

MeTEOR Performance Task

Algebra II

Mathematics
Population Growth



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Performance Task Item: Population Growth

Task/Question 1:

A. Fill in the blanks below:

A radical equation is an equation that has a variable in a _____ or a variable with a _____ exponent.

B. How do you get rid of the rational exponent?

C. Write the solution to each equation:

$$3(x + 1)^{2/3} = 12$$

$$2(x + 3)^{2/3} = 8$$

$$(7x - 3)^{1/2} = 5$$

$$\sqrt{2x - 1} = 3$$

$$4 + \sqrt{2x + 5} = 7$$

$$\sqrt{2x + 3} - 7 = 0$$

D. Johnny, the pool technician at **Jones Caribe**, tested the swimming pool water after he cleaned the pool for his routine bacteria count. The equation he used to see what the bacteria count was $y = 5500\sqrt{0.025x + .1}$ where x represents the number of minutes passed. After how many minutes are there 3000 bacteria left in the swimming pool? Round to the nearest minute.

Task/Question 2:

A. What do extraneous solutions mean?

B. Solve and check:

$$\sqrt{x} + 32 = 7$$

$$\sqrt{x + 2} + 12 = 7$$

$$\sqrt{x + 1} = x + 1$$

C. Benjamin solved $\sqrt{x} = x - 2$ and got two answers as his solution. One of his classmates, Makayla, solved the same equation and got only one answer as a solution. Solve the equation and explain who is correct and why they are correct.

D. The citrus industry conducted a survey to see the average amount of oranges consumed per year. They found the average amount of oranges consumed (in pounds per person) between years 2000 and 2016. One of the statisticians came up with the equation, $y = \sqrt{22x + 290}$, where x is the number of years since 2000. In what year were about 20 pounds of apples consumed per person? Explain how you got your answer.

Task/Question 3:

Ruthie and Lyndie opened a new company called **Educator's Brain Shop**. Knowing they would need financial backing, they went before the **Shark Team** to seek financial aid. This arrangement would not be free; it would come with a cost of the company's shares and profits. After working with the **Shark Team** for a little more than a year, their company grew to having an average profit, in the millions, per year from 2000 - 2016. The equation the Sharks used to project their earnings can be modeled by the equation $y = 4.5\sqrt{1.2x + 1.05}$ where x is the number of years since 2000.

- A. How many years will it take the profit to average 13.5 million a year?

- B. The Shark Team receives 50% of the profits. How much money will each Shark team member get if they split it equally between the five of them?

- C. Ruthie and Lyndie want each of their profits to be at least 4.5 million before they can retire. How many years will they need to work in order to reach that amount?

- D. Explain how you got your answer to Part C. Justify and defend how your approach to solving this is the **most efficient**.

Task/Question 4:

The 2015 Census showed the population of Savage Island rapidly increasing. The population increase can be calculated by $P(t) = 5\sqrt{3 + 0.23t}$. **P** is the population (measured by millions) and **t** the time (measured by years).

- A.** About how many years will it take the Island to reach 15 million people?

- B.** About how many years will it take the Island to reach 20 million people?

- C.** The Island has a population growth limit of 25 million. Using 2015 as your baseline, when will the Island hit its limit? If you work on the growth board, how will you handle stopping the growth at that time?

- D.** Explain how you determined your answer to Part C. Justify and defend how your approach to solving this is the **most efficient**.



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