School Carnival

Name: _____ Need: 2 dice, 3 coins

Play each game 10 times. Then answer the question.

Compute the expected value on the activities for the school carnival. Does the school make money or loose money at each booth? outcome$_1$ · prob$_1$ + outcome$_2$ · prob$_2$ + ...

Rolling for Dollars!

Charge: $1 per roll

If you roll
- 6: You get $5
- 5: You get $2
- 4: You get $1
- 3, 2, or 1: You get nothing.

$EV = 5\left(\frac{1}{6}\right) + 2\left(\frac{1}{6}\right) + 1\left(\frac{1}{6}\right) + \cancel{0\left(\frac{1}{2}\right)}^{0}$

$= 1.33 - 1 = .33$

school will lose .33

Big Bucks!

Charge: $1 to toss 3 coins

$EV = 5\left(\frac{2}{8}\right) + \cancel{0\left(\frac{6}{8}\right)}^{0}$

$= 1.25 - 1 = .25$

school will lose .25

Toss the coins.
If you get all heads or all tails, you receive $5.
If not, you get nothing.

HHH TTT
HTT TTH
HTH THT
HHT THH

$\underline{2} \cdot \underline{2} \cdot \underline{2} = 8$

Toss Away!

Charge: $1

Roll 2 dice.
- If you roll 2 odd numbers, like a 3 and a 5, you get $2.
- If you roll 2 even numbers, like 4 and 6, you get $2.
- Otherwise, you get nothing.

$2\left(\frac{9}{36}\right) + 2\left(\frac{9}{36}\right) = 1 - 1 = 0$

break even

Mutually Exclusive vs. Inclusive Events "OR"

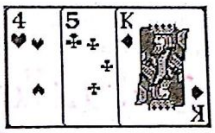
P(A) + P(B)

Mutually Exclusive - 2 things that can't happen at same time

Inclusive - 2 things that can happen at same time

P(A) + P(B) − P(A and B)

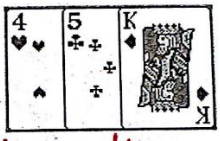
Experiment 1: A single card is chosen at random from a standard deck of 52 playing cards. What is the probability of choosing a 5 or a king?



Possibilities:
1. P(5) = 4/52
2. P(K) = 4/52

$P(5) + P(K) = \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$

Experiment 2: A single card is chosen at random from a standard deck of 52 playing cards. What is the probability of choosing a club or a king?



Possibilities:
1. P(club) = 13/52
2. P(K) = 4/52
3. P(club and K) = 1/52

$\frac{13}{52} + \frac{4}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$

In Experiment 1, the card chosen can be a five or a king, *but not both at the same time.*
These events are mutually exclusive.

In Experiment 2, the card chosen can be a club, or a king, or both at the same time.
These events are inclusive.

Definition: Two events are mutually exclusive if they cannot occur at the same time (i.e., they have no overlap).

Experiment 3: A single 6-sided die is rolled. What is the probability of rolling an odd number or an even number?

Possibilities:
1. P(odd) = 3/6
2. P(even) = 3/6

P(odd or even) = $\frac{3}{6} + \frac{3}{6} = \frac{6}{6} = 1$

Events: These events are mutually exclusive since they can't happen at same time

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Experiment 4: A single 6-sided die is rolled. What is the probability of rolling a 5 or an odd number?

Possibilities:
1. P(5) = 1/6
2. P(odd) 3/6
3. P(5 and odd) = 1/6

P(5 or odd) = $\frac{1}{6} + \frac{3}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

Events: These events are inclusive since 5 is an odd #.

Experiment 5: A single letter is chosen at random from the word SCHOOL. What is the probability of choosing an S or an O?

$\frac{1}{6} + \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$

Possibilities:
1. P(S) = 1/6
2. P(O) = 2/6

Events: These events are exclusive since can't happen at same time.

1) CW: due at end of period
2) Quizziz: 5E pts

X Experiment 6: A game has slots numbered from 0-40. What is the probability that you roll a ball and it lands in an even numbered slot or a slot higher than 28?

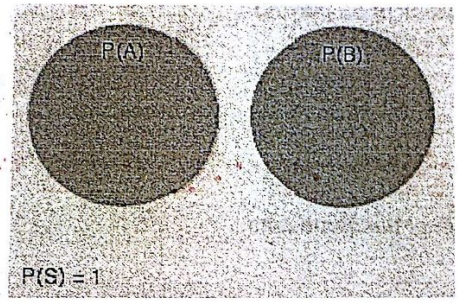
Possibilities: 1.
2.
3.

