, 16, 22\}$

    C. $\{56, 57, 58, 59\}$

    D. $\{0, -24, -48, -72\}$

19. Maria buys some CDs at Track One Records. Each CD costs $12. Which expression would find the price of n CDs?

    A. $n - 12$

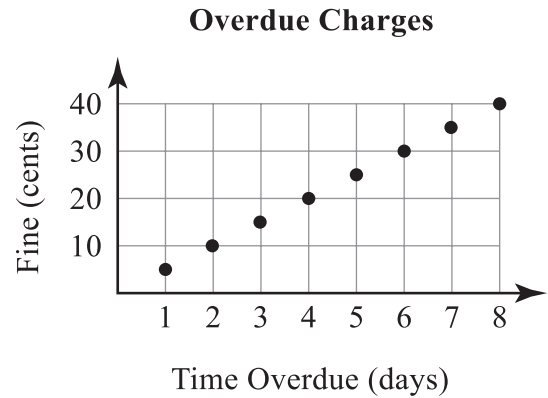   B. $n + 12$

    C. $\dfrac{n}{12}$

  * D. $12n$

20. The quadratic function $y = x^2 + 2x - 8$ is graphed below.

What is the minimum y-value of this equation?

* A. -9
   B. -5
   C. -4
   D. -1

21. Which pair of lines is parallel?

   A. $y = 2, x = 2$
* B. $y = x + 3, y = x - 4$
   C. $y = 2x + 6, y = -3x + 6$
   D. $y = -4x - 3, y = 4x + 4$

22. Based on the graph below, what would the overdue charge be for 30 days?

Overdue Charges

   A. $ 0.15
   B. $ 0.40
* C. $ 1.50
   D. $15.00

23. What is $2A - 3B$ given the matrices below?

$$A = \begin{bmatrix} 1 & 4 \\ 6 & 0 \end{bmatrix} \qquad B = \begin{bmatrix} -2 & 4 \\ 3 & -5 \end{bmatrix}$$

   A. $\begin{bmatrix} 3 & 0 \\ 3 & 5 \end{bmatrix}$

   B. $\begin{bmatrix} -1 & 0 \\ 3 & 5 \end{bmatrix}$

* C. $\begin{bmatrix} 8 & -4 \\ 3 & 15 \end{bmatrix}$

   D. $\begin{bmatrix} 8 & 3 \\ -4 & 15 \end{bmatrix}$

6

24. The cost of each bottle of juice from a juice machine is $0.65. Which expression represents the total amount of money collected from the sale of q cans of juice from the machine?

   A. $0.65 + q$

   B. $0.65 - q$

* C. $0.65 \times q$

   D. $\dfrac{0.65}{q}$

25. When the equation $y = 3x + 6$ is changed to $y = -3x + 6$, what effect does this change have on its graph?

   A.   The line moves to the left on the x-axis.

   B.   The line moves downward on the y-axis.

   C.   The line slants upward, from left to right, instead of downward.

* D.   The line slants downward, from left to right, instead of upward.

26. Manny created a computer program that randomly generates a letter from the word "Arkansas." What is the probability that the computer program will generate a letter that only appears once in the word?

   A. $\dfrac{1}{8}$

   B. $\dfrac{2}{8}$

* C. $\dfrac{3}{8}$

   D. $\dfrac{5}{8}$

27. Which graph of a function $f(x)$ has a zero at $x = 2$?

* A.
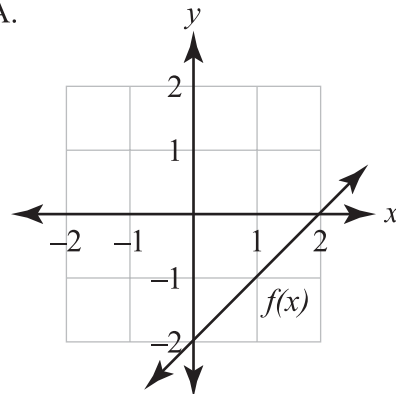
B.
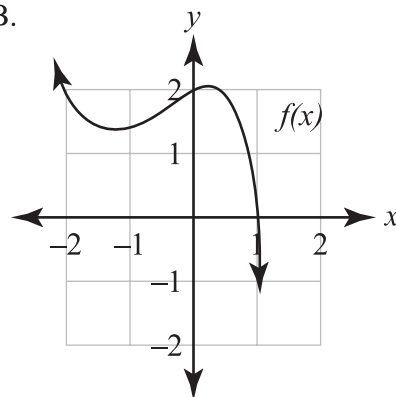
C.
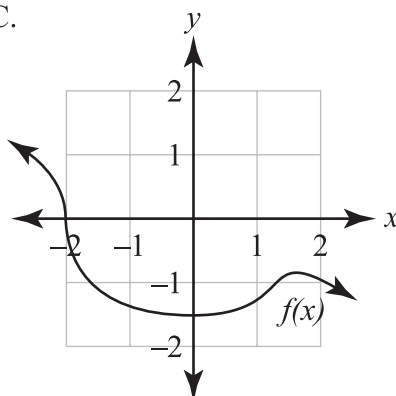
D.
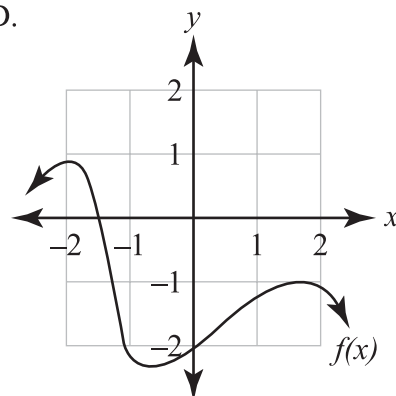
28. The formula to find a man's shoe size is $s = 3f - 24$, where s = shoe size, and f = foot length in inches. If a man's shoe size is 9, what is the length of his foot?

    A.   3 inches

    B.   5 inches

 * C.   11 inches

    D.   15 inches

29. Our galaxy has about one hundred billion stars. How is one hundred billion written in scientific notation?

    A. 1.0×10^9

    B. 1.0×10^{10}

 * C. 1.0×10^{11}

    D. 1.0×10^{14}

30. When graphed, which equation would result in a parabola that opens downward?

    A. $y = 4x^2$

    B. $y = 4x^3$

 * C. $y = -4x^2$

    D. $y = -4|x|$

31. Tamika's savings account earned $80.00 in interest. This amount is 2% of her total savings. What was Tamika's original savings?

