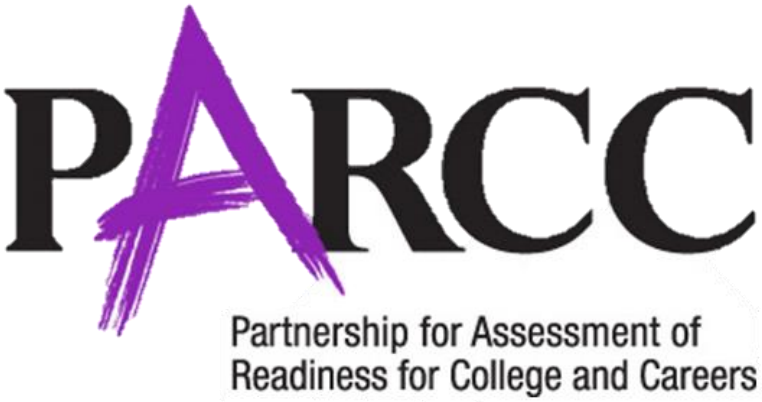


Math

Spring 2018

Algebra II

Released Items

1. **M47524P**

If $p(x) = x^3 - 3x^2 - x + 3$ and $p(3) = 0$, what is a factor of $p(x)$?

Select **all** that apply.

- [ ] A. $x - 1$
- [ ] B. $x + 1$
- [ ] C. $x - 2$
- [ ] D. $x + 2$
- [ ] E. $x - 3$
- [ ] F. $x + 3$

2. **VH046805**

What is the solution of the equation $\sqrt{x - 2} = x - 4$?

Enter your answer in the box.

$x =$ ☐

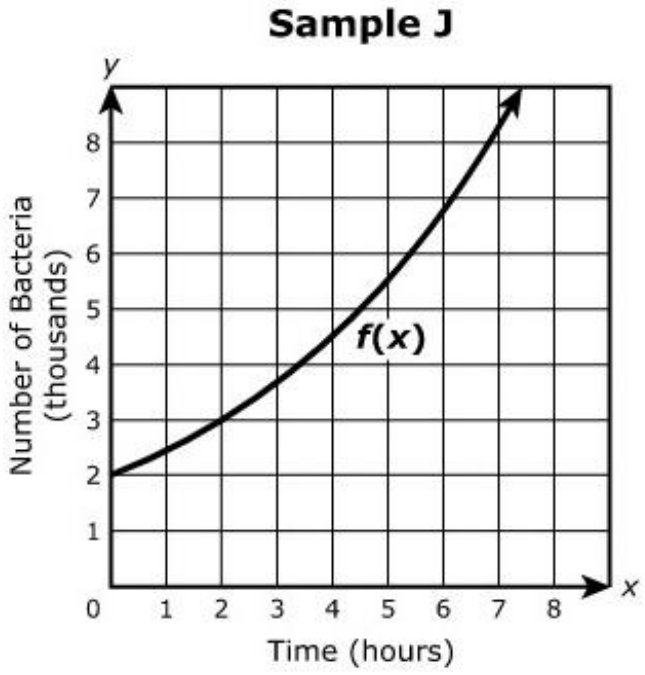
3. **VF907634**

For a material with a half-life of 4 years, the amount remaining in a sample after *t* years can be found with the equation $f(t) = A\left(\frac{1}{2}\right)^{\frac{t}{4}}$, where *A* is the amount of material in the original sample. This function can be rewritten as $f(t) = A(b)^t$. What is the value of *b*?

- ○ A. $\left(\frac{1}{2}\right)^4$
- ○ B. $\left(\frac{1}{2}\right)\left(\frac{1}{4}\right)$
- ○ C. $\sqrt{\frac{1}{4}}$
- ○ D. $\sqrt[4]{\frac{1}{2}}$

4. **3226-M44870P**

Researchers are studying two samples of bacteria whose growth can be modeled by exponential functions. The graph of $y = f(x)$ shows the number of bacteria in the thousands for sample J after *x* hours.



Part A

A researcher determines the number of bacteria in sample J at three different times of varying intervals, x_1, x_2, and x_3, such that $x_1 < x_2 < x_3$. Based on the graph of $f(x)$, which statement must be true?

