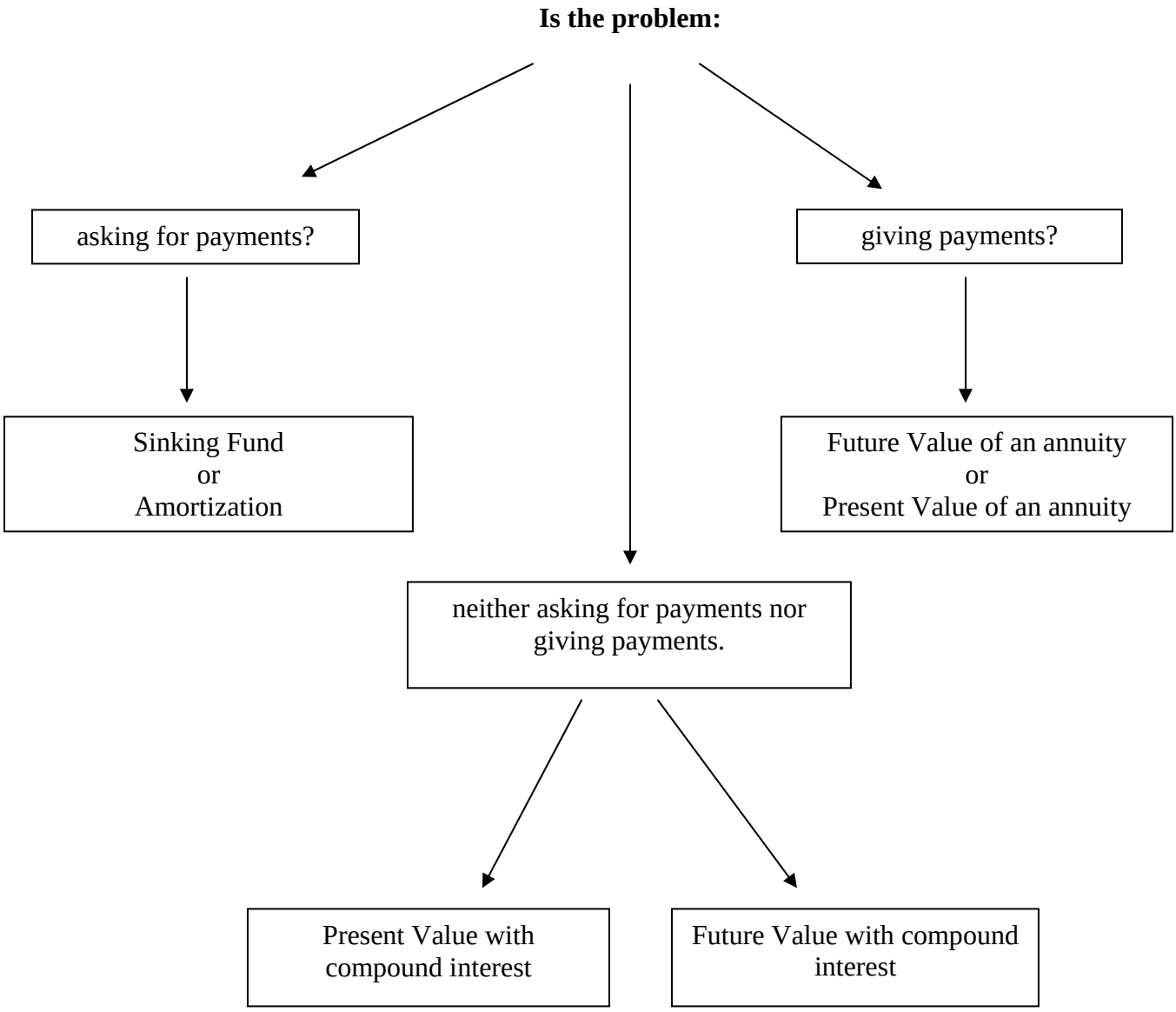
14 questions
4 q 5 pts each (20pts)
10 q 8 pts each (80pts)

Math 1313
Test 3 Review

Chapter 4 Flow Chart

The following flow chart will help categorize math of finance problems with compound interest.



1. Nicholas and Olivia are buying a house for $250,000. They made a 15% down payment. Their financing is for 30 years at 6.78% annual interest compounded monthly. Find their monthly payment.