    A. $ 81.60

    B. $ 158.40

    C. $1,600.00

 * D. $4,000.00

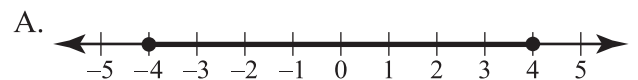**32.** What is the complete factorization of the expression below?

$$2x + xy + xyz$$

    A. $2x(y(z))$

    B. $2x(y + yz)$

    C. $x(2 + y + z)$

 * D. $x(2 + y + yz)$

33. What is the simplest form of the expression below?

$$\frac{x^5}{x^2(x)}$$

 * A. x^2

    B. x^3

    C. x^7

    D. x^8

34. Which graph below is the solution to $|x| < 4$?

A.

* B.

C.

D.

8
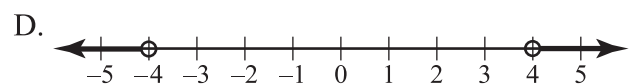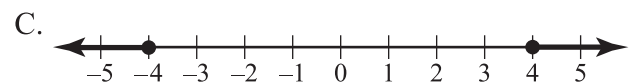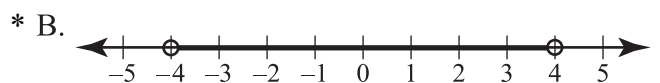
35. A motel gets 100 customers per night when the rate is $70 per customer. For each $5 by which the manager raises the rate, the motel loses 4 customers. How much money will the motel earn in one night when the rate is $85 per customer?

    A. $6,160

    B. $7,200

 * C. $7,480

    D. $8,160

36. On Monday, a restaurant has 250 pounds of garbage. Of that amount, 60 pounds can be recycled. On Tuesday, the restaurant has 310 pounds of garbage. Based on Monday's garbage, how much of Tuesday's garbage is recyclable?

    A.   48.4 pounds

 * B.   74.4 pounds

    C.   120.0 pounds

    D.   235.6 pounds

37. The Moon is 3.844×10^5 km from Earth. If a spaceship were traveling from Earth to the Moon at an average speed of 5400 km per hour, **approximately** how many hours would it take the spaceship to reach the Moon?

    A.   7.1 hours

 * B.   71 hours

    C.   710 hours

    D.   7,100 hours

38. The graph below shows the speed of a car after t minutes.
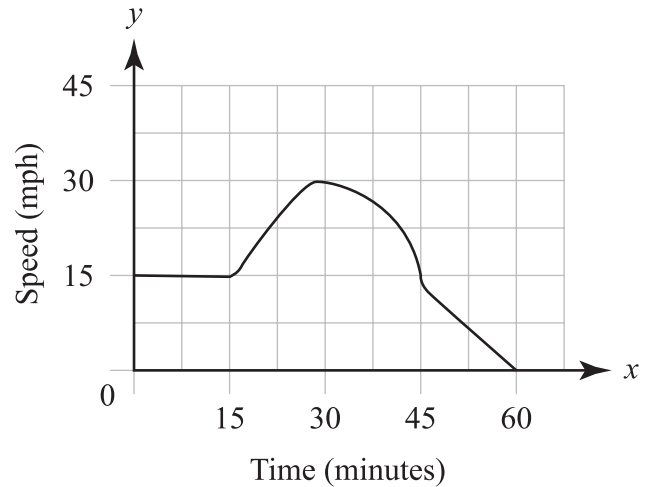
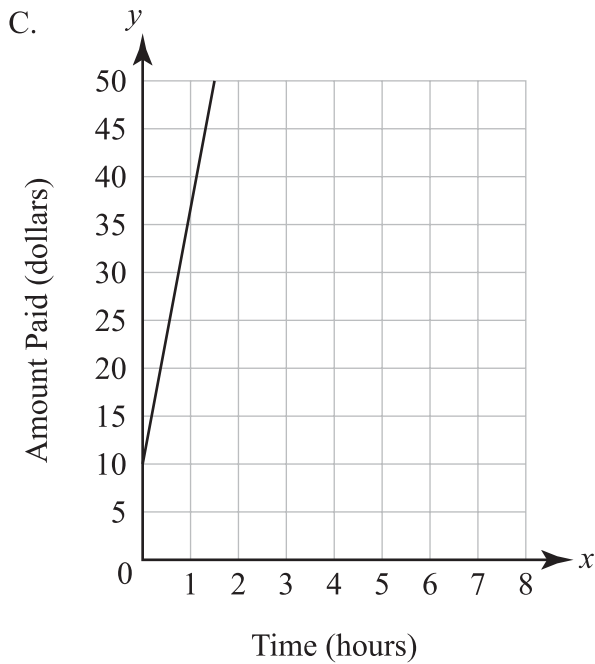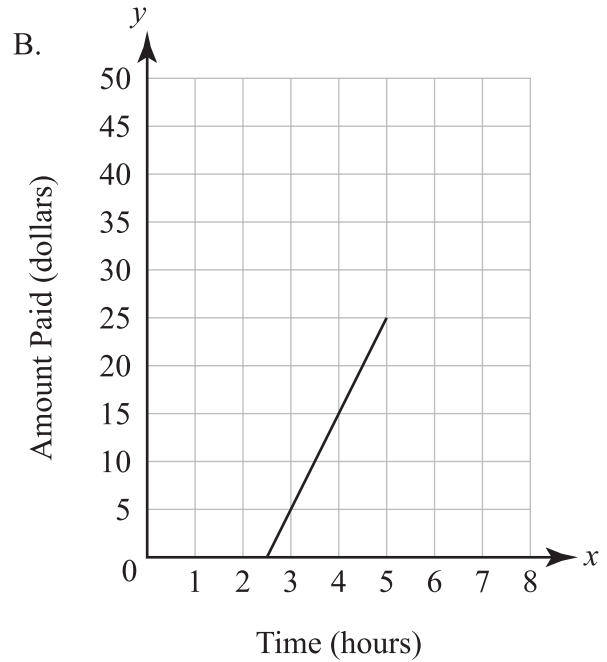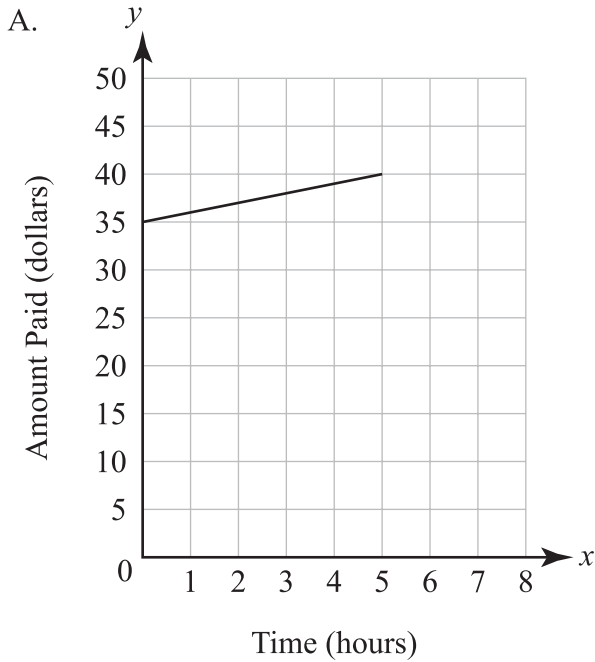After how many minutes is the car's speed zero?

