MATH 1470 Fall 2018   Mike McCraith
Exam 3   November 5, 2018

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

❖ Write your name below on the space provided.
❖ This test has a total of 9 pages.
❖ Work the problem in the space provided. If you need more space, write on the back of the test.
❖ To insure maximum credit, show your work. In general, full credit will not be given for unsupported answers.
❖ Look only at your test. Don't give me the impression that you are cheating.
❖ Connect the dots on page seven and then give the turkey a name for something extra.
❖ Be sure to write neatly. If I cannot read what was written, do not expect the problem to be graded.
❖ If you finish early, go over the test again.

Good luck!

Number	Maximum	Score
1	4	
2	3	
3	3	
4	6	
5	5	
6	5	
7	6	
8	6	
9	6	
10	9	
11	2	
12	2	
13	8	
14	4	
15	16	
16	10	
17	8	
Total	100	

Name _____

This font be crazy fancy

Circle final answers

Reduce as needed

1) (2 points each) Suppose that $4500 is deposited into an account that offers a 2.75% simple annual interest rate for 6 years.
  a) How much interest is earned after that time?   b) How much is in the account after that time?

2) (3 points) Suppose $1500 is deposited into an account that offers a 1.15% annual interest rate compounded quarterly for 10 years. How much is in the account after that time?

3) (3 points) Which is a better way to invest? 6.4% compounded quarterly or 6.3% compounded monthly? Write answers as percents rounded to two decimal places. Be sure to use the effective rate of interest formula and label your answers.

4) (6 points) Which is a better way to invest a total of $120,000:
    A) Invest $6000 a year at a 5.5% annual interest rate compounded annually for 20 years, OR
    B) Invest $500 a month at a 5.5% annual interest rate compounded monthly for 20 years?

5) (5 points) Jane, who is 35, plans on retiring in 26 years. After that time, she plans to live off of withdraws from her 401(k) account for 20 years. She knows that she'll need to be able to withdraw $4,750 a month for standard living costs. Her 401(k) is set up to return 10.05% compounded monthly. How much should she deposit each month before retirement so she has enough after retirement? You will need two formulas. Assume the account carries the 10.05% annual interest rate for the entire term.

6) (5 points) Tarzan, who is 28, plans on retiring at the age of 50. After that time, he plans to live off of withdraws from his 403-b account for 30 years until the account balance reaches $0. Before retirement, he will make monthly deposits of $350 into the account at a 8.78% annual interest rate. After that time, he will make monthly withdraws at the same rate. How much will these withdraws be? You will need two formulas.

7) (6 points) Nicole takes out a loan of $175,000 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 $847.63. **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			
2			

For numbers 8 – 10, use the following:

$$U = \{red, yellow, blue, green, orange, purple, white, black\}$$

$$A = \{yellow, blue, white\} \quad B = \{x \mid x \text{ is a primary color}\}$$

8) (2 points each) Use the symbol $\in$ or $\notin$ below:

a) *green* _____ A b) *white* _____ B c) *red* _____ B'

9) (2 points each) Use the symbol $\subseteq$ or $\not\subseteq$ below:

