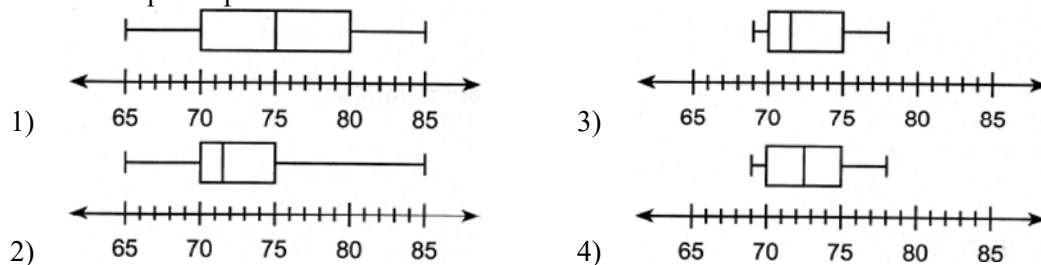


- What is the correct factorization of  $x^2 + 4x - 12$ ?
  - $(x + 3)(x - 4)$
  - $(x - 3)(x + 4)$
  - $(x + 2)(x - 6)$
  - $(x - 2)(x + 6)$
- Which situation can be modeled by a linear function?
  - A printer can print one page every three seconds.
  - A bank account earns 0.5% interest each year, compounded annually.
  - The number of cells in an organism doubles every four days.
  - The attendance at a professional sports team's games decreases by 1.5% each year.
- Which expression is equivalent to  $3(x^2 - 2x + 3) - (4x^2 + 3x - 1)$ ?
  - $-x^2 + x + 2$
  - $-x^2 - 8x + 7$
  - $-x^2 - 3x + 8$
  - $-x^2 - 9x + 10$
- At Adelynn's first birthday party, each guest brought \$1 in coins for her piggy bank. Guests brought nickels, dimes, and quarters for a total of \$28. There were twice as many dimes as nickels and 12 more quarters than nickels. Which equation could be used to determine the number of nickels,  $x$ , that her guests brought to her party?
  - $.05x + .10x + .25x = 28$
  - $.05x + .10(2x) + .25(x + 12) = 28$
  - $.05(2x) + .10x + .25(x + 12) = 28$
  - $.05(x + 12) + .10(2x) + .25x = 28$
- A student creates a fourth-degree trinomial with a leading coefficient of 2 and a constant value of 5. The trinomial could be
  - $2x^4 + 3x^2 + 5$
  - $2x^4 + 5x + 3$
  - $4x^2 - 3x + 5$
  - $4x^3 - 5x^2 + 3$
- When solving the equation  $4x^2 - 16 = 0$ , Laura wrote  $4x^2 = 16$  as her first step. Which property justifies Laura's first step?
  - distributive property of multiplication over addition
  - multiplication property of equality
  - commutative property of addition
  - addition property of equality
- Which expression results in an irrational number?
  - $\sqrt{3} \cdot \sqrt{3}$
  - $-\frac{2}{3} + \frac{1}{4}$
  - $5 \cdot \sqrt{81}$
  - $\frac{1}{3} + \sqrt{3}$

- 8 Which equation has the same solutions as  $x^2 + 6x - 18 = 0$ ?
- 1)  $(x + 3)^2 = 24$                       3)  $(x + 6)^2 = 24$   
 2)  $(x + 3)^2 = 27$                       4)  $(x + 6)^2 = 27$

- 9 The heights, in inches, of eight football players are given below.  
 76, 70, 72, 70, 69, 71, 78, 74

Which box plot represents these data?



- 10 A bookstore owner recorded the number of books sold and the profit made selling the books.

Books Sold	Profit
100	\$50.00
250	\$275.00
300	\$350.00
350	\$425.00

What is the average rate of change, in dollars per book, between 100 and 350 books sold?

