

Instructions: Show all work. Use exact answers unless specifically asked to round. Explain thoroughly using complete sentences. If you use your calculator to perform statistical tasks, say which command/operations you are using and what you entered into your calculator, and what you got back to show work. If you do not show work and the answer is incorrect, no credit will be awarded.

1. For each of the probabilities below, label each as subjective, experimental or classical. (2 points each)
 - a. A 20-sided die has faces numbered 1 through 20. The probability that a number divisible by 5 will come up is $1/5$.

theoretical (classical)

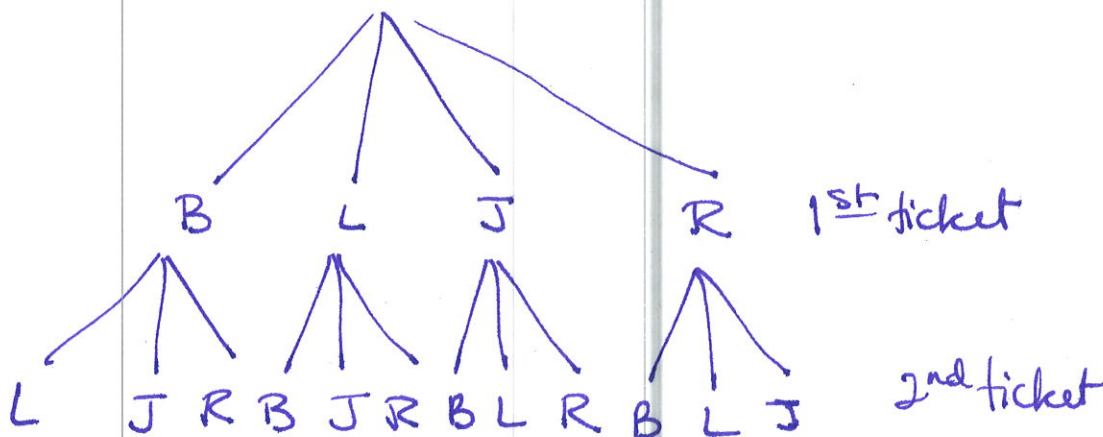
- b. The probability of a nuclear war increased in the last six months.

Subjective (personal)

- c. A coin is flipped 100 times and heads came up 42% of the time, so the probability of getting a heads is 0.42.

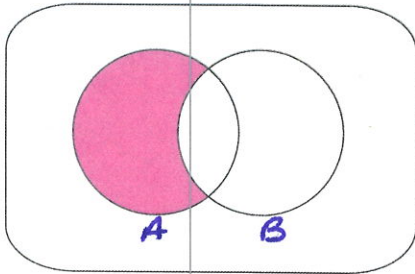
experimental (empirical)

2. Pam has four friends (Barbara, Lela, Jo, and Roxie) but has only two tickets to the Rock-n-Roll Hall of Fame. She decides to randomly select two of her friends to go with her. Draw a tree diagram to illustrate the sample space, then list the resulting possibilities. (6 points)

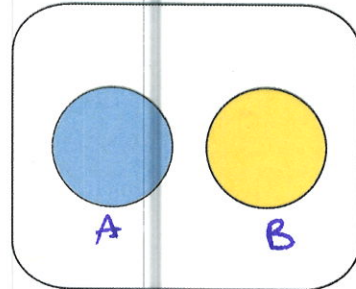


$\{BL, BJ, BR, LB, LJ, LR, JB, JL, JR, RB, RL, RJ\}$

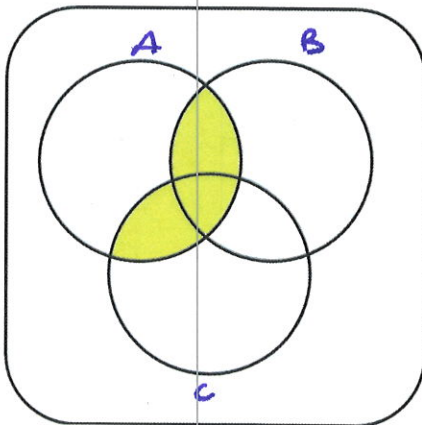
3. Venn diagrams are shown below illustrating sets and set concepts. Use set notation to describe each set. Label each set (A, B, etc.) in each diagram. (3 points each)



