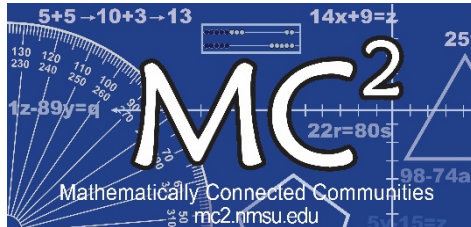


# Mathematically Connected Communities



## PARCC Practice Test Items Algebra 2

Excerpted 10/2016 from  
PARCC Paper-Based and Computer-Based  
Practice Tests

<https://parcc.pearson.com/practice-tests/math/>

## Mathematical Practice Questions for MC<sup>2</sup> Thinking Protocol

Use the MC<sup>2</sup> Thinking Protocol and follow the process below in working with the PARCC practice test items found in this packet:

1. Choose items from this packet that relate to math concepts studied in the current or previous curriculum units during your math instruction. Each item may be used as a practice item worksheet.
2. Choose a set of **Thinking/Writing Prompts** below based on the math practice the class is working to develop.
3. Add the prompts to the practice item worksheet or display the prompts for the students to respond to.
4. Continue using the same set of prompts for an extended period of time so children develop competence and confidence in describing their mathematical thinking related to the math practice.

The questions below were intentionally not included on each MC<sup>2</sup> PARCC practice test item worksheet in this packet. These are intended to help students move beyond “answer getting” to fully making sense of test item questions and their own mathematical thinking.

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### Thinking/Writing Prompts to Promote Mathematical Practices

Math Practice 1: **Make sense of problems and persevere in solving them.**

1. What do you know about the problem?
2. What questions do you have?
3. Explain your reasoning or thinking in solving the problem.

Math Practice 3: **Construct viable arguments and critique the reasoning of others.**

1. What are the assumptions, definitions, and previous knowledge to help in thinking about this problem?
2. What are some possible conjectures that you have about the problem?
3. Explain your mathematical argument so that somebody else can make sense of your thinking.

Math Practice 4: **Model with mathematics.**

1. What are the important quantities in the problem that are needed to solve it?
2. What mathematical operation(s) or representation(s) will you use to solve the problem?
3. Explain how you know your answer makes sense in the context of the situation.

Math Practice 6: **Attend to precision.**

1. What are the important units in the problem? (What are we measuring or counting?)
2. What relationship between the units/quantities do you need to know in order to solve the problem?
3. Use appropriate and precise mathematical language, units, labels and computations to clearly describe your mathematical reasoning.

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**Algebra 2 PARCC Unit 1 Section 1 Sample Test Item #1 (Non-calculator): Standard A-APR.2**

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If  $k$  is a constant, what is the value of  $k$  such that the polynomial  $k^2x^3 - 6kx + 9$  is divisible by  $x - 1$ ?

Enter your answer in the box.

**Algebra 2 PARCC Unit 1 Section 1 Sample Test Item #2 (Non-calculator): Standard A-Int. 1**

Use the information provided to answer Part A and Part B for question 2.

Consider the equation  $\frac{4^{x^2}}{2^x} = 2$ .

**2. Part A**

Which equation is equivalent to the equation shown?

- A.  $2^{x^2} = 2$
- B.  $2^{x^2-x} = 2$
- C.  $2^{2x} = 2$
- D.  $2^{2x^2-x} = 2$

**Part B**

Which values are solutions to the equation?

Select **all** that apply.

- A. -2
- B. -1
- C.  $-\frac{1}{2}$
- D.  $\frac{1}{2}$
- E. 1
- F. 2

**Algebra 2 PARCC Unit 1 Section 1 Sample Test Item #3 (Non-calculator): Standard A-REI.2**

What extraneous solution arises when the equation  $\sqrt{x+3} = 2x$  is solved for  $x$  by first squaring both sides of the equation?

Enter your answer in the box.

Which expressions are equal to a real number?

Select **all** that apply.

**A.**  $(-4i)^{11}$

**B.**  $(-3i)^{12}$

**C.**  $(2 + 3i)^2$

**D.**  $(4 + 5i)(4 - 5i)$

**E.**  $(6 + 8i)(8 + 6i)$

Algebra 2 PARCC Unit 1 Section 1 Sample Test Item #5 (Non-calculator): Standard N-RN.2

Given that  $x > 0$ , which expression is equivalent to  $5\sqrt{xy} + 25\sqrt{x}$ ?

A.  $5(xy)^{-1} + 25x^{-1}$

B.  $25x^{\frac{1}{2}}(\sqrt{y} + 5)$

C.  $\sqrt{x}\left(25y^{\frac{1}{2}} + 5\right)$

D.  $5x^{\frac{1}{2}}\left(y^{\frac{1}{2}} + 5\right)$

Which equation has non-real solutions?

**A.**  $2x^2 + 4x - 12 = 0$

**B.**  $2x^2 + 3x = 4x + 12$

**C.**  $2x^2 + 4x + 12 = 0$

**D.**  $2x^2 + 4x = 0$



Which expression is equivalent to  $a^2x^2 - 2cx^2 + a^2y - 2cy$ ?

- A.  $(x^2 - y)(a^2 - 2c)$
- B.  $(x^2 - y)(a + c)$
- C.  $(x^2 + y)(a^2 - 2c)$
- D.  $(x^2 + y)(a + c)$

Use the information provided to answer Part A and Part B for question

Consider the expression  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ .

**Part A**

Which expression is equivalent to  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ ?

- A.  $x^2(6x - 5y) + 4y^2(6x + 5y)$
- B.  $x^2(6x - 5y) + 4y^2(6x - 5y)$
- C.  $x^2(6x - 5y) - 4y^2(6x + 5y)$
- D.  $x^2(6x - 5y) - 4y^2(6x - 5y)$

**Part B**

Which expressions are factors of  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ ?

Select **all** that apply.

- A.  $x^2 + 4y^2$
- B.  $6x - 5y$
- C.  $x + 2y$
- D.  $6x + 5y$
- E.  $x - 2y$

Solve the equation  $27^x = 9^{x-3}$  for  $x$ .

Enter your answer in the box.

**Algebra 2 PARCC Unit 1 Section 1 Sample Test Item #10 (Non-calculator): Standard F-BF.1b-1**

The functions  $f$  and  $g$  are defined by  $f(x) = x^2$  and  $g(x) = 2x$ , respectively.

Which equation is equivalent to  $h(x) = \frac{f(2x)g(-2x)}{2}$ ?