- 1) 0.50                      3) 1.50  
 2) 0.67                      4) 2.00
- 11 If  $f(x) = x^2$ , then which function represents a shift of the graph of  $f(x)$  4 units to the right and 3 units down?
- 1)  $g(x) = (x + 4)^2 + 3$                       3)  $h(x) = (x - 4)^2 - 3$   
 2)  $j(x) = (x + 4)^2 - 3$                       4)  $k(x) = (x - 4)^2 + 3$
- 12 The amount of money a plumber charges is represented by the function  $p(h) = 45 + 90h$ . The best interpretation of the  $y$ -intercept of this function is that the plumber charges
- 1) \$45 to come to the house                      3) \$90 to come to the house  
 2) \$45 per hour that he works                      4) \$90 per hour that he works
- 13 What is the solution to the inequality  $2m - 4 \leq 3(2m + 4)$ ?
- 1)  $m \leq -2$                       3)  $m \leq -4$   
 2)  $m \geq -2$                       4)  $m \geq -4$

- 14 A survey of students at West High School was taken to determine a theme for the prom. The results of the survey are summarized in the table below.

	Beach Party	Hollywood	Broadway
Girls	86	112	68
Boys	123	77	79

Approximately what percentage of the students who chose the Broadway theme were girls?

- 1) 26  
2) 27  
3) 46  
4) 68
- 15 The sum of  $2\sqrt{54}$  and  $2\sqrt{6}$  is  
1)  $4\sqrt{60}$   
2)  $8\sqrt{15}$   
3)  $7\sqrt{6}$   
4)  $8\sqrt{6}$
- 16 The functions  $f(x) = x^2 - 5x - 14$  and  $g(x) = x + 2$  are graphed on the same set of axes. What are the solutions to the equation  $f(x) = g(x)$ ?  
1) -14 and 0  
2) 0 and 2  
3) -2 and 8  
4) -2 and 7
- 17 If  $x = 4a^2 - a + 3$  and  $y = a - 5$ , then which polynomial is equivalent to the product of  $x$  and  $y$ ?  
1)  $-17a^2 - 2a - 15$   
2)  $-17a^2 + 8a - 15$   
3)  $4a^3 - 21a^2 - 2a - 15$   
4)  $4a^3 - 21a^2 + 8a - 15$
- 18 What is an equation of the line that passes through (3,7) and has a slope of 2?  
1)  $y - 7 = 2(x - 3)$   
2)  $y - 3 = 2(x - 7)$   
3)  $y + 7 = 2(x + 3)$   
4)  $y + 3 = 2(x + 7)$
- 19 A geometric sequence with a common ratio of -3 is  
1) -10, -7, -4, -1, ...  
2) 14, 11, 8, 5, ...  
3) -2, -6, -18, -54, ...  
4) 4, -12, 36, -108, ...
- 20 When the equation  $6 - ax = ax - 2$  is solved for  $x$  in terms of  $a$ , and  $a \neq 0$ , the result is  
1)  $4a$   
2)  $\frac{4}{a}$   
3)  $2a$   
4)  $\frac{2}{a}$

21 Which function has the zeros  $-1$ ,  $3$ , and  $-4$ ?

1)  $f(x) = (x + 1)(x - 3)(x - 4)$

2)  $g(x) = (x - 1)(x + 3)(x - 4)$

3)  $h(x) = (x + 1)(x - 3)(x + 4)$

4)  $k(x) = (x - 1)(x + 3)(x + 4)$

22 The expression  $5^{a+2b}$  is equivalent to

1)  $5^a \cdot 5^2 \cdot 5^b$

2)  $5^a \cdot 25^b$

3)  $25^{2ab}$

4)  $25^{a+2b}$

23 In an arithmetic sequence, the first term is  $4$  and the third term is  $-2$ . What is the common difference?

1)  $-1$

2)  $-2$

3)  $-3$

4)  $-6$

24 Joe is ordering water for his swimming pool. He determines the volume of his pool to be about  $3240$  cubic feet. There are approximately  $7.5$  gallons of water in  $1$  cubic foot. A truck load holds  $6000$  gallons of water. Which expression would allow Joe to correctly calculate the number of truck loads of water he needs to fill his pool?