- A. $f(x_2) - f(x_1) > f(x_3) - f(x_2)$
- B. $f(x_3) - f(x_2) > f(x_2) - f(x_1)$
- C. $f(x_1) > f(x_3)$
- D. $f(x_2) > f(x_1)$

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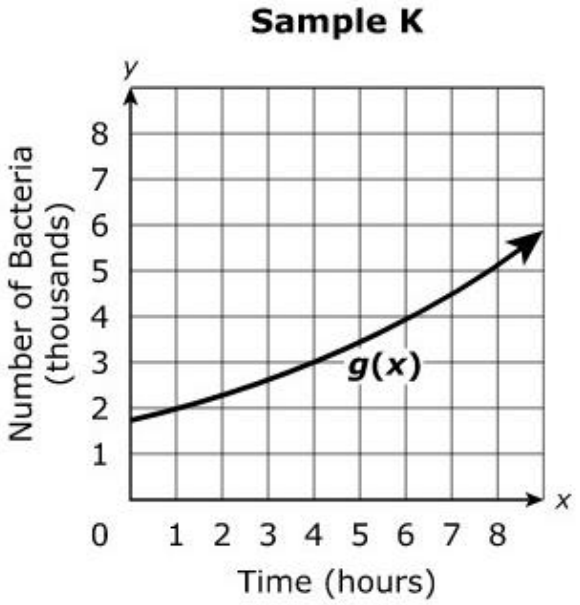
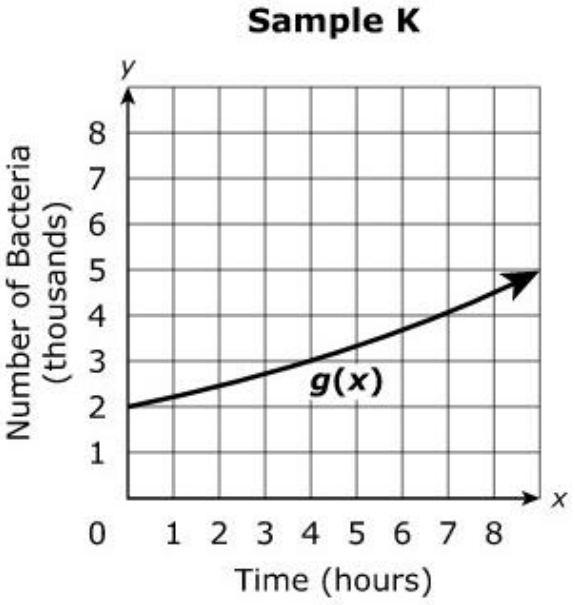
Part B

Sample J and sample K have the same number of bacteria initially. The number of bacteria in sample K at 4 hours is the same as the number of bacteria in sample J at 2 hours. Which graph shows the function $y = g(x)$, the number of bacteria, in thousands, for sample K after x hours?

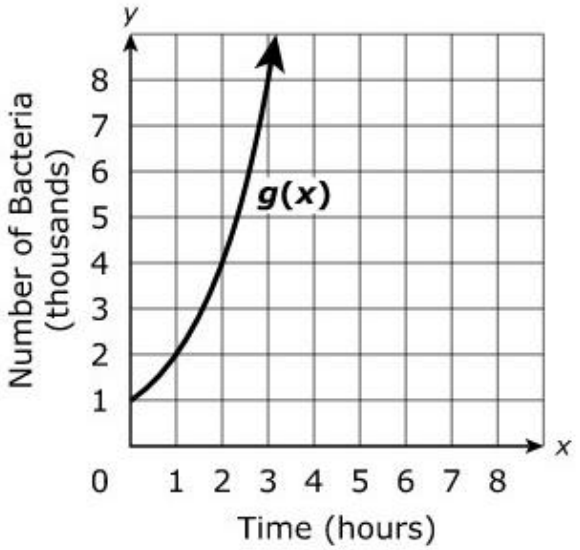
A.