Amortization

$$\frac{Pi}{1-(1+i)^{-n}} = \frac{212500(.0678/12)}{1-(1+.0678/12)^{-360}} = 1382.51$$

$P = 250000(.85) = 212500$

$i = \frac{.0678}{12}$

$n = 30(12) = 360$

2. Mary deposited $5,000 in an account that earns 9% per year compounded monthly. How much will she have in 40 years, when she retires?

F.V.C.I.

$$P(1+i)^{n} = 5000(1+.09/12)^{12(40)} = 180549.51$$

3. Megan bought a new car. Her car payments are $385.17 for 6 years. Her financing rate was 8.9% annual interest compounded monthly. She made a $1,200 down payment. What was the total purchase price of the car?

$n = 6(12) = 72$

P.V.A.

$$P = E\left[\frac{1-(1+i)^{-n}}{i}\right] = 385.17\left[\frac{1-(1+.089/12)^{-72}}{.089/12}\right]$$

$$= 21426.97 + 1200 = \$22626.97$$

4. Anna wants to have $5,000 saved when she graduates from college so that she will have a down payment for a new car. Her credit union pays 5% annual interest compounded monthly. How much money should she deposit each month to have the money available when she graduates in 3 years?

Sinking Fund

$$E = \frac{Fi}{(1+i)^{n}-1} = \frac{5000(.05/12)}{(1+.05/12)^{36}-1} = \$129.02$$

5. Sergio wants to have $5,000 in the bank in 3 years to pay for an Alaskan cruise. How much cash should he deposit today, if the bank pays 4% annual interest compounded quarterly, if he wants to be sure to have the funds available in 3 years?

P.V.C.I.

$$P = F(1+i)^{-n} = 5000(1+.04/4)^{-3(4)} = \$4437.25$$

6. Gary decided to save some money for his daughter's college education. He decided to save $300 per quarter. His credit union pays 4.5% per year compounded quarterly. How much money will he have available when his daughter starts college in 10 years?

F.V. of A.

$$F = E\left[\frac{(1+i)^n - 1}{i}\right] = 300\left[\frac{(1+.045/4)^{10(4)} - 1}{.045/4}\right] = \$15{,}050.05$$

7. John wishes to set up an account for his grandfather so that he can have some extra money each month. John wants his grandfather to be able to withdraw $120 per month for the next 4 years. How much must John invest today at 4% per year compounded monthly to set up this account?

P.V. A

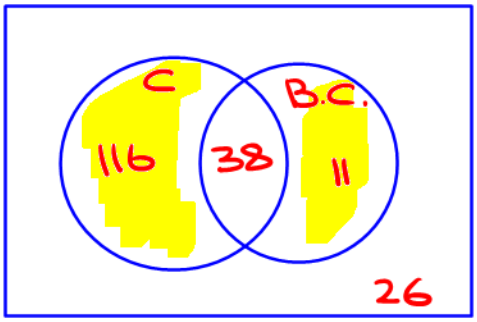
$$P = E\left[\frac{1-(1+i)^{-n}}{i}\right] = 120\left[\frac{1-(1+.04/12)^{-48}}{.04/2}\right] = \$5314.66$$

154

8. A group of students were surveyed. One-hundred fifty-four are enrolled in Chemistry, 49 are enrolled in Business Calculus, 38 are enrolled in both, and 26 are not enrolled in either course.

$154 - 38 = 116$

$49 - 38 = 11$



a. How many students were surveyed?

$116 + 38 + 11 + 26 = 191$

b. How many students are enrolled in exactly one of the two courses mentioned here?

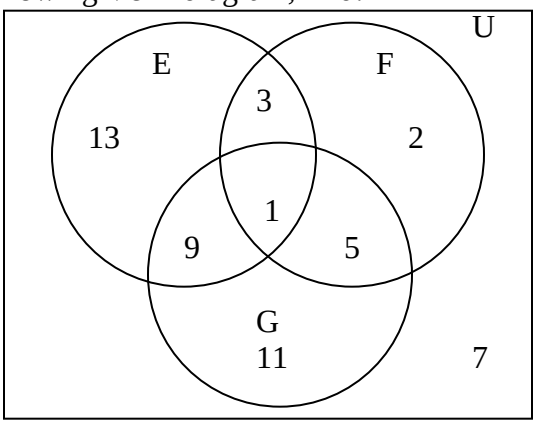
$116 + 11 = 127$

c. How many students are enrolled in Business Calculus or Chemistry?