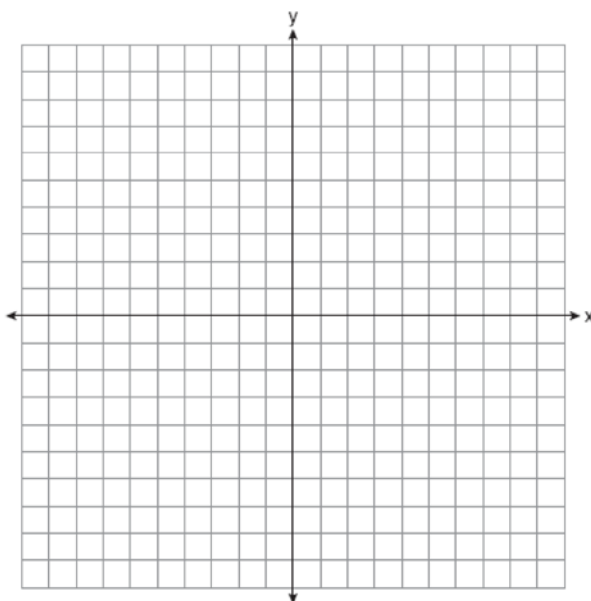
1)  $\frac{3240 \text{ ft}^3}{1 \text{ pool}} \cdot \frac{1 \text{ ft}^3}{7.5 \text{ gal}} \cdot \frac{6000 \text{ gal}}{1 \text{ truck load}}$

2)  $\frac{3240 \text{ ft}^3}{1 \text{ pool}} \cdot \frac{1 \text{ ft}^3}{7.5 \text{ gal}} \cdot \frac{1 \text{ truck load}}{6000 \text{ gal}}$

3)  $\frac{3240 \text{ ft}^3}{1 \text{ pool}} \cdot \frac{7.5 \text{ gal}}{1 \text{ ft}^3} \cdot \frac{6000 \text{ gal}}{1 \text{ truck load}}$

4)  $\frac{3240 \text{ ft}^3}{1 \text{ pool}} \cdot \frac{7.5 \text{ gal}}{1 \text{ ft}^3} \cdot \frac{1 \text{ truck load}}{6000 \text{ gal}}$

25 On the set of axes below, graph  $f(x) = x^2 + 4x + 1$ .



State the coordinates of the minimum.

26 If  $f(x) = \frac{30x^2}{x+2}$ , determine the value of  $f\left(\frac{1}{2}\right)$ .

27 Explain why the relation shown in the table below is a function.

<b>x</b>	-1	0	1	2
<b>y</b>	2	4	4	5

Complete the table below with values for both  $x$  and  $y$  so that this new relation is *not* a function.

<b>x</b>	-1	0	1	2	
<b>y</b>	2	4	4	5	

28 Solve algebraically for  $x$ :  $0.05(x - 3) = 0.35x - 7.5$

29 Use the quadratic formula to determine the exact roots of the equation  $x^2 + 3x - 6 = 0$ .

30 Factor  $5x^3 - 80x$  completely.

31 The owner of an ice cream stand kept track of the number of ice cream cones that were sold each day of the first week in June. She compared the ice cream sales to the average daily temperature. The data are shown in the table below.

