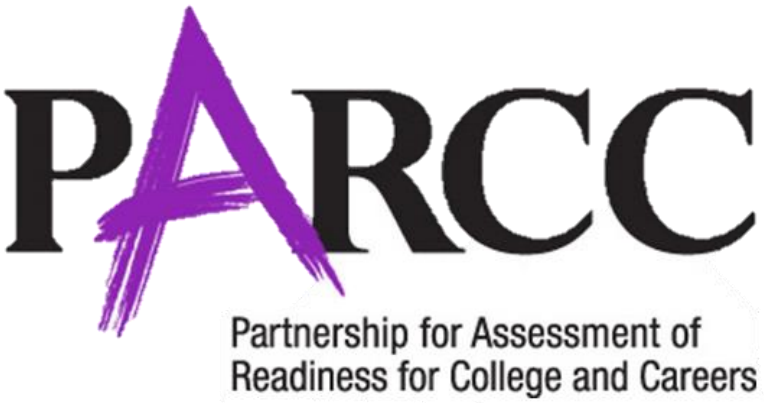


Math

Spring 2017

Algebra II

Released Items

1. VH046821

Let $p(x) = x^3 - 3x^2 - 10x + 24$. What is the remainder when $p(x)$ is divided by $x - 1$?

- A. 0
- B. 12
- C. 24
- D. 30

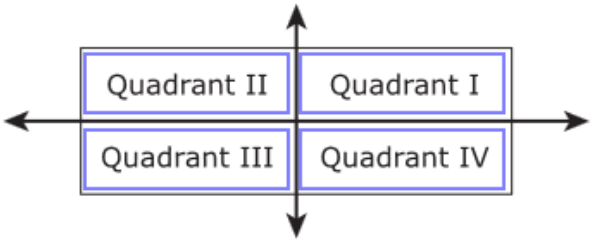
2. M40631

A logarithmic function is defined below.

$f(x) = \log x$

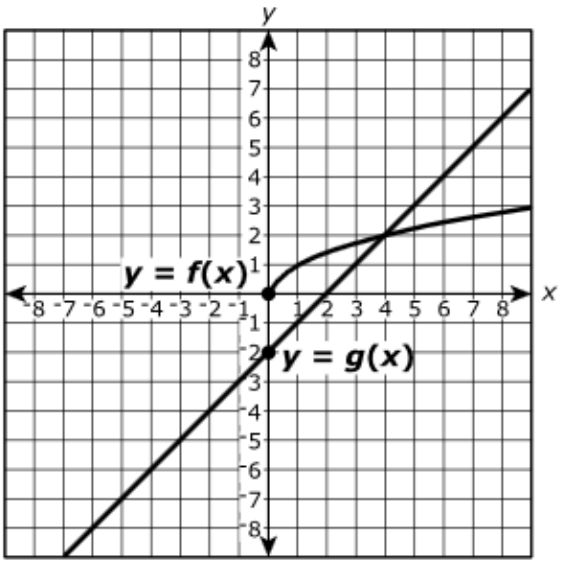
In which quadrant(s) is the graph of f?

Select **each** correct quadrant.



3. VF562837

The graphs of the functions $f(x) = \sqrt{x}$ and $g(x) = x - 2$ are shown in the *xy*-coordinate plane.



When the equation $\sqrt{x} = x - 2$ is solved by squaring both sides of the equation, the algebraic solutions to the squared equation are $x = 1$ and $x = 4$. What do the graphs of *f* and *g* reveal about the solutions?

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

The graphs reveal that [both 1 and 4 are solutions / 4 is a solution and 1 is not a solution / neither 1 nor 4 is a solution / 1 is a solution and 4 is not a solution] to the equation $\sqrt{x} = x - 2$ because [f and g intersect at x = 4 and do not intersect at x = 1 / f is a linear function and g is not a linear function f and g have different y-intercepts]

4. M40465

The variables z_1 and z_2 are defined as $z_1 = 6 + 3i$ and $z_2 = 10 + 8i$. Which expression is equivalent to $z_1 z_2$?

A. $84 + 78i$

B. $36 + 78i$

C. $60 + 54i$

D. $16 + 11i$

5. M44863

$$(\sqrt{x})^2 - 6\sqrt{x} = -8$$

Which values of x are solutions to the equation shown?

Select **all** that apply.

