



Algebra 2 – Year 2

Name: _____

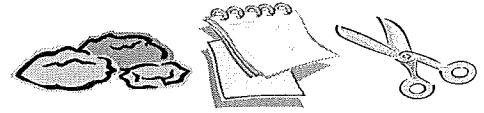
Lesson 11.3 – Probability of Multiple Events

Notes & Examples (Day 1)

Date: _____ Hour: _____

Rock-Paper-Scissors activity

- Play 18 rounds of the game, keeping track of the results for each round in the table below.



Mark R, S, or P for each player, and circle the winning letter.

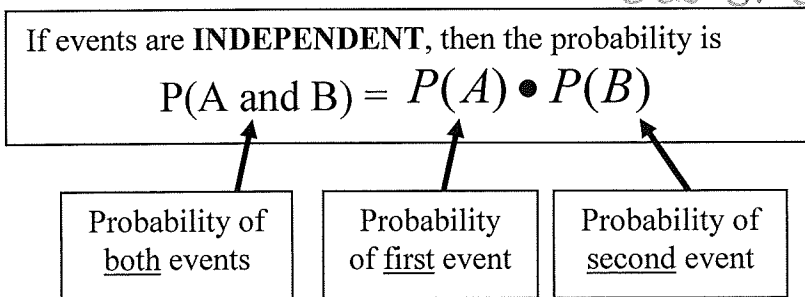
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A																		
B																		

- Change in the rules..... This time you cannot play the same thing twice
Mark R, S, or P for each player, and circle the winning letter.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A																		
B																		

Two events are INDEPENDENT if one event does NOT affect how a second event can

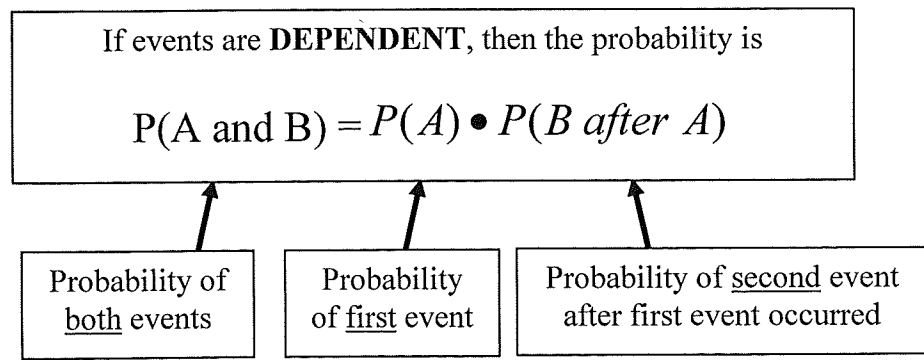
Example: The first rock, paper, scissors game, choosing one object ^{occur}
out of two different containers



Does one event affect the other event?

Two events are DEPENDENT if one event affects how a second event can occur

Example: The second rock, paper, scissors game, choosing two objects out of
one container



Example 1: Is each pair of events dependent or independent?

- a. Kathi draws a 4 from a set of cards numbered 1–10 and rolls a 2 on a number cube.

INDEPENDENT

DEPENDENT

- b. Mary chooses a game piece from a board game, and then Jason chooses a game piece from three remaining pieces.

INDEPENDENT

DEPENDENT

- c. Yuki chooses a book from the shelf to read, and then Janette chooses a book from the books that remain.

INDEPENDENT

DEPENDENT

Example 2: Events A, B, and C are independent, and $P(A) = 0.4$, $P(B) = 0.3$, and the $P(C) = 0.15$. Find the probability of each combination of events.

- a. $P(A \text{ and } B)$

$$\begin{aligned} &= P(A) \cdot P(B) \\ &= (0.4)(0.3) \\ &= 0.12 \end{aligned}$$

- b. $P(A \text{ and } B \text{ and } C)$

$$\begin{aligned} &= P(A) \cdot P(B) \cdot P(C) \\ &= (0.4)(0.3)(0.15) \\ &= 0.018 \end{aligned}$$

Example 3: At a picnic there are 10 diet drinks and 5 regular drinks. There are also 8 bags of fat-free chips and 12 bags of regular chips. If you grab a drink and a bag of chips without looking, what is the probability that you get a diet drink and fat-free chips?