<b>Average Daily Temp. (x)</b>	72	75	81	78	77	76	80
<b>Daily Ice Cream Cone Sales (y)</b>	126	183	263	229	200	185	249

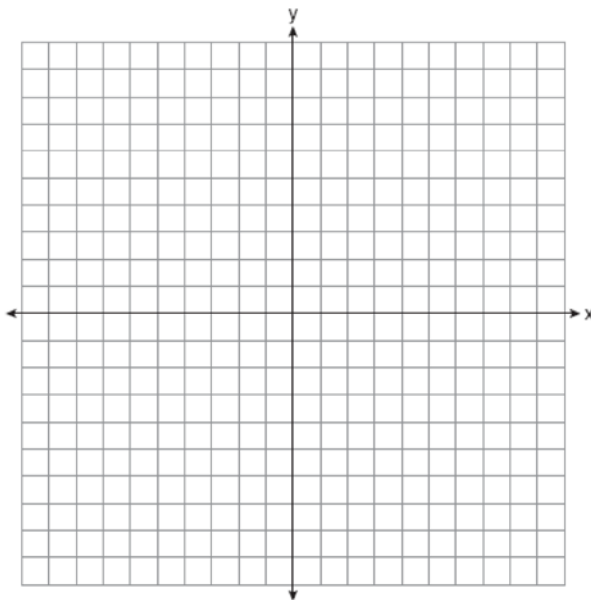
State the linear regression equation for these data, rounding all values to the *nearest hundredth*. State the correlation coefficient, to the *nearest hundredth*, for the line of best fit for these data. State what this correlation coefficient indicates about the linear fit of the data.

- 32 Graph the system of inequalities on the set of axes below:

$$y > 3x - 4$$

$$x + 2y \leq 6$$

Label the solution set  $S$ .



Is the point  $(2,2)$  a solution to the system? Justify your answer.

- 33 An object is launched upward at 64 feet per second from a platform 80 feet above the ground. The function  $s(t)$  models the height of the object  $t$  seconds after launch. If  $s(t) = -16t^2 + 64t + 80$ , state the vertex of  $s(t)$ , and explain in detail what each coordinate means in the context of the problem. After the object is launched, how many seconds does it take for the object to hit the ground? Justify your answer.

- 34 Solve the systems of equations algebraically for all values of  $x$  and  $y$ :

$$y = x^2 + 4x - 1$$

$$y = 2x + 7$$

- 35 Jen joined the Fan Favorite Movie Club at the local movie theater. At this theater, the cost of admission in May and June remains the same. In May, she saw 2 matinees and 3 regular-priced shows and spent \$38.50. In June, she went to 6 matinees and one regular-priced show and spent \$47.50. Write a system of equations to represent the cost,  $m$ , of a matinee ticket and the cost,  $r$ , of a regular-priced ticket. Jen said she spent \$5.75 on each matinee and \$9 on each regular show. Is Jen correct? Justify your answer. Use your system of equations to algebraically determine both the actual cost of each matinee ticket and the actual cost of each regular ticket.

**0824AI****Answer Section**

- 1 ANS: 4 PTS: 2 REF: 082401ai NAT: A.SSE.A.2  
TOP: Factoring Polynomials
- 2 ANS: 1 PTS: 2 REF: 082402ai NAT: F.LE.A.1  
TOP: Families of Functions
- 3 ANS: 4  
 $3(x^2 - 2x + 3) - (4x^2 + 3x - 1)$   
 $3x^2 - 6x + 9 - 4x^2 - 3x + 1$   
 $-x^2 - 9x + 10$
- PTS: 2 REF: 082403ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
KEY: subtraction
- 4 ANS: 2 PTS: 2 REF: 082404ai NAT: A.CED.A.1  
TOP: Modeling Linear Equations
- 5 ANS: 1 PTS: 2 REF: 082405ai NAT: A.SSE.A.1  
TOP: Modeling Expressions
- 6 ANS: 4 PTS: 2 REF: 082406ai NAT: A.REI.A.1  
TOP: Identifying Properties
- 7 ANS: 4 PTS: 2 REF: 082407ai NAT: N.RN.B.3  
TOP: Operations with Radicals  
KEY: classify
- 8 ANS: 2  
 $x^2 + 6x = 18$   
 $x^2 + 6x + 9 = 18 + 9$   
 $(x + 3)^2 = 27$
- PTS: 2 REF: 082408ai NAT: A.REI.B.4 TOP: Solving Quadratics  
KEY: completing the square
- 9 ANS: 3  
69,70,70,71,72,74,76,78 ordered. median:  $\frac{71 + 72}{2} = 71.5$
- PTS: 2 REF: 082409ai NAT: S.ID.A.1 TOP: Box Plots  
KEY: represent
- 10 ANS: 3  
 $\frac{425 - 50}{350 - 100} = 1.5$
- PTS: 2 REF: 082410ai NAT: F.IF.B.6 TOP: Rate of Change
- 11 ANS: 3 PTS: 2 REF: 082411ai NAT: F.BF.B.3  
TOP: Transformations with Functions
- 12 ANS: 1 PTS: 2 REF: 082412ai NAT: F.LE.B.5  
TOP: Modeling Linear Functions