- A.**  $h(x) = -2x^3$
- B.**  $h(x) = -8x^3$
- C.**  $h(x) = x^2 - 2x$
- D.**  $h(x) = 2x^2 + 2x$



**Algebra 2 PARCC Unit 1 Section 2 Sample Test Item #11 (Calculator): Standard A-SSE.4-2**

Use the information provided to answer Part A and Part B for question 11.

DeShawn is in his fifth year of employment as a patrol officer for the Metro Police. His salary for his first year of employment was \$47,000. Each year after the first, his salary increased by 4% of his salary the previous year.

**Part A**

What is the sum of DeShawn's salaries for his first five years of service?

- A. \$101,983
- B. \$188,000
- C. \$219,932
- D. \$254,567

**Part B**

If DeShawn continues his employment at the same rate of increase in yearly salary, for which year will the sum of his salaries first exceed \$1,000,000? Give your answer to the nearest integer.

Enter your answer in the box.



**Algebra 2 PARCC Unit 1 Section 2 Sample Test Item #12 (Calculator): Standard F-Int.1-2**

Use the information provided to answer Part A and Part B for question 12.

The London Eye, a Ferris wheel in England, has a diameter of 120 meters. The wheel completes a full rotation in 30 minutes to allow passengers to enter a capsule at the base of the Ferris wheel without stopping the wheel. At the highest point, a capsule reaches a height of 135 meters above the ground.

The height above the ground, in meters, of a capsule after  $x$  minutes can be modeled by  $f(x) = A \cdot \cos\left(\frac{\pi}{15}x\right) + B$ , where  $A$  and  $B$  are constants.

**Part A**

Given the situation, what is the value of  $A$ ?

Enter your answer in the box.

**Part B**

Consider a capsule that begins its rotation at the base of the London Eye. For the times listed, how many minutes after the rotation begins will the capsule be 45 meters above the ground?

Select **all** that apply.

- A. 15 minutes
- B. 25 minutes
- C. 35 minutes
- D. 45 minutes
- E. 55 minutes
- F. 65 minutes



Algebra 2 PARCC Unit 1 Section 2 Sample Test Item #13 (Calculator): Standard F-IF.4-2

Use the information provided to answer Part A through Part D for question 13.

Consider the polynomial function  $f(x) = (2x - 1)(x + 4)(x - 2)$ .

**Part A**

What is the  $y$ -intercept of the graph of the function in the  $xy$ -coordinate plane?

Enter your answer in the box.

**Part B**

For what values of  $x$  is  $f(x) > 0$ ?

Select **all** that apply.

- A.  $x < -4$
- B.  $-4 < x < \frac{1}{2}$
- C.  $-4 < x < 2$
- D.  $\frac{1}{2} < x < 2$
- E.  $x > \frac{1}{2}$
- F.  $x > 2$



**Part C**

What is the end behavior of the graph of the function?

- A. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$ .
- B. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$ .
- C. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$ .
- D. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$ .

**Part D**

How many relative maximums does the function have?

- A. none
- B. one
- C. two
- D. three





**Algebra 2 PARCC Unit 1 Section 2 Sample Test Item #14 (Calculator): Standards HS.D.CCR, 7.RP.A.02**

Use the information provided to answer Part A and Part B for question 14.

A city plans to implement a composting program. In the composting program, food waste will be collected from residents and sent to one of these compost collection sites.

Composting Program		
Collection Site	Distance from City Center (miles)	Fee (dollars per ton)
FW Processing	12	50
Hayward Ecology	60	36
Jasper Organics	70	45
Northwestern Recycling	95	40
Milton Recycling	26	65

- Operating the trucks used to transport the waste costs \$1.25 per mile driven.
- Each truck can hold 20 tons of waste.

**Part A**

Based on the given information, determine which composting collection site is cheapest. Describe the steps used to determine which composting site is cheapest and explain any assumptions made. Create a model that can be used to find the total cost of disposing food waste based on the number of tons of composting with the cheapest composting program. Describe the steps used to create your model.

Enter your answer, model, explanation, and assumptions in the space provided.



**Algebra 2 PARCC Unit 1 Section 2 Sample Test Item #14 (Calculator): Standards HS.D.CCR, 7.RP.A.02 (continued)**

**Part B**

During the previous year, the city sent 290,000 tons of waste to landfills. The cost of disposing waste at a landfill is \$75 per ton.

This year, the composting program will send 10% of the waste to composting sites instead of sending the waste to landfills. Determine the amount of money the city will save in waste disposal costs based on 290,000 tons of waste using the composting site you chose in Part A.

Show the process you used to determine your answer.

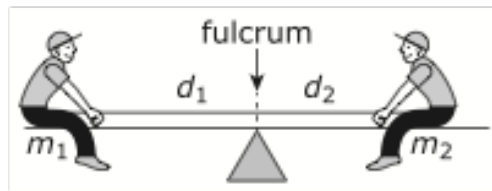
Enter your answer and your work in the space provided.



Algebra 2 PARCC Unit 1 Section 2 Sample Test Item #15 (Calculator):  
Standards HS.D.2-4, F-BF.A.01.a, F-BF.B.04.a

**Part A**

Two children sit on a seesaw, as illustrated. The mass, in kilograms, of the first child is  $m_1$  and the mass, in kilograms, of the second child is  $m_2$ . In the diagram,  $d_1$  and  $d_2$  represent the distance, in feet, from the fulcrum (the balance point) to each child. The total distance between the children is 10 feet.



For a seesaw to be balanced,  $m_1d_1 = m_2d_2$ . Use the information in the table to write the function  $f(x)$  that allows you to determine  $m_1$ , the mass of the first child.

$m_2$	$d_1$	$d_2$
40	$10 - x$	$x$

Enter your function in the space provided. Enter **only** your function.

**Part B**

Determine the inverse function  $f^{-1}(x)$  to model the distance,  $d_2$ , based on the mass of the first child. Show your work.

Enter your answer and your work in the space provided.



**Algebra 2 PARCC Unit 2 Sample Test Item #16 (Calculator): Standard A-REI.11-2**

Functions  $f$  and  $g$  are defined below.

$$\begin{cases} f(x) = \frac{1}{2x} \\ g(x) = x^2 \end{cases}$$

The graphs of  $y = f(x)$  and  $y = g(x)$  intersect at point  $P$ .

Determine the  $x$ -coordinate of  $P$ . Round your answer to the nearest tenth.

Enter your answer in the box.



**Algebra 2 PARCC Unit 2 Sample Test Item #17 (Calculator): Standard N-CN.7**

What are the solutions to the equation  $2x^2 - x + 1 = 0$ ?