Events: These events are _____ since _____.

Summary: In this lesson, we have learned the difference between mutually exclusive and non-mutually exclusive events. We can use set theory and Venn Diagrams to illustrate this difference.

Mutually Exclusive Events

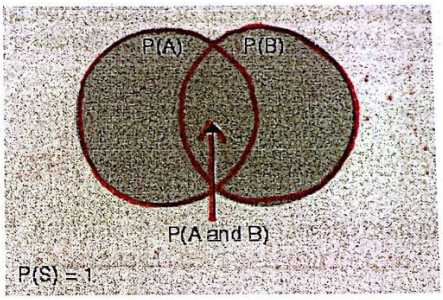
The events cannot occur at the same time (i.e., they have no outcomes in common).



In the Venn Diagram above, the probabilities of events A and B are represented by two separate sets (i.e., they have no elements in common).

Inclusive Events

Two events that have one or more outcome(s) in common.



In the Venn Diagram above, the probabilities of events A and B are represented by two overlapping sets (i.e., have some elements in common).

Complement of an Event P(A')

Definition- prob. of an event NOT happening

***The probability it will snow is 37%. What is the probability it won't snow?**

complement
P(snow')= P(no snow) = 100 - 37 = 63%

***There are 7 red marbles, 8 blue marbles, and 3 green marbles. What is the probability that you draw one that is not red?**

$P(red) = \frac{7}{18}$

P(red')= $1 - \frac{7}{18} =$

$\frac{18}{18} - \frac{7}{18} = \frac{11}{18}$

AFM – Mutually Exclusive and Mutually Inclusive Events

Name KEY

Mutually Exclusive and Inclusive Events

1. Thomas bought a bag of jelly beans that contained 10 red jelly beans, 15 blue jelly beans, and 12 green jelly beans. What is the probability of Thomas reaching into the bag and pulling out a blue or green jelly bean?

$\frac{15}{37} + \frac{12}{37} = \boxed{\frac{27}{37}}$

2. A card is chosen at random from a standard deck of cards. What is the probability that the card chosen is a heart or spade? Are these events mutually exclusive?

$\frac{13}{52} + \frac{13}{52} = \boxed{\frac{1}{2}}$ yes

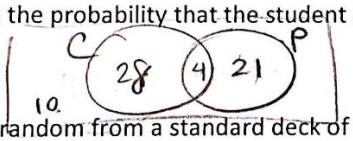
3. 3 coins are tossed simultaneously. What is the probability of getting 3 heads or 3 tails? Are these events mutually exclusive?

HHH
TTT
HHT
TTH
} 8 ↖ $2 \cdot 2 \cdot 2$

$\frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \boxed{\frac{1}{4}}$ yes

4. Suppose 2 events are mutually exclusive events. If one of the events is randomly choosing a boy from the freshman class of a high school, what could the other event be? Explain your answer. choosing a girl

5. Brenda did a survey of the students in her classes about whether they liked to get a candy bar or a new math pencil as their reward for positive behavior. She asked all 71 students she taught, and 32 said they would like a candy bar, 25 said they wanted a new pencil, and 4 said they wanted both. If Brenda were to select a student at random from her classes, what is the probability that the student chosen would want a candy bar or a pencil?



$\frac{32}{71} + \frac{25}{71} - \frac{4}{71} = \boxed{\frac{53}{71}}$

6. A card is chosen at random from a standard deck of cards. What is the probability that the card chosen is a heart or a face card? Are these events mutually inclusive?

3×4 yes

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

7. What is the probability of choosing a number from 1 to 10 that is greater than 5 or even?

$\frac{5}{10} + \frac{5}{10} - \frac{3}{10} = \boxed{\frac{7}{10}}$

8. A bag contains 26 tiles with a letter on each, one tile for each letter of the alphabet. What is the probability of reaching into the bag and randomly choosing a tile with one of the letters in the word ENGLISH on it or randomly choosing a tile with a vowel on it?

$\frac{7}{26} + \frac{5}{26} - \frac{2}{26} = \boxed{\frac{5}{13}}$

9. Could randomly choosing a teacher and randomly choosing a father mutually inclusive events? Explain your answer.

yes, a father can be a teacher

10. Suppose 2 events are mutually inclusive events. If one of the events is passing a test, what could the other event be? Explain your answer.

ex) getting an "A"