Event A = picking a diet drink

Event B = picking a fat-free chip

A and B are independent events.

$$P(A) = \frac{10}{15} = 0.667$$

$$P(A \text{ and } B) = \frac{P(A) \cdot P(B) = (0.667)(0.4)}{= 0.267 \text{ or } 26.7\%}$$

$$P(B) = \frac{8}{20} = 0.4$$

Example 4: A bag contains 6 red marbles, 4 blue, and 5 green marbles. A marble is picked at random and is replaced. Then a second marble is picked at random. Find each probability.

- a. Both are green $A = 1^{\text{st}}$ is green

$$P(A) = \frac{5}{15} = 0.333$$

$$P(B) = \frac{5}{15} = 0.333$$

$$P(A \text{ and } B) = (0.333)(0.333) = 0.111$$

- b. Neither is red $A = \text{not red}$

$$P(A) = \frac{9}{15} = 0.6$$

$$P(B) = \frac{9}{15} = 0.6$$

$$P(A \text{ and } B) = (0.6)(0.6) = 0.36$$

- c. If the first marble is not replaced, what would be the probability that both are green?

$$A = 1^{\text{st}} \text{ is green } P(A) = \frac{5}{15} = 0.333$$

$$B = 2^{\text{nd}} \text{ is green}$$

$$P(B) = \frac{4}{14} = 0.286$$

$$P(A \text{ and } B) = P(A) \cdot P(B) = (0.333)(0.286) = 0.095$$



Algebra 2 - Year 2

Name: _____

Assignment: Lesson 11.3 worksheet #1

Date: _____ Hour: _____

Give all probabilities as simplified fractions and percents rounded to the nearest tenth of percent.

Events D, E, F, and G are independent, and $P(D) = 0.2$, $P(E) = 0.1$, $P(F) = 0.4$, and the $P(G) = 0.25$. Find the probability of each combination of events.

1. $P(D \text{ and } E) = \frac{P(D) \cdot P(E)}{=} = \frac{(0.2)(0.1)}{=} = 0.02$

2. $P(D \text{ and } G) = \frac{P(D) \cdot P(G)}{=} = \frac{(0.2)(0.25)}{=} = 0.05$

3. $P(E \text{ and } F) = \frac{P(E) \cdot P(F)}{=} = \frac{(0.1)(0.4)}{=} = 0.04$

4. $P(D \text{ and } E \text{ and } F) = \frac{P(D) \cdot P(E) \cdot P(F)}{=} = \frac{(0.2)(0.1)(0.4)}{=} = 0.008$

A bag contains 3 white marbles, 2 red marbles, and 7 blue marbles. A marble is picked at random and is replaced. Then a second marble is picked at random. Find each probability.

5. Both marbles are blue. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.583)(0.583) = 0.340$
A = 1st is blue $P(A) = \frac{7}{12} = 0.583$
B = 2nd is blue $P(B) = \frac{7}{12} = 0.583$

6. The first marble is white and the second marble is red. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.25)(0.167) = 0.042$
A = 1st is white $P(A) = \frac{3}{12} = 0.25$
B = 2nd is red $P(B) = \frac{2}{12} = 0.167$

7. Neither marble is red. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.833)(0.833) = 0.694$
A = 1st is not red $P(A) = \frac{10}{12} = 0.833$
B = 2nd is not red $P(B) = \frac{10}{12} = 0.833$

8. The first marble is white and the second marble is not white. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.25)(0.75) = 0.1875$
A = 1st is white $P(A) = \frac{3}{12} = 0.25$
B = 2nd is not white $P(B) = \frac{9}{12} = 0.75$

