

Name Key

Math 102  
Test 3

Show your work and write all fractions and ratios in simplest form for full credit.

1. If you draw a single card from a standard 52-card deck what is  $P(\text{King} \mid \text{face card})$ ? (3 pts).

$$\frac{n(K)}{n(\text{Face})} = \frac{4}{12}$$

or  $\frac{4/52}{12/52} = \frac{4}{12} = \frac{1}{3}$

1. 1/3

2. The accompanying table shows the number of people in a tennis tournament. The table shows the distribution of participants: (2 pts/prob)

	Under age 21	21 years and older
Male	17	41
Female	29	38

58:67

total 125

- a. What is the probability of choosing a female?

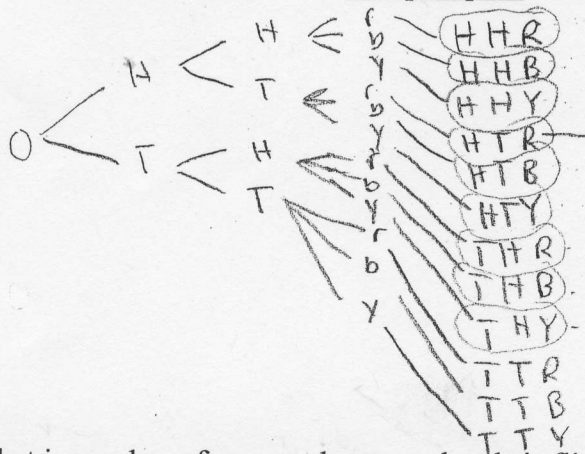
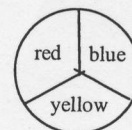
2.a.  $\frac{67}{125}$

- b. What are the odds in favor of choosing a male?

b. 58:67

3. A coin is flipped twice and a spinner is used once (like the one to the right is spun)

- a. Use a tree diagram to list the sample space for this experiment. (2 pts/problem)



- b. What is number of ways at least one heads is flipped?

b. 9

- c. What is the probability that the outcome is HTR?

c.  $\frac{1}{12}$

- d. What is the probability that a two tails are flipped?

d.  $\frac{1}{4}$

$\frac{13}{13}$

5 cards? yes

4. What is the probability of being dealt all face cards in a poker hand from a standard 52 card deck? (3 pts)

$$\frac{{}^{12}C_5}{{}^{52}C_5}$$

$$\frac{95040}{311875200} \quad \frac{19008}{62375040} \quad \left(\frac{12}{52}\right) \left(\frac{11}{51}\right) \left(\frac{10}{50}\right) \left(\frac{9}{49}\right) \left(\frac{8}{48}\right)$$

$$\frac{9504}{31187520} = \frac{33}{108290}$$

5. What are the odds against Tiffany winning if the probability that Tiffany wins is  $\frac{7}{12}$ ? (2 pts)

$$\frac{7}{12} \quad 5:7$$

5. 5:7

6. The Farmstock Police Department is running a raffle with a grand prize worth \$600, and two other prizes each worth \$100. There are 1,200 tickets sold at \$1 each.

a. What is the expected value of one raffle ticket? (3 pts)

value	probability	v · p
600.	$\frac{1}{1200}$	$\frac{600}{1200} = \frac{1}{2}$
100.	$\frac{1}{1200}$	$\frac{100}{1200}$
100.	$\frac{1}{1200}$	$\frac{100}{1200}$
-1.00	$\frac{1197}{1200}$	$-\frac{1197}{1200}$

$\frac{800}{1200} + \frac{-1197}{1200} = -\frac{397}{1200}$   
 a. \$ -0.33

b. If this were a "fair game", what would the cost of a ticket be? (2 pt)

b. \$ .67

7. a. How many ways can three people be selected to use their phones to text from a class of 17? (2 pts/problem)

$$C = \frac{n!}{(n-r)!r!}$$

$$\frac{17!}{14! \cdot 3!}$$

7.a. 680

b. A lock has numbers 0-49 on its dial. How many three-number codes are possible?