U

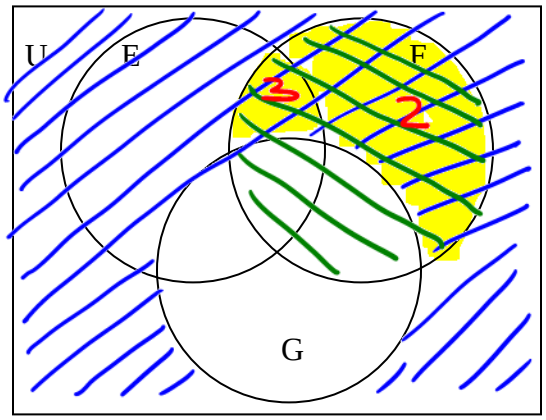
$116 + 38 + 11$ OR $191 - 26 = 165$

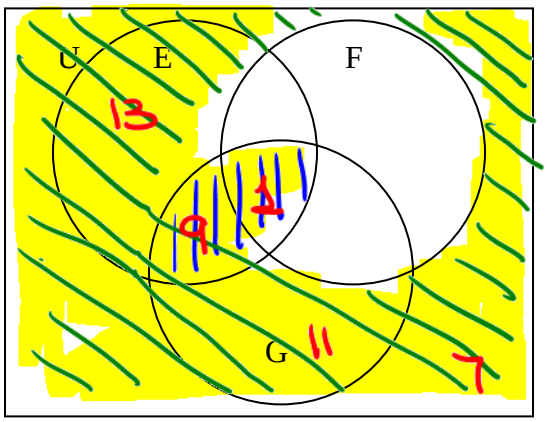
9. Given the following Venn diagram, find:



a. $n(G^c \cap F)$ = 3 + 2 = 5

b. $n(F^c \cup (E \cap G))$ = 13 + 9 + 1 + 11 + 7 = 41





10. A license plate consists of 2 letters followed by 4 digits. How many license plates are possible if the 1st letter can't be O, and no repetition of letters or digits is allowed?

25 · 25 · 10 · 9 · 8 · 7 = 3,150,000

11. A restaurant offers 6 appetizers, 4 salads, 8 entrees, and 5 desserts. In how many ways can a customer select a meal consisting of an appetizer, a salad, an entrée, and a dessert?

6(4)(8)(5) = 960

12. In how many ways can a president, vice-president and a secretary be chosen from 22 members of a club, if one person cannot hold more than one position and all 22 members are eligible for any position?

P ↑ 22 · V.P ↑ 21 · S ↑ 20

22(21)(20) = 9240

P(22,3) = 9240

13. A committee consists of 11 people. In how many ways can a subcommittee of 4 people be chosen?

$C(11,4) = 330$

14. A coin is tossed 20 times.

a. How many outcomes are possible?

$2^{20} = 1,048,576$

b. In how many outcomes do 10 tails occur?

$C(20,10) = 184,756$

c. In how many outcomes do at least 18 tails occur? 18T, 19T, 20T

$C(20,18) + C(20,19) + C(20,20) = 211$

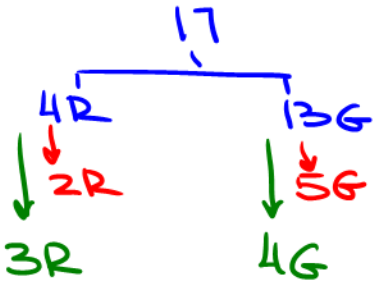
d. In how many outcomes do at most 17 tails occur? 0T, 1T, 2T, ..., 17T comp. = 18T, 19T, 20T

$2^{20} - [C(20,18) + C(20,19) + C(20,20)] = 1,048,365$

15. A crate of 17 apples contains 4 rotten apples. Seven apples are chosen at random from the crate.

a. How many selections contain 2 rotten and 5 good apples?

