

JMAP

REGENTS BY DATE

NY Algebra I Regents Exam Questions
from Fall 2023 to August 2024 Sorted by Date

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2023 Algebra I Sample Items

1 What is the sum of $3x\sqrt{7}$ and $2x\sqrt{7}$?

1) $5x\sqrt{7}$

2) $5x^2\sqrt{7}$

3) $5x\sqrt{14}$

4) $5x^2\sqrt{14}$

2 What is an equation of the line that passes through the points $(2, 7)$ and $(-1, 3)$?

1) $y - 2 = \frac{3}{4}(x - 7)$

3) $y - 7 = \frac{3}{4}(x - 2)$

2) $y - 2 = \frac{4}{3}(x - 7)$

4) $y - 7 = \frac{4}{3}(x - 2)$

3 Rationalize: $\frac{3}{2\sqrt{6}}$

4 Use the method of completing the square to determine the exact values of x for the equation $x^2 + 6x - 41 = 0$. Express your answer in simplest radical form.

5 Solve the following systems of equations algebraically for all values of x and y :

$$y = x^2 + 5x - 17$$

$$x - y = 5$$

0624AI

- 1 A ball was launched into the air, and its height above the ground was recorded each second, as shown in the table below.

| | | | | | |
|--------------------|----|----|----|----|----|
| Time (sec) | 0 | 1 | 2 | 3 | 4 |
| Height (ft) | 11 | 59 | 75 | 59 | 11 |

Based on these data, which statement is a valid conclusion?

- 1) The ball lands on the ground at 4 seconds.
- 2) The ball reaches a maximum height of 11 feet.
- 3) The ball was launched from a height of 0 feet.
- 4) The ball reaches its maximum height at 2 seconds.
- 2 A tour bus can seat, at most, 48 passengers. An adult ticket costs \$18 and a child ticket costs \$12. The bus company must collect at least \$650 to make a profit. If a represents the number of adult tickets sold and c represents the number of child tickets sold, which system of inequalities models this situation if they make a profit?
- 1) $a + c < 48$
 $18a + 12c > 650$
- 2) $a + c \leq 48$
 $18a + 12c \geq 650$
- 3) $a + c < 48$
 $18a + 12c < 650$
- 4) $a + c \leq 48$
 $18a + 12c \leq 650$
- 3 Which equation is always true?
- 1) $x^2 \cdot x^3 = x^5$
- 2) $3^x \cdot 3^2 = 9^{2x}$
- 3) $-z^2 = z^2$
- 4) $7^a \cdot 7^b = 7^{ab}$
- 4 The expression $-2(x^2 - 2x + 1) + (3x^2 + 3x - 5)$ is equivalent to
- 1) $x^2 + x - 4$
- 2) $x^2 - x - 7$
- 3) $x^2 + 7x - 4$
- 4) $x^2 + 7x - 7$
- 5 Which sum is irrational?
- 1) $-2\sqrt{12} + \sqrt{100}$
- 2) $-\sqrt{4} + \frac{1}{3}\sqrt{900}$
- 3) $\frac{1}{2}\sqrt{25} + \sqrt{64}$
- 4) $\sqrt{49} + 3\sqrt{121}$
- 6 The solution to $\frac{4(x-5)}{3} + 2 = 14$ is
- 1) 15
- 2) 14
- 3) 6
- 4) 4
- 7 On an island, a rare breed of rabbit doubled its population each month for two years. Which type of function best models the increase in population at the end of two years?
- 1) linear growth
- 2) linear decay
- 3) exponential growth
- 4) exponential decay