A number cube is rolled twice. On each roll, the number on the top face is recorded. Find the probability of each event. 1 2 3 4 5 6

9. The first number is greater than 5 and the second is less than 3. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.167)(0.333) = 0.056$
A = 1st > 5 $P(A) = \frac{1}{6} = 0.167$
B = 2nd < 3 $P(B) = \frac{2}{6} = 0.333$

10. Both numbers are greater than 4. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.333)(0.333) = 0.111$
A = 1st > 4 $P(A) = \frac{2}{6} = 0.333$
B = 2nd > 4 $P(B) = \frac{2}{6} = 0.333$

11. The first number is even and the second number is odd. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.5)(0.5) = 0.25$
A = 1st is even $P(A) = \frac{3}{6} = 0.5$
B = 2nd is odd $P(B) = \frac{3}{6} = 0.5$

A number cube is rolled, and two coins are tossed. Find the probability of each event.

1 2 3 4 5 6 H T H T

12. The number on the cube is 2 and both coins are heads. $P(A \text{ and } B \text{ and } C) = P(A) \cdot P(B) \cdot P(C)$

$$A = \text{roll } 2 \quad P(A) = \frac{1}{6} = 0.167$$

$$B = \text{Heads} \quad P(B) = \frac{1}{2} = 0.5$$

$$C = \text{Heads} \quad P(C) = \frac{1}{2} = 0.5$$

$$= (0.167)(0.5)(0.5) = 0.042$$

13. The number on the cube is even, one coin shows heads, and one shows tails. $P(A \text{ and } B \text{ and } C) =$

$$A = \text{roll even} \quad P(A) = \frac{3}{6} = 0.5$$

$$B = \text{Heads} \quad P(B) = \frac{1}{2} = 0.5$$

$$C = \text{Tails} \quad P(C) = \frac{1}{2} = 0.5$$

$$P(A) \cdot P(B) \cdot P(C) = (0.5)(0.5)(0.5)$$

$$= 0.125$$

14. The number on the cube is greater than 2 and the coins show different sides. $(0.667)(1)(0.5) = 0.334$

$$A = \text{roll } > 2, B = \text{Heads or tails}, C = \text{other side} \quad P(A) = \frac{4}{6} = 0.667 \quad P(B) = \frac{2}{2} = 1 \quad P(C) = \frac{1}{2} = 0.5$$

A box contains 5 purple marbles, 3 green marbles, and 2 orange marbles. Two consecutive draws are made from the box without replacement of the first draw. Find the probability of each event.

15. purple first, orange second $P(A \text{ and } B) = P(A) \cdot P(B) = (0.5)(0.222) = 0.111$

$$A = 1^{\text{st}} \text{ purple} \quad P(A) = \frac{5}{10} = 0.5$$

$$B = 2^{\text{nd}} \text{ orange} \quad P(B) = \frac{2}{9} = 0.222$$

16. green first, purple second $P(A \text{ and } B) = P(A) \cdot P(B) = (0.3)(0.556) = 0.167$

$$A = 1^{\text{st}} \text{ green} \quad P(A) = \frac{3}{10} = 0.3$$

$$B = 2^{\text{nd}} \text{ purple} \quad P(B) = \frac{5}{9} = 0.556$$

17. orange first, orange second $P(A \text{ and } B) = P(A) \cdot P(B) = (0.2)(0.111) = 0.022$

$$A = 1^{\text{st}} \text{ orange} \quad P(A) = \frac{2}{10} = 0.2$$

$$B = 2^{\text{nd}} \text{ orange} \quad P(B) = \frac{1}{9} = 0.111$$

18. purple first, blue second $P(A \text{ and } B) = P(A) \cdot P(B) = (0.5)(0) = 0$

$$A = 1^{\text{st}} \text{ purple} \quad P(A) = \frac{5}{10} = 0.5$$

$$B = 2^{\text{nd}} \text{ blue} \quad P(B) = \frac{0}{9} = 0$$

19. purple first, purple second $P(A \text{ and } B) = P(A) \cdot P(B) = (0.5)(0.444) = 0.222$

$$A = 1^{\text{st}} \text{ purple} \quad P(A) = \frac{5}{10} = 0.5 \quad P(B) = \frac{4}{9} = 0.444$$

$$B = 2^{\text{nd}} \text{ purple}$$

A bag contains 6 red chips, 9 white chips, and 5 blue chips. A chip is selected at random and then replaced. Then a second chip is selected. Find the probability of each event.