$C(4,2)\,C(13,5) = 7,722$



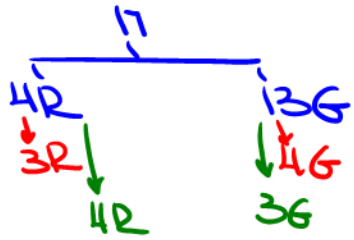
b. How many selections contain 3 rotten apples? 4G

$C(4,3)\,C(13,4) = 2,860$

c. How many selections contain at least 3 rotten apples? 3R or 4R

3R 4R

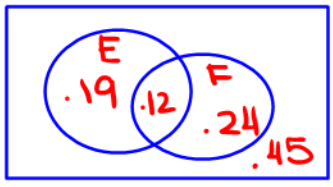
$C(4,3)C(13,4) + C(4,4)C(13,3) = 3,146$



d. How many selections contain at least 1 rotten apple? we comp OR 7G

$C(17,7) - C(4,0)\,C(13,7) = 17,732$

16. Let E and F be events of a sample space S. Let $P(E^c) = 0.69$, $P(F) = 0.36$ and $P(E \cup F)^c = 0.45$. Find: $P(E) = .31$ $P(F) = .36$ $P(E \cup F) = .55$



$P(\text{only } E) = P(E \cup F) - P(F) = .55 - .36 = .19$

$P(\text{only } F) = P(E \cup F) - P(E) = .55 - .31 = .24$

a. Find $P(E \cup F)$

$= .19 + .12 + .24 = .55$

OR

$1 - .45 = .55$

b. $P(E \cap F)^c$

$= 1 - P(E \cap F)$

$= 1 - .12 = .88$

c. $P(E \cap F^c)$

$= P(\text{only } E)$

$= .19$

17. A coin is tossed 10 times. 2^{10}

a. Find the probability that exactly 2 heads occur.

$$\frac{C(10,2)}{2^{10}} = .0439$$

b. Find the probability that at most 1 head occurs. 0H or 1H

$$\frac{C(10,0) + C(10,1)}{2^{10}} = \frac{1+10}{2^{10}} = \frac{11}{2^{10}} = .0107$$

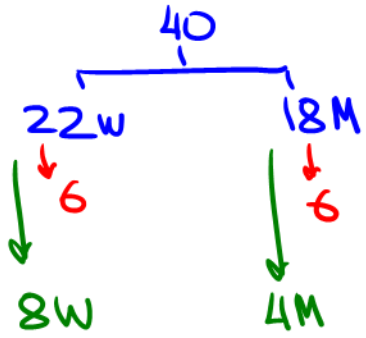
c. Find the probability that at least 3 tails occur. 3T, 4, 5, ..., 10 Use complement! 0T, 1T, 2T

$$\frac{2^{10} - [C(10,0) + C(10,1) + C(10,2)]}{2^{10}} = .9453$$

18. A judge has a jury pool of 40 people that contains 22 women and 18 men. She needs a jury of 12 people.

a. What is the probability that the jury contains 6 women and 6 men?

$$\frac{C(22,6)\,C(18,6)}{C(40,12)} = .2479$$



b. What is the probability that the jury contains 8 women? 4M

$$\frac{C(22,8)\,C(18,4)}{C(40,12)} = .1751$$

c. What is the probability that at most 10 men are on the jury? 0, 1, ..., 10 comp. 11M or 12M

$$\frac{C(40,12) - [C(22,1)\,C(18,11) + C(20,0)\,C(18,12)]}{C(40,12)} = .9998$$

d. What is the probability that at least 11 women are on the jury? 11W or 12W

$$\frac{C(22,11)\,C(18,1) + C(22,12)\,C(18,0)}{C(40,12)} = .0024$$

Formulas to be Provided on Test 3

It will be a link!

$I = \Pr t$

$F = P(1 + rt)$

$E = \dfrac{Fi}{(1+i)^n - 1}$

$P = F(1+i)^{-n}$

$P = E\left[\dfrac{1-(1+i)^{-n}}{i}\right]$

$E = \dfrac{Pi}{1-(1+i)^{-n}}$

$F = P(1+i)^n$

$F = E\left[\dfrac{(1+i)^n - 1}{i}\right]$

$i = \dfrac{r}{m}$

$n = mt$

$n(A \cup B) = n(A) + n(B)$, if $A \cap B = \varnothing$

$P(E \cup F) = P(E) + P(F)$, if $E \cap F = \varnothing$

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$, if $A \cap B \neq \varnothing$

$P(E \cup F) = P(E) + P(F) - P(E \cap F)$, if $E \cap F \neq \varnothing$

$(A \cup B)^c = A^c \cap B^c$

$(A \cap B)^c = A^c \cup B^c$