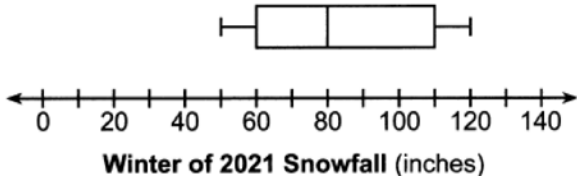
Algebra I Regents Exam 0624

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- 8 What is the degree of the polynomial $2x - x^2 + 4x^3$?
- 1) 1 3) 3
2) 2 4) 4
- 9 The zeros of the function $f(x) = x(x - 5)(3x + 6)$ are
- 1) 0, -5, and 2 3) -5 and 2, only
2) 0, 5, and -2 4) 5 and -2, only
- 10 What is the y -intercept of the line that passes through the points $(-1, 5)$ and $(2, -1)$?
- 1) -1 3) 3
2) -2 4) 5
- 11 Nancy has just been hired for her first job. Her company gives her four choices for how she can collect her annual salary over the first eight years of employment. Each function below represents the four choices she has for her annual salary in thousands of dollars, where t represents the number of years after she is hired.
- $a(t) = 2^t + 25$
 $b(t) = 10t + 75$
 $c(t) = \sqrt{400t} + 80$
 $d(t) = 2(t + 1)^2 - 10t + 50$

Which pay plan should Nancy choose in order to have the highest salary in her eighth year?

- 1) $a(t)$ 3) $c(t)$
2) $b(t)$ 4) $d(t)$
- 12 The third term in a sequence is 25 and the fifth term is 625. Which number could be the common ratio of the sequence?
- 1) $\frac{1}{5}$ 3) $\frac{1}{25}$
2) 5 4) 25
- 13 The box plot below summarizes the data for the amount of snowfall, in inches, during the winter of 2021 for 12 locations in western New York.



What is the interquartile range?

- 1) 30 3) 80
2) 50 4) 110

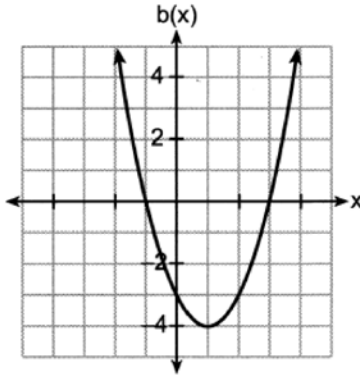
14 Four quadratic functions are represented below.

$$a(x) = (x - 3)^2 - 7$$

I

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

III



II

| x | d(x) |
|----|------|
| -4 | -1 |
| -3 | -4 |
| -2 | -5 |
| -1 | -4 |
| 0 | -1 |

IV

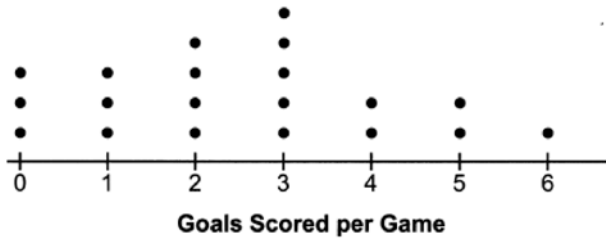
Which function has the *smallest* minimum value?

- 1) I
- 2) II
- 3) III
- 4) IV

15 The equation that represents the sequence $-2, -5, -8, -11, -14, \dots$ is

- 1) $a_n = -3 + (-2)(n - 1)$
- 2) $a_n = -2 + (-3)(n - 1)$
- 3) $a_n = 3 + (-2)(n - 1)$
- 4) $a_n = -2 + (3)(n - 1)$

16 The dot plot below shows the number of goals Jessica scored in each lacrosse game last season.



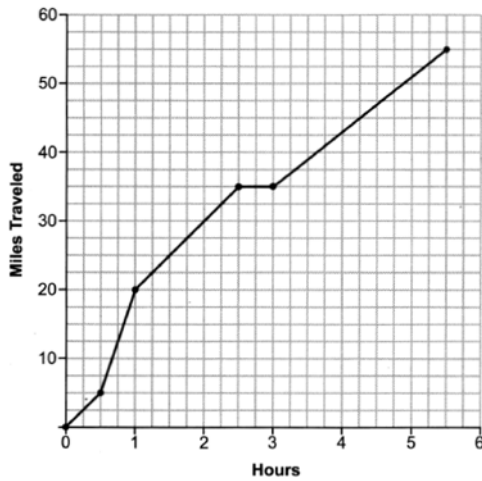
Which statement about the dot plot is correct?