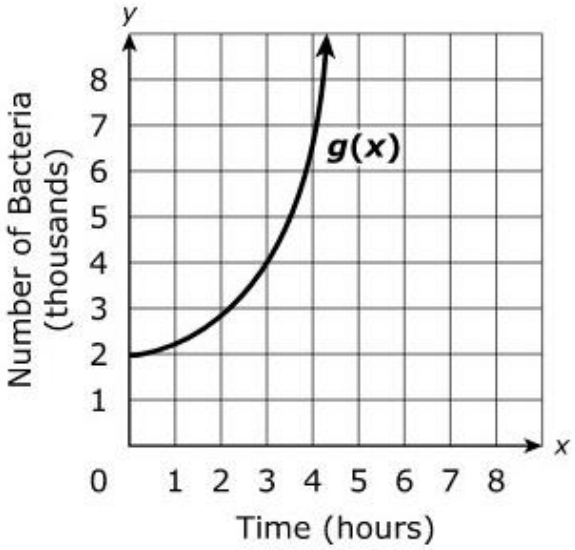
C.



B.



D.



5. **M50152**

What is the standard form of $(9+3i)^2$?

- A. 72
- B. 78
- C. $81+9i$
- D. $72+54i$

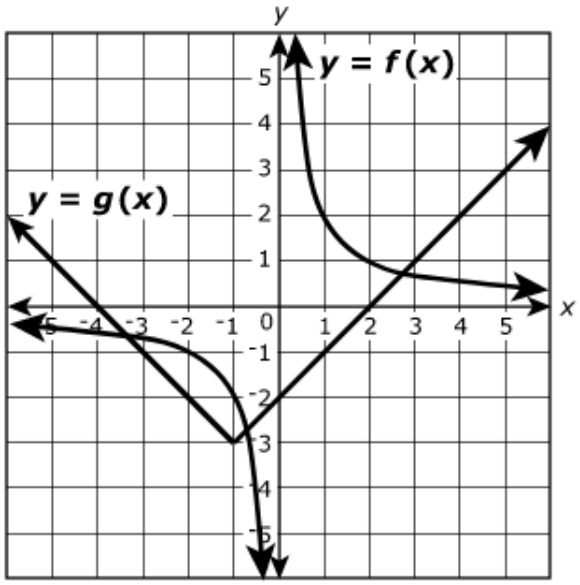
6. **M43762**

Which expression is equivalent to $\frac{9-x}{x^2-81}$ for $x \neq 9$ and $x \neq -9$?

- A. $\frac{-1}{x+9}$
- B. $\frac{1}{x+9}$
- C. $\frac{-x+9}{(x-9)(x-9)}$
- D. $\frac{x-9}{(x+9)(x-9)}$

7. **VH134142**

The graphs of a rational function $f(x)$ and an absolute value function $g(x)$ are shown in the coordinate plane.



Which intervals contain a solution of the equation $f(x) = g(x)$?

Select **all** that apply.

- ☐ A. $-4 < x < -3$
- ☐ B. $-3 < x < -2$
- ☐ C. $-2 < x < -1$
- ☐ D. $-1 < x < 0$
- ☐ E. $0 < x < 1$
- ☐ F. $1 < x < 2$
- ☐ G. $2 < x < 3$
- ☐ H. $3 < x < 4$

8. **M42108**

Solve the quadratic equation $(2x-3)^2 = 6(3-2x)$.

Select from the drop-down menus to correctly complete the sentence.

The solutions are Choose... and Choose... .

Choose...
-2.25
-1.5
-1.0
1
1.5
2.25

9. **VH007924**

A soda geyser can be produced by placing candy in a bottle of soda. The number of candies, x, dropped into the bottle affects the height, y, in feet, of the soda geyser. The results from an experiment are given in the table.

Number of Candies	Height of Soda Geyser (in feet)
1	2
5	9
10	12
15	14
20	15

Part A

Based on the data in the table that the height of the soda geyser appears to increase at a decreasing rate as the number of candies increases, which of the following functions should be used to fit the data?

- A. a linear function
- B. a quadratic function
- C. a logarithmic function
- D. an exponential function

Part B

Based on the data in the table, which height is the most reasonable to expect if 25 candies were placed in the bottle?

- A. 16 feet
- B. 20 feet
- C. 24 feet
- D. 30 feet

10. **VH145748**

A family compares the costs of renting a truck from two different companies for its 2-day move to another state. The costs are shown in the table.

Truck Rental Costs

Item	Company X	Company Y
base rental charge	$29.95 per day	$19.95 per day
mileage charge	59 cents per mile	79 cents per mile
drop-off charge	$150	included
insurance	$18 per day	$26 per day

Part A

Create a model that can be used to determine the rental cost of each truck for the 2-day move. Describe the process you used to determine your model.