- A.  $\frac{1}{4} - \frac{\sqrt{5}}{4}$  and  $\frac{1}{4} + \frac{\sqrt{5}}{4}$
- B.  $\frac{1}{4} - \frac{\sqrt{7}}{4}$  and  $\frac{1}{4} + \frac{\sqrt{7}}{4}$
- C.  $\frac{1}{4} - \left(\frac{\sqrt{7}}{4}\right)i$  and  $\frac{1}{4} + \left(\frac{\sqrt{7}}{4}\right)i$
- D.  $\frac{1}{4} - \left(\frac{\sqrt{5}}{4}\right)i$  and  $\frac{1}{4} + \left(\frac{\sqrt{5}}{4}\right)i$



**Algebra 2 PARCC Unit 2 Sample Test Item #18 (Calculator): Standards HS.C.5.11, A-REI.D.11**

Let  $f(x) = ax^2$  where  $a > 0$ , and let  $g(x) = mx + b$  where  $m > 0$  and  $b < 0$ .

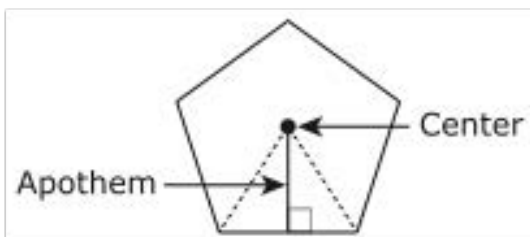
The equation  $f(x) = g(x)$  has  $n$  distinct real solution(s). What are **all** the possible values of  $n$ ? Justify your answers.

Enter your answers and your justification in the space provided.



**Algebra 2 PARCC Unit 2 Sample Test Item #19 (Calculator): Standard F-IF.6-2**

The apothem of a regular polygon is the distance from the center to any side.



If the length of the apothem remains constant at 10 inches, the formula for the perimeter of a regular polygon as a function of the number of sides  $n$  is

$$P(n) = 10\left(\tan\frac{360^\circ}{2n}\right)(2n).$$

As the regular polygon changes from a pentagon (5 sides) to an octagon (8 sides), what is the approximate average rate of change in the perimeter?

- A.** decrease of 0.80 inches for each additional side
- B.** decrease of 2.13 inches for each additional side
- C.** decrease of 4.56 inches for each additional side
- D.** decrease of 6.38 inches for each additional side



**Algebra 2 PARCC Unit 2 Sample Test Item #20 (Calculator): Standard S-CP.Int.1**

Use the information provided to answer Part A and Part B for question 20.

The two-way table shows the classification of students in a mathematics class by gender and dominant hand. A student who is ambidextrous uses both hands equally well.

	Right-handed	Left-handed	Ambidextrous	Total
Male	11	4	1	16
Female	12	2	0	14
Total	23	6	1	30

**Part A**

What is the probability that a randomly selected student in the class is female given that the student is right-handed?

- A.  $\frac{1}{12}$
- B.  $\frac{12}{30}$
- C.  $\frac{12}{23}$
- D.  $\frac{23}{30}$

**Part B**

One student will be selected at random from the class.

Consider the events:

X: the selected student is female

Y: the selected student is right-handed

Which statement about events X and Y is true?

- A. The events are independent because the number of right-handed students in the class is larger than the number of female students.
- B. The events are independent because the number of categories for dominant hand is different from the number of categories for gender.
- C. The events are not independent because for one of the dominant hand categories the number of female students is 0.
- D. The events are not independent because the probability of X is not equal to the probability of X given Y.





**Algebra 2 PARCC Unit 2 Sample Test Item #21 (Calculator): Standard F-BF.2**

Paul started to train for a marathon. The table shows the number of miles Paul ran during each of the first three weeks after he began training.

Week	1	2	3
Distance (miles)	10	12	14.4

If this pattern continues, which of the listed statements could model the number of miles Paul runs  $a_n$ , in terms of the number of weeks,  $n$ , after he began training?

Select **all** that apply.

- A.  $a_n = 10 + 2(n - 1)$
- B.  $a_n = 10n^2$
- C.  $a_n = 10(1.2)^{n-1}$
- D.  $a_1 = 10, a_n = 1.2a_{n-1}$
- E.  $a_1 = 10, a_n = 2 + a_{n-1}$



**Algebra 2 PARCC Unit 2 Sample Test Item #22 (Calculator): Standards HS.D.2-13, S-ID.A.04, S-IC.A.01**

The heights of the male students at a college are approximately normally distributed. Within this curve, 95% of the heights, centered about the mean, are between 62 inches and 78 inches. The standard deviation is 4 inches. Use this information to estimate the mean height of the males. Approximate the probability that a male student is taller than 74 inches. Explain how you determined your answers.

Enter your answers and your explanation in the space provided.



**Algebra 2 PARCC Unit 2 Sample Test Item #23 (Calculator): Standard N-RN.2**

If  $\sqrt[3]{(x+1)^5} = (x+1)^a$ , for  $x \geq -1$ , and  $a$  is a constant, what is the value of  $a$ ?

A.  $\frac{3}{10}$

B.  $\frac{5}{6}$

C.  $\frac{5}{3}$

D.  $\frac{10}{3}$



**Algebra 2 PARCC Unit 2 Sample Test Item #24 (Calculator): Standard F-TF.8-2**

Angle  $\theta$  is in Quadrant II, and  $\sin\theta = \frac{4}{5}$ . What is the value of  $\cos\theta$ ?

