Name the Event

Strand: Data Analysis

Topic: Differentiate between type of events

Primary SOL: AFDA.6   The student will calculate probabilities. Key concepts include

        b. dependent and independent events;

        c. mutually exclusive events.

Related SOL: AFDA.6a, d

Materials

- Name the Event activity sheet (attached)
- Standard deck of 52 playing cards
- One six-sided die

Vocabulary

complementary events, dependent event, independent event, mutually exclusive event, outcomes, probability, sample space, simultaneous

Student/Teacher Actions: What should students be doing? What should teachers be doing?
Time: 90 minutes

1. Begin class by showing students the deck of cards and drawing out one card. Ask, *"What are the odds that I draw a king from the deck?"* Students should reply that the odds are 4 in 52.

2. Replace the card. Ask, *"If I draw another card, what is the probability that I will draw the ace of hearts?"* Students should respond that the odds are 1 in 52. Then ask the students whether it is possible to draw an ace and a king with one draw. Have the students explain why it is impossible to both an ace and a king. Tell the students that this situation describes two mutually exclusive events and have them write the definition of *mutually exclusive events* (two events that cannot occur simultaneously) and several more examples in their notes.

   Examples:
   - Turning right and turning left.
   - Choosing one card from the deck and choosing a heart and a spade.
   - Picking an even number and an odd number.
   - Rolling two die and getting a sum of 7 or 11.

3. Going back to the cards, ask, *"What are the odds that I will draw a heart from the deck?"* Students should reply that the odds are 13 in 52. *"What would the odds be that the card I'll draw isn't a heart?"* Students should reply that the odds are 39/52. Discuss the relationship between these two situations to show an example of complementary events. Have students enter the definition of <u>complement of an event</u> (all outcomes in the sample space that are not in A) and some examples in their notes.

Examples:
- Flipping a coin and getting heads. Complement: flipping the coin and getting tails.
- Drawing a heart from a deck of cards. Complement: drawing a spade, diamond or club.
- Rolling a 5 or 3 on a die. Complement: rolling a 1, 2, 4, or 6 on the die

4. Tell the students that now you're going to draw two cards from the deck. Draw one card and show the card to the class. Ask, *"What were the odds that this first card would be that particular suit?"* Students should reply that the odds are 13 in 52. Now, without replacing the card, draw a second card. Without showing the students the card, ask, *"What are the odds that this card will be the same suit?"* Remind students that now there are only 51 cards in the deck and one less card in that suit, making the odds 12 in 51. Ask, *"Why are the odds smaller now?"* Describe to the students that these are dependent events. Because we drew a particular suit, that limited our ability to draw that suit again. Have them write the definition of *dependent events* (Two events are dependent if the outcome or occurrence of the first affects the outcome or occurrence of the second.) and examples in their notes.

Examples:
- Two cards are chosen from a deck of cards.
- Picking two colored marbles from a bag of multicolored marbles.
- Choosing winners for first, second, and third place in an essay contest.
- Picking four digits for a PIN number if the digits cannot be repeated.

5. Put the deck back together and again draw a card, showing it to the class. Ask, *"What could I do now so that if I drew another card the odds of getting the same suit would be the same as the first time we drew?"* The students should reply that we could put the card back in the deck before we draw. That would make the events independent of each other. Have students write the definition of *independent events* (Two events, A and B, are independent if the occurrence of one does not affect the probability of the occurrence of the other.) and some examples in their notes.

Examples:
- Rolling two 5s on a pair of dice
- Choosing a 3 from a deck of cards, replacing it, and then choosing an ace as the second card.
- The Boston Red Sox winning their division and the San Francisco 49ers winning the Super Bowl.
- Picking a vowel and a consonant from the alphabet.

6. Distribute the Name the Event activity sheet. Have students complete the sheet individually and check for understanding.

Assessment
- **Questions**
  - Is picking four different digits (0 – 9) for a PIN number an independent or dependent event?
  - What is the complementary event if we are picking hearts from a deck of cards?

- **Journal/writing prompts**
  - Can an event be both mutually exclusive and independent? Why or why not?
  - Describe how to find the complementary event for a given event.
  - Complementary events are mutually exclusive, but mutually exclusive events are not necessarily complementary. Give an example of events that are mutually exclusive but not complementary and describe why they are not complementary.

- **Other Assessments**
  - Have students brainstorm an additional example of each type of event as you discuss the definitions.

Extensions and Connections

- Have the students change the odds into probabilities in preparation for the probability discussion.
- Ask the students to write out the number of ways we can select a 5 and an 8 from a deck of cards. Discuss the different suits and order in preparation for the permutations and combinations standards.

Strategies for Differentiation

- Use a graphic organizer to help students organize the vocabulary, with examples and non-examples.
- Use vocabulary cards for related vocabulary listed above.
- Give groups of students their own deck of cards so they can count out the cards remaining after drawing.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

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Given the following events, identify each as *dependent*, *independent*, or *mutually exclusive*. If they are *mutually exclusive*, say whether or not they are *complementary*.

1. A National Football Conference team wins the Super Bowl and an American Football Conference team wins the Super Bowl.

2. The Washington Redskins win the Super Bowl and the Washington Wizards win the National Basketball Association championship.

3. The Washington Redskins win the Super Bowl and Washington, D.C., has a parade.

4. The first two numbers of your Pick 3 lottery ticket match the winning numbers and the third number does not match.

5. Gus takes the bus to school and he receives a speeding ticket on his way to school.

6. Picking an even number and a number divisible by 5.

7. Joe is flipping a coin 10 times and gets heads each time.

8. Alex is a waiter at Olive Garden and he is a chef at Olive Garden.

9. Herman wants to pick out a pair of black socks from his drawer containing five black pairs, four red pairs and two blue pairs. He picks out a red pair, throws them back in the drawer, and picks out a red pair.

10. Rolling a 4 on a single, six-sided die and rolling a 1 on a second roll of the die.