Use your model to determine the number of miles when the rental costs of the two trucks will be equal.

Enter your answers in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

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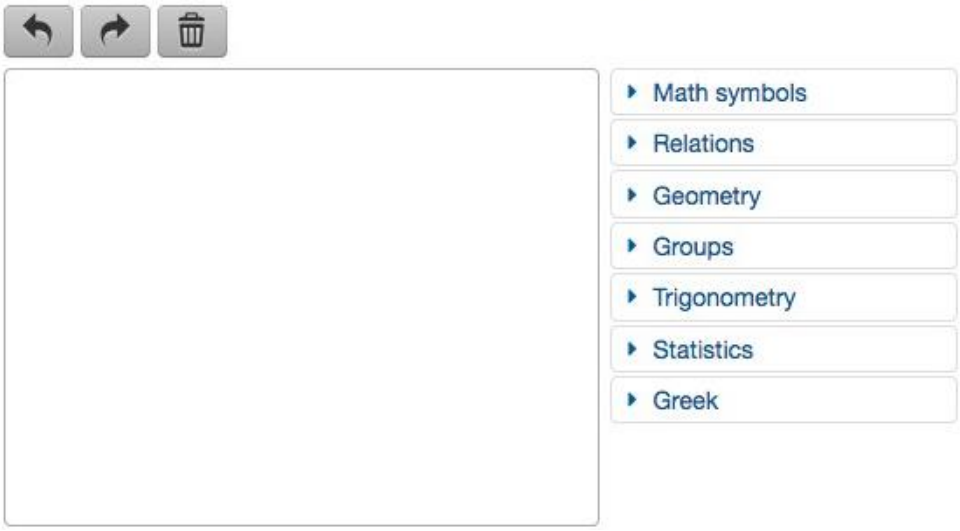
10. (continued from previous page) **VH145748**

Part B

The family estimates they will travel 750 miles total. In addition to the truck rental cost, they will also need to pay for gasoline. The price of gasoline is $3.50 per gallon across the states they will be traveling. The truck from Company X averages 10 miles per gallon; the truck from Company Y averages 7 miles per gallon.

Which of the two trucks should the family rent? Provide an answer supported by valid mathematical reasoning and/or calculations.

Enter your answer and your justification in the space provided.

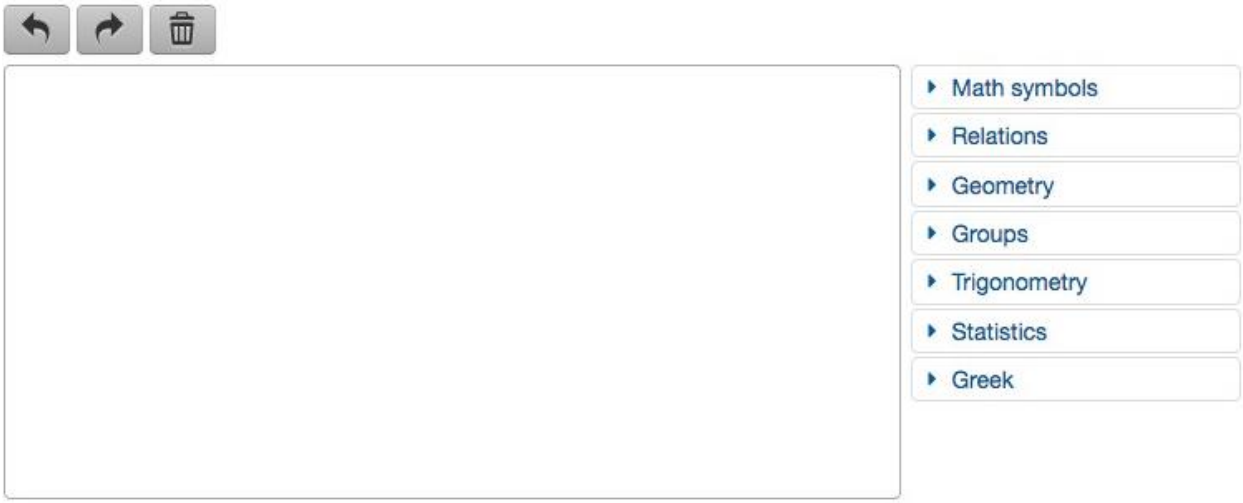


11. **M43214**

A school principal wants to know how far students travel in the morning to arrive at school. The principal interviews the first 40 students that arrive at school on two randomly selected days. The principal then calculates the average distance traveled.