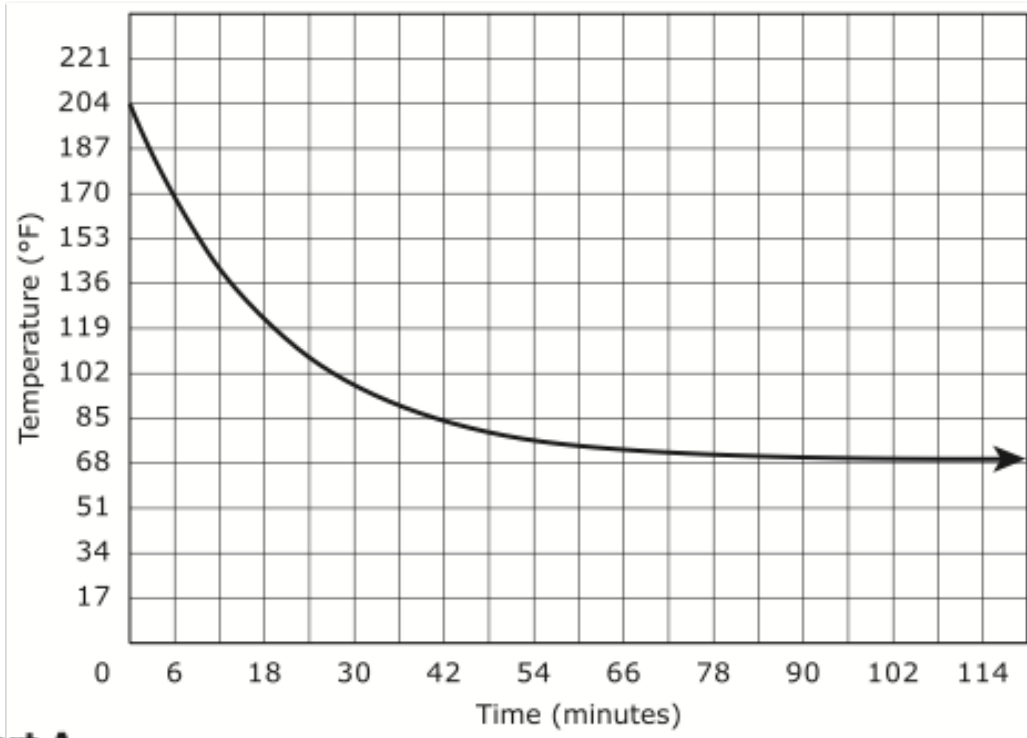
- A.  $\frac{4}{5}$
- B.  $\frac{3}{5}$
- C.  $-\frac{3}{5}$
- D.  $-\frac{4}{5}$



**Algebra 2 PARCC Unit 2 Sample Test Item #25 (Calculator): Standard F-IF.4-2**

Use the information provided to answer Part A and Part B for question 25.

The graph represents the temperature, in degrees Fahrenheit ( $^{\circ}\text{F}$ ), of tea for the first 120 minutes after it was poured into a cup.



**Part A**

Based on the graph, what was the temperature of the tea when it was first poured into the cup?

- A.  $68^{\circ}$
- B.  $114^{\circ}$
- C.  $136^{\circ}$
- D.  $204^{\circ}$

**Part B**

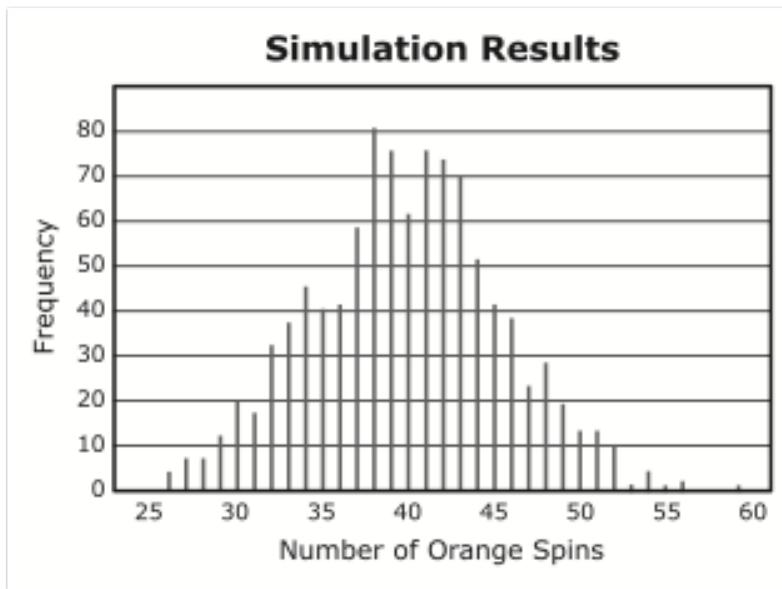
Based on the graph, as the number of minutes increased, what temperature did the tea approach?

- A.  $68^{\circ}$
- B.  $114^{\circ}$
- C.  $136^{\circ}$
- D.  $204^{\circ}$



**Algebra 2 PARCC Unit 2 Sample Test Item #26 (Calculator): Standard S-IC. 2**

A circular spinner is divided into five sectors of different colors. A student spun the arrow on the spinner 200 times and recorded that the arrow stopped on the orange sector 38 times out of the 200 spins. To test whether the spinner was fair, the student used a computer to simulate the number of times the arrow stops on orange in 200 spins of a fair spinner equally divided into five sectors of different colors. The results of 1,000 trials of the simulation are shown.



Based on the results of the simulation, is there statistical evidence that the spinner is not fair?

- A. Yes, because 38 was the most frequent outcome.
- B. Yes, because about 8% of the outcomes were 38.
- C. No, because the distribution is approximately normal.
- D. No, because an outcome of 38 or less is not unusual.



**Algebra 2 PARCC Unit 2 Sample Test Item #27 (Calculator):**  
**Standards HS.C.CCR, A-SSE.A.01.b, 7.RP.A.03, 8.EE.C.07.b**

**Part A**

A bank offers a savings account that accrues simple interest annually based on an initial deposit of \$500. If  $S(t)$  represents the money in the account at the end of  $t$  years and  $S(5) = 575$ , write a function that could be used to determine the amount of money in the account over time. Show your work or explain your reasoning.

Enter your equation and your reasoning in the space provided.

**Part B**

Another bank offers a savings account that accrues compound interest annually at a rate of 3%.

What is the initial amount needed in this account so that it will have the same amount of money at the end of 10 years as the account in Part A at the end of 10 years? Show your work or explain your reasoning.

Enter your answer and your reasoning in the space provided.



**Algebra 2 PARCC Unit 2 Sample Test Item #28 (Calculator): Standard A-REI.11-2**

Given the functions  $h(x) = |x - 4| + 1$  and  $k(x) = x^2 + 3$ , which intervals contain a value of  $x$  for which  $h(x) = k(x)$ ?

Select **all** that apply.

- A.**  $-4.5 < x < -3$
- B.**  $-3 < x < -1.5$
- C.**  $-1.5 < x < 1.5$
- D.**  $1.5 < x < 3$
- E.**  $3 < x < 4.5$





**Algebra 2 PARCC Unit 2 Sample Test Item #29 (Calculator): Standard S-IC.3-1**

Use the information provided to answer Part A and Part B for question 29.

The manager of food services at a local high school is interested in assessing student opinion about a new lunch menu in the school cafeteria. The manager is planning to conduct a sample survey of the student population.

**Part A**

Which of the listed methods of sample selection would be the **most** effective at reducing bias?

- A. Randomly select one day of the week and then select the first 30 students who enter the cafeteria on that day.
- B. Post the survey on the school Web site and use the first 30 surveys that are submitted.
- C. Randomly select 30 students from a list of all the students in the school.
- D. Randomly select one classroom in the school and then select the first 30 students who enter that classroom.

