

Name: _____

Sample Space: The set of all possible outcomes

ex) Sample Space of days in a school week

Example 1: List the sample space, S, for each of the following: $S = \{M, Tu, W, Th, F\}$

- a. Tossing a coin: $\{H, T\}$
- b. Rolling a six-sided die: $\{1, 2, 3, 4, 5, 6\}$
- c. Drawing a marble from a bag that contains two red, three blue, and one white marble: $\{R, B, W\}$

Example 2: Suppose a bag contains 5 colored rocks: 1 red, 2 green, and 2 purple.

a) In the first experiment, one rock is randomly taken from the bag. What is the sample space of this experiment?

$S = \{R, G, P\}$

b) In another experiment, one rock is randomly drawn, its color observed, and the rock is placed back in the box. The rocks are shaken and then another rock is randomly drawn and its colored observed. What is the sample space of this experiment?

$S = \{RR, RG, RP, GG, GR, GP, PR, PG, PP\}$

Intersection of two sets (A ∩ B):

Union of two sets (A ∪ B)

The set of elements that exist in BOTH A AND B. [Must be in both A & B.]

The set of ALL elements in either A OR B. [Includes A, B & intersection]

Example 3: Given the following sets, find A ∩ B and A ∪ B

$A = \{1, 3, 5, 7, 9, 11, 13, 15\}$ $B = \{0, 3, 6, 9, 12, 15\}$

$A \cap B = \{3, 9, 15\}$
(Intersection) AND

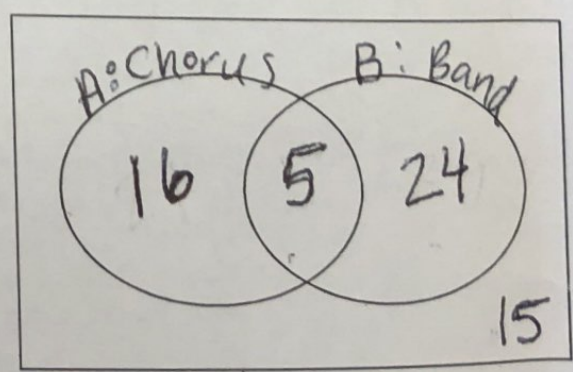
$A \cup B = \{0, 1, 3, 5, 6, 7, 9, 11, 12, 13, 15\}$
(Union) OR

Venn Diagrams

Example 5: In a freshman class of 60 students, 21 sign up for chorus, 29 sign up for band, and of those, 5 take both. 15 students in the class are not enrolled in either band or chorus.

1. Put this information into a Venn Diagram. If the sample space, S, is the set of all students in the class, let students in chorus be set A and students in band be set B.
2. Why did we subtract 5 from the chorus and band total?

3. What is A ∪ B? $16 + 24 + 5 = 45$
4. What is A ∩ B? 5



↑
overlap.
Whats in between

* Be careful not to over count in middle!

Sample Space & Simple Prob

$\frac{\text{number of favorable outcomes}}{\text{total outcomes}}$

Probability of an Event: $P(E) =$

Example 1: What is the probability that a dice lands on a 4?

$P(4) = 1/6$

Notation: $P(4)$ means "prob of rolling a 4"

Example 2: What is the probability that a dice lands on an odd number?

$P(\text{ODD}) = \frac{3}{6} = 1/2$

Example 3: An experiment consists of tossing three coins.

1. List the sample space for the outcomes of the experiment.

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

2. Find the following probabilities:

a. $P(\text{all heads}) = 1/8$

c. $P(\text{two tails}) = 3/8$ (exactly 2 tails)

b. $P(\text{no heads}) = 1/8$

d. $P(\text{at least one tail}) = 7/8$ (1 or more tails)

The probabilities of all possible outcomes must add to 1 (100%)

Example 4: A bag contains six red marbles, four blue marbles, two yellow marbles and 3 white marbles. One marble is drawn at random.

1. What is the total number of marbles? 15

2. Find the following probabilities:

a. $P(\text{red}) = 6/15 = 2/5$

c. $P(\text{blue or white}) = 7/15$

b. $P(\text{not yellow}) = 13/15$
2 yellow

4 blue
3 white
7 want

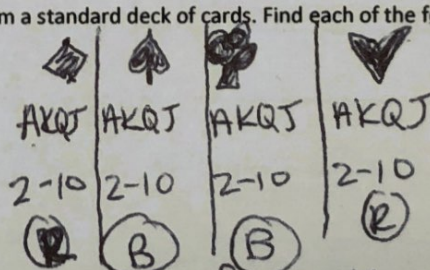
Example 5: A card is drawn at random from a standard deck of cards. Find each of the following:

1. $P(\text{heart}) = 13/52 = 1/4$

2. $P(\text{black card}) = 26/52 = 1/2$

3. $P(2 \text{ or jack}) = 8/52 = 2/13$

4. $P(\text{not a heart}) = 39/52 = 3/4$



52 cards in Deck
4 Suits
13 cards in each suit

Odds: The odds of an event occurring are equal to the ratio of favorable to unfavorable

Odds = $\frac{\text{favorable}}{\text{unfavorable}} = \frac{\text{what we want}}{\text{what we don't want}}$

Example 6: What are the odds of drawing an ace at random from a standard deck of cards?

4 aces / 48 non aces = $4/48 = 1/12$

Example 7: A bag contains six red marbles, four blue marbles, two yellow marbles and 3 white marbles. One marble is drawn at random.

15 marbles

1. Find the following ODDS:

a. Odds(red) $6/9 = 2/3$

b. Odds(blue or white) $1/8$

c. Odds(not yellow) $13/2$

6 red
9 non-red

4 blue
3 white
7 wanted

2 don't want (yellow)

8 nonwanted

13 want