Chapter 7 Applications

The following is known about three numbers: Three times the first number plus the second number plus twice the third number is 5. If 3 times the second number is subtracted from the sum of the first number and 3 times the third number, the result is 2. If the third number is subtracted from 2 times the first number and 3 times the second number, the result is 1. Find the numbers.

\[
\begin{align*}
A & = 15 \\
B & = 10
\end{align*}
\]

The chemistry lab at the University of Hardwoods keeps two acid solutions on hand. One is 20% acid and the other is 35% acid. How much 20% acid solution and how much 35% solution should be used to prepare 25 liters of a 26% solution?

Let \( A \) = amt 20% sol.
Let \( B \) = amt 35% sol.

\[
\begin{align*}
A + B &= 25 \\
.20A + .35B &= .26(25)
\end{align*}
\]

\[A = 15, \quad B = 10\]
Kelly receives an $80,000, inheritance. She invests part of it in CDs earning 6.7%, part in bonds earning 9.3%, and the remainder in a growth fund earning 15.6%. She invests three times as much in the growth fund as in the other two combined. How much does she have in each investment if she receives $10,843 interest the first year?

Let $C$ = amt in CD's
Let $B$ = amt in bonds
Let $G$ = amt Growth fund

\[ C + B + G = 80000 \]
\[ 0.067C + 0.093B + 0.1566G = 10843 \]
\[ 3(C + B) = G \]

\[
\begin{bmatrix}
1 & 1 & 1 \\
0.067 & 0.093 & 0.1566 \\
3 & 3 & -1
\end{bmatrix}
\begin{bmatrix}
C \\
B \\
G
\end{bmatrix}
\begin{bmatrix}
80000 \\
10843 \\
0
\end{bmatrix}
\]

\[
\begin{align*}
C &= 14,500 \\
B &= 5500 \\
G &= 60,000
\end{align*}
\]

The sum of two numbers is 20 and their product is 96. Find the numbers.

\[
\begin{align*}
x + y &= 20 \\
x y &= 96
\end{align*}
\]

\[
y = 20 - x
\]

\[
x(20 - x) = 96
\]

\[
(12, 8), (8, 12)
\]

\[
0 = x^2 - 20x + 96
\]

Quad Program
The area of a rug is 108 square feet and the length of its diagonal is 15 feet. Find the length and width of the rug.

\[ 108 = lw \quad l = \frac{108}{w} \]
\[ 15^2 = l^2 + w^2 \]
\[ 225 = \left(\frac{108}{w}\right)^2 + w^2 \]

\[ w^2 - 144 = 0 \]
\[ w^2 = 144 \]
\[ w = \pm 12 \]
\[ w^2 - 81 = 0 \]
\[ w^2 = 81 \]
\[ w = \pm 9 \]

\( (9, 12) \)
\[ 225 = \frac{11664}{w^2} + w^2 \]
\[ 225w^2 = 11664 + w^4 \]
\[ 0 = w^4 - 225w^2 + 11664 \]
\[ 0 = (w^2 - 144)(w^2 - 81) \]

Assignment

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