PSSA Open Ended – Linear Equations #2

Please read the given situation carefully. Then, answer each question that follows. If you are asked to EXPLAIN something, please do so using COMPLETE SENTENCES!

Situation:

The population of coyotes in Pennsylvania from 1955 – 2005 can be approximated using the equation, \( y = 230x + 180 \), where “\( x \)” represents the number of years (1955 \( \Rightarrow x = 0 \)) and “\( y \)” represents the population.

The population of bald eagles in Pennsylvania from 1955 – 2005 can be approximated using the equation, \( y = -90x + 9500 \), where “\( x \)” represents the number of years (1955 \( \Rightarrow x = 0 \)) and “\( y \)” represents the population.

Part A) What was the approximate coyote population in Pennsylvania in 1980? Show all work.

\[
\begin{align*}
1980 & \quad y = 230x + 180 \\
\downarrow & \quad y = 230(25) + 180 \\
X=25 & \quad y = 5750 + 180 \\
& \quad y = 5930 \\
\end{align*}
\]

5,930 coyotes

Part B) What was the approximate bald eagle population in Pennsylvania in 1990? Show all work.

\[
\begin{align*}
1990 & \quad y = -90x + 9500 \\
\downarrow & \quad y = -90(35) + 9500 \\
X=35 & \quad y = -3150 + 9500 \\
& \quad y = 6350 \\
\end{align*}
\]

6,350 bald eagles

Part C) In which year was the approximate coyote population 4,090? Show all work.

\[
\begin{align*}
& \quad \frac{4090 - 180}{230} = \frac{3910}{230} \rightarrow x = 17 \\
1955 + 17 & \quad 1972 \\
\end{align*}
\]
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Part D) In which year was the approximate bald eagle population 5,900? Show all work.

\[ y = -90x + 9500 \]
\[ 5900 = -90x + 9500 \]
\[ -9500 \]
\[ -3600 = -90x \]
\[ x = 40 \]

\[ 1955 + 40 \]

\[ 1995 \]

Part E) In which year was the approximate Pennsylvania populations of the coyote and the bald eagle nearly the same? Show all work. EXPLAIN what you did and why.

(Using a calculator)

Begin substituting x-values into both equations and continue to make adjustments until the populations are nearly the same. Then add the x-value to the year 1955.

(Using equations)

Set each equation equal to each other and solve for x. Add the x-value to the year 1955.

\[ 230x + 180 = -90x + 9500 \]
\[ +90x \]
\[ 320x + 180 = 9500 \]
\[ -180 -180 \]
\[ 320x = 9320 \]
\[ 320 \]
\[ \frac{320x}{320} = \frac{9320}{320} \]
\[ x = 29.125 \]

\[ 1955 + 29 \]

\[ 1984 \]