- [ ] A. 0
- [ ] B. 4
- [ ] C. 7
- [ ] D. 8
- [ ] E. 14
- [ ] F. 16

6. VH094128

On a TV game show, contestants win money for correctly answering trivia questions. The first question is worth $1,000. The value of each subsequent question is two times the value of the previous question.

Part A

If a contestant answers the first 5 questions correctly, how much money will the contestant win?

Enter your answer in the box.

The contestant will win $ [ ] .

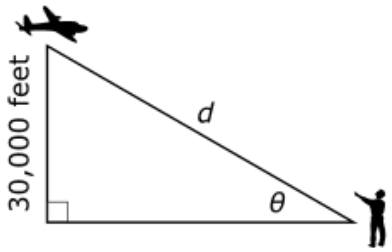
Part B

Contestant A answers the first 3 questions correctly. Contestant B answers the first 10 questions correctly. Which expression can be used to calculate how much more contestant B will win than contestant A?

- ( ) A. $\frac{1{,}000(1-2)^{10}}{1-2} - \frac{1{,}000(1-2)^{3}}{1-2}$
- ( ) B. $\frac{1{,}000(1-2^{10})}{1-2} - \frac{1{,}000(1-2^{3})}{1-2}$
- ( ) C. $1{,}000(1-2)^{9} - 1{,}000(1-2)^{2}$
- ( ) D. $1{,}000\left(1-2^{9}\right) - 1{,}000\left(1-2^{2}\right)$

7. VF891409

An airplane is flying at an altitude of 30,000 feet. The distance, d, in feet, from an observer on the ground to the plane is a function of the angle of elevation, θ, defined as the acute angle between the ground and the line between the observer and the plane, as shown in the figure.



Part A

Which equation gives d as a function of θ?

- A. $d(\theta) = \frac{30{,}000}{\sin\theta}$
- B. $d(\theta) = \frac{\sin\theta}{30{,}000}$
- C. $d(\theta) = \frac{30{,}000}{\cos\theta}$
- D. $d(\theta) = \frac{\cos\theta}{30{,}000}$

Part B

Within the context of the situation described, what is the domain of the function d? Enter the appropriate values, in degrees, in the inequality.

Enter your answer in the boxes.

$\square^\circ < \theta < \square^\circ$

Part C

When the angle of elevation is 75 degrees, what is the distance between the observer and the plane, to the nearest foot?

Enter your answer in the box.

$\square$ feet

Part D

For what value of θ will the distance between the observer and the plane be 60,000 feet?

Enter your answer in the box.

$\square$ degrees

8. M43701

Which equation has non-real solutions?

- A. $3x^2 - 2x - 5 = 0$
- B. $4x^2 - 3x + 3 = 0$
- C. $4x^2 + 12x + 9 = 0$
- D. $6x^2 + 5x - 6 = 0$

9. VH124339

The expression 8^x is equivalent to 32^y, where *x* and *y* are positive. What is the value of $\frac{y}{x}$?

- A. $\frac{1}{4}$
- B. $\frac{3}{5}$
- C. $\frac{5}{3}$
- D. 4

10. VF649763

What are the solutions of the equation $x^2 - 4x + 5 = 0$?

Select **all** solutions.

- [ ] A. $2 + i$
- [ ] B. $2 - i$
- [ ] C. $2 + 2i$
- [ ] D. $2 - 2i$
- [ ] E. 5
- [ ] F. -1

11. VF649896

A system of three equations is given.

$$\begin{cases} 2x - 3y + z = -2 \\ x + 6y - 2z = -6 \\ x + 3y = 1 \end{cases}$$

What is the solution (x, y, z)?

Enter your answers in the boxes.

(☐ , ☐ , ☐)

12. VF888430

A certain computer loses half of its value every **two** years.

Part A

After how many years will the computer be worth 12.5% of its initial value?

Enter your answer in the box.

☐ years

Part B

If the value of the computer after 3 years is \$425, what was the initial value of the computer?

- A. \$601.04
- B. \$850.00
- C. \$1,202.08
- D. \$2,404.16

13. VH079817

Consider these functions:

$g(n) = \frac{1}{2}n - 4$

$f(x) = g(n)\,x^2 + 2\,(g(n))\,x$

$n \neq 8$

Part A

Determine the zeros of $f(x)$ when $n = 2$.

Explain how the value of *n* affects the zeros of $f(x)$. Support your answer with an algebraic statement.

Enter your answer and your explanation in the space provided.