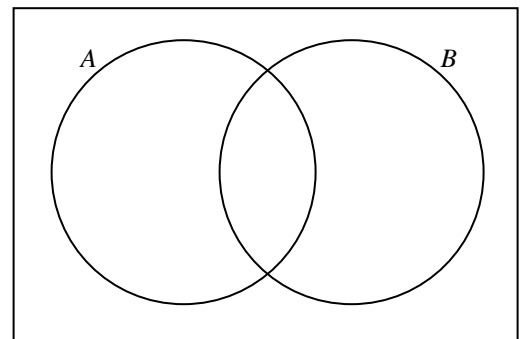a) $\{yellow, white\}$ _____ $A \cap B$ b) $\{yellow, white\}$ _____ $A \cup B$ c) $\varnothing$ _____ B'
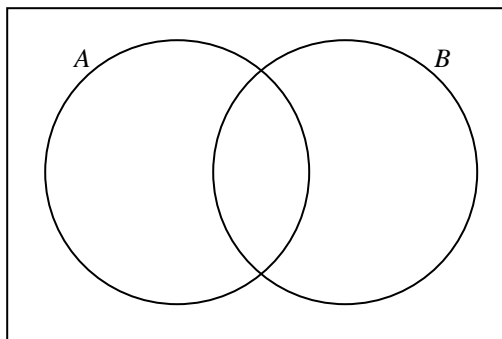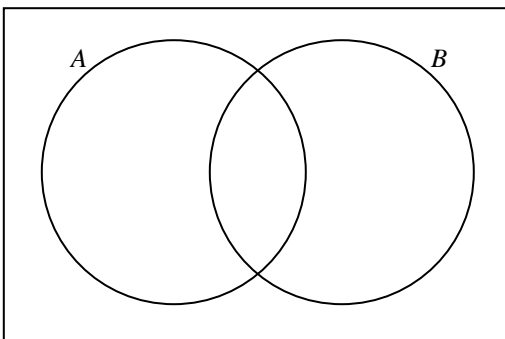
10) (3 points each) List the elements of the following sets:

a) $A \cap B$:   b) $A' \cup B'$:

c) The subsets of set A:

11) (2 points) Shade in $A' \cup B'$. Several graphs are provided. Be sure to indicate which one is your final answer:

12) (2 points) Let $U = \{x \mid x$ is a type of mammal$\}$, $E = \{x \mid x$ is a mammal that lives in trees$\}$, and $F = \{x \mid x$ is a mammal that lives in the water$\}$. Describe the set $E \cup F'$ in words.

13) 140 dogs were surveyed on which toys they liked to play with. The results are below:

> 80 liked to play with tennis balls
> 56 liked to play with Kongs
> 42 liked to play with squeaky toys
> 20 liked to play with tennis balls and Kongs
> 20 liked to play with tennis balls and squeaky toys
> 28 liked to play with Kongs and squeaky toys
> 16 liked to play with all three

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

a) (5 points) The corresponding Venn Diagram. Be sure to label everything

b) (1 point) How many dogs liked exactly one type of toy?
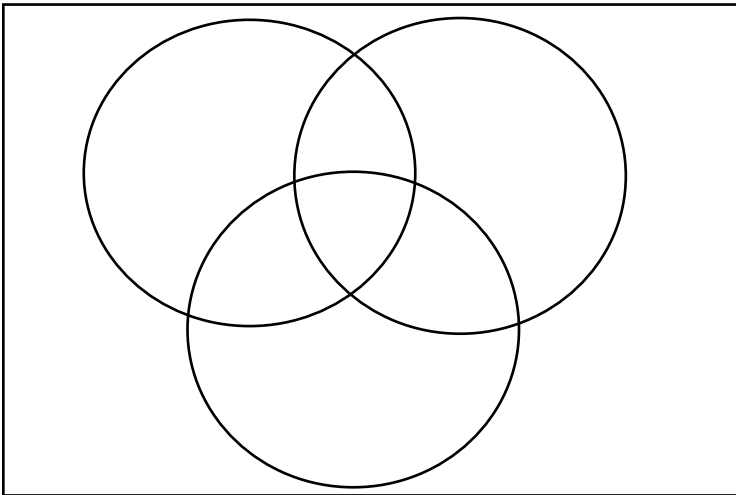
c) (1 point) How many dogs liked at most one type of toy?

d) (1 point) How many liked Kongs or squeaky toys but not tennis balls?

14) (2 points each) Write the samples space for the following experiments:
a) Flip a coin twice:

b) Recording the gender of three children:

15) (2 points each) A card is selected from a standard deck of cards. What is the probability that the card is a…

a) Jack?

b) Queen?

c) Jack or a Queen?

d) Heart?

e) Face Card?

f) Heart and a Face Card?

g) Heart or a Face Card?

h) What are the **odds** of picking a face card?

