Trig Honors **Name:**
Probability Day 4

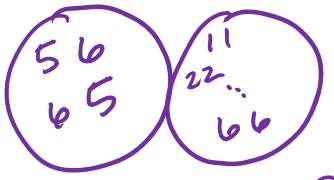
1. Consider the events below when rolling two standard dice:

   A = the total is 11 B = the same number is rolled C = the total is 8

a. **A and B** are **mutually exclusive** events, and **B and C** are **not mutually exclusive** events. In your own words, define what it means for two events to be mutually exclusive.

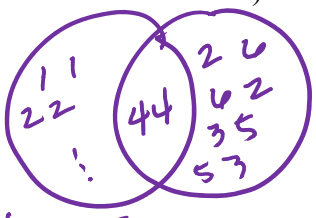
They do not have an event in common

b. Find P(the total is 11 or the same number is rolled).



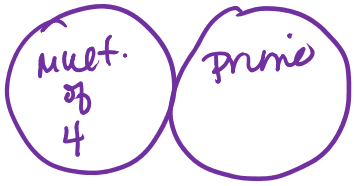
$\frac{2}{36} + \frac{6}{36} = \frac{8}{36} = \frac{2}{9}$

c. Find P(the same number is rolled or the total is 8).



$\frac{6}{36} + \frac{5}{36} - \frac{1}{36} = \frac{10}{36} = \frac{5}{18}$

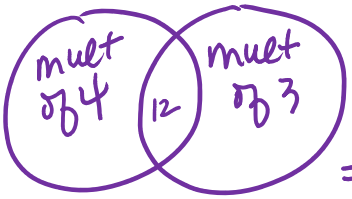
d. Find P(roll a sum that is a multiple of 4 or roll a sum that is prime)



$= \frac{9}{36} + \frac{15}{36} - 0$

$= 2/3$

e. Find P(roll a sum that is a multiple of 4 or roll a sum that is a multiple of 3).



$\frac{9}{36} + \frac{12}{36} - \frac{1}{36}$

$= \frac{20}{36} = \frac{5}{9}$

2. In a group of 103 underclassmen, fifty-five of the students are male, 31 of them are female sophomores, and 6 are male freshman. Find the probability that a random student picked from this group is either a female or a sophomore.

	female	male	total
fresh	17	6	23
soph	31	49	80
total	48	55	103

$P(\text{frosh or } n) = \frac{48}{103} + \frac{80}{03} - \frac{31}{103} = \frac{97}{03} = 1 - \frac{6}{103}$

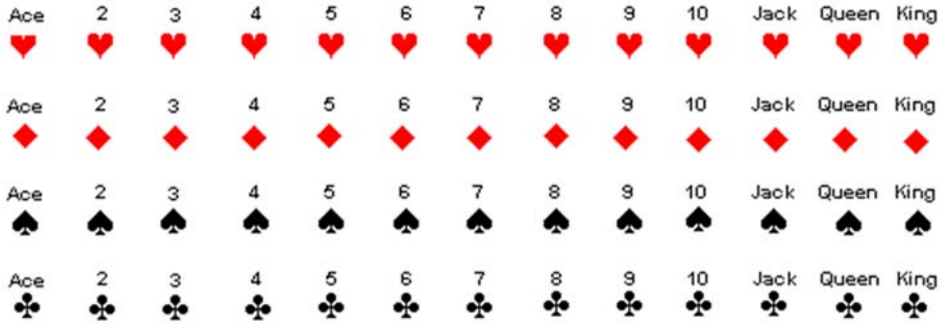
P 1 1

= P(NO male fresh)

$$Probability\ of\ A\ or\ B = P(A) + P(B) - P(A \cap B)$$

**If events A and B are mutually exclusive, $P(A \cap B) = 0$ **

Sample Space for Choosing a Card from a Deck



*Face cards are considered to be Jacks, Queens, and Kings

2. Use the sample space given above to answer the following questions about picking one card.

a) P(face card)

$\frac{12}{52} = \frac{3}{13}$

b) P(not a face card)

$\frac{40}{52} = \frac{10}{13}$

c) P(king or queen)

$\frac{4}{52} + \frac{4}{52} - 0 = \frac{2}{13}$

d) P(red or black)

$\frac{26}{52} + \frac{26}{52} - 0 = 1$

e) P(a 4 or a red card)

$\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{7}{13}$

f) P(face card or a club)

$\frac{12}{52} + \frac{13}{52} - \frac{3}{52} = \frac{11}{26}$

3. Use the sample space given above to answer the following questions about picking two cards without replacement.

a. P(face card, then face card)

$\frac{12}{52} \cdot \frac{11}{51} = 0.05$

b. P(no face cards)

$\frac{40}{52} \cdot \frac{39}{51} = 0.588$

c. P(at least one face card)

$= P(1\ FACE\ or\ 2\ FACE) = \frac{12}{52} \cdot \frac{40}{51} + \frac{40}{52} \cdot \frac{12}{51} + \frac{12}{52} \cdot \frac{11}{51}$

$= 1 - P(NO\ Face) = 0.412$ is ?

which FASTER.