$$50 \cdot 50 \cdot 50$$

b. 125000

8. What is the probability of rolling a pair of dice and getting a sum greater than 4? (Hint: list the complement 3 pts)

1,1	1,2	1,3	1,4	1,5	1,6
2,1	2,2	2,3	2,4	2,5	2,6
3,1	3,2	3,3	3,4	3,5	3,6
4,1	4,2	4,3	4,4	4,5	4,6
5,1	5,2	5,3	5,4	5,5	5,6
6,1	6,2	6,3	6,4	6,5	6,6

$$\frac{30}{36} = \frac{15}{18} = \frac{5}{6}$$

8.  $\frac{5}{6}$

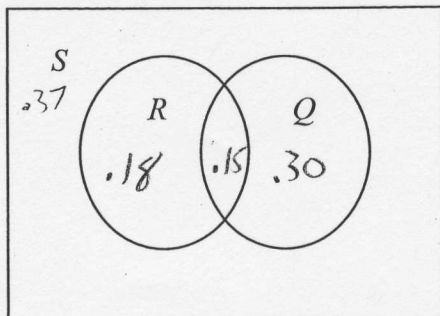
9. Explain what is meant by P(Brown Hair | a member of your family).

The probability of having Brown Hair given that you are a member of your family

$$\frac{+19}{19}$$



10. Given  $P(R) = 0.33$ ,  $P(Q) = 0.45$ , and  $P(R \cap Q) = 0.15$ . Fill in the Venn diagram and determine the following probabilities: (2 pts/problem)



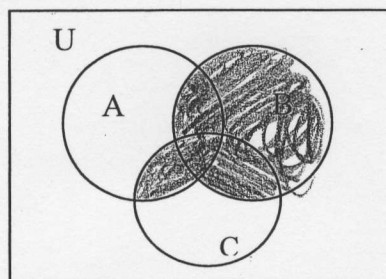
- a.  $P(Q')$   
 b.  $P(R \cup Q)$   
 c.  $P(R|Q)$

10.a. 0.55

b. 0.63

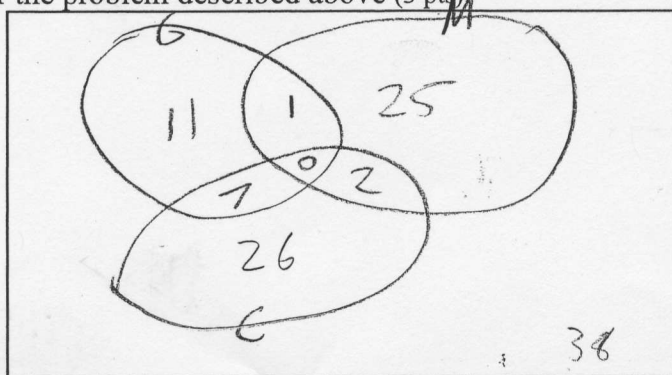
c. 0.35

11. Shaded the region  $(A \cap C) \cup B$  (3 pts)



12. In a survey of 110 MSUM students there were 19 graphic design majors, 28 music majors, and 35 communications majors. Seven students were double majoring in communications and graphic design, one was double majoring in graphic design and music, two were double majoring in music and communications, and no one was majoring in all three.

- a. Create a Venn diagram for the problem described above (3 pts)



$$\frac{12}{110} \quad \frac{36}{55}$$

- b. What is the probability a student is majoring in music or communications or graphic design? (2 pts)

b. 36/55

- c. What is the probability a student is only majoring in graphic design? (2 pts)

c. 1/10

$$\frac{116}{16}$$

13. How many different arrangements can be formed from the letters: FRIDAY? (2 pts)

$$6 \times \frac{5}{1} \times \frac{4}{2} \times \frac{3}{3} \times \frac{2}{4} \times \frac{1}{5} = 720$$