    A.   15

    B.   30

    C.   45

 * D.   60

39. What is the simplest form of $\dfrac{\sqrt{15}}{\sqrt{81}}$?

    A. $\dfrac{3\sqrt{5}}{9}$

    B. $\dfrac{5\sqrt{3}}{9}$

 * C. $\dfrac{\sqrt{15}}{9}$

    D. $\dfrac{\sqrt{15}}{\sqrt{81}}$

40. Jan's family rented a boat at Lake Ouachita. They paid a rental fee of $25 plus $10 per hour. Which graph shows the total amount the family paid, as a function of time?

A.

Time (hours)

B.

Time (hours)

C.

Time (hours)

* D.

Time (hours)
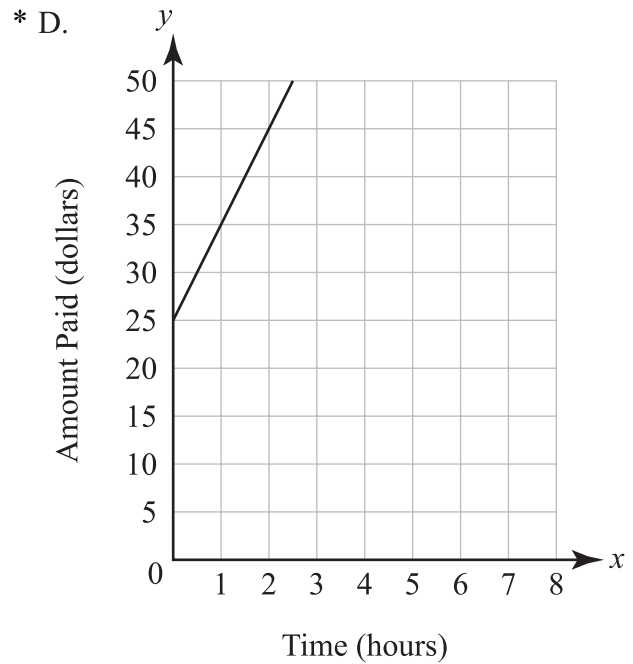
41. Nancy scored 75, 83, and 79 on her first 3 algebra tests. If she wants her mean score for the first 4 tests to be at **least** 80, what is the minimum she must score on the next test?

   A.   79

   B.   80

 * C.   83

   D.   85

42. The function $f(x) = 6x^2$ represents the amount of wrapping paper needed to wrap a cube having a length of x feet. The length of Janine's cube is 3 feet. How much paper is needed to wrap her cube?

   A. 36 ft^2

 * B. 54 ft^2

   C. 108 ft^2

   D. 324 ft^2

43. Shawn delivered propane to homes for heat during the months of October through December. The amounts, in gallons, that Shawn delivered last year are shown in the table below.

Month	Gallons
October	x
November	$2x + 500$
December	$x^2 - 10x - 800$

Which expression represents the total amount of propane Shawn delivered for these three months?

   A. $-6x - 300$

   B. $-6x^5 - 300$

 * C. $x^2 - 7x - 300$

   D. $4x^2 - 10x - 300$

44. Which table represents a function?

* A.

Price (dollars)	Sales Tax (dollars)
1	0.07
2	0.14
3	0.21
4	0.28
5	0.35

B.

x	y
-2	6
-2	19
-2	-25
-2	-8
-2	0

C.

Age (years)	Height (inches)
13	60
13	62
14	64
14	66
16	68

D.

x	y
3	6
3	-6
0	0
-5	10
-5	-10

45. Based on the box-and-whisker plot shown below, which statement is true?

Player X

Player Y

$$0 \quad 2 \quad 4 \quad 6 \quad 8 \quad 10 \quad 12 \quad 14 \quad 16 \quad 18 \quad 20 \quad 22 \quad 24 \quad 26 \quad 28 \quad 30 \quad 32 \quad 34 \quad 36 \quad 38 \quad 40$$
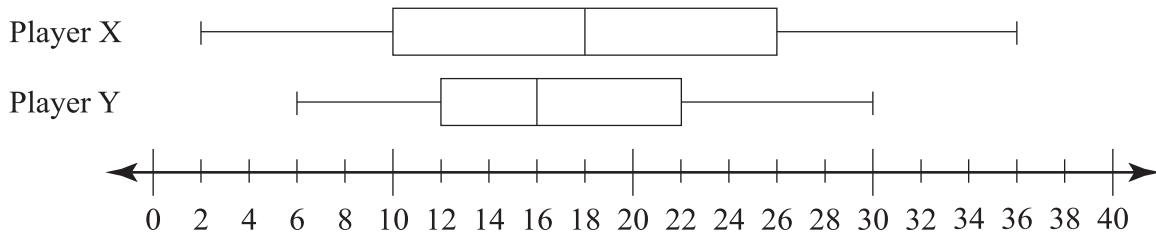
* A.   The median score for Player X is greater than the median score for Player Y.