- 1) mean > mode
- 2) mean = median
- 3) mode = median
- 4) median > mean

17 The students in Mrs. Smith's algebra class were asked to describe the graph of $g(x) = 2(x - 3)^2$ compared to the graph of $f(x) = x^2$. Which student response is correct?

- 1) Ashley said that the graph of $g(x)$ is wider and shifted left 3 units.
- 2) Beth said that the graph of $g(x)$ is narrower and shifted left 3 units.
- 3) Carl said that the graph of $g(x)$ is wider and shifted right 3 units.
- 4) Don said that the graph of $g(x)$ is narrower and shifted right 3 units.

18 One Saturday, Dave took a long bike ride. The graph below models his trip.



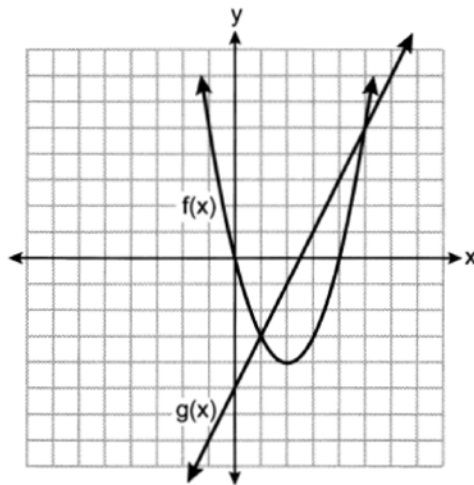
What was Dave's average rate of change, in miles per hour, on this trip?

- 1) 10
- 2) 11
- 3) 11.6
- 4) 14.5

19 Which expression is equivalent to $(x - 5)(2x + 7) - (x + 5)$?

- 1) $2x^2 - 2x - 30$
- 2) $2x^2 - 2x - 40$
- 3) $2x^2 - 4x - 30$
- 4) $2x^2 - 4x - 40$

20 The functions $f(x)$ and $g(x)$ are graphed on the set of axes below.



What is the solution to the equation $f(x) = g(x)$?

- 1) 1 and 5
- 2) -5 and 0
- 3) -3 and 5
- 4) 0 and 4

- 21 When babysitting, Nicole charges an hourly rate and an additional charge for gas. She uses the function $C(h) = 6h + 5$ to determine how much to charge for babysitting. The constant term of this function represents
- 1) the additional charge for gas
 - 2) the hourly rate Nicole charges
 - 3) the number of hours Nicole babysits
 - 4) the total Nicole earns from babysitting
- 22 When solved for x in terms of a , the solution to the equation $3x - 7 = ax + 5$ is
- 1) $\frac{12}{3a}$
 - 2) $\frac{12}{3-a}$
 - 3) $\frac{3a}{12}$
 - 4) $\frac{3-a}{12}$
- 23 Wayne van Niekerk, a runner from South Africa, ran 400 meters in 43.03 seconds to set a world record. Which calculation would determine his average speed, in miles per hour?
- 1) $\frac{400 \text{ m}}{43.03 \text{ sec}} \cdot \frac{1000 \text{ m}}{0.62 \text{ mi}} \cdot \frac{1 \text{ hr}}{3600 \text{ sec}}$
 - 2) $\frac{400 \text{ m}}{43.03 \text{ sec}} \cdot \frac{0.62 \text{ mi}}{1000 \text{ m}} \cdot \frac{1 \text{ hr}}{3600 \text{ sec}}$
 - 3) $\frac{400 \text{ m}}{43.03 \text{ sec}} \cdot \frac{0.62 \text{ mi}}{1000 \text{ m}} \cdot \frac{3600 \text{ sec}}{1 \text{ hr}}$
 - 4) $\frac{400 \text{ m}}{43.03 \text{ sec}} \cdot \frac{1000 \text{ m}}{0.62 \text{ mi}} \cdot \frac{3600 \text{ sec}}{1 \text{ hr}}$
- 24 Which function has a domain of all real numbers and a range greater than or equal to three?
- 1) $f(x) = -x + 3$
 - 2) $g(x) = x^2 + 3$
 - 3) $h(x) = 3^x$
 - 4) $m(x) = |x + 3|$
- 25 Solve $5(x - 2) \leq 3x + 20$ algebraically.
- 26 Given $g(x) = x^3 + 2x^2 - x$, evaluate $g(-3)$.
- 27 Given the relation $R = \{(-1, 1), (0, 3), (-2, -4), (x, 5)\}$. State a value for x that will make this relation a function. Explain why your answer makes this a function.
- 28 A survey of 150 students was taken. It was determined that $\frac{2}{3}$ of the students play video games. Of the students that play video games, 85 also use social media. Of the students that do not play video games, 20% do not use social media. Complete the two-way frequency table.

