Math 1320 Practice Exam 2 Fall 2018

① simple ⇒ INT = PVrt and FV = PV(1+rt)
r = 5.5% = .055 some time ⇒ t = ? paid ⇒ FV = 2302.50
borrowed $2000 = PV "How long" ⇒ find t.

$$2302.50 = 2000(1+.055t)$$
$$2302.50 = 2000 + 110t \rightarrow 302.50 = 110t \rightarrow \boxed{t = 2.75 \text{ yrs}}$$

② will receive 3000 refund; $40 fee = INT t = 4 weeks = $\frac{4}{52} = \frac{1}{13}$

$$INT = PVrt$$
$$40 = 3000(r)\left(\frac{1}{13}\right) \rightarrow 40 = \frac{3000}{13}r$$
$$\frac{13}{3000} \cdot 40 = r = .173333 = \boxed{17.3\%}$$

③ $INT = 12{,}100(.07)\left(\frac{6}{12}\right) = \boxed{\$423.50}$

④ 4000 now = PV r = 8% = .08, total repayment = 4640 = FV
"When will..." ⇒ Find time

$$FV - PV = INT$$
$$4640 - 4000 = 640$$
$$640 = 4000(.08)t$$
$$640 = 320t$$
$$2 \text{ yrs} = t$$

Compare to method used in ①. Same type of problem with two different approaches.

(5) Gold: $PV = 5000$, $r = .08$ $t = 13$ (default $m=1$)

CDs: $PV = 5000$, $r = .04$ $m = 2$ $t = 13$

no mention of "simple interest" so both are compounded

Total = Gold + CDs

$= 5000(1+.08)^{13} + 5000\left(1+\frac{.04}{2}\right)^{26}$

$\boxed{\$21,965.21} = 13,598.12 + 8367.09$

(6) $FV = 28,000,000$ Determine amount $\Rightarrow$ find PV

$r = 9\% = .09$ $t = 28$ Compounded monthly $m = 12$

$n = 12(28) = 336$

$PV = \frac{28,000,000}{\left(1+\frac{.09}{12}\right)^{336}}$

$PV = 2274152.657 = \boxed{\$2,274,153}$

(7) $r = .045$ $m = 12$

pension = ordinary annuity $PMT = 4000$ $t = 25$

$PV = \frac{4000\left(1-\left(1+\frac{.045}{12}\right)^{-300}\right)}{(.045/12)} = 719,641.29$ is what you need at retirement

to save $\Rightarrow$ Sinking fund $t = 30$

$\frac{719,641.29\left(\frac{.045}{12}\right)}{\left(\left(1+\frac{.045}{12}\right)^{360}-1\right)} = \boxed{\$947.66}$

(8) withdrawals $\Rightarrow$ ordinary annuity

$PMT = \frac{150,000\left(\frac{.05}{12}\right)}{\left(1-\left(1+\frac{.05}{12}\right)^{-156}\right)} = \boxed{\$1309.59}$

⑨ deposits ⇒ sinking fund

$$PMT = \frac{75{,}000\left(\frac{.052}{2}\right)}{\left(\left(1+\frac{.052}{2}\right)^{34}-1\right)} = 1399.48 \rightarrow \$1399.$$

⑩ FV, deposits ⇒ sinking fund

$$FV = 350\frac{\left(\left(1+\frac{.02}{12}\right)^{240}-1\right)}{\left(.02/12\right)} = \boxed{\$103{,}178.89}$$

⑪ PV, annuity, withdrawals ⇒ ordinary annuity

$$PV = 100\frac{\left(1-\left(1+\frac{.02}{12}\right)^{-240}\right)}{\left(.02/12\right)} = \boxed{\$19{,}767.40}$$

⑫ "How many of each burger..." → tells variables are
x = # plain burgers, y = # dable cheeseburgers, z = # regular chb
Total of 11 buns, 13 beef, 7 cheese → totals tell equations

$$\begin{cases} x+y+z=11 \\ x+2y+z=13 \\ 2y+z=7 \end{cases}$$

EQ2 $x+2y+z=13$
−EQ1 $-x-y-z=-11$
$y=2$

Since $y=2$ and $2y+z=7 \Rightarrow 2(2)+z=7 \Rightarrow 4+z=7$
and $z=3$

if $y=2$, $z=3$ and $x+y+z=11$ then
$x+2+3=11$
and $x=6$

- 6 plain
- 2 Doubles
- 3 regular chb

(13) "How many sections of each..." tells variables

x = #sections FM, y = #sections AC, z = #sections CM

totals tell equations → sections, students, revenue

Sections / Students / revenues
$$\begin{cases} x + y + z = 6 \\ 40x + 40y + 10z = 210 \\ 40{,}000x + 60{,}000y + 13{,}000z = 253{,}000 \end{cases}$$

-40 EQ1 $\quad -40x - 40y - 40z = -240$

$+$ EQ2 $\quad 40x + 40y + 10z = 210$

$\quad -30z = -30$ So $z = 1$

3 FM
2 AC
1 CM

-40 EQ1 $\quad -40x - 40y - 40z = -240$

$+\frac{1}{1000}$ EQ3 $\quad 40x + 60y + 13z = 253$

$\quad 20y - 27z = 13$ with $z = 1$

$\quad 20y - 27(1) = 13$

$\quad 20y - 27 = 13$

$\quad 20y = 40$ So $y = 2$ if $z = 1$, $y = 2$ then $x = 3$

(14)
$$\begin{cases} x + y + 6z = 4 \\ x - y + 2z = 2 \\ x + 2z = 0 \end{cases}$$

$-$ EQ1 $\quad -x - y - 6z = -4$

$+$ EQ2 $\quad x - y + 2z = 2$

New EQ2 $\quad -2y - 4z = -2$

divide by -2

$-$ EQ1 $\quad -x - y - 6z = -4$

$+$ EQ3 $\quad x + 2z = 0$

New EQ3 $\quad -y - 4z = -4$

divide by -1

$(-3, -2, 3/2)$

$$\begin{cases} x + y + 6z = 4 \\ y + 2z = 1 \\ y + 4z = 4 \end{cases}$$

$-$ EQ2 $\quad -y - 2z = -1$

$+$ EQ3 $\quad y + 4z = 4$

New EQ3 $\quad 2z = 3$ → $z = 3/2$

$y + 2(\frac{3}{2}) = 1 \rightarrow y + 3 = 1 \rightarrow y = -2$

$x + 2(\frac{3}{2}) = 0 \rightarrow x + 3 = 0$

$x = -3$