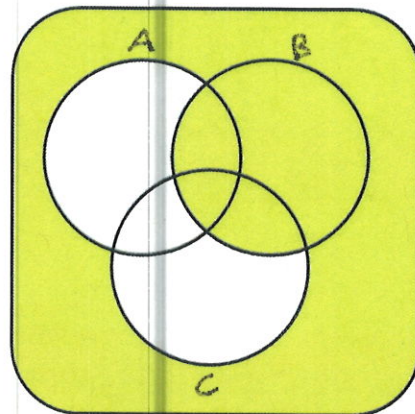
$A - B$ or $A \cap B'$



A & B are disjoint

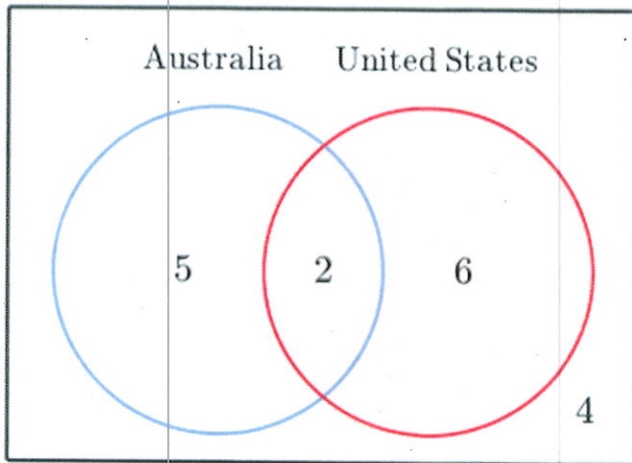


$(A \cap B) \cup (A \cap C)$



$[(A \cup C) - B]^c$

4. Convert the following Venn diagram into a two-way table if it illustrates the number of soccer fans in a sample that cheer for teams from the US or Australia. (5 points)



	fan of Australia	not a fan of Australia
Fan of US	2	6
Not a fan of US	5	4

5. Use the two-way table below to answer the questions that follow. (3 points each)

Gender	Preferred Program			Total
	Dance	Sports	Movies	
Women	16	6	8	30
Men	2	10	8	20
Total	18	16	16	50

a. What is the probability that a randomly selected person from this sample is a woman?

$$\frac{30}{50} = \frac{3}{5} = 60\%$$

b. What is the probability that a randomly selected person from this sample prefers to watch sports?

$$\frac{16}{50} = \frac{8}{25} = 32\%$$

c. What is the probability that a randomly selected person from this sample is both a woman and prefers to watch sports?

$$\frac{6}{50} = \frac{3}{25} = 12\%$$

d. What is the probability that a randomly selected person from this sample is either a woman or prefers to watch sports?

$$\frac{30}{50} + \frac{16}{50} - \frac{6}{50} = \frac{40}{50} = \frac{4}{5} = 80\%$$

e. What is the probability that a randomly selected person from this sample is a woman given that they watch sports?

$$\frac{6}{16} = \frac{3}{8} = 37.5\%$$

f. Are gender and preferred program independent? Why or why not? Show mathematical calculations to justify your answer.

$$P(W) \cdot P(S)$$

$$\frac{3}{5} \cdot \frac{8}{25} = \frac{24}{125} = 19.2\%$$

$$P(W \text{ and } S)$$

$$\neq 12\%$$

they are dependent

6. Find the value of the following expressions. (2 points each)

a. $5!$

$$120$$

b. $\frac{9!}{4!}$

$$15,120$$

c. $7P3$

$$210$$

d. ${}_{21}C_{11}$

$$352,716$$

e. $\binom{18}{7}$

$$31,824$$

7. Find the number of items in the set described by each scenario. (4 points each)

a. How many 5-card poker hands are there drawn from a standard deck of cards?

$${}_{52}C_5 = 2,598,960$$

b. How many ways can we rearrange the letters of SUPERCALIFRAGILISTICEXPIALIDOCIOUS to form a puzzle?

$$\frac{34!}{2!2!2!2!2!3!3!3!6!2!} = 2.966 \times 10^{31}$$

S U P E R C A L I F O

c. At Baskin Robbins, you decide to get three scoops of ice cream selected from their 31 possible flavors. If you don't select any flavors more than once, how many different kinds of "three-scoop" cones can you get?

$${}_{31}P_3 = 26,970$$

d. You visit a restaurant having an á la carte special. You can select one item from each category for one special price. There are 3 appetizers to choose from, 5 main dishes, 2 sides, 4 desserts and 6 drinks. How many different meals are possible?

$$3 \cdot 5 \cdot 2 \cdot 4 \cdot 6 = 720$$

8. A committee is to consist of 8 faculty selected from a staff of 28. 18 of the faculty are women, and 10 are men. (4 points each)

a. What is the probability that the entire committee will be women?

$$\frac{\binom{18}{8}}{\binom{28}{8}} = \frac{43,758}{3,108,105} = 1.4\%$$