13. 720

14. How many different arrangements can be formed from the letters: SUMMER? (3 pts)

$$\frac{6!}{2!} = \frac{720}{2}$$

M repeats twice  $\rightarrow 2!$

14. 360

15. A primary zip code is made up of five-digits. How many zip codes end with 63? (2 pts)

$$\frac{10}{10} \times \frac{10}{2} \times \frac{10}{3} \times \frac{1}{4} \times \frac{1}{5} = 1000$$

15. 1000

16. If Cai is choosing his clothes for the day and she has five shirts, four pair of pants, and four pair of shoes, how many different outfits are possible (clashing allowed)? (2 pts)

$$\frac{5}{S} \times \frac{4}{P} \times \frac{4}{S} = 80$$

16. 80

17. A ball is randomly selected from a jar containing 20 green balls, 12 brown balls, and 6 white balls. (2 pts/problem)

(38)

a. P( a brown ball is chosen)

$$\frac{12}{38} = \frac{6}{19}$$

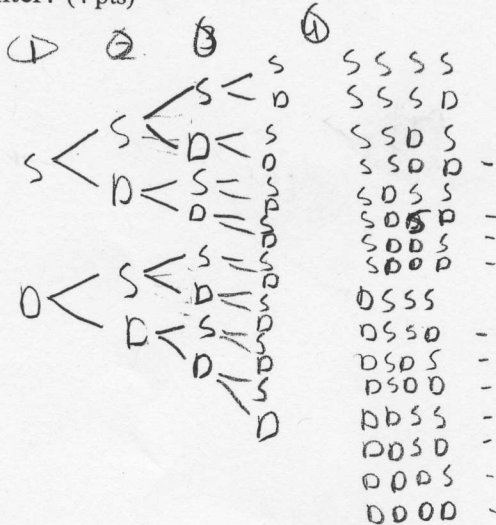
a.  $\frac{6}{19}$

b. P( a non-green ball is chosen)

$$\frac{18}{38} = \frac{9}{19}$$

b.  $\frac{9}{19}$

18. A couple is planning to have 4 children. The chance of having a son is equal to the chance of having a daughter. What is the probability that they have more than 1 daughter? (4 pts)



$$\frac{11}{16}$$

18.  $\frac{11}{16}$

(16)





22. Find the following: (1 pt/problem)

a.  ${}_{24}P_7$   
 $= 1$

22.a. 1,744,364,160

b.  ${}_{12}C_3$   
 $=$

b. 220

c.  $\frac{7!}{4!3!} = \frac{7 \cdot \cancel{6} \cdot 5 \cdot \cancel{4} \cdot 3 \cdot 2 \cdot 1}{\cancel{4} \cdot \cancel{3} \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = \frac{7 \cdot 5 \cdot 2}{2} = \frac{70}{2} = 35$

c. 35

23. If the odds in favor of Minnesota winning this week are 6:17, what is the probability that Minnesota wins? (2 pts)

$\frac{6}{6+17}$

23.  $\frac{6}{23}$

24. What are three basic properties of probability? (3 pts)

$0 \leq P(E) \leq 1$  Probability must fall between 0 and 1 inclusive  
 $P(\emptyset) = 0$  The probability of the empty set is impossible  
 $P(S) = 1$  The probability of the sample space is sure to occur

25. Complete a truth table to determine if the argument is valid or invalid. (4 pts)

$a \rightarrow d$   
 $\frac{a}{\therefore d}$

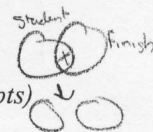
a	d	$(a \rightarrow d) \wedge a$	$\rightarrow d$
T	T	T	T
T	F	F	F
F	T	T	T
F	F	T	F

25. Valid

26. Write the following set  $\{0, 1, 2, 3, \dots, 18\}$  in set-builder notation. (2 pts)

26.  $\{x: x \text{ is a whole number } \leq 18\}$

27. Write the negation of: "At least one of the students will finish this test in half an hour." (2 pts)



No student will finish this test in half an hour.