20. The first chip is not red and the second chip is not white. $P(A \text{ and } B) = P(A) \cdot P(B) = (0.7)(0.55) =$

$$A = 1^{\text{st}} \text{ not red} \quad P(A) = \frac{14}{20} = 0.7$$

$$B = 2^{\text{nd}} \text{ not white} \quad P(B) = \frac{11}{20} = 0.55$$

$$= 0.385$$

21. The first chip is green and the second chip is blue. $P(A \text{ and } B) = P(A) \cdot P(B) = (0)(0.25) = 0$

$$A = 1^{\text{st}} \text{ is green} \quad P(A) = \frac{0}{20} = 0 \quad P(B) = \frac{5}{20} = 0.25$$

$$B = 2^{\text{nd}} \text{ is blue}$$

22. Suppose you have seven CDs in a box. Four are rock, one is jazz, and two are country. Today you choose one CD without looking, play it, and put it back in the box. Tomorrow, you do the same thing. What is the probability that you choose a country CD both days?

$$A = 1^{\text{st}} \text{ is country} \quad P(A) = \frac{2}{7} = 0.286$$

$$B = 2^{\text{nd}} \text{ is country} \quad P(B) = \frac{2}{7} = 0.286$$

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

$$= (0.286)(0.286)$$

$$= 0.0816$$



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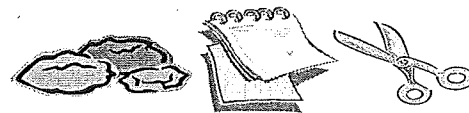
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Notes & Examples (Day 1)

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Rock-Paper-Scissors activity

- Play 18 rounds of the game, keeping track of the results for each round in the table below.



Mark R, S, or P for each player, and circle the winning letter.

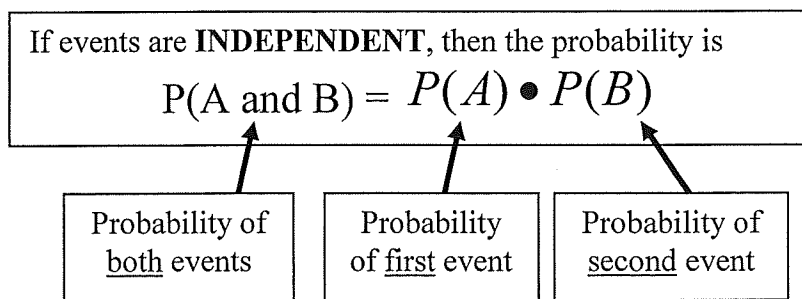
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A																		
B																		

- Change in the rules..... This time you cannot play the same thing twice
Mark R, S, or P for each player, and circle the winning letter.

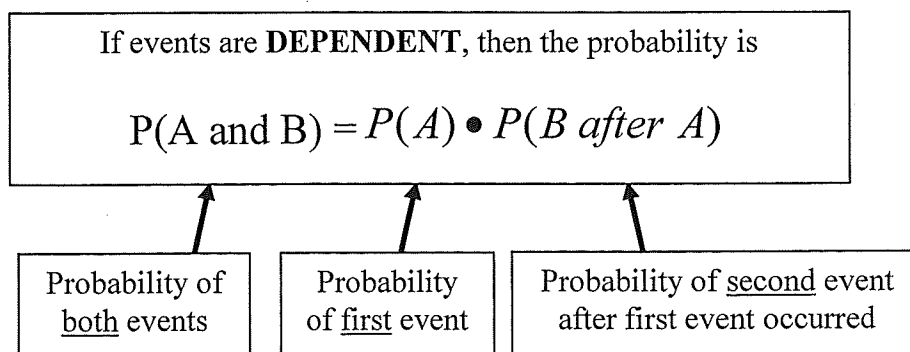
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A																		
B																		

Two events are INDEPENDENT if _____

Example: _____

Two events are DEPENDENT if _____

Example: _____



Example 1: Is each pair of events dependent or independent?

