# Review 1 - Solution

Tuesday, June 13, 2017 5:31 PM

1. $I = P \cdot R \cdot t$.

So, $R = \dfrac{I}{P \cdot t}$

$t = 90$ days $= \dfrac{90}{\boxed{360}}$ years. $P = \$3000$

problem asked to use 360 days in a year.

$I = \$105$.

So, $R = \dfrac{105}{3000 \cdot \left(\frac{90}{360}\right)} = 0.14$

So, $\boxed{R = 14\%}$

2. $A = P(1 + R \cdot t)$

$P = \$15{,}400$, $R = 16\% = 0.16$, $t = 5$ years

$A = 15400 \cdot (1 + 0.16 \cdot 5) = \boxed{27720}$

3. $APY = \left(1 + \dfrac{R}{m}\right)^m - 1$

$R = 6\% = 0.06$

$m = 4$ (compounded quarterly)

$APY = \left(1 + \dfrac{0.06}{4}\right)^4 - 1 \approx 0.0614$

So, $APY \approx \boxed{6.14\%}$

(4) $A = P(1+i)^n$

$A = \$15{,}000$. $i = \frac{0.12}{4} = 0.03$ (12% compounded quarterly)

$n = 3 \cdot 4 = 12$ (4 compounding periods a year for 3 years)

$$P = \frac{A}{(1+i)^n} = \frac{15\,000}{(1+0.03)^{12}} = \boxed{10520.70}$$

(5) $FV = PMT\left(\frac{(1+i)^n - 1}{i}\right)$

So, $PMT = FV \cdot \left(\frac{i}{(1+i)^n - 1}\right)$

$FV = \$17{,}000$

$i = \frac{0.08}{12}$ (8% compounded monthly)

$n = 3 \cdot 12 = 36$ (12 compounding periods per year for 3 years)

$$PMT = 17000\left(\frac{\frac{0.08}{12}}{\left(1+\frac{0.08}{12}\right)^{36} - 1}\right) \simeq \boxed{419.38}$$

(6) $PMT = FV \cdot \left(\frac{i}{(1+i)^n - 1}\right)$

$FV = \$500{,}000$.

$i = \frac{0.08}{2} = 0.04$ (8% compounded semiannually)

$n = 23 \cdot 2 = 46$ (2 times per year for 23 years)

$$PMT = 500000\left(\frac{0.04}{\quad}\right) \simeq \boxed{3941.02}$$

$$PMT = 500000\left(\frac{0.04}{(1+0.04)^{46}-1}\right) \approx \boxed{3941.02}$$

7) $$PV = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

So, $$PMT = PV \cdot \left(\frac{i}{1-(1+i)^{-n}}\right)$$

$PV = \$10{,}000$, $i = \frac{0.11}{12}$ ; $n = 5 \cdot 12 = 60$

$$PMT = 10000 \cdot \left(\frac{\frac{0.11}{12}}{1-\left(1+\frac{0.11}{12}\right)^{-60}}\right) \approx 217.42$$

Interest paid: $= (217.42) \cdot (60) - 10000 \approx 3045.45$

Rounded to the nearest dollar $\rightarrow$ $\boxed{\$3045}$

8) Interest in the first month:

$$(79{,}000) \cdot \left(\frac{0.14}{12}\right) \approx 921.67.$$

9) # of tickets Sam sells : $x$

# of tickets Chad sells: $y$

$$\begin{aligned} x + y &= 24 \\ 2x + 5.5y &= 83 \end{aligned} \rightarrow \underbrace{\begin{pmatrix} 1 & 1 \\ 2 & 5.5 \end{pmatrix}}_{A} \cdot \underbrace{\begin{pmatrix} x \\ y \end{pmatrix}}_{X} = \underbrace{\begin{pmatrix} 24 \\ 83 \end{pmatrix}}_{B}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = A^{-1} \cdot B = \begin{pmatrix} 14 \\ 10 \end{pmatrix}$$

