



Math 521A

Constructed Response

Item Bank

Course: Math 521A

Outcome: LR1

Level: 2

Item #: 2015-19-LR1-2

A vending machine sells chips for \$2 and pop for \$4. Prove deductively that the amount of money collected daily from the machine would be an even number of dollars.

Answer _____



Math 521A
Selected Response
Item Bank

Course: Math 521A

Outcome: LR1

Level: 2

Item #: 2015-43-LR1-2

Which of the following proves that the product of an even number and an odd number is even?

(A) $2n + 2m + 1$
 $4mn + 1$
 $2(2mn + 1)$

(B) $2n(3m)$
 $6mn$
 $2(3mn)$

(C) $2n(2m + 1)$
 $4mn + 2n$
 $2(2mn + n)$

(D) $2n + 3m$
 $5mn$
 $2(3mn)$

Which of the following proves that the sum of consecutive numbers is an odd number?

Ⓐ $n(n+1)$
 $n^2 + 1$

Ⓑ $m + n + 1$
 $mn + 1$

Ⓒ $m(n+1)$
 $mn + 1$

Ⓓ $n + n + 1$
 $2n + 1$

Course: Math 521A

Outcome: M1

Level: 1

Item #: 2015-22-M1-1

A store sells twelve 650 ml cans of motor oil for \$15.99. Find the unit price.

Ⓐ \$0.20246 / ml

Ⓑ \$1.33 / ml

Ⓒ \$0.0021 / ml

Ⓓ \$0.0185 / ml

Course: Math 521A

Outcome: M2

Level: 2

Item #: 2015-28-M2-2

A poster is $40\text{ cm} \times 30\text{ cm}$. A scale diagram of the poster must fit in a space that is $4\text{ m} \times 3\text{ m}$. Which scale factor is the most reasonable one to use for the scale diagram?

Ⓐ 0.1

Ⓑ 100

Ⓒ 10

Ⓓ 1%

Course: Math 521A

Outcome: M2

Level: 2

Item #: 2015-29-M2-2

A company's logo has a rectangular shape, which measures 6 cm by 10 cm. The company wants to advertise on the ice surface of the local rink and the area of the logo is to be at most 1.35 m^2 . Determine the greatest dimensions the company could use.

- Ⓐ $0.9 \text{ m} \times 1.5 \text{ m}$
- Ⓑ $13.5 \text{ m} \times 22.5 \text{ m}$
- Ⓒ $0.4 \text{ m} \times 0.7 \text{ m}$
- Ⓓ $2.7 \text{ m} \times 4.4 \text{ m}$

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-39-M3-2

If the sides of a cube were originally 2 cm and increased to 6 cm, by what factor has the surface area increased?

Ⓐ 3

Ⓑ 9

Ⓒ 27

Ⓓ 6

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-38-M3-2

If the sides of a cube were originally 6 cm and decreased to 2 cm, by what factor has the surface area decrease?

Ⓐ $\frac{1}{3}$

Ⓑ $\frac{1}{9}$

Ⓒ $\frac{1}{27}$

Ⓓ $\frac{1}{6}$

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-40-M3-2

The sides of a cube are halved, by what factor has the volume decreased?

- Ⓐ $\frac{1}{2}$
- Ⓑ $\frac{1}{4}$
- Ⓒ $\frac{1}{6}$
- Ⓓ $\frac{1}{8}$

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-41-M3-2

the volume of a cube is 40 m^3 . If the length of each side is tripled, what is the surface area of the larger cube?

- Ⓐ 120 m^3
- Ⓑ $64,000 \text{ m}^3$
- Ⓒ 360 m^3
- Ⓓ $1,080 \text{ m}^3$

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-26-RF2-2

Determine the equation in vertex form of the quadratic function with a vertex of $(-2, -1)$ and a y-intercept of 3.