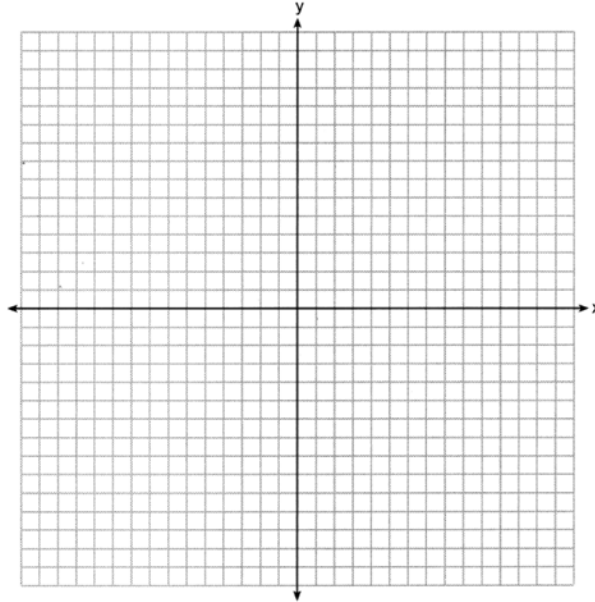
| | Play Video Games | Do Not Play Video Games | Total |
|-----------------|------------------|-------------------------|-------|
| Social Media | | | |
| No Social Media | | | |
| Total | | | |

- 29 Use the method of completing the square to determine the exact values of x for the equation $x^2 + 10x - 30 = 0$.
- 30 Factor $20x^3 - 45x$ completely.

- 31 Graph the following system of equations on the set of axes below.

$$y = x^2 - 3x - 6$$

$$y = x - 1$$



State the coordinates of all solutions.

- 32 The table below shows the amount of money a popular movie earned, in millions of dollars, during its first six weeks in theaters.

| | | | | | | |
|--|-----|-----|----|----|----|---|
| Week (x) | 1 | 2 | 3 | 4 | 5 | 6 |
| Dollars Earned, in Millions (y) | 185 | 150 | 90 | 50 | 25 | 5 |

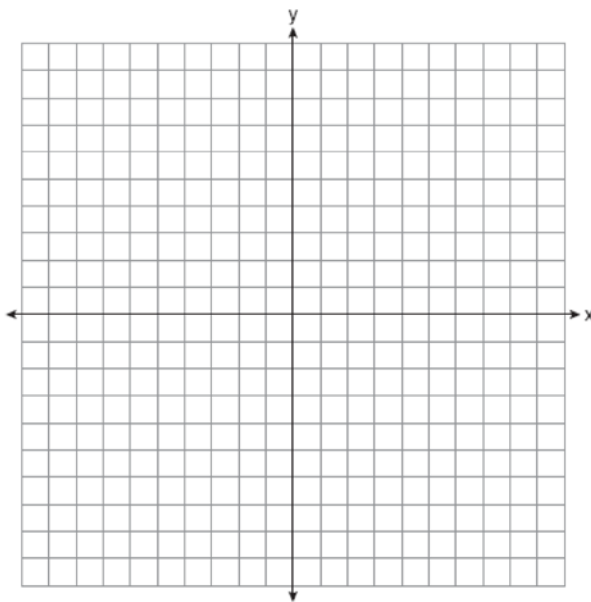
Write the linear regression equation for this data set, rounding all values to the *nearest hundredth*. State the correlation coefficient to the *nearest hundredth*. State what this correlation coefficient indicates about the linear fit of the data.

