CP.7 Apply the Addition Rule, P(A or B)=P(A)+P(B)–P(A and B), and interpret the answers in context.

CP.2 Understand that if two events A and B are independent, the probability of A and B occurring together is the product of their probabilities.

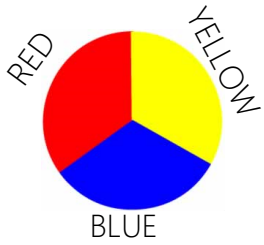
CP.3 Understand the conditional probability of A given B as P(A and B)/P(B).

Sample Space - a set of all possible outcomes for an activity or experiment.

Ex. 1 What is the sample space of fingers on your right hand?

{Thumb, index, middle, ring, pinky}

What is the sample space of this spinner?



{Red, yellow, Blue}

Event - in a probability experiment, a subset of the sample space.

Ex.1 Identifty an event from the sample space of the fingers on your right hand.

{Thumb}

$P(\text{Thumb}) = \frac{1}{5}$

Ex. 2 Identify an event for the spinner.

{Blue}

$P(\text{Blue}) = \frac{1}{3}$

Single Event Probability

Probability is expressed as a number from 0 to 1 that shows how likely an event is to occur.

It can be written as a fraction, a decimal, or a percent and is calculated with the following.

P(A) is read as "the probability of event A"

$$P(A) = \frac{\text{Number of ways event A can happen}}{\text{Total number of outcomes}}$$

$\frac{\text{Event}}{\text{Samplespace}}$

Examples of Single Event Probability:

ex.1 Rolling a 2 on a 6 sided die

$$P(2) = \frac{1}{6} = 0.\overline{166} = 16.\bar{6}\%$$

ex. 2 Rolling an even number on a 12 sided die.

$$P(\text{Even}) = \frac{6}{12} = \frac{1}{2} = 0.5 = 50\%$$

ex. 3 Drawing a four out of a deck of cards.

$$P(4) = \frac{4}{52}$$
$$= \frac{1}{13}$$
$$= 0.0\overline{769}$$
$$= 7.7\%$$

♥ - 13
♦ - 13
♠ - 13
♣ - 13
52

Probability of Multiple Events

Three types of Probability

1. Addition Rule Probability - single draw

OR

2. Multiplication Rule Probability - multiple drawing

AND

3. Conditional Probability

GIVEN divide

Additional Rule

The probability that A OR B will occur in one draw

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

where the P(A and B) is zero if events are mutually exclusive .

Mutually Exclusive Events - cannot happen at the same time.

Examples:

1 card - king and 4

Non-examples (not mutually exclusive)

1 card – king and ♡

Determine whether these events are mutually exclusive.

1) Roll a die: get an even number and get a number less than 3

Not M.E.

2) Roll a die: get a prime number and get an odd number 2, 3, 5

Not M.E

3) Roll a die: get a number greater than 3 and get a number less than 3.

M.E.

4)Select a student in the classroom: Student has blond hair and blue eyes.

Not M.E.

5) Select a student at Kennesaw State: A student is a sophomore and a business major.

Not M.E.

6)Select any high school course: The course is calculus and the course is English.

M.E.

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Determine if the events are mutually exclusive then find the probability.

Ex. 1 What is the probability of rolling a 6 sided die and getting a 3 or 6?

$$P(3 \text{ OR } 6) = P(3) + P(6) - P(3 \text{ and } 6)$$
$$= \frac{1}{6} + \frac{1}{6} - 0 = \frac{2}{6} = \boxed{\frac{1}{3}}$$

Ex. 2 Rolling a 6 sided die and getting an even number or a number greater than 3. Not M.E.

{2,4,6} {4,5,6}

$$P(\text{Even or } >3) = P(\text{Even}) + P(>3) - P(\text{Even and } >3)$$

{1,2,3,4,5,6}

$$= \frac{3}{6} + \frac{3}{6} - \frac{2}{6} = \frac{4}{6} = \boxed{\frac{2}{3}}$$

Ex 3. In a math class of 30 students, 17 are boys and 13 girls.
On a unit test, 4 boys and 5 girls earned an A. If a student is chosen at random from the class, what is the probability of choosing a girl or an A student. Not M.E.

$$P(\text{Girl or A student}) = P(\text{Girl}) + P(\text{A student}) - P(\text{Girl and A student})$$
$$= \frac{13}{30} + \frac{9}{30} - \frac{5}{30} = \boxed{\frac{17}{30}}$$

Ex. 4 On New Year's Eve, the probability of a person having a car accident is 0.09. The probability of a person driving while intoxicated is 0.32. The probability of having a car accident while driving intoxicated is 0.15. What is the probability of a person driving while intoxicated or having a car accident on New Year's Eve?

$P(\text{Car Accident}) = 0.09$
$P(\text{DWI}) = 0.32$
$P(\text{Car Accident and DWI}) = 0.15$

$$P(\text{DWI or Car Accident}) = 0.32 + 0.09 - 0.15 = \boxed{0.26}$$