Ⓐ $y = (x - 2)^2 - 1$

Ⓑ $y = (x + 2)^2 - 1$

Ⓒ $y = (x + 2)^2 + 1$

Ⓓ $y = (x + 2)^2 + 3$

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-46-RF2-2

A stone is tossed upwards from a bridge and falls to the water below. The approximate height, h , in meters, of the stone above the water t seconds after being tossed is modeled by the function $h(t) = -4.9t^2 + 10.78t + 35$.

What is the height of the stone in relation to the bridge after 2 seconds?

- Ⓐ The stone has hit the ground.
- Ⓑ The stone is in the air above the height of the bridge.
- Ⓒ The stone is in the air below the height of the bridge.
- Ⓓ The stone is in the air at the same height as the bridge.

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-47-RF2-2

The height, $h(t)$ in meters, of an object thrown upward from the top of a cliff is related to time, t in seconds, since the object was thrown, by the function $h(t) = -4.9(t - 2)^2 + 99.6$.

What is the height of the object in relation to the cliff after 4 seconds?

- Ⓐ The object is on the ground.
- Ⓑ The object is in the air above the height of the cliff.
- Ⓒ The object is in the air below the height of the cliff.
- Ⓓ The object is in the air at the same height as the cliff.

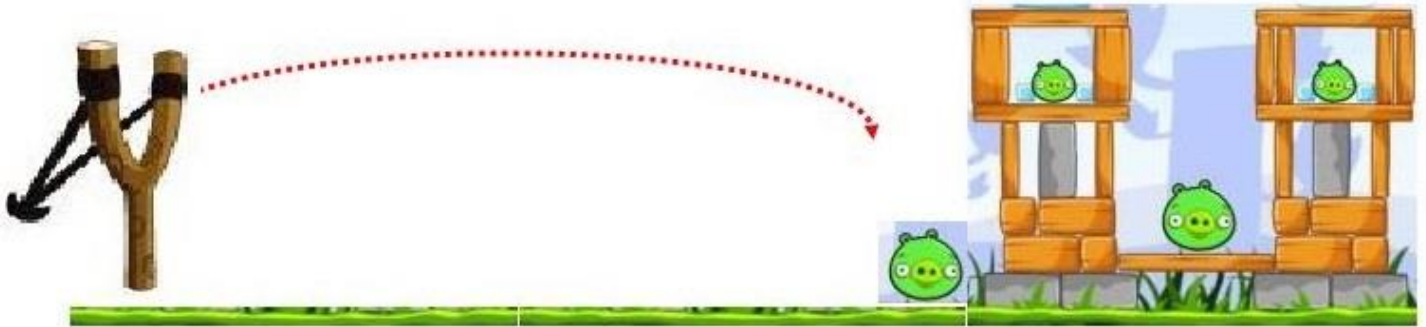
Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-48-RF2-2

An Angry Bird is launched from a catapult. The path of the Angry bird is modeled by the function $h(d) = -0.0113d^2 + 0.577d + 6.06$ where h represents the height of the bird in meters and d is the horizontal distance of the bird in meters. A structure of equal height to the catapult, is 60 m away. Based on its flight path, what happens to the Angry Bird?



- Ⓐ The Angry Bird hits the base of the structure.
- Ⓑ The Angry Bird hits the very top of the structure.
- Ⓒ The Angry Bird hits the structure.
- Ⓓ The Angry Bird clears the structure.

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-27-RF2-2

Which statement about the quadratic function $y = -2(x - 3)^2 + 1$ is NOT correct?

- Ⓐ The graph opens downward
- Ⓑ The vertex is at (3,1)
- Ⓒ The range is $\{y|y \geq 1, y \in R\}$
- Ⓓ The axis of symmetry is $x = 3$

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-49-RF2-2

A squirrel is on a tree branch. The squirrel's height in meters above the ground level can be represented by the function $h(d) = -2(d - 1)^2 + 12$, where h represents the height in meters and d the horizontal distance of the squirrel from the branch. The squirrel jumps into the air and falls towards the ground. When the squirrel is a horizontal distance of 2.5 meters from its starting position, what is the squirrel's vertical height in relation to the branch?