- 33 Use the quadratic formula to solve the equation $3x^2 - 10x + 5 = 0$. Express the answer in simplest radical form.

- 34 Graph the system of inequalities on the set of axes below.

$$3y + 2x \leq 15$$

$$y - x > 1$$



State the coordinates of a point in the solution to this system. Justify your answer.

- 35 Courtney went to a coffee shop to purchase lattes and donuts for her friends. One day she spent a total of \$15.50 on four lattes and two donuts. The next day she spent a total of \$18.10 on three lattes and five donuts. All prices included tax. If x represents the cost of one latte and y represents the cost of one donut, write a system of equations that can be used to model this situation. Courtney thinks that one latte costs \$2.75 and one donut costs \$2.25. Is Courtney correct? Justify your answer. Use your equations to determine algebraically the exact cost of one latte and the exact cost of one donut.

0824AI

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

- 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?

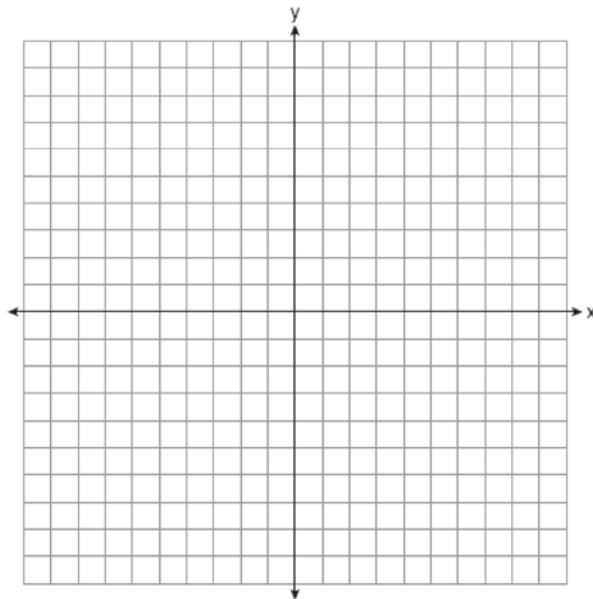
1) $\frac{3240 \text{ ft}^3}{1 \text{ pool}} \cdot \frac{1 \text{ ft}^3}{7.5 \text{ gal}} \cdot \frac{6000 \text{ gal}}{1 \text{ truck load}}$

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.

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

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

| | | | | | |
|----------|----|---|---|---|--|
| x | -1 | 0 | 1 | 2 | |
| y | 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.

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

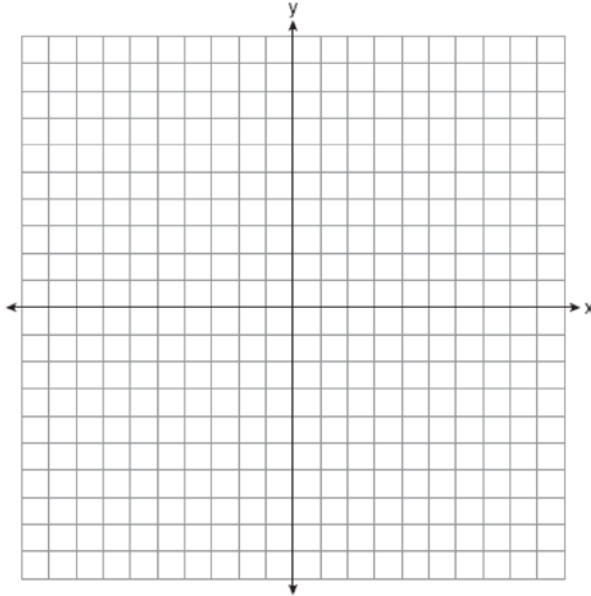
State the linear regression equation for these data, rounding all values to the *nearest hundredth*. State the correlation coefficient, to the *nearest hundredth*, for the line of best fit for these data. State what this correlation coefficient indicates about the linear fit of the data.