**Part B**

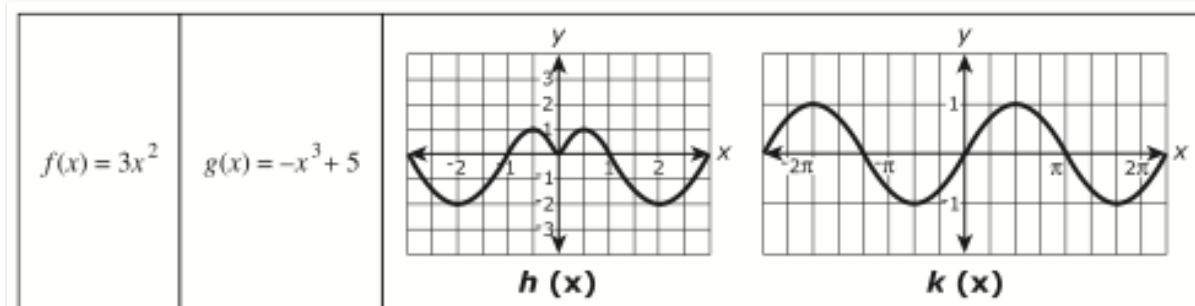
The manager wants to know if a student's gender is related to the student's opinion about the menu. Which statement **best** describes the study?

- A. This is an observational study, and therefore, the manager will be able to establish a cause-and-effect relationship between gender and opinion.
- B. This is an observational study, and therefore, the manager will not be able to establish a cause-and-effect relationship between gender and opinion.
- C. This is an experimental study, and therefore, the manager will be able to establish a cause-and-effect relationship between gender and opinion.
- D. This is an experimental study, and therefore, the manager will not be able to establish a cause-and-effect relationship between gender and opinion.



Algebra 2 PARCC Unit 2 Sample Test Item #30 (Calculator): Standard F-BF.3-3

Consider the functions  $f(x)$  and  $g(x)$  described by the equations and the functions  $h(x)$  and  $k(x)$  shown by graphs.



Which of the statements are true? Select **all** that apply.

- A.  $f$  is an odd function.
- B.  $f$  is neither an even nor odd function.
- C.  $g$  is an even function.
- D.  $g$  is neither an even nor odd function.
- E.  $h$  is an even function.
- F.  $h$  is an odd function.
- G.  $k$  is an odd function.
- H.  $k$  is neither an even nor odd function.

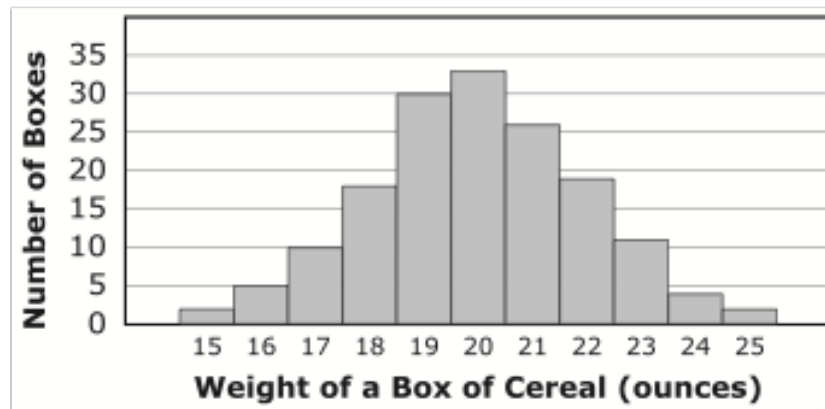


**Algebra 2 PARCC Unit 3 Sample Test Item #31 (Calculator): Standard S-ID.4**

Use the information provided to answer Part A and Part B for question 31.

The distribution of weights (rounded to the nearest whole number) of all boxes of a certain cereal is approximately normal with mean 20 ounces and standard deviation 2 ounces.

A sample of the cereal boxes was selected, and the weights of the selected boxes are summarized in the histogram shown.



**Part A**

If  $w$  is the weight of a box of cereal, which range of weights includes all of the weights of cereal boxes that are within 1.5 standard deviations of the mean?

- A.  $17 \leq w \leq 23$
- B.  $18.5 \leq w \leq 21.5$
- C.  $19 \leq w \leq 21$
- D.  $20 \leq w \leq 23$

**Part B**

Which of these values is the **best** estimate of the number of boxes in the sample with weights that are more than 1.5 standard deviations above the mean?

- A. 2
- B. 6
- C. 17
- D. 36



**Algebra 2 PARCC Unit 3 Sample Test Item #32 (Calculator): Standards HS.C.17.2, S-IC.A.01**

For a statistics project, a group of students decide to collect data in order to approximate the percent of people in the town who are left-handed. They ask every third student entering the school cafeteria whether he or she is left-handed or right-handed. What type of method did this group use? Explain which population the group can draw a conclusion about based on their method. Suggest a better method that would allow the students to draw a conclusion about all the residents in their town.

Enter your answers and your explanation in the space provided.



$$\begin{cases} y = 1 - x^2 \\ y = 2 - x \end{cases}$$

How many points of intersection does the given system of equations have?

- A. none
- B. one
- C. two
- D. infinitely many



**Algebra 2 PARCC Unit 3 Sample Test Item #34 (Calculator): Standard HS-Int.3-3**

Use the information provided to answer Part A through Part D for question 34.

The population of country A was 40 million in the year 2000 and has grown continually in the years following. The population  $P$ , in millions, of the country  $t$  years after 2000 can be modeled by the function  $P(t) = 40e^{0.027t}$ , where  $t \geq 0$ .

**Part A**

Based on the model, what was the average rate of change, in millions of people per year, of the population of country A from 2000 to 2005? Give your answer to the nearest hundredth.

Enter your answer in the box.

**Part B**

Based on the model, the solution to the equation  $50 = 40e^{0.027t}$  gives the number of years it will take for the population of country A to reach 50 million. What is the solution to the equation expressed as a logarithm?

A.  $0.027\ln(1.25)$

B.  $\frac{\ln(1.25)}{0.027}$

C.  $\ln\left(\frac{1.25}{0.027}\right)$

D.  $\ln\left(\frac{0.027}{1.25}\right)$



Algebra 2 PARCC Unit 3 Sample Test Item #34 (Calculator): Standard HS-Int.3-3  
(continued)

**Part C**

Based on the model, in which years will the population of country A be greater than 55 million?

Select **all** that apply.