   B.   The minimum score for Player Y is less than the minimum score for Player X.

   C.   The range of scores for Player Y is greater than the range of scores for Player X.

   D.   The interquartile range for Player X is less than the interquartile range for Player Y.

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46. What is the slope of the line on the graph below?
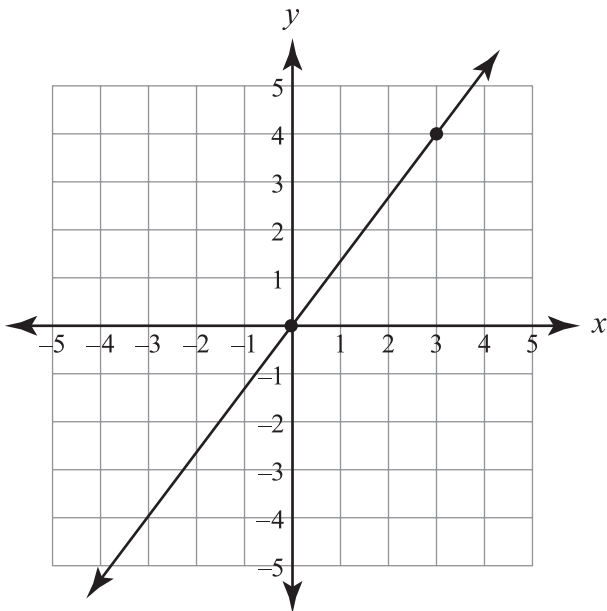
A. $-\dfrac{4}{3}$

B. $-\dfrac{3}{4}$

C. $\dfrac{3}{4}$

* D. $\dfrac{4}{3}$

47. What is the perimeter of the rectangle below?

$2x^2$

$5x^2 - 6$
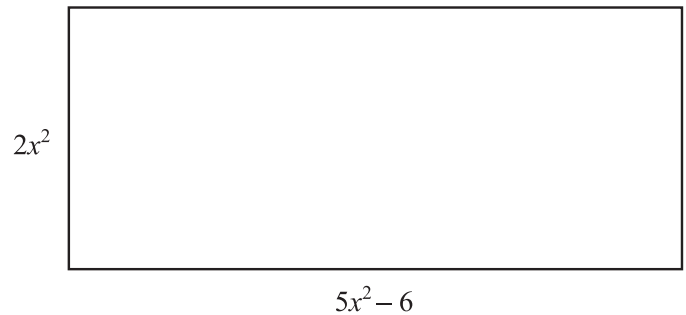
* A. $14x^2 - 12$

   B. $14x^8 - 12$

   C. $4x^2 - 12$

   D. $4x^2 - 2$

48. George had 3 days to drive 1,500 miles. On the first day, he drove 450 miles. How many miles per day does George need to drive to complete his trip?

   A.   350

* B.   525

   C.   650

   D.   975

12

49. Cally's Candle Shop uses the equation below to determine how much to charge for candles.

Cost $= 2t^2 - 7t + 5$, where t is the burning time, in hours.

Which expression completely factors the cost equation?

   A. $(2t^2 - 1)(t - 5)$

   B. $(2t + 1)(t - 5)$

* C. $(2t - 5)(t - 1)$

   D. $(2t + 5)(t + 1)$

50. Which table demonstrates that monthly cell phone charges are a linear function of the number of minutes used?

A.

Minutes Used	Monthly Charge
0	$25.00
100	$30.00
200	$40.00
300	$60.00

* B.

Minutes Used	Monthly Charge
0	$25.00
100	$30.00
200	$35.00
300	$40.00

C.

Minutes Used	Monthly Charge
0	$25.00
100	$26.00
200	$28.00
300	$29.00

D.

Minutes Used	Monthly Charge
0	$25.00
100	$26.00
200	$29.00
300	$34.00

51. On a map, the longitude lines run north and south and have an undefined slope. The latitude lines run east and west and have a slope of zero. Together, the longitude and latitude lines on a graph form what type of lines?
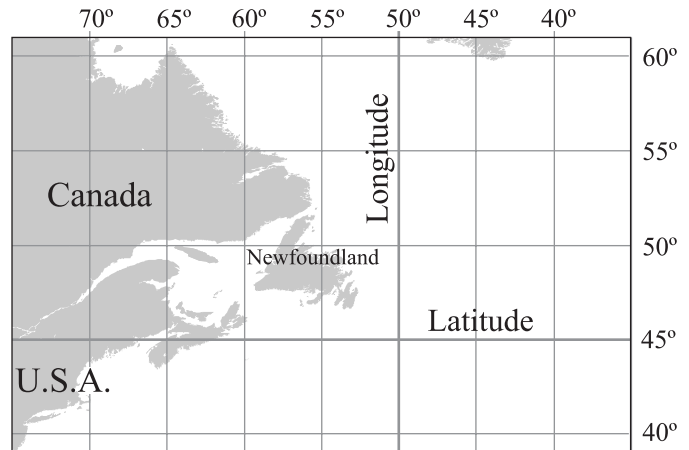
   A.   skew lines

   B.   parallel lines

* C.   perpendicular lines

   D.   non-intersecting lines

52. Maurice received $90 from relatives for graduation. He wants to buy a new pair of jeans for $55 and 2 DVDs. He uses the expression $2d + 55 \leq 90$ to determine the amount of money that he can spend on each DVD. Which line graph shows this amount?

* A.

B.

C.

D.
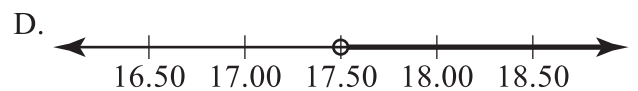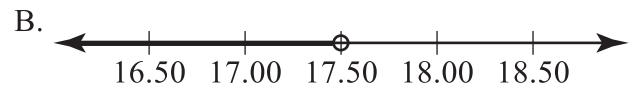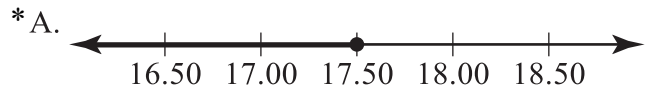
53. What is the complete factorization of the polynomial below?