- 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.

2023 Algebra I Sample Items Answer Section

- 1 ANS: 1 PTS: 2 REF: fall2301ai NAT: N.RN.B.3
TOP: Operations with Radicals KEY: addition
- 2 ANS: 4
$$m = \frac{7-3}{2--1} = \frac{4}{3}$$
- PTS: 2 REF: fall2302ai NAT: A.REI.D.10 TOP: Writing Linear Equations
KEY: other forms
- 3 ANS:
$$\frac{3}{2\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{6}}{12}$$
- PTS: 2 REF: fall2303ai NAT: N.RN.B.3 TOP: Operations with Radicals
KEY: division
- 4 ANS:
$$x^2 + 6x + 9 = 41 + 9$$

$$(x+3)^2 = 50$$

$$x+3 = \pm\sqrt{50}$$

$$x = -3 \pm 5\sqrt{2}$$
- PTS: 4 REF: fall2304ai NAT: A.REI.B.4 TOP: Solving Quadratics
KEY: completing the square
- 5 ANS:
$$x^2 + 5x - 17 = x - 5 \quad -6 - y = 5 \quad 2 - y = 5 \quad (-6, -11), (2, -3)$$

$$x^2 + 4x - 12 = 0 \quad y = -11 \quad y = -3$$

$$(x+6)(x-2) = 0$$

$$x = -6, 2$$
- PTS: 4 REF: fall2305ai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

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Answer Section

- 1 ANS: 4 PTS: 2 REF: 062401ai NAT: F.IF.B.4
TOP: Graphing Quadratic Functions KEY: key features
- 2 ANS: 2 PTS: 2 REF: 062402ai NAT: A.CED.A.3
TOP: Modeling Systems of Linear Inequalities
- 3 ANS: 1 PTS: 2 REF: 062403ai NAT: A.APR.A.1
TOP: Multiplication of Powers
- 4 ANS: 4
 $-2x^2 + 4x - 2 + 3x^2 + 3x - 5 = x^2 + 7x - 7$
- PTS: 2 REF: 062404ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: addition
- 5 ANS: 1 PTS: 2 REF: 062405ai NAT: N.RN.B.3
TOP: Operations with Radicals KEY: classify
- 6 ANS: 2
 $\frac{4(x-5)}{3} = 12$
 $4x - 20 = 36$
 $4x = 56$
 $x = 14$
- PTS: 2 REF: 062406ai NAT: A.REI.B.3 TOP: Solving Linear Equations
- 7 ANS: 3 PTS: 2 REF: 062407ai NAT: F.LE.A.1
TOP: Families of Functions
- 8 ANS: 3 PTS: 2 REF: 062408ai NAT: A.SSE.A.1
TOP: Modeling Expressions
- 9 ANS: 2 PTS: 2 REF: 062409ai NAT: A.APR.B.3
TOP: Zeros of Polynomials
- 10 ANS: 3
 $\frac{5 - -1}{-1 - 2} = \frac{6}{-3} = -2$ $5 = -2(-1) + b$
 $3 = b$
- PTS: 2 REF: 062410ai NAT: F.IF.B.4 TOP: Graphing Linear Functions
- 11 ANS: 1
 $a(8) = 2^8 + 25 = 281$ $b(8) = 10(8) + 75 = 155$ $c(8) = \sqrt{400(8)} + 80 \approx 137$ $d(8) = 2(8 + 1)^2 - 10(8) + 50 = 132$
- PTS: 2 REF: 062411ai NAT: F.LE.A.3 TOP: Families of Functions

