

1. Jeremy determines that $\sqrt{9} = 9^{\frac{1}{2}}$. Part of his work is shown.

$$\sqrt{9} = 3 = 3^1 = 3^{\frac{1}{2} + \frac{1}{2}} = \underline{\hspace{2cm}} = 9^{\frac{1}{2}}$$

$$\sqrt[3]{9} = 9^{\frac{1}{2}}$$

Which expression or equation should be placed in the blank to correctly complete Jeremy's work?

(A) $(3^2)^1$

(B) $3^{\frac{1}{2}} + 3^{\frac{1}{2}}$

(C) $3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} = (3 \cdot 3)^{\frac{1}{2}}$

(D) $3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} = (3 \cdot 3)^{\frac{1}{2} + \frac{1}{2}}$

~~$(3 \cdot 3)^1$~~
 ~~9~~

$$\sqrt{9} = 3 = 3^1 = 3^{\frac{1}{2} + \frac{1}{2}} = 3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} = (3 \cdot 3)^{\frac{1}{2}} = 9^{\frac{1}{2}}$$

$$3^{\frac{1}{2} + \frac{1}{2}} = 3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}} = (3 \cdot 3)^{\frac{1}{2}} = (9)^{\frac{1}{2}}$$

2. A bird drops a stick from the top of Miami Tower. The height of the stick after x seconds is given by $f(x) = 625 - 16x^2$.

Select all the correct interpretations of the coordinates of the point at the maximum of the function $f(x)$.

- (A) the time it takes the stick to hit the ground
- (B) the time when the stick is at its highest point
- (C) the height of the stick when it is dropped from Miami Tower
- (D) the time when the stick is dropped from the top of Miami Tower
- (E) the distance of the stick from Miami Tower when it hits the ground

$x = \text{time}$

from $f(x)$



$$f(x) = -16x^2 + 0x + 625$$

$$y = ax^2 + bx + c$$

$x = 0 = \text{time}$

$f(0) = \boxed{625}$

Max time = 0
height = 625 = building height



3. Some of the steps in Raya's solution to $2.5(6.25x + 0.5) = 11$ are shown.

Statement	Reason
1. $2.5(6.25x + 0.5) = 11$	1. Given
2. $15.625x + 1.25 = 11$	2. Distributive Property
3. $15.625x = 9.75$	3. Subtraction property of equality
4. $x = 0.624$	4. ?

Division Property of Equality

Select the correct reason for line 4 of Raya's solution.

- (A) Closure property
- (B) Distributive property
- (C) Addition property of equality
- (D) Division property of equality
- (E) Symmetric property of equality

$$\frac{15.625x}{15.625} = \frac{9.75}{15.625} = .624$$

4. Cora is using successive approximations to estimate a positive solution to $f(x) = g(x)$, where $f(x) = x^2 + 13$ and $g(x) = 3x + 14$. The table shows her results for different input values of x .

x	$f(x)$	$g(x)$
0	13	14
1	14	17
2	17	20
3	22	23
4	29	26
3.5	25.25	24.5

*any
ans
near
this*

When $f(x) = g(x)$

$$x^2 + 13 = 3x + 14$$

$$\begin{array}{r} x^2 + 13 \\ -3x \quad -14 \\ \hline x^2 - 3x - 1 = 0 \end{array}$$

$$x^2 - 3x + 13 = 14$$

$$\begin{array}{r} x^2 - 3x + 13 \\ -14 \quad -14 \\ \hline x^2 - 3x - 1 = 0 \end{array}$$

$$x^2 - 3x - 1 = 0$$

$$ax^2 + bx + c = 0$$

$$\begin{aligned} a &= 1 \\ b &= -3 \\ c &= -1 \end{aligned}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Use Cora's process to find the positive solution, to the nearest tenth, of $f(x) = g(x)$.