$$25z^2 + 10z + 1$$

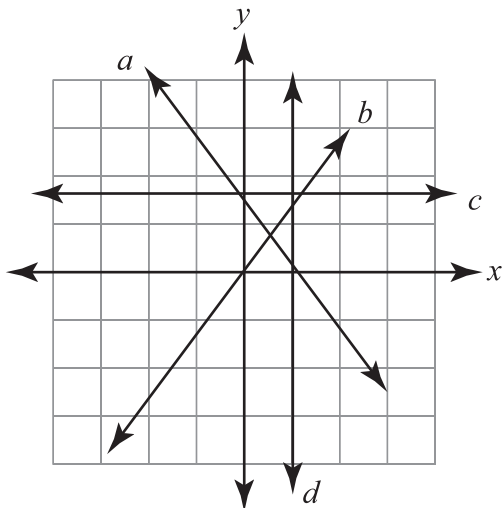* A. $(5z + 1)^2$

B. $(5z - 1)^2$

C. $(5z + 1)(5z - 1)$

D. $(25z + 1)(z + 1)$

54. What is the sum of the two polynomials below?
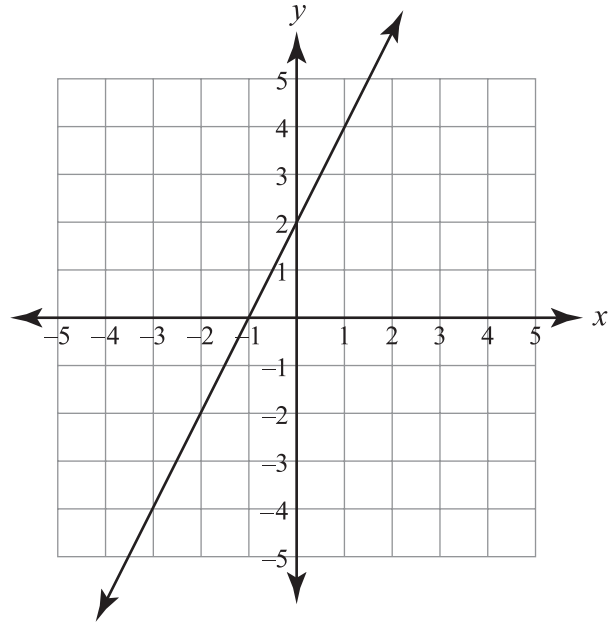
$$-3x^2 + 7xy - 6y^2$$
$$5xy + 3y^2 - 4x^2$$

A. $7x^2 - 12xy + 3y^2$

* B. $-7x^2 + 12xy - 3y^2$

C. $-7x^4 + 12x^2y^2 - 3y^4$

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

55. Which line on the graph below shows a positive slope?

A.   line a

* B.   line b

C.   line c

D.   line d

56. Which linear equation describes the line on the graph below?

A. $y = \dfrac{1}{2}x - 1$

B. $y = \dfrac{1}{2}x + 2$

C. $y = 2x - 1$

* D. $y = 2x + 2$

57. Every month a company has expenses of $15,000 plus monthly salaries of $1,500 per employee. Which inequality shows how much the company will have to earn to make a profit? Let y equal revenue.

* A. $y > 15,000 + 1,500x$

B. $y < 15,000 + 1,500x$

C. $y + 1,500x > 15,000$

D. $y + 15,000 < 1,500x$

58. A manufacturer needs to know the zeroes of the graph below in order to provide the appropriate mixture of compounds in a solution.
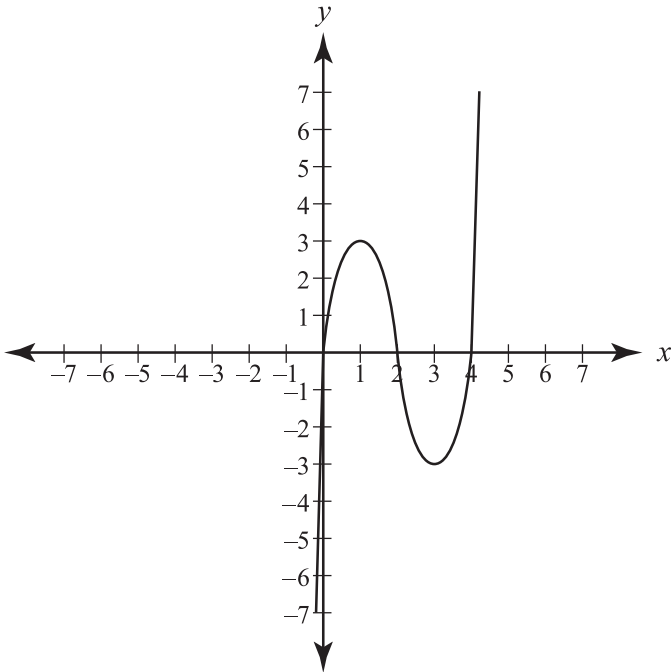

What are all the zeroes of the graph?

A. $(0, 0)$

B. $(0, 0)$ and $(0, 4)$

* C. $(0, 0)$, $(2, 0)$, and $(4, 0)$

D. $(0, 0)$, $(0, 2)$, and $(0, 4)$

59. The general admission price at the movie theater is $6.50. Children 12 years old and under, and adults who are at least 65, are charged only half price. Which number line represents the ages of people eligible for half-price admission?

A.

B.

C.

* D.

60. The box-and-whisker plot below represents the number of people who attended Coolsville Water Park each day during the summer seasons of 2003 and 2004.
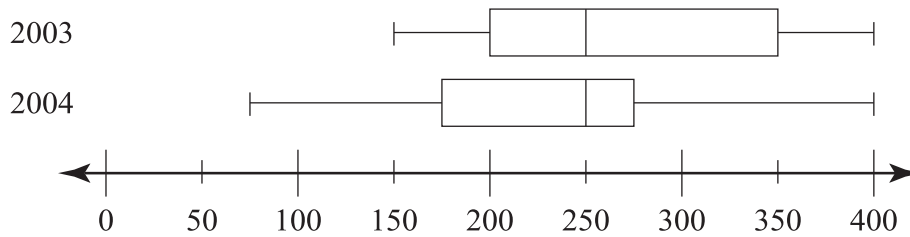
Which statement accurately describes the data?

    A.   The minimum number of attendees was in 2003.

    B.   The interquartile range in 2004 was greater than it was in 2003.

    C.   The maximum number of attendees was greater in 2003 than it was in 2004.

  * D.   The median number of people who attended the Water Park was the same for both years.

ALGEBRA I OPEN-RESPONSE ITEM A

A. Ten students were asked to estimate the number of minutes they spent studying for the last chapter test. The table below shows the data.