- a. Kathi draws a 4 from a set of cards numbered 1–10 and rolls a 2 on a number cube.

INDEPENDENT DEPENDENT

- b. Mary chooses a game piece from a board game, and then Jason chooses a game piece from three remaining pieces.

INDEPENDENT DEPENDENT

- c. Yuki chooses a book from the shelf to read, and then Janette chooses a book from the books that remain.

INDEPENDENT DEPENDENT

Example 2: Events A, B, and C are independent, and $P(A) = 0.4$, $P(B) = 0.3$, and the $P(C) = 0.15$. Find the probability of each combination of events.

- a. $P(A \text{ and } B)$

- b. $P(A \text{ and } B \text{ and } C)$

Example 3: At a picnic there are 10 diet drinks and 5 regular drinks. There are also 8 bags of fat-free chips and 12 bags of regular chips. If you grab a drink and a bag of chips without looking, what is the probability that you get a diet drink and fat-free chips?

Event A = _____ Event B = _____

A and B are _____ events.

$P(A \text{ and } B) =$ _____

Example 4: A bag contains 6 red marbles, 4 blue, and 5 green marbles. A marble is picked at random and is replaced. Then a second marble is picked at random. Find each probability.

- a. Both are green

- b. Neither is red

- c. If the first marble is not replaced, what would be the probability that both are green?



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Name: _____

Assignment: Lesson 11.3 worksheet #1

Date: _____ Hour: _____

Give all probabilities as simplified fractions and percents rounded to the nearest tenth of percent.

Events D, E, F, and G are independent, and $P(D) = 0.2$, $P(E) = 0.1$, $P(F) = 0.4$, and the $P(G) = 0.25$. Find the probability of each combination of events.

1. $P(D \text{ and } E)$ _____

2. $P(D \text{ and } G)$ _____

3. $P(E \text{ and } F)$ _____

4. $P(D \text{ and } E \text{ and } F)$ _____

A bag contains 3 white marbles, 2 red marbles, and 7 blue marbles. A marble is picked at random and is replaced. Then a second marble is picked at random. Find each probability.

5. Both marbles are blue. _____

6. The first marble is white and the second marble is red. _____

7. Neither marble is red. _____

8. The first marble is white and the second marble is not white. _____

A number cube is rolled twice. On each roll, the number on the top face is recorded. Find the probability of each event.

9. The first number is greater than 5 and the second is less than 3. _____

10. Both numbers are greater than 4. _____

11. The first number is even and the second number is odd. _____

A number cube is rolled, and two coins are tossed. Find the probability of each event.

12. The number on the cube is 2 and both coins are heads. _____

13. The number on the cube is even, one coin shows heads, and one shows tails. _____

14. The number on the cube is greater than 2 and the coins show different sides. _____

A box contains 5 purple marbles, 3 green marbles, and 2 orange marbles. Two consecutive draws are made from the box without replacement of the first draw. Find the probability of each event.

15. purple first, orange second _____

16. green first, purple second _____

17. orange first, orange second _____

18. purple first, blue second _____

19. purple first, purple second _____

A bag contains 6 red chips, 9 white chips, and 5 blue chips. A chip is selected at random and then replaced. Then a second chip is selected. Find the probability of each event.

20. The first chip is not red and the second chip is not white. _____

21. The first chip is green and the second chip is blue. _____

22. Suppose you have seven CDs in a box. Four are rock, one is jazz, and two are country. Today you choose one CD without looking, play it, and put it back in the box. Tomorrow, you do the same thing. What is the probability that you choose a country CD both days?