- Ⓐ The squirrel is in the air below the branch.
- Ⓑ The squirrel is in the air above the branch.
- Ⓒ The squirrel is in the air at the same height as the branch.
- Ⓓ The squirrel is on the ground.

Course: Math 521A

Outcome: RF2

Level: 3

Item #: 2015-23-RF2-3

Write an equation in vertex form with vertex $(4, -8)$ and a point at $(3, -6)$.

Ⓐ $y = 2(x - 4)^2 - 8$

Ⓑ $y = -\frac{2}{7}(x + 4)^2 + 8$

Ⓒ $y = \frac{2}{49}(x + 4)^2 - 8$

Ⓓ $y = (x - 4)^2 - 8$

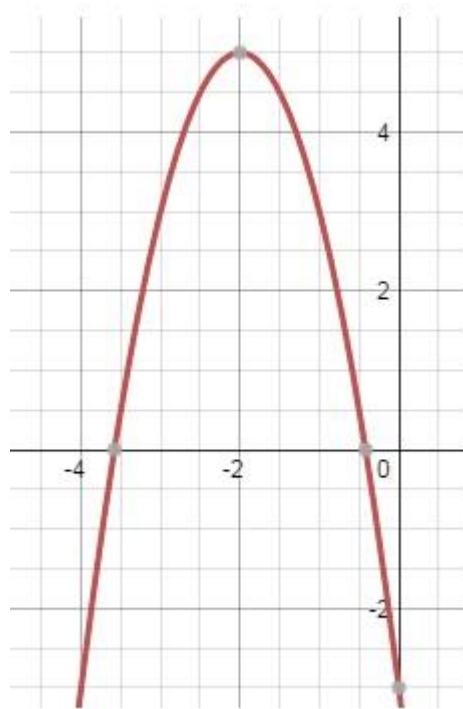
Course: Math 521A

Outcome: RF2

Level: 3

Item #: 2015-24-RF2-3

Write an equation for the given graph.



Ⓐ $y = -(x + 2)^2 + 5$

Ⓑ $y = -(x - 2)^2 + 5$

Ⓒ $y = -2(x + 2)^2 + 5$

Ⓓ $y = \frac{-1}{5}(x - 2)^2 + 5$

Course: Math 521A

Outcome: RF2

Level: 3

Item #: 2015-25-RF2-3

The path of a calculator that has been thrown by a math student is described by the function

$y = -0.015(x - 19.2)^2 + 12.3$. At what height was the calculator when it left the student's hand?

Ⓐ 12.3 ft

Ⓑ 6.8 ft

Ⓒ 17.8 ft

Ⓓ 19.2 ft

Course: Math 521A

Outcome: S1

Level: 2

Item #: 2015-44-S1-2

Determine the percent of data between $z = 0.35$ and $z = -0.38$ in data that has a normal distribution.

Ⓐ 28.4%

Ⓑ 98.8%

Ⓒ 98.9%

Ⓓ 28.5%

Course: Math 521A

Outcome: S1

Level: 2

Item #: 2015-45-S1-2

Determine the percent of data between $z = -1.43$ and $z = 0.66$.

Ⓐ 67.0%

Ⓑ 82.1%

Ⓒ 66.9%

Ⓓ 82.2%

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-35-S2-2

A survey of 200 shoppers indicated that 70% prefer smooth over chunky peanut butter. The results are considered accurate within 3 points, 9 times out of 10. What range of shoppers would you expect to prefer chunky?

Ⓐ 140

Ⓑ 54 - 66

Ⓒ 134 - 146

Ⓓ 60

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-30-S2-2

A political poll reports approval rates for the current Prime Minister of 65% \pm 2.5%, 9 times out of 10. What is the confidence level of this poll?