Survey of Ten Students in an Algebra I Class										
Time Spent Studying (minutes)	10	15	15	20	25	30	30	40	45	45
Test Scores (percent)	67	64	72	74	80	80	76	84	90	82
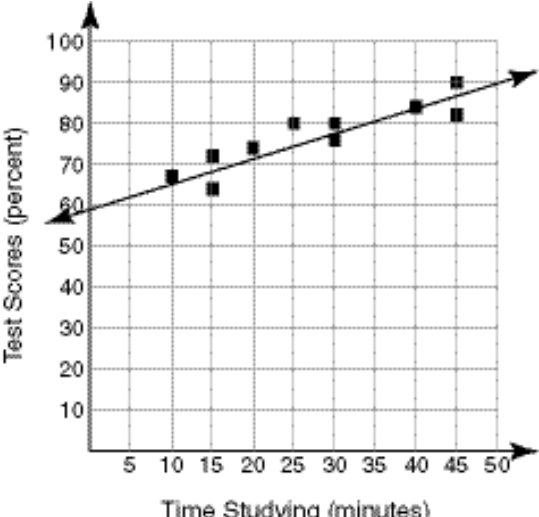
1.   On the grid provided in your answer document, plot the data in a scatterplot. Let x represent the time spent studying and y represent the test scores. Draw a line of best fit for your scatterplot.

2.   Describe the correlation of the data as being either a strong positive, weak positive, strong negative, weak negative, or having no correlation. Give reasons for your answer.

3.   **Estimate** the test score of a student who studied for one hour. Explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

RUBRIC FOR ALGEBRA I OPEN-RESPONSE ITEM A

SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3–3 ½ points.
2	The student earns 2–2 ½ points.
1	The student earns ½–1 ½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" assigned for the item.)

Solution and Scoring

Part	Points
1	**2 points possible** 2 points: **Correct and complete scatterplot with line of best fit, as shown below.** Give credit for the following: • All points plotted correctly. • The *x*- and *y*-axes are labeled. • Intervals are consistent on both axes. OR 1 point: **Scatterplot incomplete (minor omission) but otherwise correct.** Ex: One label missing. Ex: One point not plotted. OR **Scatterplot contains one error**. Ex: Inconsistent interval(s) on *x*- and/or *y*- axis. Ex: One point plotted incorrectly. Note: Do not give credit for scatterplot if a line of best fit is not drawn. Plotting points in Quadrant 1 is a lower grade level skill. Note: Title is not required (even for a score of 4).
2	**1 point possible** ½ point: **Correct answer: Strong Positive.** AND ½ point: **Correct and complete explanation.** Do not give credit for incomplete explanations. Give credit for the following or equivalent: • A positive correlation exists when both variables increase. The correlation is strong because the points are close to a straight line.

Part	Points
3	**1 point possible** 1 point: **Correct estimate: Approximately 95(%); (will accept 90 − 100), and Correct and complete procedure: Line of best fit is extended and explanation is included.** Give credit for the following or equivalent: • According to the line of best fit (must be extended to $x = 60$), the x-coordinate of 60 minutes corresponds to the y-coordinate value of about 95, or • The line of best fit is extended to $x = 60$ and some reference is made to correct y coordinate. Ex: "The line goes through (60, 97)." OR ½ point: **Correct estimate: Approximately 95(%) (accept 90−100) with missing or incomplete, but not incorrect, procedure. If procedure is shown and/or explained, it must refer to the line of best fit.** Ex: "About 94." Ex: "98 because I used the line of best fit," but the line has not been extended to $x = 60$. OR **Incorrect estimate due to misreading of the graph but procedure is correct.** Ex: The line of best fit is extended to x = 60 and (60, 90) is on the graph but student's estimate is 95. Note: Do not give credit for estimate if it is clear that it is not based on the line of best fit or if the line of best fit is incorrect. Ex: "93 because the longer you study the better you do." Ex: "96 because it goes up a little then down but it's mostly higher." [Uses given table only.]

ALGEBRA I OPEN-RESPONSE ITEM B

B. Maria is buying school pictures. The basic package is $50 plus $3 for additional wallet-size pictures. The equation to find her total bill is $50 + 3n = c$, where n = number of additional wallet-size pictures needed, and c = total cost.

1.   Copy the table below into your answer document. Complete the table.

n	c
0	
1	
2	
3	

2.   On the grid provided in your answer document, graph the coordinates from the table. Does the graph show a function or non-function relationship? Explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

RUBRIC FOR ALGEBRA I OPEN-RESPONSE ITEM B

SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 points.
2	The student earns 2 points.
1	The student earns 1 point, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" assigned for the item.)

Solution and Scoring

Part	Points
1	**1 point possible** 1 point: **Table is correct and complete, as shown below:** (Work is not required.) <table><tr><th>*n*</th><th>*c*</th></tr><tr><td>0</td><td>50</td></tr><tr><td>1</td><td>53</td></tr><tr><td>2</td><td>56</td></tr><tr><td>3</td><td>59</td></tr></table>
2	**2 points possible** 2 points: **Graph is correct and complete based on Part 1 table.** Graph must contain all of the following: • 4 points correctly plotted. • *n*-axis labeled # of pictures, intervals consistent. • *c*-axis labeled cost, intervals consistent. Note: *x*-axis may just be labeled "*n*" and *y*-axis may just be labeled "*c*." Axes may not be reversed. OR 1 point: **Graph contains the following (one or two errors):** • Graph is based on at least three correct #'s in Part 1, but one point is incorrectly plotted, *n*- and/or *c*-axis isn't labeled, or • Graph is based on at least three correct #'s in Part 1. All points are correctly plotted but are connected. Note: No credit awarded if there are more than 2 errors. Ex: Points are correctly plotted but connected, interval(s) inconsistent, axes not labeled.

Part	Points
3	**1 point possible** 1 point: **Correct answer with correct and complete explanation, or correct answer/explanation based on incorrect graph.** Give credit for the following or equivalent: Ex: "This is a function because … • no two points lie on the same vertical line," or • it passes the vertical line test," or • each value of $n(x)$ has a single value of $c(y)$," or • for each element in the domain there is exactly one element in the range." Note: No credit for correct answer, "function" if there is either no valid explanation or if the explanation is vague or incomplete. The explanation must refer to the graph. Ex: "This is a function because … • the x–axis doesn't repeat itself," or • the more pictures you sell, the higher the price," or • none of the x-coordinates are the same."

ALGEBRA I OPEN-RESPONSE ITEM C

C.   An ant weighs approximately 4.0×10^{-3} grams.

1.   An ant can carry between 15 and 25 times its body weight. Determine the range of weights, in grams, that an ant can carry. Express your answers in scientific notation. Show and/or explain all of your work even if you use mental math or a calculator.