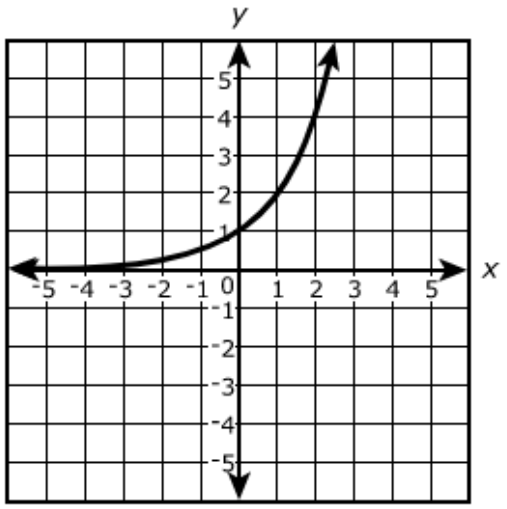
- Explain whether this situation is an observational study or an experiment.
- Explain why the principal's randomization process may not give accurate data.
- Explain how the principal's randomization process can be improved and why the improvements would give more accurate data.

Enter your explanations in the space provided.



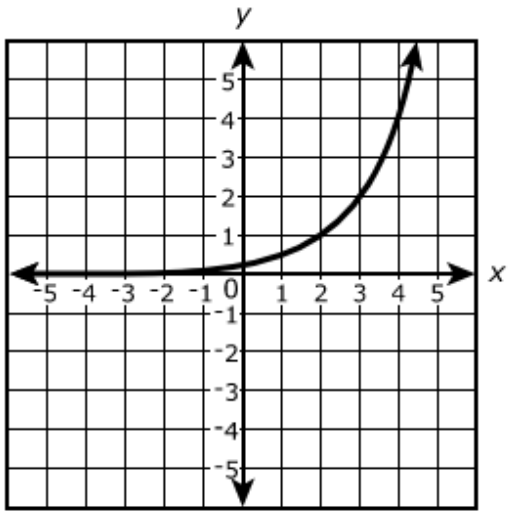
12. **VH222716**

The graph of $y = f(x)$ is shown in the coordinate plane.

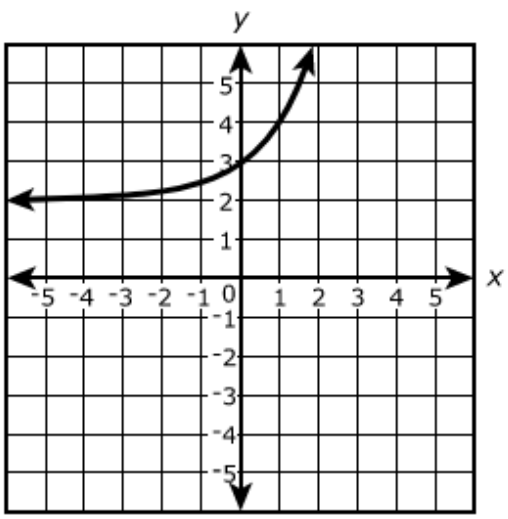


Which graph shows $y = f(x) - 2$?

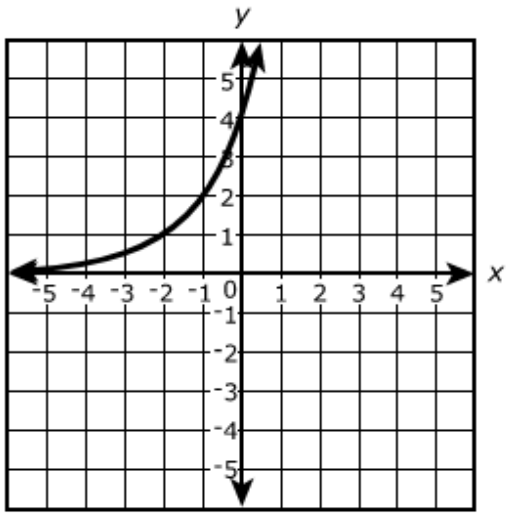
A.