$$X = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-1)}}{2(1)} = \frac{3 \pm \sqrt{9 + 4}}{2} = \frac{3 \pm \sqrt{13}}{2} = \frac{3 \pm 3.606}{2}$$

$$X_2 = \frac{3 - 3.606}{2} = \frac{-0.606}{2} = -0.303$$

$$X_1 = \frac{3 + 3.606}{2} = \frac{6.606}{2} = 3.303 \approx 3.3$$

*ans
tenths
hundredths*

5. The system $\begin{cases} Px + Qy = R \\ Fx + Gy = H \end{cases}$ has the solution ~~$(3, -1)$~~ where $F, G, H, P, Q,$ and R are nonzero real numbers

Select all the systems that are also guaranteed to have the solution $(3, -1)$.

- (A) $\begin{cases} (P+F)x + (Q+G)y = R+H \\ Fx + Gy = H \end{cases}$
- (B) $\begin{cases} (P+F)x + Qy = R+H \\ Fx + (G+Q)y = H \end{cases}$
- (C) $\begin{cases} Px + Qy = R \\ (3P+F)x + (3Q+G)y = 3H+R \end{cases}$
- (D) $\begin{cases} Px + Qy = R \\ (F-2P)x + (G-2Q)y = H-2R \end{cases}$
- (E) $\begin{cases} Px + Qy = R \\ 5Fx + 5Gy = 5H \end{cases}$

$$\begin{array}{r} Px + Qy = R \\ + Fx + Gy = H \\ \hline (P+F)x + (Q+G)y = (R+H) \end{array}$$

$$\begin{array}{r} 3Px + 3Qy = 3R \\ Fx + Gy = H \\ \hline (3P+F)x + (3Q+G)y = 3R+H \end{array}$$

$$(3P+F)x + (3Q+G)y = 3R+H$$

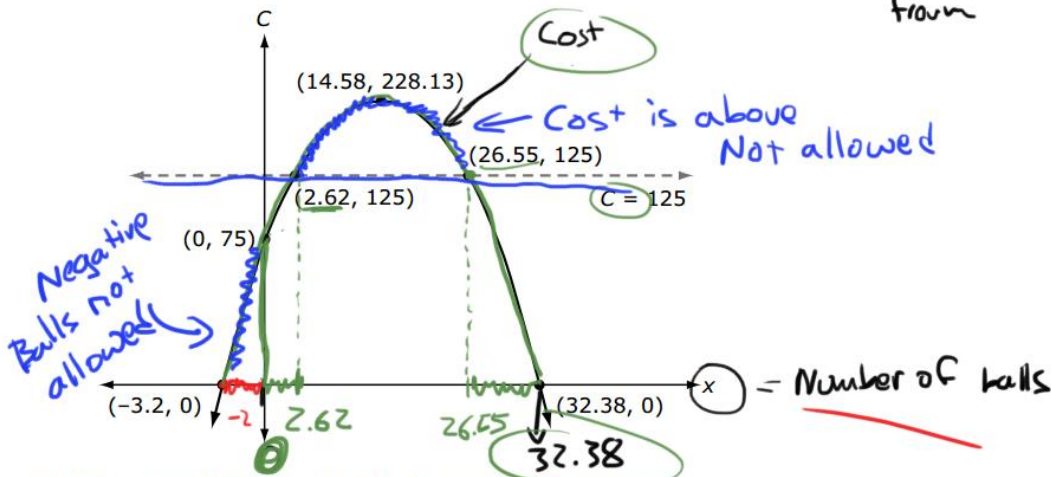
$$\begin{array}{r} Fx + Gy = H \\ -2Px - 2Qy = -2R \\ \hline (F-2P)x + (G-2Q)y = H-2R \end{array}$$

6. The production cost, C , in thousands of dollars, for a toy company to manufacture a ball is given by the model $C(x) = 75 + 21x - 0.72x^2$, where x is the number of balls produced in one day, in thousands. The company wants to keep its production cost at or below \$125,000. The graph shown models the situation.

$$C(x) = -0.72x^2 + 21x + 75$$

$$y = ax^2 + bx + c$$

from



What is a reasonable constraint for the model?

$$0 \leq x \leq 2.62 \quad \text{and} \quad \del{26.55 \leq x \leq 32.38}$$

$$26.55 \leq x \leq 32.38$$

7. Sue removes the plug from a trough to drain the water inside. The volume, in gallons, in the trough after it has been unplugged can be modeled by $4t^2 - 32t + 63$, where t is time, in minutes.