So, $\boxed{x = 14}$

(10) $\left(\begin{array}{cc|c} 1 & -5 & 4 \\ 2 & 2 & 5 \end{array}\right) \xrightarrow{-2R_1 + R_2 \to R_2} \boxed{\left(\begin{array}{cc|c} 1 & -5 & 4 \\ 0 & 12 & -3 \end{array}\right)}$

(11) $\left(\begin{array}{cc|c} 2 & 0 & 2 \\ -2 & 2 & 8 \end{array}\right) \longrightarrow \begin{pmatrix} 2 & 0 & 2 \\ 0 & 1 & 5 \end{pmatrix}$

Row operation to go from $1^{st}$ matrix to $2^{\underline{nd}}$ matrix

$\frac{1}{2}R_1 + \frac{1}{2}R_2 \longrightarrow R_2$

(12) $\left(\begin{array}{cc|c} 1 & -4 & 10 \\ 0 & 0 & 0 \end{array}\right)$ System: $x - 4y = 10$.

So, $y = t$ where $t$ could be any real #

and $x = 10 + 4t$

Answer: D.

(13) Matrix is not in reduced form.

(14) $\left(\begin{array}{ccc|c} 1 & -1 & 0 & 1 \\ 0 & 4 & 8 & 4 \\ 0 & 0 & 0 & 0 \end{array}\right) \xrightarrow{\frac{1}{4}R_2 \to R_2} \left(\begin{array}{ccc|c} 1 & -1 & 0 & 1 \\ 0 & 1 & 2 & 1 \\ 0 & 0 & 0 & 0 \end{array}\right)$

(15) $x + y + z = 124000$ (total of bonds, CDs, mortgages)

$x + y = z$ or $x + y - z = 0$ (Sum of bonds and CDs = mortgages)

$$0.09x + 0.08y + 0.1z = 11{,}400 \quad (\text{return})$$

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$$\begin{pmatrix} -1 & 5 & 1 \end{pmatrix} \begin{pmatrix} -6 & -2 & 9 \\ -5 & -7 & -3 \\ 6 & -8 & 2 \end{pmatrix} = \begin{pmatrix} -1\cdot(-6) + 5\cdot(-5) + 1\cdot 6 \\ -1\cdot(-2) + 5\cdot(-7) + 1\cdot(-8) \\ -1\cdot 9 + 5\cdot(-3) + 1\cdot 2 \end{pmatrix}$$

$$= \boxed{\begin{pmatrix} -13 \\ -41 \\ -22 \end{pmatrix}}$$

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$$\begin{pmatrix} a & b+5 \\ c-4 & d+7 \end{pmatrix} = \begin{pmatrix} 3 & 7 \\ 2 & -1 \end{pmatrix}$$

$a = 3$ ; $b = 2$ ; $c = 6$ ; $d = -8$

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Inverse: $\dfrac{1}{25-24} \cdot \begin{pmatrix} 5 & -12 \\ -2 & 5 \end{pmatrix} = \boxed{\begin{pmatrix} 5 & -12 \\ -2 & 5 \end{pmatrix}}$

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$$A^{-1} = \begin{pmatrix} -\frac{1}{6} & \frac{1}{3} \\ \frac{1}{2} & 0 \end{pmatrix}$$

$$BA^{-1} = \begin{pmatrix} 5 & 1 \\ 20 & 30 \\ 25 & 15 \\ 21 & 18 \\ 30 & 22 \\ 5 & 7 \\ 5 & 20 \\ 1 & 2 \\ 12 & 5 \\ 19 & 40 \end{pmatrix}$$

$B$: given matrix

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$$\begin{pmatrix} 2 & 1 \\ 5 & 3 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 2 \\ 13 \end{pmatrix}$$

So $\boxed{\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 3 & -1 \\ -5 & 2 \end{pmatrix} \begin{pmatrix} 2 \\ 13 \end{pmatrix}}$