12 ANS: 2

$$25r^2 = 625$$

$$r^2 = 25$$

$$r = \pm 5$$

PTS: 2 REF: 062412ai NAT: F.IF.A.3 TOP: Sequences
KEY: difference or ratio

13 ANS: 2

$$110 - 60 = 50$$

PTS: 2 REF: 062413ai NAT: S.ID.A.1 TOP: Box Plots
KEY: interpret

14 ANS: 1

$$1) -7; 2) -4; 3) x = \frac{-6}{2(1)} = -3, c(-3) = (-3)^2 + 6(-3) + 3 = -6; 4) -5$$

PTS: 2 REF: 062414ai NAT: F.IF.C.9 TOP: Comparing Quadratic Functions
15 ANS: 2 PTS: 2 REF: 062415ai NAT: F.BF.A.1
TOP: Sequences KEY: explicit

16 ANS: 2

$$\text{mean: } \frac{3(0) + 3(1) + 4(2) + 5(3) + 2(4) + 2(5) + 1(6)}{3 + 3 + 4 + 5 + 2 + 2 + 1} = \frac{50}{20} = 2.5, \text{ mode: } 3, \text{ median: } \frac{2+3}{2} = 2.5$$

PTS: 2 REF: 062416ai NAT: S.ID.A.1 TOP: Dot Plots
17 ANS: 4 PTS: 2 REF: 062417ai NAT: F.BF.B.3
TOP: Transformations with Functions

18 ANS: 1

$$\frac{55 - 0}{5.5 - 0} = 10$$

PTS: 2 REF: 062418ai NAT: F.IF.B.6 TOP: Rate of Change
19 ANS: 4

$$2x^2 + 7x - 10x - 35 - x - 5 = 2x^2 - 4x - 40$$

PTS: 2 REF: 062419ai NAT: A.APR.A.1 TOP: Operations with Polynomials
KEY: multiplication
20 ANS: 1 PTS: 2 REF: 062420ai NAT: A.REI.D.11
TOP: Quadratic-Linear Systems
21 ANS: 1 PTS: 2 REF: 062421ai NAT: F.LE.B.5
TOP: Modeling Linear Functions

22 ANS: 2

$$3x - ax = 12$$

$$x(3 - a) = 12$$

$$x = \frac{12}{3 - a}$$

PTS: 2 REF: 062422ai NAT: A.CED.A.4 TOP: Transforming Formulas

23 ANS: 3 PTS: 2 REF: 062423ai NAT: N.Q.A.1

TOP: Conversions

24 ANS: 2

All four functions have a real domain. f has a real range. h has a positive real range. m has a nonnegative real range.

PTS: 2 REF: 062424ai NAT: F.IF.A.2 TOP: Domain and Range

25 ANS:

$$5x - 10 \leq 3x + 20$$

$$2x \leq 30$$

$$x \leq 15$$

PTS: 2 REF: 062425ai NAT: A.REI.B.3 TOP: Solving Linear Inequalities

26 ANS:

$$g(-3) = (-3)^3 + 2(-3)^2 - (-3) = -27 + 18 + 3 = -6$$

PTS: 2 REF: 062426ai NAT: F.IF.A.2 TOP: Functional Notation

27 ANS:

x may be any value other than $-2, -1, 0$, so that for any value of x , there is a unique y .

PTS: 2 REF: 062427ai NAT: F.IF.A.1 TOP: Defining Functions

28 ANS:

| | Play Video Games | Do Not Play Video Games | Total |
|-----------------|------------------|-------------------------|-------|
| Social Media | 85 | 40 | 125 |
| No Social Media | 15 | 10 | 25 |
| Total | 100 | 50 | 150 |

PTS: 2 REF: 062428ai NAT: S.ID.B.5 TOP: Frequency Tables

KEY: two-way

29 ANS:

$$x^2 + 10x = 30$$

$$x^2 + 10x + 25 = 30 + 25$$

$$(x + 5)^2 = 55$$

$$x + 5 = \pm\sqrt{55}$$

$$x = -5 \pm \sqrt{55}$$

PTS: 2 REF: 062429ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: completing the square

