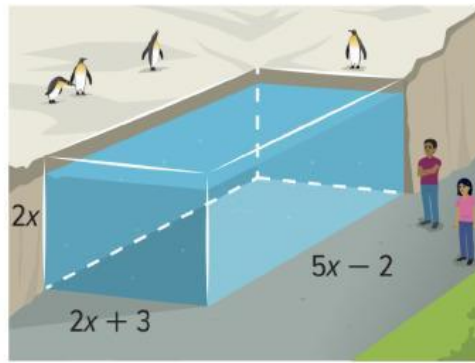


ANIMALS For an exhibit with six or fewer Emperor penguins, the pool must have a depth of at least 4 feet and a volume of at least 1620 gallons, or about 217 ft^3 , per bird. If a zoo has five Emperor penguins, what should the dimensions of the pool shown at the right be to meet the minimum requirements?



Part A Write a polynomial equation.

Use the formula for the volume of a rectangular prism, $V = \ell wh$, to write a polynomial equation that represents the volume of the pool. Let h represent the depth of the pool.

Since the minimum required volume for the pool is 217 ft^3 per penguin, or $217 \cdot 5 = 1085 \text{ ft}^3$, the equation that represents the volume of the pool is $(2x + 3)(5x - 2)2x = 1085$. Simplify the equation.

$$(2x + 3)(5x - 2)2x = 1085 \quad \text{Volume of pool}$$

$$[2x(5x) + 2x(-2) + 3(5x) + 3(-2)]2x = 1085 \quad \text{FOIL}$$

$$(10x^2 - 4x + 15x - 6)2x = 1085 \quad \text{Simplify.}$$

$$(10x^2 + 11x - 6)2x = 1085 \quad \text{Combine like terms.}$$

$$20x^3 + 22x^2 - 12x = 1085 \quad \text{Distributive Property}$$

So, the volume of the pool is $20x^3 + 22x^2 - 12x = 1085$.

Part B Write and solve a system of equations.

Set each side equal to y to create a system of equations.

$$y = 20x^3 + 22x^2 - 12x \quad \text{First equation}$$

$$y = 1085 \quad \text{Second equation}$$

Enter the equations in the **Y =** list and graph.

Use the **intersect** feature on the **CALC** menu to find the coordinates of the point of intersection.

The real solution is the x -coordinate of the intersection, which is

Part C Find the dimensions.

Substitute 3.5 feet for x in the length, width, and depth of the pool.

Length: $2x + 3 =$ Width: $5x - 2 =$

Depth: $2x =$