ame: _____ Date: _____ Period: _____

CCGPS Analytic Geometry
Notes: Compound Probability & Dependent Events
Homework: Compound Probability Worksheet

Essential Question: How do you determine the probability of conditional events?

We have discussed **mutually exclusive** versus **overlapping events**. We have also discussed **independent events**. Sometimes with determining the probability of more than one event it is necessary to first determine if the events are **independent** or **dependent** upon each other.
Remember: Events are **independent** when the outcome of one event does not affect the outcome of the second (or subsequent) events, such as rolling a 6-sided die and getting first 5 and then 2. Events are **dependent** when the outcome of the first event affects the probability of the second event, such as drawing a marble from a bag and then drawing another without returning the first marble to the bag.

Example 1: Determine whether the following events are independent or dependent.

a. Flipping a coin for heads and spinning a game spinner for $500.

b. Drawing a spade from a deck, keeping it, then drawing a heart from the deck.

The probability of two independent events both happening can be found by multiplying the probabilities of each event happening.

P (A and B) = _____ * _____

The probability of two dependent events both happening can be found by multiplying the probability of the first event happening times the probability of the second event happening **after the first event occurs**. Can you think of a situation where the second event would be dependent upon the first event?

P (A and B) = _____ * _____

Another method of writing this notation: **P(A) * P(B | A).**

This reads, "The probability of event A multiplied by the probability of event B given that event A has occurred." **Conditional Probabilty** is represented by the notation:
P(A | B) – the probability that event A will occur given that event B has occurred.
P(B | A) – the probability that event B will occur given that event A has occurred.

Example 2: Twice, you roll a die with sides numbered 1 to 10. Find the probability that ...

a. ... you roll 5, then 7.

b. ... you roll an even, then an odd.

Are these events independent or dependent? Explain.

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CCGPS Analytic Geometry
Worksheet: Compound Probability

1. Determine if the following events are independent or dependent.
   a) Throwing a 4 with one die and a 6 with another.
   b) Picking a 7 from a deck of cards, keeping it, and then picking a jack.
   c) Flipping a tail with a coin and rolling a 4 with a die.
   d) Drawing a spade and drawing a heart from the same deck without replacing the first card.
   e) Picking two black marbles from a bag of black and white marbles after replacing the first one.
   f) Flipping tails with a coin and then flipping it heads.

2. Two letters are chosen, without replacement, at random from the English alphabet. If "Y" is considered to be a consonant, find the probability that ...
   a) ... both are vowels
   b) ... both are consonants.

3. A bag contains 4 white, 3 blue, and 6 red marbles. A marble is drawn from the bag, replaced, and another marble is drawn. Find the indicated probability.
   a) P (both are red)
   b) P (both are blue)
   c) P (red, then blue)
   d) P (neither is red)

4. A box has 3 hockey and 6 football cards.
   a) What is the probability of selecting a hockey card, keeping it, and then selecting another hockey card?
   b) What is the probability of selecting a hockey card, keeping it, and then selecting a football card?

5. A player rolls a pair of 6-sided dice.
   a) What is the probability of throwing two even values?
   b) What is the probability of throwing a sum of 10?

6. A card is chosen from a deck of 52. Find...
   a) P (a 4 or a diamond)
   b) P (a face card or a club)
   c) P (a black card or a red card)
   d) P (a black card or a card with a number)

ne _____Date_____Period_____

CGPS Analytic Geometry
Homework Worksheet: Steelers Vs. Packers

Complete the contingency table and use it to answer the following questions.

	Steelers	Packers	Subtotal
Male	40	50	
Female	35	25	
Subtotal			

1. P(Steelers) =

2. P(Female) =

3. P(Steelers and Female) =

4. Are 'Steelers' and 'Female' mutually exclusive? Explain.

5. P(Steelers or Female) =

6. P(Steelers | Female) =

7. P(Female | Steelers) =

8. Are 'Steelers' and 'Female' independent? Explain.

The strict definition of $P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)}$.

9. P(Steelers and Male) =

10. P(Male) =

11. Using the definition above, P(Steelers | Male) =

12. Using the contingency table, P(Steelers | Male) =

13. If P(Male | Steelers) = _____ and P(Male and Steelers) = _____,

then P(Steelers) = _____

Hint: Solve $P(Male \mid Steelers) = \frac{P(Male \text{ and } Steelers)}{P(Steelers)}$ **for P(Steelers).**

Name: _____ Date: _____ Period: _____ key

CCGPS Analytic Geometry
Notes: Compound Probability & Dependent Events
Homework: Compound Probability Worksheet

Mon-Wed 3/30-4/1

Essential Question: How do you determine the probability of conditional events?

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Example 1: Determine whether the following events are independent or dependent.

a. Flipping a coin for heads and spinning a game spinner for $500.

independent

b. Drawing a spade from a deck, keeping it, then drawing a heart from the deck.

dependent

The probability of two independent events both happening can be found by multiplying the probabilities of each event happening.

P (A and B) = $P(A) * P(B)$

The probability of two dependent events both happening can be found by multiplying the probability of the first event happening times the probability of the second event happening **after the first event occurs**. Can you think of a situation where the second event would be dependent upon the first event?