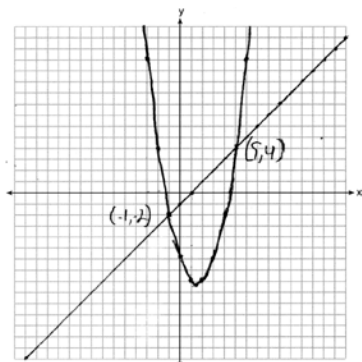
30 ANS:

$$20x^3 - 45x = 5x(4x^2 - 9) = 5x(2x + 3)(2x - 3)$$

PTS: 2 REF: 062430ai NAT: A.SSE.A.2

TOP: Factoring the Difference of Perfect Squares

31 ANS:



PTS: 4 REF: 062431ai NAT: A.REI.C.7 TOP: Quadratic-Linear Systems

32 ANS:

$$y = -37.57x + 215.67, -0.98, \text{strong}$$

PTS: 4 REF: 062432ai NAT: S.ID.B.6 TOP: Regression

KEY: linear with correlation coefficient

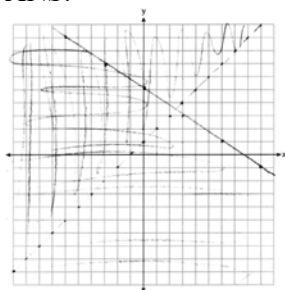
33 ANS:

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(5)}}{2(3)} = \frac{10 \pm \sqrt{40}}{6} = \frac{10 \pm 2\sqrt{10}}{6} = \frac{5 \pm \sqrt{10}}{3}$$

PTS: 4 REF: 062433ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: quadratic formula

34 ANS:



$(-1, 1)$ is a solution as it is in the overlap area.

PTS: 4

REF: 062434ai

NAT: A.REI.D.12

TOP: Graphing Systems of Linear Inequalities

35 ANS:

$4x + 2y = 15.5$ $5(4x + 2y = 15.5)$ Courtney is incorrect because of the following calculations: $20x + 10y = 77.5$

$3x + 5y = 18.1$ $2(3x + 5y = 18.1)$

$6x + 10y = 36.2$

$14x = 41.3$

$x = 2.95$

$4(2.95) + 2y = 15.5$

$11.8 + 2y = 15.5$

$2y = 3.7$

$y = 1.85$

PTS: 6

REF: 062435ai

NAT: A.CED.A.3

TOP: Modeling Linear Systems

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.CED.A.4 TOP: Transforming Formulas

21 ANS: 3 PTS: 2 REF: 082421ai NAT: A.APR.B.3
TOP: Zeros of Polynomials

22 ANS: 2
 $5^{a+2b} = 5^a \cdot 5^{2b} = 5^a \cdot 25^b$

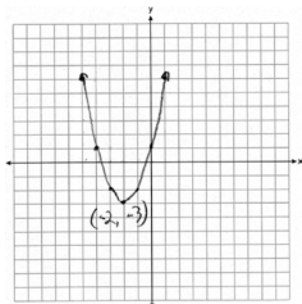
PTS: 2 REF: 082422ai NAT: A.APR.A.1 TOP: Multiplication of Powers

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

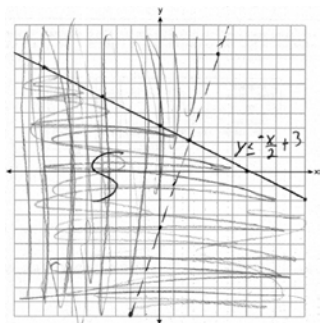
REF: 082431ai

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:

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

$$6m + r = 47.5$$

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

$$8r = 68 \quad 2m = 13$$

$$r = 8.50 \quad m = 6.50$$

PTS: 6 REF: 082435ai NAT: A.CED.A.3 TOP: Modeling Linear Systems