A sandwich at a picnic is made of the ingredients below.

Ingredient	Weight
2 slices of bread	28 grams each
peanut butter	35 grams
jelly	21 grams

2.   Determine the total weight of the sandwich, in grams. Express the weight of the sandwich in scientific notation. Determine how many ants it would take to carry the sandwich if each ant carried the minimum amount possible. Show and/or explain all of your work even if you use mental math or a calculator.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

RUBRIC FOR ALGEBRA I OPEN-RESPONSE ITEM C

SCORE	DESCRIPTION
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3–3 ½ points.
2	The student earns 2–2 ½ points.
1	The student earns ½–1 ½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" assigned for the item.)

Solution and Scoring

Part	Points
1	**2 points possible** ½ point: **Correct minimum in Scientific Notation: 6.0×10^{-2}.** AND ½ point: **Correct procedure shown and/or explained.** Work may contain a calculation or copy error. Give credit for the following or equivalent: • $15 \times 4.0 \times 10^{-3} = 60 \times 10^{-3}$, or • $15 \times .004 = .06$ AND ½ point: **Correct maximum in Scientific Notation: 1.0×10^{-1}.** AND ½ point: **Correct procedure shown and/or explained.** Work may contain a calculation or copy error. Give credit for the following or equivalent: • $25 \times 4.0 \times 10^{-3} = 100 \times 10^{-3}$, or • $25 \times .004 = .1$
2	**2 points possible** 1 point: **Correct # of ants: 1867, 1870, 1.87×10^{3}, 1.9×10^{3}, or 1900, _or_** **correct answer based on incorrect minimum in Part 1.** AND 1 point: **Correct and complete procedure shown and/or explained.** Weight of sandwich must be given in Scientific Notation. Work may contain a calculation, copy, or rounding error or may be based on an incorrect minimum in Part 1. Give credit for the following or equivalent: • Weight of sandwich $= 1.12 \times 10^{2}$ $2(28) + 35 + 21 = 112$ (not required) $$\frac{\text{Weight of sandwich}}{\text{Minimum from Part 1}} = \# .$$ Ex: $\dfrac{1.12 \times 10^{2}}{.06} = \#$ Ex: $112 \div .06 = 1866.66$ OR ½ point: **Give credit for any of the following:** • Work is correct and complete but weight of sandwich is not given in Scientific Notation, or • Correct weight of sandwich is given in Scientific Notation $\left(1.12 \times 10^{2}\right)$; incorrect procedure to find # of ants or procedure missing, or • Correctly divides incorrect sandwich weight by .06 or incorrect minimum from Part 1. Ex: Sandwich weight $= 84$ grams, $84 \div .06 = 1400$ ants.

ALGEBRA I OPEN-RESPONSE ITEM D

D. A corporation offered its new president a salary of $50,000.00 per year for 5 years. In addition to the yearly salary, the president can choose one of the two incentive plans below.

- a yearly increase in salary of 5.5% each year, beginning the 2nd year

- a yearly increase in salary of 2,900.00 each year, beginning the 2nd year

1.   The president needs help in deciding which incentive plan to take. Make a table showing the amount the president would make each year for 5 years under each of the incentive plans. Show all of your work.

2.   What would the president's total salary be under each plan, cumulatively, for the entire 5-year period? Which plan would you recommend?

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

RUBRIC FOR ALGEBRA I OPEN-RESPONSE ITEM D

SCORE	DESCRIPTION
4	The student earns 5 points. The response contains no incorrect work.
3	The student earns 4 points.
2	The student earns 2–3 points.
1	The student earns 1 point, or some minimal understanding is shown. Ex: Correct totals for each plan are given in Part 2 but recommendation is missing or incorrect.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" assigned for the item.)

Solution and Scoring

Part	Points
1	**4 points possible**

1 point: **Correct salaries for years 1–5 for Plan 1 (+5.5%/year) as shown in the table below.**

AND

1 point: **Correct procedure shown and/or explained.**
Amounts may be rounded to the nearest dollar or truncated.
Work may contain one or two calculation, copy, or rounding errors.
Give credit for the following or equivalent:

Year		Salary	Accept
1		50,000	50,000
2	1.055 (50,000) =	52,750	52,750
3	1.055 (52,750) =	55,651.25	55,651 – 55,651.25
4	1.055 (55,651.25) =	58,712.07	58,711 – 58,712.07
5	1.055(58,712.07) =	61,941.23	61,940 – 61,941.23

Be aware that there may be calculation errors even if the numbers are in the correct range.

Or

- "I multiplied 50,000 by .055 and added the product to 50,000. Then I multiplied 52,750 by .055 and added that, and so on."

AND

1 point: **Correct salaries for years 1–5 for Plan 2 (+ $2,900/year) as shown in the table below.**

AND

1 point: **Correct procedure shown and/or explained.**
Work may contain a calculation error.
Give credit for the following or equivalent:

Year		Salary
1		50,000
2	50,000 + 2,900 =	52,900
3	52,900 + 2,900 =	55,800
4	55,800 + 2,900 =	58,700
5	58,700 + 2,900 =	61,600

Or

- "The first year was 50,000 so I added 2,900 to that and got 52,900 for the second year. Then I just kept adding 2,900 to the last year to get the next."

Note: For both Part 1 procedures, work needs to be shown or explained for at least one table entry beyond the first year, with a statement that the procedure used continues.

Part	Points
2	**1 point possible**
	1 point: **Response contains all of the following or equivalent:** • Correct total for Plan 1: ($) 279,054.55 or correct total based on incorrect amounts in Part 1. Work is not required. • Correct total for Plan 2: ($) 279,000 or correct total based on incorrect amounts in Part 1. Work is not required. • Correct plan is recommended (based on Part 1 amounts). No reason for recommendation is required beyond having correct totals, but if one is given, it may not be incorrect. Ex: Plan 1—$279,054.55, Plan 2—$279,000. "…so pick Plan 1 because he'll make more money each year." (Does not receive credit.) Note: Give credit for "Plan 1 pays $54.55 more," or correct difference based on incorrect amount(s) in Part 1.

ALGEBRA I OPEN-RESPONSE ITEM E

E. A charity organization gets 1 pledge for every 15 people it calls.

1.   Write a proportion of pledges per people called, where *x* is the number of pledges, and *y* is the number of people called.