Ⓐ 90%

Ⓑ 2.5%

Ⓒ 5%

Ⓓ 65%

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-31-S2-2

Which of these increases the width of a confidence interval and margin of error?

- Ⓐ Decreased population
- Ⓑ Reduced confidence level
- Ⓒ Increased sample size
- Ⓓ Increased confidence level

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-32-S2-2

What is the range for the confidence interval $47.8\% \pm 3.7\%$?

- Ⓐ 47.8%
- Ⓑ 44.1% to 47.8%
- Ⓒ 47.8% to 51.5%
- Ⓓ 44.1% to 51.5%

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-34-S2-2

Out of 500 shoppers, 55% that were surveyed preferred strawberry jam over raspberry jam. These results were considered accurate within 5 percentage points, 19 times out of 20. How many of the population of shoppers would be expected to prefer raspberry?

- Ⓐ 90
- Ⓑ 225
- Ⓒ 275
- Ⓓ 100

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-33-S2-2

What is the correct expression for the confidence interval twenty-four percent with a four point two percent range as a margin of error?

- Ⓐ $24\% \pm 4.2$
- Ⓑ $24\% \pm 4.2\%$
- Ⓒ $24\% \pm 2.1\%$
- Ⓓ $24\% \pm 2.1$



Math 521A
Selected Response
Item Bank
Rationale

Course: Math 521A

Outcome: LR1

Level: 2

Item #: 2015-43-LR1-2

Which of the following proves that the product of an even number and an odd number is even?

Ⓐ
$$\begin{aligned} &2n + 2m + 1 \\ &4mn + 1 \\ &2(2mn + 1) \end{aligned}$$

Added

Ⓑ
$$\begin{aligned} &2n(3m) \\ &6mn \\ &2(3mn) \end{aligned}$$

Assigned variables incorrectly

Ⓒ
$$\begin{aligned} &2n(2m + 1) \\ &4mn + 2n \\ &2(2mn + n) \end{aligned}$$

Correct Answer

Ⓓ
$$\begin{aligned} &2n + 3m \\ &5mn \\ &2(3mn) \end{aligned}$$

Assigned variables incorrectly, grouped incorrectly,
and factored incorrectly

Which of the following proves that the sum of consecutive numbers is an odd number?

- (A) $n(n+1)$
 $n^2 + 1$ Multiplied incorrectly
- (B) $m + n + 1$
 $mn + 1$ Assigned variables incorrectly and grouped incorrectly
- (C) $m(n+1)$
 $mn + 1$ Multiplied incorrectly and assigned variables incorrectly
- (D) $n + n + 1$
 $2n + 1$ Correct Answer

Course: Math 521A

Outcome: M1

Level: 1

Item #: 2015-22-M1-1

A store sells twelve 650 ml cans of motor oil for \$15.99. Find the unit price.

Ⓐ \$0.20246 / ml

15.9/650

Ⓑ \$1.33 / ml

15.99/12

Ⓒ \$0.0021 / ml

Correct Answer

Ⓓ \$0.0185 / ml

12/650

Course: Math 521A

Outcome: M2

Level: 2

Item #: 2015-28-M2-2

A poster is $40 \text{ cm} \times 30 \text{ cm}$. A scale diagram of the poster must fit in a space that is $4 \text{ m} \times 3 \text{ m}$. Which scale factor is the most reasonable one to use for the scale diagram?

Ⓐ 0.1

Upside down ration

Ⓑ 100

Forgot to square root in caculation

Ⓒ 10

Correct Answer

Ⓓ 1%

1/100, written as a percentage and not square rooted and upside down.

Course: Math 521A

Outcome: M2

Level: 2

Item #: 2015-29-M2-2

A company's logo has a rectangular shape, which measures 6 cm by 10 cm. The company wants to advertise on the ice surface of the local rink and the area of the logo is to be at most 1.35 m^2 . Determine the greatest dimensions the company could use.