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

(continues on next page)

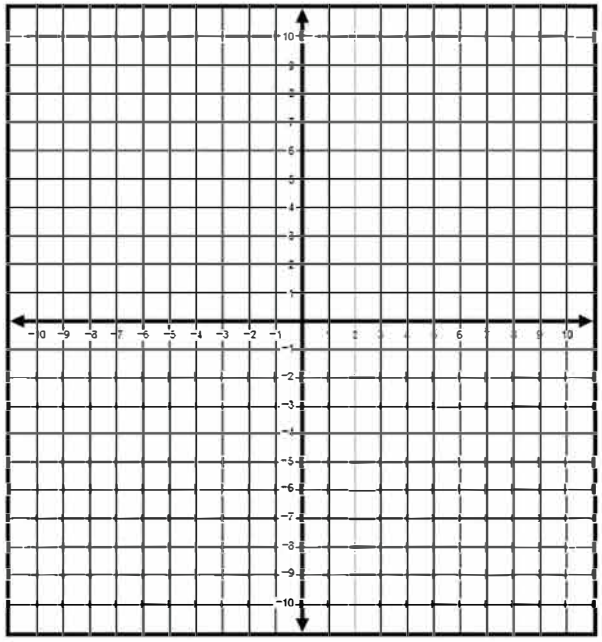
13. (continued from previous page)

VH079817

Part B

The graph may be used to graph a quadratic function of the form $f(x) = ax^2 + bx + c$. Drag the vertex and another point to graph the function. The graph may be used to help answer the next question and will not be scored.

Quadratic



Determine the values of n for which $f(x)$ has a maximum value. Provide an answer supported by valid mathematical reasoning and/or calculations using the information about the graph of $f(x)$.

Enter your answer and your justification in the space provided.

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

14. VH004207

A researcher wants to study the relationship between the type of sport and the type of injury in student athletes from a certain high school. Of the 345 student athletes in the school who have had injuries, 100 agreed to participate in the study and will give the researcher legal permission to view their records of sports injuries. From the records, the researcher will record the sport and the type of injury.

Part A

Which option **best** describes the type of investigation the researcher is conducting and the type of conclusion that the researcher will **most likely** be able to determine?

- A. an observational study and a causal relationship
- B. an observational study and a level of association
- C. an experiment and a causal relationship
- D. an experiment and a level of association

Part B

What is the largest group of students to which the results of the study can be generalized?

- A. all students in the school
- B. all student athletes in the school
- C. the 345 athletes who have had injuries
- D. the 100 athletes who agreed to participate in the study

15. VF890884

When the angle θ is in standard position in the *xy*-coordinate plane, the terminal side of the angle lies in Quadrant I. If $\sin\theta = \frac{3}{5}$, what is $\tan\theta$?

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

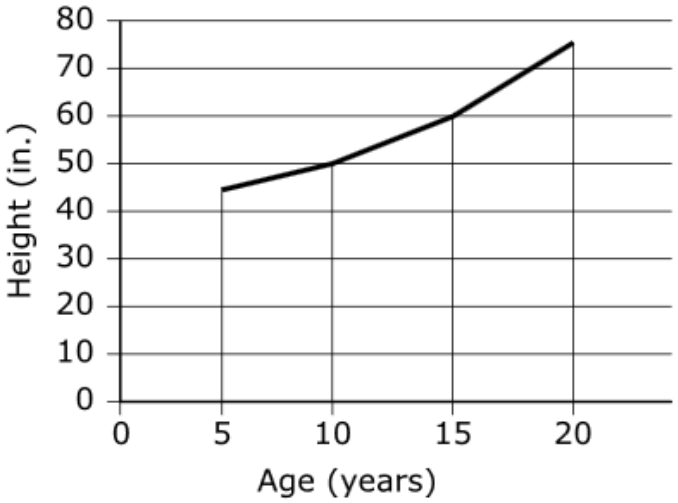
16. M41892

Rewrite $\left(\sqrt[3]{8}\right)^{\frac{3}{2}}\left(\sqrt[4]{256}\right)^{\frac{3}{4}}$ as a whole number.

Enter your answer in the box.

17. VF649761

The graph represents the height, in inches (in.), of a boy from age 5 to age 20.



Select the correct number and phrase to complete the statements.

Between the ages of 5 and 20, the boy's height increased at an average of [2 / 5 / 10] inches per year. The fastest increase in height occurred from [age 5 to age 10 / age 10 to age 15 / age 15 to age 20]