- A. 2004
- B. 2007
- C. 2010
- D. 2013
- E. 2016
- F. 2019

**Part D**

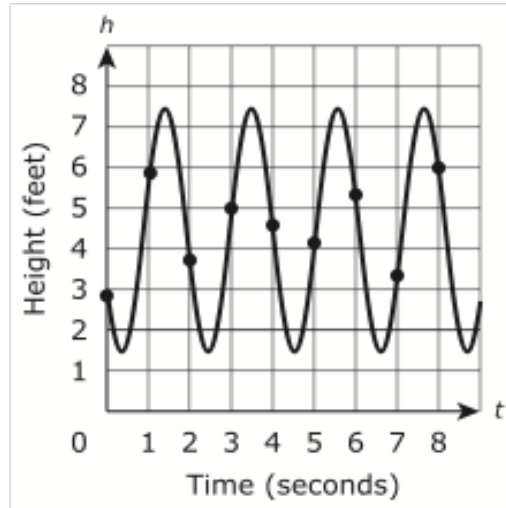
For another country, country B, the population  $M$ , in millions,  $t$  years after 2000 can be modeled by the function  $M(t) = 35e^{-0.042t}$ , where  $t \geq 0$ . Based on the models, what year will be the first year in which the population of country B will be greater than the population of country A?

- A. 2009
- B. 2012
- C. 2021
- D. The population of country B will not exceed the population of country A.



**Algebra 2 PARCC Unit 3 Sample Test Item #35 (Calculator): Standard F-IF.6-7**

The graph models the height,  $h$ , above the ground, in feet, at time  $t$ , in seconds, of a person swinging on a swing. Each point indicated on the graph represents the height of the person above the ground at the end of each one-second interval.



Select **two** time intervals for which the average rate of change in the height of the person is approximately  $-\frac{1}{2}$  feet per second.

- A. from 0 seconds to 1 second
- B. from 1 second to 2 seconds
- C. from 2 seconds to 3 seconds
- D. from 3 seconds to 4 seconds
- E. from 4 seconds to 5 seconds
- F. from 5 seconds to 6 seconds
- G. from 6 seconds to 7 seconds
- H. from 7 seconds to 8 seconds





**Algebra 2 PARCC Unit 3 Sample Test Item #36 (Calculator): Standard S-ID.6a-1**

Use the information provided to answer Part A and Part B for question 36.

To investigate housing needs in the future, a town planning committee created a model to help predict the growth of the population of the town. The committee created a model based on data about the population of the town for five years. The data are shown in the table.

Year	Population (in thousands)
1985	5.35
1990	6.01
1995	6.91
2000	8.07
2005	9.45
2010	11.06

**Part A**

Which model for  $P(t)$ , the population of the town  $t$  years after 1985, **best** fits the data?

- A.  $P(t) = 4.95 + 0.229t$
- B.  $P(t) = 5.35 + 0.228t$
- C.  $P(t) = 5.24(1.030)^t$
- D.  $P(t) = 5.35(1.029)^t$

**Part B**

Consider the value predicted by the model for the year 2010. Which statement is true?

- A. The model overpredicts the actual population of the town by fewer than 1,000 people.
- B. The model overpredicts the actual population of the town by more than 1,000 people.
- C. The model underpredicts the actual population of the town by fewer than 1,000 people.
- D. The model underpredicts the actual population of the town by more than 1,000 people.



**Algebra 2 PARCC Unit 3 Sample Test Item #37 (Calculator): Standard A-SSE.3c-2**

A scientist places 7.35 grams of a radioactive element in a dish. The half-life of the element is 2 days. After  $d$  days, the number of grams of the element remaining in the dish is given by the function  $R(d) = 7.35\left(\frac{1}{2}\right)^{\frac{d}{2}}$ . Which statement is true about the equation when it is rewritten without a fractional exponent?

Select **all** that apply.

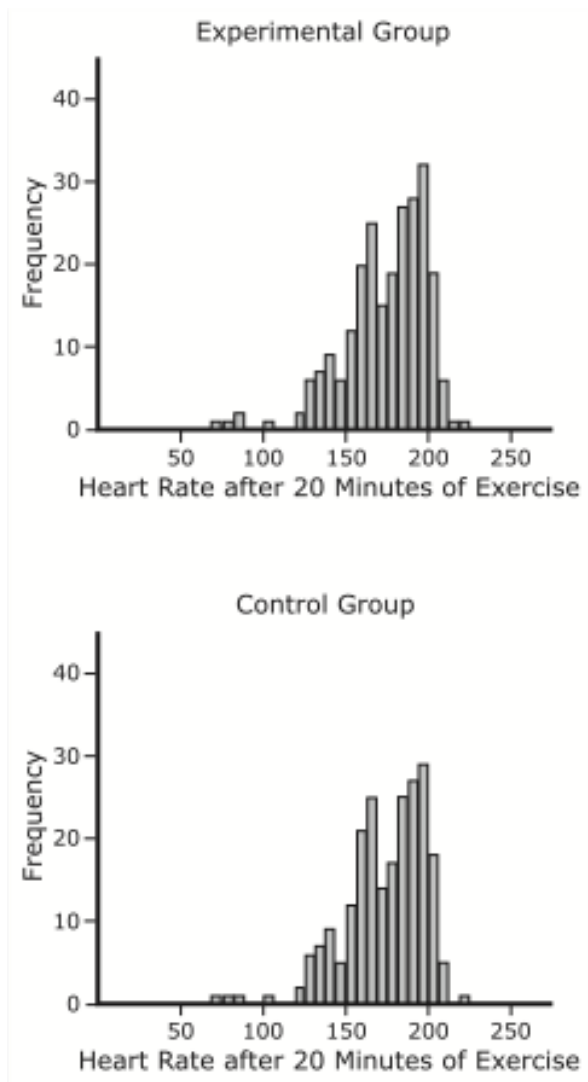
- A.** An approximately equivalent equation is  $R(d) = 7.35(0.250)^d$ .
- B.** An approximately equivalent equation is  $R(d) = 7.35(0.707)^d$ .
- C.** The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.250 grams per day.
- D.** The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.707 grams per day.
- E.** The base of the exponent in this form of the equation can be interpreted to mean that about 25% of the element remains from one day to the next day.
- F.** The base of the exponent in this form of the equation can be interpreted to mean that about 70.7% of the element remains from one day to the next day.