- 13 ANS: 4  
 $2m - 4 \leq 3(2m + 4)$   
 $2m - 4 \leq 6m + 12$   
 $-16 \leq 4m$   
 $-4 \leq m$   
 PTS: 2 REF: 082413ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities
- 14 ANS: 3  
 $\frac{68}{68 + 79} \approx 0.46$   
 PTS: 2 REF: 082414ai NAT: S.ID.B.5 TOP: Frequency Tables  
 KEY: two-way
- 15 ANS: 4  
 $2\sqrt{54} + 2\sqrt{6} = 2\sqrt{9}\sqrt{6} + 2\sqrt{6} = 6\sqrt{6} + 2\sqrt{6} = 8\sqrt{6}$   
 PTS: 2 REF: 082415ai NAT: N.RN.B.3 TOP: Operations with Radicals  
 KEY: addition
- 16 ANS: 3  
 $x^2 - 5x - 14 = x + 2$   
 $x^2 - 6x - 16 = 0$   
 $(x - 8)(x + 2) = 0$   
 $x = 8, -2$   
 PTS: 2 REF: 082416ai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems
- 17 ANS: 4  
 $(4a^2 - a + 3)(a - 5) = 4a^3 - 20a^2 - a^2 + 5a + 3a - 15 = 4a^3 - 21a^2 + 8a - 15$   
 PTS: 2 REF: 082417ai NAT: A.APR.A.1 TOP: Operations with Polynomials  
 KEY: multiplication
- 18 ANS: 1 PTS: 2 REF: 082418ai NAT: A.REI.D.10  
 TOP: Writing Linear Equations KEY: other forms
- 19 ANS: 4 PTS: 2 REF: 082419ai NAT: F.IF.A.3  
 TOP: Sequences KEY: difference or ratio



20 ANS: 2

$$6 - ax = ax - 2$$

$$8 = 2ax$$

$$\frac{8}{2a} = x$$

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

PTS: 2

REF: 082420ai

NAT: A.REI.B.3

TOP: Solving Linear Equations

KEY: coefficients represented by letters

21 ANS: 3

PTS: 2

REF: 082421ai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

22 ANS: 2

$$5^{a+2b} = 5^a \bullet 5^{2b} = 5^a \bullet 25^b$$

PTS: 2

REF: 082422ai

NAT: A.APR.A.1

TOP: Multiplication of Powers

23 ANS: 3

$$\frac{-2-4}{3-1} = \frac{-6}{2} = -3$$

PTS: 2

REF: 082423ai

NAT: F.IF.A.3

TOP: Sequences

KEY: difference or ratio

24 ANS: 4

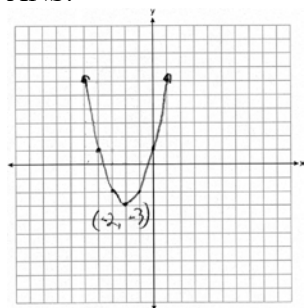
PTS: 2

REF: 082424ai

NAT: N.Q.A.1

TOP: Conversions

25 ANS:



PTS: 2

REF: 082425ai

NAT: F.IF.C.7

TOP: Graphing Quadratic Functions

26 ANS:

$$f\left(\frac{1}{2}\right) = \frac{30\left(\frac{1}{2}\right)^2}{\frac{1}{2} + 2} = \frac{\frac{30}{4}}{\frac{5}{2}} = \frac{15}{2} \times \frac{2}{5} = 3$$

