

Name: _____

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Mutually Exclusive Events Algebra 1

Mutually exclusive events are two events which have **no outcomes in common**. The probability that these two events would occur at the same time is zero.

Exercise #1: A **single** card is drawn from a standard deck of playing cards.

Let A = The event of drawing a black queen Let B = The event of drawing a red five

- (a) Why are A and B mutually exclusive events? (b) What is $P(A \text{ and } B)$?

Calculating probabilities involving mutually exclusive events is extremely important and fairly easy, as the next exercise will illustrate.

Exercise #2: A fair six-sided die is rolled, what is the probability of *rolling a number less than 3 or rolling a 5*?

MUTUALLY EXCLUSIVE EVENTS

If A and B are two mutually exclusive events then:

$$(1) P(A \text{ or } B) = P(A) + P(B) \qquad \text{and} \qquad (2) P(A \text{ and } B) = 0$$

Exercise #3: One card is drawn at random from a standard deck. Find the probability that the card is:

- (a) A king or a queen (b) A king and a queen

The concept of mutually exclusive events can now allow us to solve harder probability problems that involve what we have seen before. The key will be to identify the mutually exclusive events that make up the larger event.

Exercise #4: Two cards are drawn at random from a deck of cards without replacement. What is the probability that the two cards are a queen and a king?

Exercise #5: Two standard dice are rolled. What is the probability that the sum of the numbers on the dice is equal to 9?

Exercise #6: Nadine has 6 quarters, 2 nickels, 1 dime, and 3 pennies in her coin purse. She pulls out two coins randomly *without* replacement. What is the probability that Nadine has at least 35 cents in her hand?

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Mutually Exclusive Events Algebra 1 Homework

Applications

1. A person is shopping for a new snowmobile. The probability that someone buys an Artic Cat is 39%, a Polaris is 27% and a Ski-Doo is 18%. Which of the following is the probability that this person buys either an Arctic Cat or a Ski-Doo?

(1) 84%

(3) 57%

(2) 66%

(4) 45%

2. A single, fair 6-sided die is thrown. Which of the following is the probability that it lands on a multiple of 2 or a five?

(1) $\frac{2}{3}$

(3) $\frac{1}{3}$

(2) $\frac{1}{6}$

(4) $\frac{5}{6}$

3. A pair of dice are thrown. Which of the following represents the probability that a sum of 11 is thrown?

(1) $\frac{11}{36}$

(3) $\frac{1}{36}$

(2) $\frac{6}{11}$

(4) $\frac{1}{18}$

4. Two cards are drawn at random from a standard deck without replacement. Which of the following represents the probability that the two cards drawn are a five and a six (in either order)?

(1) $\frac{8}{663}$

(3) $\frac{4}{663}$

(2) $\frac{2}{13}$

(4) $\frac{4}{13}$

5. Two cards are drawn at random from a standard deck without replacement. Which of the following represents the probability that the two cards drawn are either both kings or both queens?

(1) $\frac{2}{13}$

(3) $\frac{2}{221}$

(2) $\frac{1}{221}$

(4) $\frac{8}{13}$

6. A bag of marbles contains 8 red marbles and 6 yellow marbles. Two marbles are drawn out of the bag at random without replacement. What is the probability that

(a) first a red marble then a yellow marble are drawn out?

(b) two red marbles are drawn out?

(c) two yellow marbles are drawn out?

(d) two marbles of the same color are drawn out?

Reasoning

7. A particular history class at Arlington High School has the following breakdown of students by grade and by gender:

Grade	Gender
6 Freshmen	3 Girls and 3 Boys
16 Sophomores	10 Girls and 6 Boys
8 Juniors	5 Girls and 3 Boys
30 Total Students	18 Girls and 12 Boys

One student is chosen at random from the 30 total students to give a speech the next day. Find the probability that the student chosen is:

(a) A girl

(b) A sophomore

(c) A girl or a sophomore

(d) Why is the probability that you calculated in part (c) not the sum of the probabilities that you found in parts (a) and (b)?

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Non-Mutually Exclusive Events Algebra 1

Non-mutually exclusive events are two events which *share* one or more of the same outcomes. The first exercise will illustrate how to think about these events and their associated probabilities.

Exercise #1: A standard six sided die is rolled once.

Let A = The event of rolling an even

Let B = The event of rolling a multiple of 3

(a) List all of the elements in each of these events

A:

B:

(b) Find the probability of A

(c) Find the probability of B

(d) Find the probability of A or B.

(e) Why is the answer from part (d) not the sum of the answers from parts (b) and (c)?

NON-MUTUALLY EXCLUSIVE EVENTS

If A and B are any two events that share outcomes in common, non-mutually exclusive, then:

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

Exercise #2: If one card is drawn at random from a standard deck of cards, what is the probability of randomly selecting a 10 or a red card?

Exercise #3: If a fair six sided die is rolled, what is the probability of rolling an odd number or a number less than 4?

In simple situations involving non-mutually exclusive events, the formula shown on the front side of the sheet does not need to be used because outcomes can be counted easily enough. Sometimes, though, this formula is necessary.

Exercise #4: On a given night in March, the probability that it is going to rain is 0.60, the chance that it is going to rain and snow is 0.17, and the chance that it is going to snow is 0.32. What is the probability that it is going to rain or snow?

Exercise #5: The probability that the Fitzy rugby team will win is 68%. The probability that a team member gets injured in the game is 36% and the probability that a team member gets hurt or they win the game is 86%. What is the probability that the Fitzy team wins and a team member gets hurt in the game?

Exercise #6: Shana would like to take her son Maxwell to the zoo one day this weekend but will only do so if it doesn't rain. The probability of rain on Saturday is 20% and the probability of rain on Sunday is 40%. Assume that the events of rain on Saturday and Sunday are independent of each other.

(a) What is the probability it won't rain on Saturday?

(b) What is the probability it won't rain on Sunday?

(c) What is the probability it won't rain on Saturday and it won't rain on Sunday?

(d) What is the probability it won't rain either Saturday or Sunday?

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Non-Mutually Exclusive Events
Algebra 1
Homework

Applications

1. If one card is pulled from a standard deck of cards, which of the following is the probability that the card is a red card or an ace?

(1) $\frac{15}{52}$

(3) $\frac{28}{52}$

(2) $\frac{30}{52}$

(4) $\frac{26}{52}$

2. If a child tossed a fair six-sided die, which of the following is the probability that an odd number or a number greater than 3 would be showing?

(1) $\frac{5}{6}$

(3) $\frac{1}{3}$

(2) $\frac{2}{3}$

(4) $\frac{1}{6}$

3. The probability that Latisha orders French fries at lunch is .32 and the probability that she orders a grilled cheese sandwich and fries is .65. If the probability that she orders just a grilled cheese sandwich is .76, what is the probability that she will order a grilled cheese or fries?

4. If a person is picked at random from the general population there is a 0.52 probability the person is a woman, a 0.56 probability the person is younger than 40 and a 0.78 probability that the person is a woman or is younger than 40. What is the probability that a person picked at random is a woman and younger than 40?

Reasoning

5. The probability it is going to rain on Saturday is 50% and the probability it is going to rain on Sunday is 80%. Assuming that these two events are independent, find the following:

(a) The probability it will rain on Saturday and Sunday.

(b) The probability it will rain Saturday or Sunday.

6. Two events A and B have probabilities given below:

$$P(A) = \frac{1}{3}$$

$$P(B) = \frac{1}{2}$$

$$P(A \text{ or } B) = \frac{5}{6}$$

Are events A and B mutually exclusive or non-mutually exclusive? Justify your answer. Hint – Determine the probability of A and B .