**Algebra 2 PARCC Unit 3 Sample Test Item #38 (Calculator):**  
**Standards HS.D.3-5, S-IC.B.03, S-IC.A.01**

**Part A**

The histograms show the distribution of heart rates of randomly selected adult males between the ages of 40 and 45 after 20 minutes of continuous exercise. The adult males were randomly assigned to use either a new elliptical machine (Experimental Group) or a traditional treadmill machine (Control Group).



What conclusion about the difference between the distributions of the heart rates for these two groups can be drawn? Justify your answer.

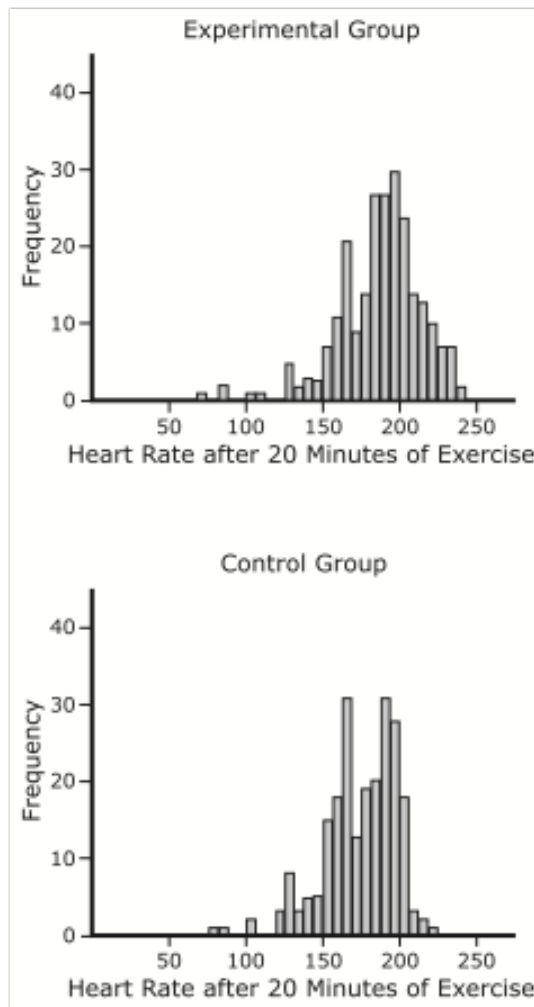
Enter your answer and your justification in the space provided.



**Algebra 2 PARCC Unit 3 Sample Test Item #38 (Calculator):**  
**Standards HS.D.3-5, S-IC.B.03, S-IC.A.01 (continued)**

**Part B**

After the participants worked out three times per week for four weeks solely on their assigned machines, participants' heart rates were collected again after 20 minutes of continuous exercise. The data are shown in the histograms.



What conclusion about the difference between the distributions of the heart rates for the two groups can be drawn? Justify your answer.

If the target heart rate range for adult males aged between 40 and 45 after 20 minutes of exercise is around 175 beats per minute, what recommendation would you make in terms of which machine to use? Justify your answer.

Based upon these data, what conclusion about exercise machines in general can be made?

Enter your answers and your justification in the space provided.



**Algebra 2 PARCC Unit 3 Sample Test Item #39 (Calculator): Standard F-IF.7e-2**

Select **each** statement that is true about the graph of  $f(x) = \sin(x + 3) - 2$ .

- A. amplitude: 1
- B. amplitude: 2
- C. midline:  $y = 2$
- D.  $y$ -intercept:  $(0, -2)$
- E.  $x$ -intercept:  $(0, 0)$



**Algebra 2 PARCC Unit 3 Sample Test Item #40 (Calculator): Standards HS.C.18.4, A-APR.B.03**

The polynomial  $p(x) = 2x^3 + 13x^2 + 17x - 12$  has  $(x + 4)$  as a factor. Factor the polynomial into three linear factors. Describe the steps you would use to sketch the graph of the function defined by this polynomial. Identify all intercepts and describe the end behavior of the graph.

Enter your factored polynomial, your description, and your answers in the space provided.



**Algebra 2 PARCC Unit 3 Sample Test Item #41 (Calculator): Standard A-SSE.2-6**

Use the information provided to answer Part A and Part B for question 41.

Consider the expression  $3^x - 3^{x-2}$ .

**Part A**

Which is an equivalent form of the given expression?

A.  $3^x - 9(3^x)$

B.  $3^x - 2(3^x)$

C.  $3^x - \frac{3^x}{2}$

D.  $3^x - \frac{3^x}{9}$

**Part B**

This expression can also be rewritten in the form  $a(3^x)$ , where  $a$  is a constant. What is the value of  $a$ ?

A.  $\frac{1}{9}$

B.  $\frac{1}{2}$

C.  $\frac{8}{9}$

D.  $\frac{3}{2}$

**Algebra 2 PARCC COMPUTER-BASED Unit 1 (Non-calculator) Sample Test Item #2: Standard A-Int.1**

**Part A**

An expression is given.

$$x^2 - 8x + 21$$

Determine the values of  $h$  and  $k$  that make the expression  $(x - h)^2 + k$  equivalent to the given expression.

Enter your answers in the space provided. Enter **only** your answer.

$h =$

$k =$

A calculator interface with a grid of mathematical symbols: +, -, ×, ÷, fraction, decimal,  $y^x$ ,  $\sqrt{\quad}$ ,  $\sqrt[3]{\quad}$ , =, (-), %, and a blue arrow button.

**Part B**

An equation is given.

$$x^2 - 8x + 21 = (x - 4)^2 + 3x - 16$$

Find one value of  $x$  that is a solution to the given equation.

Enter your answer in the space provided. Enter **only** your answer.

$x =$

A calculator interface with a grid of mathematical symbols: +, -, ×, ÷, fraction, decimal,  $y^x$ ,  $\sqrt{\quad}$ ,  $\sqrt[3]{\quad}$ , =, (-), %, and a blue arrow button.



**Algebra 2 PARCC COMPUTER-BASED Unit 1 (Non-calculator) Sample Test Item #3: Standard A.REI.2**

What is the solution to the equation  $-\sqrt{x+10} = -7$ ?

Enter your answer in the box.

**Algebra 2 PARCC COMPUTER-BASED Unit 1 (Non-calculator) Sample Test Item #4:**  
**Standard N-CN.2**

The table shows several complex numbers where  $i$  is the imaginary unit.

Select **all** appropriate cells in the table where the product of the two numbers is a real number.