2.   If the organization calls 450 people in one month, how many pledges does it receive? Show your work and/or explain your answer.

3.   If the monthly goal is 150 pledges, how many calls will the organization have to make? Show your work and/or explain your answer.
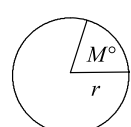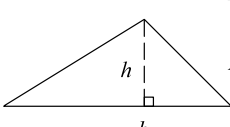
BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.
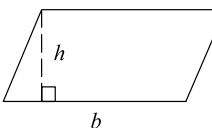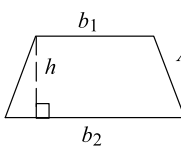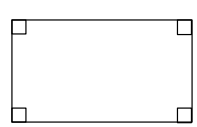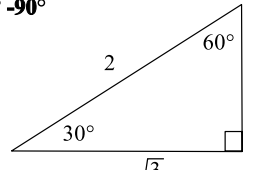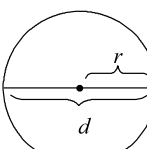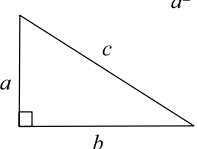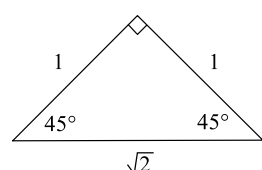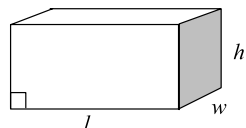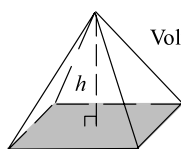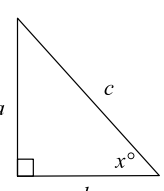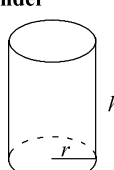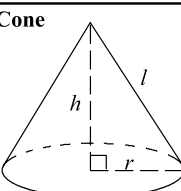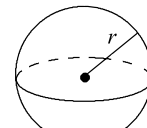
RUBRIC FOR ALGEBRA I OPEN-RESPONSE ITEM E

SCORE	DESCRIPTION
4	The student earns 6 points. The response contains no incorrect work.
3	The student earns 5 points.
2	The student earns 3–4 points.
1	The student earns 1–2 points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank—No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" assigned for the item.)

Solution and Scoring

Part	Points
1	**2 points possible** 2 points: **Correct proportion.** Give credit for the following or equivalent: • $\dfrac{1}{15}=\dfrac{x}{y}$, or • $\dfrac{y}{15}=x$, or • $1:15::x:y.$ OR 1 point: **Correct equation <u>NOT</u> expressed as a proportion.** Give credit for the following or equivalent: • $y=15x$, or • $x=y\div 15$
2	**2 points possible** 1 point: **Correct answer: 30 (pledges).** AND 1 point: **Correct and complete procedure.** Work may be based on incorrect answer in Part 1 or may contain one calculation error. Give credit for the following or equivalent: • $\dfrac{1}{15}=\dfrac{x}{450}$, $15x=450$, $x=\#$, or • $450\div 15=\#$, or • $15\times 30=450$ (guess and check). Note: If guess and check is used, 30 must be explicitly stated as the guess or obvious from work shown. No credit for guess and check procedure if guess is incorrect. Ex: Guess is 20 and procedure is $15\times 20=450$ (receives no credit).
3	**2 points possible** 1 point: **Correct answer: 2250 (calls).** AND 1 point: **Correct and complete procedure.** Work may be based on incorrect answer in Part 1 or may contain one calculation error. Give credit for the following or equivalent: • $\dfrac{1}{15}=\dfrac{150}{y}$, $y=150\times 15$, $y=\#$, or • $150\times 15=\#$, or • $\dfrac{2250}{15}=150$ (guess and check). Note: No credit for guess and check procedure if guess is incorrect.

End-of-Course Mathematics Reference Sheet

Parallelogram

$P =$ sum of all sides

$A = bh$

Trapezoid

$A = \dfrac{h(b_1 + b_2)}{2}$

Arc and Sector

Arc Length $= \left(\dfrac{M}{360}\right) \times 2\pi r$

Sector area $= \left(\dfrac{M}{360}\right) \times \pi r^2$

Triangle

$P =$ sum of all sides

$A = \dfrac{bh}{2}$

Rectangle

$P = 2l + 2w$

$A = lw$

30° -60° -90°

Circle

$C = 2\pi r$

$C = \pi d$

$A = \pi r^2$

$\pi \approx 3.14$

Pythagorean Theorem

$a^2 + b^2 = c^2$

45° -45° -90°

Rectangular Solid

Volume $= lwh$

Surface area $= 2lw + 2lh + 2wh$

Pyramid

$B =$ area of base (shaded)

Volume $= \dfrac{Bh}{3}$

Trigonometric Ratios

$\sin x° = \dfrac{a}{c}$

$\cos x° = \dfrac{b}{c}$

$\tan x° = \dfrac{a}{b}$

Cylinder

Volume $= \pi r^2 h$

Surface area $= 2\pi rh + 2\pi r^2$

Cone

$l =$ slant height

Volume $= \dfrac{\pi r^2 h}{3}$

Surface area $= \pi rl + \pi r^2$

Sphere

Volume $= \dfrac{4\pi r^3}{3}$

Surface area $= 4\pi r^2$

Miscellaneous Formulas		
Area of an equilateral triangle	$A = \dfrac{s^2\sqrt{3}}{4}$	$s =$ length of a side
Distance	rate × time	
Interest	principal × rate × time in years	
Sum of the angles of a polygon having n sides	$(n - 2)180°$	
Distance between points on a coordinate plane	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	
Midpoint	$\left(\dfrac{x_2 + x_1}{2}, \dfrac{y_2 + y_1}{2}\right)$	
Slope of a nonvertical line (where $x_2 \neq x_1$)	$m = \dfrac{y_2 - y_1}{x_2 - x_1}$	
Slope intercept (where $m =$ slope, $b =$ intercept)	$y = mx + b$	
Last term of an arithmetic series	$a_n = a + (n - 1)d$	
Last term of a geometric series (where $n \geq 1$)	$a_n = ar^{n - 1}$	
Quadratic formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
Area of a square	$A = s^2$	
Volume of a cube	$V = s^3$	
Area of a regular polygon	$A = \dfrac{1}{2}ap$	$a =$ apothem, $p =$ perimeter