Ⓐ $0.9 \text{ m} \times 1.5 \text{ m}$

Correct Answer

Ⓑ $13.5 \text{ m} \times 22.5 \text{ m}$

Forgot to square root

Ⓒ $0.4 \text{ m} \times 0.7 \text{ m}$

Upside down but did square root

Ⓓ $2.7 \text{ m} \times 4.4 \text{ m}$

Did $6/1.35$ and didn't square root

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-39-M3-2

If the sides of a cube were originally 2 cm and increased to 6 cm, by what factor has the surface area increased?

Ⓐ 3 6/2 = 3 as the answer

Ⓑ 9 Correct Answer

Ⓒ 27 6/2 = 3 -> Cubed

Ⓓ 6 Uses new number

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-38-M3-2

If the sides of a cube were originally 6 cm and decreased to 2 cm, by what factor has the surface area decrease?

Ⓐ $\frac{1}{3}$

Ⓑ $\frac{1}{9}$

Correct Answer

Ⓒ $\frac{1}{27}$

Ⓓ $\frac{1}{6}$

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-40-M3-2

The sides of a cube are halved, by what factor has the volume decreased?

Ⓐ $\frac{1}{2}$

Halved

Ⓑ $\frac{1}{4}$

Did Surface area

Ⓒ $\frac{1}{6}$

Added another $\frac{1}{2}$ to surface area

Ⓓ $\frac{1}{8}$

Correct Answer

Course: Math 521A

Outcome: M3

Level: 2

Item #: 2015-41-M3-2

the volume of a cube is 40 m^3 . If the length of each side is tripled, what is the surface area of the larger cube?

Ⓐ 120 m^3

Tripled

Ⓑ $64,000 \text{ m}^3$

Cubed

Ⓒ 360 m^3

Used area instead of volume

Ⓓ $1,080 \text{ m}^3$

Correct Answer

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-26-RF2-2

Determine the equation in vertex form of the quadratic function with a vertex of $(-2, -1)$ and a y-intercept of 3.

Ⓐ $y = (x - 2)^2 - 1$

Wrong sign for "h"

Ⓑ $y = (x + 2)^2 - 1$

Correct Answer

Ⓒ $y = (x + 2)^2 + 1$

Changing both signs in vertex form

Ⓓ $y = (x + 2)^2 + 3$

Confuse "c" with "k"

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-46-RF2-2

A stone is tossed upwards from a bridge and falls to the water below. The approximate height, h , in meters, of the stone above the water t seconds after being tossed is modeled by the function $h(t) = -4.9t^2 + 10.78t + 35$.

What is the height of the stone in relation to the bridge after 2 seconds?

- Ⓐ The stone has hit the ground.
- Ⓑ The stone is in the air above the height of the bridge.
- Ⓒ The stone is in the air below the height of the bridge.
- Ⓓ The stone is in the air at the same height as the bridge.

Correct Answer

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-47-RF2-2

The height, $h(t)$ in meters, of an object thrown upward from the top of a cliff is related to time, t in seconds, since the object was thrown, by the function $h(t) = -4.9(t - 2)^2 + 99.6$.

What is the height of the object in relation to the cliff after 4 seconds?

- Ⓐ The object is on the ground.
- Ⓑ The object is in the air above the height of the cliff.
- Ⓒ The object is in the air below the height of the cliff.
- Ⓓ The object is in the air at the same height as the cliff.