PTS: 2

REF: 082426ai

NAT: F.IF.A.2

TOP: Functional Notation

27 ANS:

x	-1	0	1	2	2
y	2	4	4	5	4

For every value of  $x$ , there is a unique value of  $y$ .

PTS: 2 REF: 082427ai NAT: F.IF.A.1 TOP: Defining Functions

28 ANS:

$$0.05(x - 3) = 0.35x - 7.5$$

$$x - 3 = 7x - 150$$

$$147 = 6x$$

$$24.5 = x$$

PTS: 2 REF: 082428ai NAT: A.REI.B.3 TOP: Solving Linear Equations

29 ANS:

$$x = \frac{-3 \pm \sqrt{(3)^2 - 4(1)(-6)}}{2(1)} = \frac{-3 \pm \sqrt{33}}{2}$$

PTS: 4 REF: 082429ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: quadratic formula

30 ANS:

$$5x^3 - 80x = 5x(x^2 - 16) = 5x(x + 4)(x - 4)$$

PTS: 2 REF: 082430ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

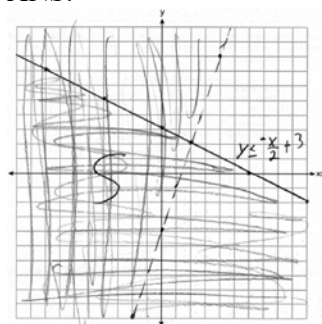
31 ANS:

$$y = 15.13x - 959.63, 0.99, \text{strong}$$

PTS: 4 REF: 082431ai NAT: S.ID.B.6 TOP: Regression

KEY: linear with correlation coefficient

32 ANS:



; No, because  $2 > 3(2) - 4$  is false.

PTS: 4 REF: 082432ai NAT: A.REI.D.12 TOP: Graphing Systems of Linear Inequalities

33 ANS:

$$t = \frac{-64}{2(-16)} = 2 \quad h(2) = -16(2)^2 + 64(2) + 80 = -64 + 128 + 80 = 144 \quad (2, 144). \text{ At 2 seconds, the object is 144 feet}$$

above the ground.  $0 = -16t^2 + 64t + 80$ 

$$0 = t^2 - 4t - 5$$

$$0 = (t - 5)(t + 1)$$

$$t = 5$$

PTS: 4

REF: 082433ai

NAT: F.IF.B.4

TOP: Graphing Quadratic Functions

KEY: key features

34 ANS:

$$x^2 + 4x - 1 = 2x + 7 \quad y = 2(-4) + 7 = -1 \quad (-4, -1), (2, 11)$$

$$x^2 + 2x - 8 = 0 \quad y = 2(2) + 7 = 11$$

$$(x + 4)(x - 2) = 0$$

$$x = -4, 2$$

PTS: 4

REF: 082434ai

NAT: A.REI.C.7

TOP: Quadratic-Linear Systems

35 ANS:

$$2m + 3r = 38.5 \quad \text{Jen is not correct because the prices are } 6m + 9r = 115.5 \quad 2m + 3(8.5) = 38.5$$

$$6m + r = 47.5$$

$$6m + r = 47.5 \quad 2m + 25.5 = 38.5$$

$$8r = 68$$

$$2m = 13$$

$$r = 8.50$$

$$m = 6.50$$

PTS: 6

REF: 082435ai

NAT: A.CED.A.3

TOP: Modeling Linear Systems