16) (2 points each) Consider the chart below. Be sure to show which values are being added together:

Results from a survey of which system a child likes the best				
	X-Box One	Switch	PS4	**Total**
USA	30	45	25	**100**
Japan	10	30	60	**100**
Total	**40**	**75**	**85**	**200**

Assuming no child likes more than one system and a child is picked at random, find the probability that child…

a) Likes X-Box One:

b) Likes X-Box One given they are from the USA:

c) Is from Japan and likes the Switch:

d) Is from Japan given they like the Switch:

e) Likes the PS4 or the Switch given they are from Japan:

17) (2 points each) Teacher serves two types of beverages: white and chocolate milk. Teacher has 8 white milks and 10 chocolate milks available. Assume once milk is selected, it is not replaced.
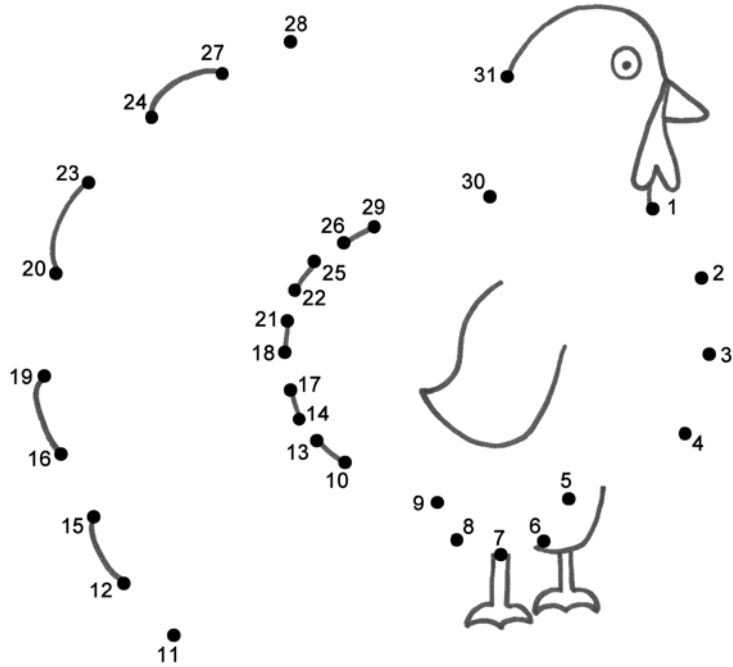
a) Draw a tree diagram for this scenario and fill in the probabilities:

b) The first milk picked is white and second is chocolate:

c) The second milk is chocolate given the first milk is chocolate:

d) Two chocolate milks are selected:

Chapter 5 Formulas

Simple Interest: $I = Prt$

Amount of Simple Interest: $A = P + Prt = P(1 + rt)$

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Present Value: $P = A\left(1 + \frac{r}{n}\right)^{-nt}$

Effective Rate of Ineterest: $APY = \left(1 + \dfrac{r}{n}\right)^{n} - 1$

Future Value of an Annuity: $FV = \dfrac{PMT\left(\left(1 + \frac{r}{n}\right)^{nt} - 1\right)}{\left(\frac{r}{n}\right)}$

Sinking Fund: $PMT = \dfrac{FV\left(\frac{r}{n}\right)}{\left(\left(1 + \frac{r}{n}\right)^{nt} - 1\right)}$

Present Value of an Annuity: $PV = \dfrac{PMT\left(1 - \left(1 + \frac{r}{n}\right)^{-nt}\right)}{\left(\frac{r}{n}\right)}$

Amortization: $PMT = \dfrac{PV\left(\frac{r}{n}\right)}{\left(1 - \left(1 + \frac{r}{n}\right)^{-nt}\right)}$

Chapter 7 Formulas

Addition Rule for Sets: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Addition Rule for Probability: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Odds for an Event: $\dfrac{P(E)}{P(\overline{E})}$ reduced   Odds against an Event: $\dfrac{P(\overline{E})}{P(E)}$ reduced

Odds for event E a to b imply $P(E) = \dfrac{a}{a+b}$

Odds against event E a to b imply $P(E) = \dfrac{b}{a+b}$

Complement Rule: $P(E) = 1 - P(E')$

Conditional Probability: $P(E \mid F) = \dfrac{P(E \cap F)}{P(F)}$

Product Formula: $P(E \cap F) = P(F) \times P(E \mid F)$