Correct Answer

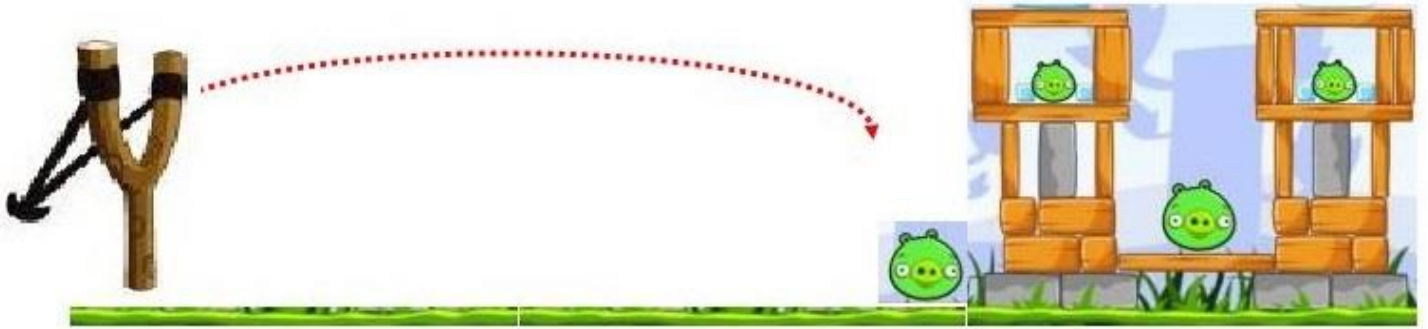
Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-48-RF2-2

An Angry Bird is launched from a catapult. The path of the Angry bird is modeled by the function $h(d) = -0.0113d^2 + 0.577d + 6.06$ where h represents the height of the bird in meters and d is the horizontal distance of the bird in meters. A structure of equal height to the catapult, is 60 m away. Based on its flight path, what happens to the Angry Bird?



- Ⓐ The Angry Bird hits the base of the structure.
- Ⓑ The Angry Bird hits the very top of the structure.
- Ⓒ The Angry Bird hits the structure.
- Ⓓ The Angry Bird clears the structure.

Correct Answer

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-27-RF2-2

Which statement about the quadratic function $y = -2(x - 3)^2 + 1$ is NOT correct?

- Ⓐ The graph opens downward
- Ⓑ The vertex is at (3,1)
- Ⓒ The range is $\{y|y \geq 1, y \in R\}$
- Ⓓ The axis of symmetry is $x = 3$

Correct Answer

Course: Math 521A

Outcome: RF2

Level: 2

Item #: 2015-49-RF2-2

A squirrel is on a tree branch. The squirrel's height in meters above the ground level can be represented by the function $h(d) = -2(d - 1)^2 + 12$, where h represents the height in meters and d the horizontal distance of the squirrel from the branch. The squirrel jumps into the air and falls towards the ground. When the squirrel is a horizontal distance of 2.5 meters from its starting position, what is the squirrel's vertical height in relation to the branch?

- Ⓐ The squirrel is in the air below the branch.
- Ⓑ The squirrel is in the air above the branch.
- Ⓒ The squirrel is in the air at the same height as the branch.
- Ⓓ The squirrel is on the ground.

Correct Answer

Course: Math 521A

Outcome: RF2

Level: 3

Item #: 2015-23-RF2-3

Write an equation in vertex form with vertex $(4, -8)$ and a point at $(3, -6)$.

Ⓐ $y = 2(x - 4)^2 - 8$

Correct Answer

Ⓑ $y = -\frac{2}{7}(x + 4)^2 + 8$

Substitute h/k incorrectly +/-

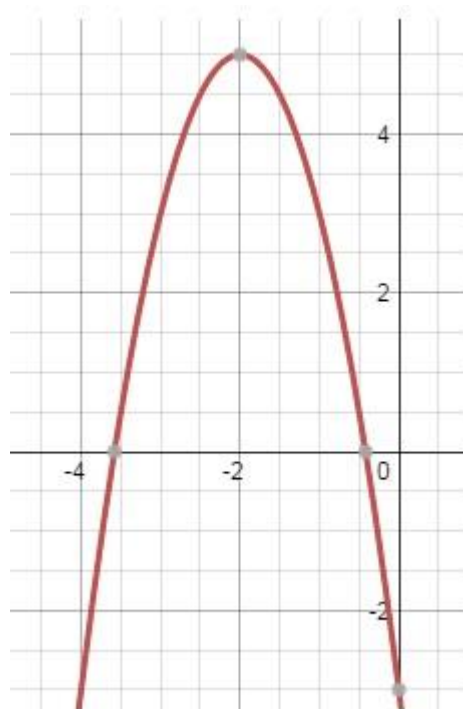
Ⓒ $y = \frac{2}{49}(x + 4)^2 - 8$

Put h in as the wrong sign

Ⓓ $y = (x - 4)^2 - 8$

Forgot they needed to find "a"

Write an equation for the given graph.