A. Select the correct property that will give Sue the amount of time it takes the trough to drain.

- A minimum
- B maximum
- C y-intercept
- D zero

B. Select the expression that will reveal the property.

- A $4(0)^2 - 32(0) + 63 = 0$
- B $(2t-7)(2t-9) \rightarrow$ factored
- C $4(t-4)^2 - 1$
- D $4(t-8)^2 + 47$

Volume in gal = $4t^2 - 32t + 63$

$0 = 4t^2 - 32t + 63$

$4t^2 - 14t - 18t + 63$

$(2t-7)(2t-9)$

X-axis \rightarrow Root \rightarrow zero

Quadratic Formula $(4t^2 - 14t) + (-18t + 63)$

factor

$0 = (2t-7)(2t-9)$

$2t-7=0 \rightarrow t=3.5$

$2t-9=0 \rightarrow t=4.5$

8. Florida has 67 counties, and Texas has 254 counties.

- The mean population for the state of Florida by county is 291,834 with a standard deviation of 467,012.03, and the median is 107,056.
- The mean population for the state of Texas by county is 104,127 with a standard deviation of 374,012.2261, and the median is 18,293.

Some of the data for both states are shown.

Florida		Texas	
County	Population	County	Population
Smallest	8,349	Smallest	95
First quartile	27,013	First quartile	7,057
Median	107,056	Median	18,293
Third quartile	337,362	Third quartile	49,426
Largest	2,617,176	Largest	4,336,853

Texas \rightarrow Florida

$2,617,000 - 8,000 = 2,610,000$

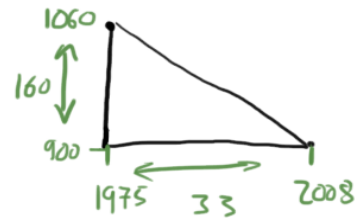
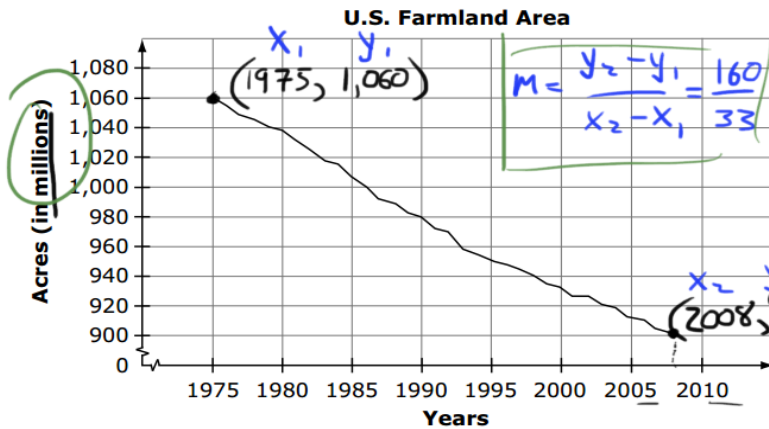
$8,000 + 8,000 = 16,000$

A business moves its corporate location from Texas to Florida. As a result of the move, 8,193 people move from the largest Texas county to the smallest Florida county, in terms of population.

Select all the population statistics that will be affected by this population change.

