

- 1) (3 points) Frank invests in the Darko Bank that offers a 3.25% simple interest rate. He invests \$600 at this rate for 8 years. How much is in the account after that time?

simple interest

$$A = 600 (1 + 0.0325 \cdot 8)$$

$$= \boxed{756}$$

- 2) (3 points) Find the simple interest rate required for an investment of \$1,800 to grow to \$2,500 in 4 years. Write answer as a percent rounded to two decimal places.

simple interest

$$2500 = 1800 (1 + r \cdot 4) = 1800 + 7200r$$

$$700 = 7200r \Rightarrow r = \frac{700}{7200} \approx \boxed{9.72\%}$$

- 3) (3 points) After accidentally knocking over an unmanned armored truck, Jesse found \$5,500 on the side of the road. He decided to put the money into a savings account that offered a 2.35% annual interest rate compounded monthly for 4 years. How much money will be in the account after that time and how much interest did he earn?

compound interest

$$A = 5500 \left(1 + \frac{0.0235}{12}\right)^{12 \cdot 4} = 6041.52 - \text{total}$$

$$\frac{-5500}{\hline} 541.52 - \text{interest}$$

- 4) (3 points) How much should be invested now so that in 12 years there will be \$7,000 in an account that offers a 5.35% annual interest rate compounded quarterly?

present value

$$P = 7000 \left(1 + \frac{0.0535}{4}\right)^{-4 \cdot 12} = \boxed{\$3699.38}$$

- 5) (3 points) Which is a better way to invest? Option A: 6.3% compounded semi-annually or Option B: 6.25% compounded monthly? Write answer as a percent rounded to two decimal places.

Effective rate of interest

Option A

$$\left(1 + \frac{0.063}{2}\right)^2 - 1$$

$$\approx 6.40\%$$

Option B

$$\left(1 + \frac{0.0625}{12}\right)^{12} - 1$$

$$\approx 6.43\%$$

Better

2/8

- 6) (4 points) Kondor takes out a loan of \$100,000 for a condo. Her loan has a 4.12% annual interest rate compounded monthly for 30 years. Chart the first two months of the loan given the monthly mortgage payment is \$532.80. **Be sure to show the numbers that are being multiplied and subtracted. Round to two decimal places as you work:**

END OF MONTH	INTEREST	PRINCIPAL	BALANCE
1	$I = 100000(.0412)(\frac{1}{12})$ 343.33	$532.80 - 343.33$ 189.47	$100000 - 189.47$ 99,810.53
2	$I = 99810.53(.0412)(\frac{1}{12})$ 342.68	$532.80 - 342.68$ 190.12	$99810.53 - 190.12$ 99,620.41

- 7) Balthier is 30 years old and is working as a local sky pirate. He is able to deposit \$525 a month into a Pirate Bank 401-k which offers a 7.25% annual interest rate. He does this for 30 years. After that time, he will retire. He wishes, over the next 25 years, to take out equal withdraws until the account is emptied. Assume the interest rate is the same after retirement.

- a) (6 points) What are the equal withdraws he is able to take out? b) (2 points) How much did he deposit before retirement?

FV = $\frac{525 \left(\left(1 + \frac{.0725}{12} \right)^{12 \cdot 30} - 1 \right)}{\left(\frac{.0725}{12} \right)}$
= \$672,993.98

$525 \cdot 12 \cdot 30$
= \$189,000

Amort PMT = $\frac{672,993.98 \left(\frac{.0725}{12} \right)}{\left(1 - \left(1 + \frac{.0725}{12} \right)^{-12 \cdot 25} \right)}$ = \$4,864.45

- c) (2 points) How much did he withdraw after retirement?

$4,864.45 \cdot 12 \cdot 25$

= \$1,459,335

- d) (2 points) How much interest did he earn overall?

$1,459,335 - 189,000$

= \$1,270,335

- 8) (3 points each) Schmidt works out that he would need \$4,000 a month during his retired years. He is currently 25 years old and plans to work until his is 65. He assumes that he would need to make withdraws for 30 years past his retirement. Assuming he finds an account that will offer him a 6.25% annual interest rate compounded monthly...