Ⓐ $y = -(x + 2)^2 + 5$

Don't calculate "a"

Ⓑ $y = -(x - 2)^2 + 5$

Don't calculate "a" and substitute "h" incorrectly

Ⓒ $y = -2(x + 2)^2 + 5$

Correct Answer

Ⓓ $y = \frac{-1}{5}(x - 2)^2 + 5$

Mix up the x and y when putting them into the equation

Course: Math 521A

Outcome: RF2

Level: 3

Item #: 2015-25-RF2-3

The path of a calculator that has been thrown by a math student is described by the function

$y = -0.015(x - 19.2)^2 + 12.3$. At what height was the calculator when it left the student's hand?

Ⓐ 12.3 ft

They use the "k" value to answer

Ⓑ 6.8 ft

Correct Answer

Ⓒ 17.8 ft

"-" error

Ⓓ 19.2 ft

Use the "h" value

Course: Math 521A

Outcome: S1

Level: 2

Item #: 2015-44-S1-2

Determine the percent of data between $z = 0.35$ and $z = -0.38$ in data that has a normal distribution.

Ⓐ 28.4%

Rounding error

Ⓑ 98.8%

Adding and rounding errors

Ⓒ 98.9%

Adding error

Ⓓ 28.5%

Correct Answer

Course: Math 521A

Outcome: S1

Level: 2

Item #: 2015-45-S1-2

Determine the percent of data between $z = -1.43$ and $z = 0.66$.

Ⓐ 67.0%

Rounding error

Ⓑ 82.1%

Added instead of subtracting

Ⓒ 66.9%

Correct Answer

Ⓓ 82.2%

Adding and rounding errors

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-35-S2-2

A survey of 200 shoppers indicated that 70% prefer smooth over chunky peanut butter. The results are considered accurate within 3 points, 9 times out of 10. What range of shoppers would you expect to prefer chunky?

- Ⓐ 140 70% of 200
- Ⓑ 54 - 66 Correct Answer
- Ⓒ 134 - 146 67% - 73% of 200
- Ⓓ 60 30% of 200

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-30-S2-2

A political poll reports approval rates for the current Prime Minister of 65% \pm 2.5%, 9 times out of 10. What is the confidence level of this poll?

Ⓐ 90%

Correct Answer

Ⓑ 2.5%

Use margin of error

Ⓒ 5%

Use margin of error

Ⓓ 65%

Use result

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-31-S2-2

Which of these increases the width of a confidence interval and margin of error?

- Ⓐ Decreased population
- Ⓑ Reduced confidence level
- Ⓒ Increased sample size
- Ⓓ Increased confidence level

Correct Answer

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-32-S2-2

What is the range for the confidence interval $47.8\% \pm 3.7\%$?

- Ⓐ 47.8% no use of margin of error
- Ⓑ 44.1% to 47.8% Only uses part of margin
- Ⓒ 47.8% to 51.5% Only uses upper end of margin
- Ⓓ 44.1% to 51.5% Correct Answer

Course: Math 521A

Outcome: S2

Level: 2

Item #: 2015-33-S2-2

What is the correct expression for the confidence interval twenty-four percent with a four point two percent range as a margin of error?

Ⓐ 24% +- 4.2

Doesn't divide by 2 and no percent

Ⓑ 24% +- 4.2%

Doesn't divide by 2

Ⓒ 24% +- 2.1%

Correct Answer

Ⓓ 24% +- 2.1

Doesn't use percent