	Increases	Decreases	Stays the Same
Interquartile Range of Florida	<input type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/>
Mean of Texas	<input type="checkbox"/> D	<input checked="" type="checkbox"/>	<input type="checkbox"/> F
Median of Florida	<input type="checkbox"/> G	<input type="checkbox"/> H	<input checked="" type="checkbox"/>
Standard Deviation of Texas	<input type="checkbox"/> J	<input checked="" type="checkbox"/>	<input type="checkbox"/> L

9. The graph shows the number of acres, in millions, of farmland in the United States from 1975 to 2008.

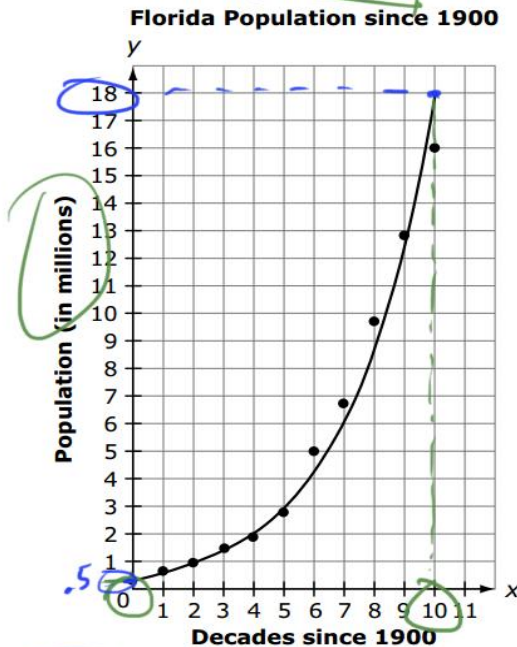


$$\frac{\text{Rise}}{\text{Run}} = \frac{160}{33} = 4.8$$

4.8 acres in millions
year

Which statement describes the average rate of change of the graph?

- A The number of acres of farmland in the United States decreases by 0.21 million each year.
 - B The amount of farmland in the United States decreases by 4.8 million acres each year.
 - C The time it takes the farmland in the United States to decrease by 160 acres is 33 years.
 - D Every 5 years, the amount of farmland in the United States decreases by 20 acres.
10. The points on the graph show the population data, in millions, of the state of Florida for each decade from 1900 to 2000. The data are modeled by the function $P(x) = 506975(1.43)^x$ shown on the graph.



$$y = A(d)^x$$

↓ multiplier
Starting common Ratio

Range Height $\rightarrow y$

Domain Width $\rightarrow x$

Domain

$$0 \leq x \leq 10$$

Range

$$.5 \leq y \leq 18$$

What is the domain of the graph of $P(x)$ that is shown?

11. A bird drops a stick from the top of Miami Tower. The height of the stick after x seconds is given by $f(x) = 625 - 16x^2$.

What is the maximum value of $f(x)$?

$$f(x) = 625 - 16x^2$$

$$f(0) = 625 - \cancel{16(0)^2}$$

$$f(0) = \boxed{625}$$



12. A librarian in a large city collects data about his summer reading program. He collects data for two years, 2011 and 2012, on how many books are read each week. His ordered data sets are shown.

$$\frac{382497}{6} = 63,749$$

Bigger

2011	2012
44,126	35,001
44,901	41,534
55,080	68,550
58,546	75,534
79,984	76,617
99,860	84,834

$$\frac{382070}{6} = 63,678$$

Median

$$\frac{55,080 + 58,546}{2}$$

The librarian writes a summary about his data, as shown.

Choose the correct word or phrase to fill in each blank in the summary. For each blank, fill in the circle **before** the word or phrase that is correct.

If you compare the means, it appears that in 2011 71 more [(A) approximately 71 fewer (B) approximately 71 more (C) approximately 15,229 fewer (D) approximately 15,229 more] books were read on average than in 2012. When the medians for the two years are compared, the data show that in 2011 _____ [(A) approximately 71 fewer (B) approximately 71 more (C) approximately 15,229 fewer (D) approximately 15,229 more] books were read than in 2012. As far as the spread of the data, both data sets have the same _____ [(A) range (B) lower quartile (C) upper quartile (D) interquartile range].