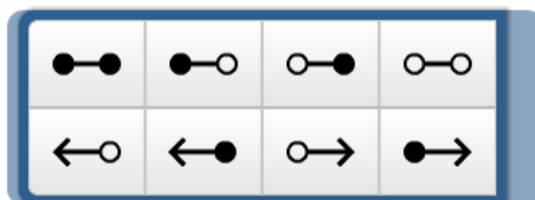
	$8 - 2i$	$3$	$i$
$8 + 2i$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$5i$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$-4$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Algebra 2 PARCC COMPUTER-BASED Unit 1 (Non-calculator) Sample Test Item #7:**  
**Standard A-Int.1**

Solve  $\sqrt{x^2 - 4x + 4} = x - 2$ .

Graph your solution.

Select a solution set indicator. Drag the points on the indicator to the appropriate locations on the number line.



**Algebra 2 PARCC COMPUTER-BASED Unit 1 (non-calculator) Sample Test Item #9: Standard N-CN.1**

Drag and drop each value into the box that represents an equivalent value.

$\sqrt{-4}$	$2i^3$	$2i^2$	$2(i^2)^2$
2	-2	$2i$	$-2i$

**Algebra 2 PARCC COMPUTER-BASED Unit 1 (Non-calculator) Sample Test Item #10:**  
**Standard A-SSE.2-3**

The expression  $x^4 - 81$  can be rewritten in this form where  $a$ ,  $b$ , and  $c$  are real numbers:

$$(x^2 + a)(x + b)(x + c)$$

What are the values of  $a$ ,  $b$ , and  $c$  ?

Enter your answers in the boxes.

$a =$

$b =$

$c =$



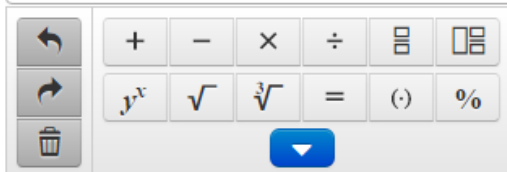
Algebra 2 PARCC COMPUTER-BASED Unit 1 (Calculator) Sample Test Item #2 Standard A-SSE.2-6

Write the expression  $x - xy^2$  as the product of the greatest common factor and a binomial.  
Then determine the complete factorization of  $x - xy^2$ .

Enter your answers in the space provided. Enter **only** your answers.

Product of greatest common factor and binomial :

Complete factorization :





## Algebra 2 PARCC COMPUTER-BASED Unit 2 (Calculator) Sample Test Item #5: Standard S-CP.Int.1

The two-way table shows the classification of students in a mathematics class by gender and dominant hand. A student who is ambidextrous uses both hands equally well.

	Right-handed	Left-handed	Ambidextrous	Total
Male	11	4	1	16
Female	12	2	0	14
Total	23	6	1	30

### Part A

What is the probability that a randomly selected student in the class is female given that the student is right-handed?

Enter your answer in the space provided. Enter **only** your fraction.

### Part B

One student will be selected at random from the class.

Consider the events:

$X$ : the selected student is female

$Y$ : the selected student is right-handed

Which statement about events  $X$  and  $Y$  is true?

- A. The events are independent because the number of right-handed students in the class is larger than the number of female students.
- B. The events are independent because the number of categories for dominant hand is different from the number of categories for gender.
- C. The events are not independent because for one of the dominant hand categories the number of female students is 0.
- D. The events are not independent because the probability of  $X$  is not equal to the probability of  $X$  given  $Y$ .

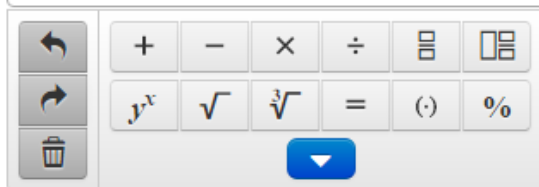


**Algebra 2 PARCC COMPUTER-BASED Unit 2 (Calculator) Sample Test Item #8: Standard F-BF.1b-1**

The functions  $f$  and  $g$  are defined by  $f(x) = x^2$  and  $g(x) = 2x$ , respectively. Rewrite the function  $h(x) = \frac{f(2x)g(-2x)}{2}$  in terms of  $x$ .

Enter your answer in the space provided. Enter **only** your answer.

$$h(x) = \square$$







**Algebra 2 PARCC COMPUTER-BASED Unit 2 (Calculator) Sample Test Item #13: Standard A-REI.7**

For each system of equations shown in the table, determine the number of points of intersection.

Select one cell for each row.

System	No Points of Intersection	One Point of Intersection	Two Points of Intersection
$\begin{cases} y = 1 - x^2 \\ y = x - 1 \end{cases}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$\begin{cases} y = 1 - x^2 \\ y = 1 \end{cases}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
$\begin{cases} y = 1 - x^2 \\ y = 2 - x \end{cases}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## Algebra 2 PARCC COMPUTER-BASED Unit 3 (Calculator) Sample Test Item #1: Standard A-SSE.4-2

An investor deposits  $g$  dollars into an account at the beginning of each year for  $n$  years. The account earns an annual interest rate of  $r$ , expressed as a decimal. The amount of money  $S$ , in dollars, in the account can be determined by the formula  $S = \frac{g}{r} [(1 + r)^n - 1]$ .

### Part A

Suppose the investor deposits \$500 a year for 10 years into an account that earns an annual interest rate of 5%. If no additional deposits or withdrawals are made, what will be the balance in the account at the end of 10 years?

- A. \$6,003.05
- B. \$6,015.06
- C. \$6,288.95
- D. \$6,301.52

### Part B

Enter a number in the answer box to complete the sentence. Give your answer to the nearest cent.

Suppose the investor wanted the balance in the account to be at least \$12,000 at the end of 10 years. At an annual interest rate of 5%, the amount of the yearly deposit should be at least \$  .



**Algebra 2 PARCC COMPUTER-BASED Unit 3 (Calculator) Sample Test Item #3: Standard F-IF.6-2**

An investor deposited \$5,000 in an account that earns 1% annual interest. The amount of money in the account is represented by the function  $f(x) = 5,000(1.01)^x$ , where  $x$  represents the number of years since the account was opened.

What is the average rate of change of the function between  $x = 2$  and  $x = 7$ ?

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

The average rate of change is  .

**37.17**

**dollars**

**51.53**

**dollars per year**

**52.04**

**years**

**72.14**

**years per dollar**



## Algebra 2 PARCC COMPUTER-BASED Unit 3 (Calculator) Sample Test Item #5 Standard F-IF.7e-2

Using your knowledge of period, amplitude, and points on the midline, graph the function  $f(x) = \sin\left(\frac{\pi(x)}{2}\right) + 3$ .

First, select the Sin/Cos button. Then, drag the two points to graph the function. One point is on the midline and the other point is on either the minimum or maximum within the same period of the function.

Sin/Cos