- a) How much should he have in his account at retirement?

PV = $\frac{4000 \left(1 - \left(1 + \frac{.0625}{12} \right)^{-12 \cdot 30} \right)}{\left(\frac{.0625}{12} \right)}$

= \$649,648.90

- b) How much should he deposit monthly during his working years to ensure he meets his goal?

PMT = $\frac{649648.90 \left(\frac{.0625}{12} \right)}{\left(\left(1 + \frac{.0625}{12} \right)^{12 \cdot 40} - 1 \right)}$

= \$304.73

[Handwritten signature]

For numbers 9 – 11, use the following:

$$\{a, e, i\}$$

$$U = \{a, b, c, d, e, f, g, h, i\}, A = \{a, b, c\} B = \{x \mid x \text{ is a vowel}\}$$

9) (1 point each) Use the symbol \in or \notin below:

a) $b \in A$

b) $d \in A'$

c) $u \notin B$

10) (1 point each) Use the symbol \subseteq or $\not\subseteq$ below:

a) $\{a, e\} \subseteq B$

b) $\{j, k\} \not\subseteq B'$

c) $\emptyset \subseteq A$

11) (2 points each) List the elements of the following sets:

a) $A \cap B$:

$$\underline{\{a\}}$$

b) $A' \cup B$:

$$\begin{aligned} & \{d, e, f, g, h, i\} \cup \{a, e, i\} \\ &= \underline{\{a, d, e, f, g, h, i\}} \end{aligned}$$

c) The subsets of set B :

$$\{a, e, i\}$$

$$\{a, e\}$$

$$\{a\}$$

$$\emptyset$$

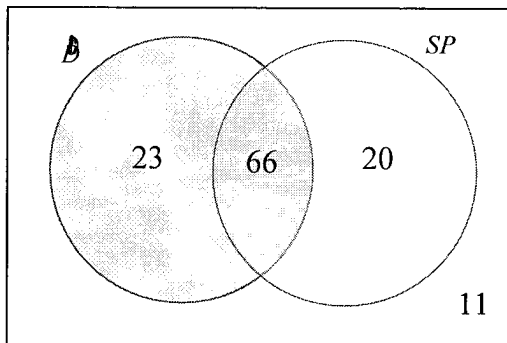
$$\{a, i\}$$

$$\{e\}$$

$$\{e, i\}$$

$$\{i\}$$

- 12) (3 points) 120 adults who watch good TV were surveyed. The results are given in the Venn diagram below where B = Adults who watch *Bob's Burgers* and SP = Adults who watch *South Park*. Interpret, using the language of the problem, what each number in the Venn diagram means for this example:



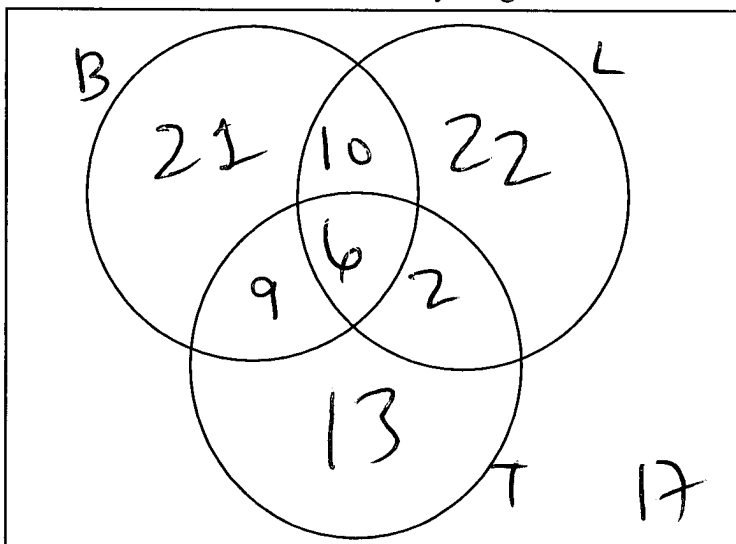
23 - only watch Bob's Burgers
 66 - watch both
 20 - only watch South Park
 11 - watch neither

- 13) 100 people were surveyed on what addition(s) they like on their burgers. The results are below:

46 people like Bacon
 40 like Lettuce
 30 like Tomato
 16 like Bacon and Lettuce
 15 like Bacon and Tomato
 8 like Lettuce and Tomato
 6 like all three

Given this information, find **BY SHOWING THE NUMBERS YOU ARE ADDING TO GET YOUR ANSWER...**

- a) (3 points) The corresponding Venn Diagram.
 Be sure to label everything



- b) (1 point) How many people like either Lettuce or Tomato but not Bacon?

$$22 + 2 + 13 = 37$$

- c) (1 point) How many people only like Bacon?

$$21$$

- d) (1 point) How many people do not like Lettuce nor Tomato?

$$21 + 17 = 38$$

14) (2 points each) Find the sample space associated with the following experiments:

a) Flip a coin 2 times:

$$\{HH, HT, TH, TT\}$$

b) Flip a coin 3 times:

$$\{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$$

15) (2 points each) After flipping a coin 3 times, find the probability of...

a) Getting exactly 1 head:

$$\frac{3}{8} \quad \begin{array}{l} HTT \\ THT \\ TTH \end{array}$$

b) Getting at least 2 heads:

$$\frac{4}{8} = \frac{1}{2} \quad \begin{array}{l} HHH \\ HHT \\ HTH \\ THH \end{array}$$

16) (2 points each) Dario has 12 PS3 games, 14 PS4 games, and 6 PSVita games. Picking a game at random, what are the odds that the game is....

a) A PS4 game?

$$14 \text{ to } 18$$

$$\boxed{7 \text{ to } 9}$$

b) Not a PSVita game?

$$26 \text{ to } 6$$

$$\boxed{13 \text{ to } 3}$$

17) (3 points each) In a room of 30 people, 17 saw the movie *Up*, 14 people saw the movie *Finding Nemo (FN)*, and 6 people saw both. Picking a person at random, what is the probability that they:

a) Saw *Up* and *FN*?

$$\frac{6}{30} = \frac{1}{5}$$

b) Saw *Up* or *FN*?

$$\frac{17 + 14 - 6}{30} = \frac{25}{30} = \frac{5}{6}$$

c) Saw *Up* given they saw *FN*?

$$\frac{6}{14} = \frac{3}{7}$$

d) Saw *FN* given they didn't see *Up*?

$$\frac{14 - 6}{30 - 17} = \frac{8}{13}$$

18) (3 points each) Consider picking a card from a standard deck of cards.

a) What is the probability of picking a Face Card and a Heart?

$$\frac{3}{52}$$

J, Q, K
H P D

b) What is the probability of picking a Face Card and a Seven?

$$\frac{0}{52} = \frac{\bigcirc}{\square}$$

19) (3 points each) Three cards are picked from a standard deck of cards. Writing answers as a fraction, what is the probability that...

a) All three cards are Face Cards (if the cards are not replaced once picked):

$$\frac{12}{52} \cdot \frac{11}{51} \cdot \frac{10}{50} = \frac{1320}{132600} = \frac{11}{1105}$$

b) All three cards are Face Cards (if the cards are replaced once picked):

$$\frac{12}{52} \cdot \frac{12}{52} \cdot \frac{12}{52} = \frac{27}{2197}$$

c) The third card is a Heart given the previous cards were not replaced and were Diamonds:

$$\frac{13}{50} \leftarrow \begin{array}{l} \text{still 13 Hearts} \\ \text{two cards not replaced} \end{array}$$

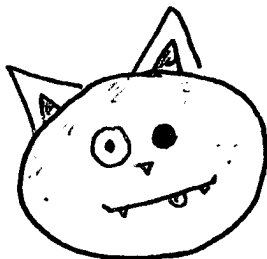
d) The third card is a Heart given the previous cards were replaced and were Diamonds:

$$\frac{13}{52} \leftarrow \begin{array}{l} \text{still 13 Hearts} \\ \text{two cards replaced} \end{array} \rightarrow \frac{1}{4}$$

20) (1 points each) Short answer. When writing the answer to a question that give the following directions, how can you write your answer?

a) "What is the probability that..."

b) "What are the odds that..."



MEOW?

28