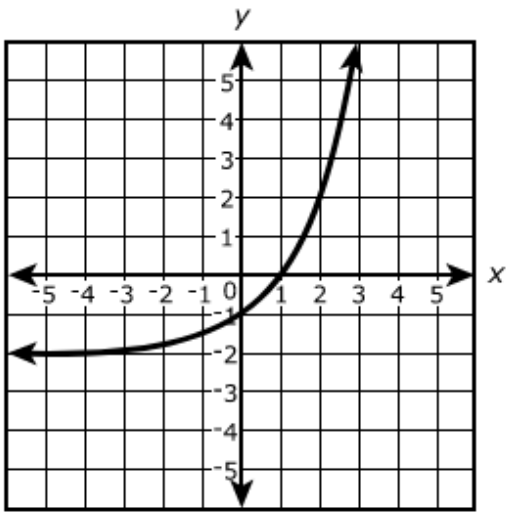
C.



B.



D.



13. **VH076702**

The system of equations shown is graphed on the coordinate plane. The graphs of the equations form a line and a parabola that intersect at two points.

$$\begin{cases} x + y = 5 \\ x^2 + y = 11 \end{cases}$$

One point of intersection is $(3, 2)$. What are the coordinates of the other point?

Enter your answers in the boxes.

(☐ , ☐)

14. **VH147862**

The amount of a radioactive element left after a certain number of hours can be determined by the function $A(t) = A_0(1-p)^t$ where A_0 is the initial amount of the element, t is the time in hours, and $0 < p < 1$.

Part A

What is the meaning of $1 - p$ in terms of the context?

Enter your answer in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

Part B

After 2 hours, 36% of a certain element remains. If a sample has an initial amount of 100 grams, how many hours will it take until only 1 gram remains? Provide an answer supported by valid mathematical reasoning and/or calculations.

Enter your answer and your support in the space provided.

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

15. **M40974**

At noon, a tank contains 100 gallons of water. The table shows the input and output of water for pipes A, B, and C. The pipes begin operating simultaneously at noon.

Pipe	A	B	C
Flow in (gallons per minute)	$a(x) = 25x$	$b(x) = 10x$	
Flow out (gallons per minute)			$c(x) = 30x$

Let $T(x)$ represent the amount of water in the tank x minutes after all of pipes A, B, and C are opened. Which function represents $T(x)$?

A. $T(x) = 100 + a(x) + b(x) + c(x)$

B. $T(x) = a(x) + b(x) - c(x)$

C. $T(x) = 100 + a(x) + b(x) - c(x)$

D. $T(x) = a(x) + b(x) + c(x)$

16. **VF649831**

Which of the choices listed is a solution to $2x^2 + 4x + 9 = 0$?

A. $x = -1 - i\sqrt{14}$

B. $x = -1 + \sqrt{14}$

C. $x = \frac{-2+\sqrt{14}}{2}$

D. $x = \frac{-2-i\sqrt{14}}{2}$

17. **M43130**

$$\left(\frac{64m^{\frac{1}{2}}r^3}{m^{\frac{5}{2}}r^{\frac{1}{4}}}\right)^{\frac{1}{2}}$$

Which expression is equivalent to the expression shown? Assume the value of each variable is a positive real number.

A. $\frac{8r^{\frac{11}{4}}}{m^2}$

B. $\frac{8r^{\frac{11}{8}}}{m}$

C. $\frac{32r^{\frac{11}{8}}}{m}$

D. $\frac{32r^{\frac{11}{4}}}{m^2}$

18. **VH081283**

Town A has a population size of 4,000 and is predicted to increase in size by 8% each year. Town B has a population size of 5,000 and is predicted to increase in size by 6% each year.

Part A

Which statement **best** compares the size of the populations of the towns in 5 years?

A. The size of the population in Town A will be greater than that of Town B with a difference less than 1,000 people.

B. The size of the population in Town A will be greater than that of Town B with a difference greater than 1,000 people.

C. The size of the population in Town B will be greater than that of Town A with a difference less than 1,000 people.

D. The size of the population in Town B will be greater than that of Town A with a difference greater than 1,000 people.

Part B

If the predictions are correct, the two populations will be equal in size at some point in time. To the nearest person, which is the **best** estimate of the size of each population at the point in time when they are equal?

A. 8,636 people

B. 9,919 people

C. 10,025 people

D. 10,878 people