P (A and B) = $P(A) * P(B|A)$

Another method of writing this notation: **P(A) * P(B | A).**

This reads, "The probability of event A multiplied by the probability of event B given that event A has occurred." **Conditional Probabilty** is represented by the notation:
P(A | B) – the probability that event A will occur given that event B has occurred.
P(B | A) – the probability that event B will occur given that event A has occurred.

Example 2: Twice, you roll a die with sides numbered 1 to 10. Find the probability that ...

a. ... you roll 5, then 7.

$\frac{1}{10} \cdot \frac{1}{10}$ $\frac{1}{100}$

b. ... you roll an even, then an odd.

$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

Are these events independent or dependent? Explain.

independent

Name: _____ **Date:** _____ **Period:** ____

CCGPS Analytic Geometry
Worksheet: Compound Probability

1. Determine if the following events are independent or dependent. (I) (D)
   a) Throwing a 4 with one die and a 6 with another.
   independent
   b) Picking a 7 from a deck of cards, keeping it, and then picking a jack.
   Dependent
   c) Flipping a tail with a coin and rolling a 4 with a die.
   I
   d) Drawing a spade and drawing a heart from the same deck without replacing the first card.
   D
   e) Picking two black marbles from a bag of black and white marbles after replacing the first one.
   I
   f) Flipping tails with a coin and then flipping it heads.
   I

2. Two letters are chosen, without replacement, at random from the English alphabet. If "Y" is considered to be a consonant, find the probability that ... AEIOU 5 vowels, 26 letters
   a) ... both are vowels
   $\frac{5}{26} \cdot \frac{4}{25}$
   b) ... both are consonants.
   $\frac{21}{26} \cdot \frac{20}{25}$

3. A bag contains 4 white, 3 blue, and 6 red marbles. A marble is drawn from the bag, replaced, and another marble is drawn. Find the indicated probability. 13 total
   a) P (both are red)
   $\frac{6}{13} \cdot \frac{6}{13}$
   b) P (both are blue)
   $\frac{3}{13} \cdot \frac{3}{13}$
   c) P (red, then blue)
   $\frac{6}{13} \cdot \frac{3}{13}$
   d) P (neither is red)
   $\frac{7}{13} \cdot \frac{7}{13}$

4. A box has 3 hockey and 6 football cards. total: 9
   a) What is the probability of selecting a hockey card, keeping it, and then selecting another hockey card?
   $\frac{3}{9} \cdot \frac{2}{8}$
   b) What is the probability of selecting a hockey card, keeping it, and then selecting a football card?
   $\frac{3}{9} \cdot \frac{6}{8}$

5. A player rolls a pair of 6-sided dice. Indep.
   a) What is the probability of throwing two even values?
   $\frac{1}{2} \cdot \frac{1}{2}$
   b) What is the probability of throwing a sum of 10? 36 possibilities
   $\frac{4}{36}$
   4,6 5,5 6,4 5,5

6. A card is chosen from a deck of 52. Find...
   a) P (a 4 or a diamond)
   $\frac{4}{52} + \frac{13}{52} - \frac{1}{52}$
   b) P (a face card or a club)
   $\frac{12}{52} + \frac{13}{52} - \frac{3}{52}$
   c) P (a black card or a red card)
   $\frac{26}{52} + \frac{26}{52}$
   d) P (a black card or a card with a number)
   $\frac{26}{52} + \frac{40}{52} - \frac{20}{52}$

ame Key Date Period

Integrated Advanced Algebra
Worksheet: Steelers Vs. Packers

Complete the contingency table and use it to answer the following questions.

	Steelers	Packers	Subtotal
Male	40	50	90
Female	35	25	60
Subtotal	75	75	150

1. P(Steelers) = 75/150 = 1/2

2. P(Female) = 60/150 = 2/5

3. P(Steelers and Female) = Look at table: 35/150 = 7/30
Assume Dependence: Using P(st) * P(fml | st)
= 75/150 *35/75 = 35/150 = 7/30

4. Are 'Steelers' and 'Female' mutually exclusive? Explain.
No, Females can prefer the Steelers.

5. P(Steelers or Female) = (75 + 60 – 35)/150 = 100/150 = 2/3

6. P(Steelers | Female) = 35/60 = 7/12

7. P(Female | Steelers) = 35/75 = 7/15

8. Are 'Steelers' and 'Female' independent? Explain.
No, #1 is not equal to #6 and #2 is not equal to #7. NOTE: Only one has to be unequal.

The strict definition of $P(A \mid B) = \frac{P(A \text{ and } B)}{P(B)}$.

9. P(Steelers and Male) = 40/150 = 4/15

10. P(Male) = 90/150 = 3/5

11. Using the definition above, P(Steelers | Male) = $\frac{4/15}{3/5} = 20/45 = 4/9$

12. Using the contingency table, P(Steelers | Male) = 4/9

13. If P(Male | Steelers) = 40/75 and P(Male and Steelers) = 40/150,

then P(Steelers) = 40/75 = (40/150)/P(Steelers)
40/150 * 75/40 = P(Steelers) = $\frac{1}{2}$

$\frac{40}{75} = \frac{\frac{40}{150}}{P(S)}$