Probability of not A
$P(not\ A) = 1 - P(A)$

4. Calvin and Phoebe visit the Children's Ward at the hospital. The probability that Calvin will catch mumps as a result of the visit is 0.13, and the probability that Phoebe will catch mumps is 0.07. Find the probability that:

a. Both catch mumps $0.13 \cdot 0.07 = 0.0091$

b. Calvin does not catch mumps 0.87

c. Phoebe does not catch mumps 0.93

d. Calvin and Phoebe both do not catch mumps $0.87 \cdot 0.93 = 0.809$

e. At least one of them catches mumps

$1 - P(\text{NO mumps}) = 0.191$

Homework

1. Kara Vann is a good student. She figures that her probability of getting an A is 0.92 for Algebra 2 and 0.88 for History. What is her probability of getting

a. An A in algebra and history? $0.92 \cdot 0.88 = 0.81$

b. No A in algebra? 0.08

c. No A in history? 0.12

d. An A in neither algebra nor history? $0.08 \cdot 0.12 = 0.0096$

e. At least one A?

$1 - P(\text{NO A}) = 0.9904$

2. The three basketball teams from Lowe High each play on Friday night. The probabilities that they will win are: varsity, 0.7; junior varsity, 0.6; and freshman, 0.8. What is the probability that

   a. All three win? $0.7 \cdot 0.6 \cdot 0.8 = 0.336$

   b. All three lose? $0.3 \cdot 0.4 \cdot 0.2 = 0.024$

   c. At least one team wins? $1 - P(\text{all lose}) = 0.976$

   d. The varsity wins and the other two lose?

$$0.7 \cdot 0.4 \cdot 0.2 = 0.056$$

3. Suppose you are rolling 2 standard 6-sided dice and look at the sum. What is the probability that you roll a pair or a 10?

$$\frac{6}{36} + \frac{3}{36} - \frac{1}{36} = \frac{8}{36} = \frac{2}{9}$$

4. Pick a card from the standard deck. Calculate P(black or a 2).

$$\frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

5. A department store employs 28 high school students, all juniors and seniors. Six of the 12 seniors are females and 12 of the juniors are males. One student employee is chosen at random. What is the probability of selecting a senior or a female?

	female	male	total
junior	4	12	16
senior	6	6	12
total	10	18	28

$$P(\text{S or female}) = \frac{12}{28} + \frac{10}{28} - \frac{6}{28} = \frac{16}{28} = \frac{4}{7}$$

$$P(\text{male junior}) = 1 - \frac{12}{28} = \frac{4}{7}$$

6. The Katz brothers, Bob and Tom, are hiding in the cellar. If either one sneezes, they will reveal their hiding place and be found. Bob's probability of sneezing is 0.6 and Tom's probability is 0.7. What is the probability that at least one sneezes?

$P(\text{no sneeze}) = 1 - 0.4 \cdot 0.3 = 0.88$

7. Vital systems such as electric power distribution systems have "back-up" components in case one component fails. Suppose that two generators each have a probability of 98% (0.98) of working. The system will continue to work as long as at least one of the generators works. What is the probability that the system will continue to operate?

$1 - P(\text{both fail}) = 1 - 0.02 \cdot 0.02 = 0.9996$

8. The silversword is a rare plant that grows only atop the 10,000 foot high Haleakela volcano in Maui, Hawaii. The seeds have only a small probability of germinating, but if enough are planted, there is a fairly good chance of getting a new plant. Suppose that the probability of any one seed germinating is 0.004.

   a. What is the probability that a seed will not germinate? 0.996

   b. If 100 seeds are planted, what is the probability that

      i. None will germinate? $0.996^{100} = 0.6698$

      ii. At least one will germinate? 0.330

   c. If 1000 seeds are planted, what is the probability that at least one will germinate?

$1 - 0.996^{1000} = 0.982$