

CCGPS Geometry

Unit 10 – Probability

10.2 – Practice

Name: _____ Date: _____

Mutually Exclusive Practice

Determine if the following events are mutually exclusive or overlapping.

- _____ 1. The experiment is rolling a die.
The 1st event: the number is greater than 3
The 2nd event: the number is even.

- _____ 2. The experiment is year in school.
The 1st event: the person is a senior.
The 2nd event: the person is a junior.

- _____ 3. The experiment is answering multiple choice questions.
The 1st event: the correct answer is chosen
The 2nd event: the answer A is chosen.

- _____ 4. The experiment is selecting a chocolate bar.
The 1st event: the bar has nuts
The 2nd event: the bar has caramel.

- _____ 5. One card is randomly drawn from a deck of 52 cards. The card is face down on the table. What is the probability of getting a Jack or a Spade?

Use the general addition rule to compute the probability that if you roll two six-sided dice.

$\frac{2}{9}$ _____ 6. you get doubles or a sum of 4

$$\frac{6}{36} + \frac{3}{36} - \frac{1}{36} = \frac{8}{36} = \frac{2}{9}$$

_____ 7. you get doubles or a sum of 7

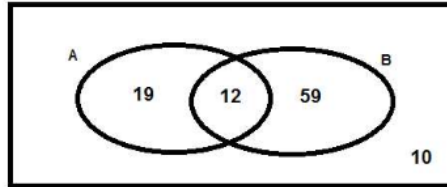
1	2	3	4	5	6
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10
6	7	8	9	10	11

$\frac{11}{36}$ _____ 8. you get a 5 on the first die or you get a 5 on the second die.

$$\frac{6}{36} + \frac{6}{36} - \frac{1}{36} = \frac{11}{36}$$

Use the Venn Diagram to answer the following questions.

- _____ 9. $P(A)$
- _____ 10. $P(B)$
- _____ 11. $P(B)'$
- _____ 12. $P(A \cup B)$
- _____ 13. $P(A \cap B)$

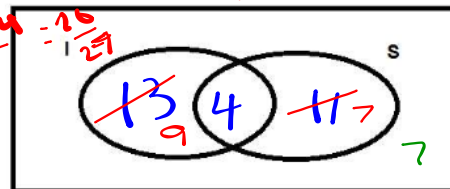


When you arrive home today, you find 27 cupcakes in a large circular plate. There are 13 that have icing 11 have sprinkles, and 4 have both.

- $\frac{13}{27}$ _____ 14. $P(I)$
- $\frac{11}{27}$ _____ 15. $P(S)$
- $\frac{20}{27}$ _____ 16. $P(I \cup S)$
- $\frac{4}{27}$ _____ 17. $P(I \cap S)$

$$P(I \cup S) = P(I) + P(S) - P(I \cap S)$$

$$\frac{13 + 11 - 4}{27} = \frac{20}{27}$$



$$9 + 4 + 7 = 20$$

Use the data below to find each of the following probabilities.

Coollest Deals Sold at Ike's

Topping choice	Ice cream choice			
	Vanilla	Chocolate	Cookie dough	Mint chip
Sprinkles	9	12	16	14
Hot fudge	11	4	16	15
Caramel	10	12	18	15

- _____ 18. $P(\text{Chocolate})$
- _____ 19. $P(\text{Chocolate})'$
- _____ 20. $P(\text{Sprinkles} \cap \text{Cookie Dough})$
- _____ 21. $P(\text{Caramel} \cup \text{Vanilla})$

Good morning!

1. "Here"
2. Notes on Conditional Probability
3. Upload practice to CTLS
4. Quiz tomorrow:)

Conditional Probability

In order....., it ~~has~~
If _____, then _____.

Conditional
If... Given...
Out of... Of...

Definition:

The probability that A occurs given that B occurs is called the conditional probability of "A given B" and is written $P(A | B)$

— \rightarrow denominator

Examples of Conditional Scenarios

- What is the probability that someone is in the Harrison band if you know the person is a freshman?

B and H Freshmen# freshmen

- What is the probability of drawing an ace in a game of go fish if you know that you already have two of them?

Aces in deck# Aces from 2

- What is the probability of drawing a Queen if you know that it is a face card?

Queens# face



1

~~10,016~~ total people
16 band members
10k crowd

How many people have hats? (Probability)

10,016

Out of all band, probability of having hat? 16



The "Lawyers and Liars" Scenario

- ✓ There are 100 people at a party.
- ✓ Forty are liars.
- ✓ Twenty-five are lawyers.
- ✓ 15 of the lawyers are liars.

	liar	not liar	
lawyer	15	10	25
not lawyer	25	50	75
	40	60	100

A non-conditional Scenario: What is the probability that you randomly pick a lawyer?

$$\frac{25}{100} \quad \frac{\text{lawyer}}{\text{total}}$$

The "Lawyers and Liars" Scenario

- There are 100 people at a party.
- Forty are liars.
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- 15 of the lawyers are liars.

	liar	not liar	
lawyer	15	10	25
not lawyer	25	50	75
	40	60	100

A Conditional Scenario: What is the probability that you pick a liar if you know that the person you are talking to is a lawyer?

$$\frac{15}{25} = \frac{\text{liar} \cap \text{lawyer}}{\text{lawyer}} = \frac{3}{5} = \boxed{.6}$$

$$\frac{15}{100} \cdot \frac{100}{25} = \frac{15}{25}$$

A Formula and How to Use it.

- There are 100 people at a party.
- Forty are liars.
- Twenty-five are lawyers.
- 15 of the lawyers are liars.

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$P(\text{liar} | \text{lawyer}) = \frac{P(\text{liar} \cap \text{lawyer})}{P(\text{lawyer})}$$

A Conditional Scenario: What is the probability that you pick a liar if you know that the person you are talking to is a lawyer?

$$= \frac{15/100}{25/100}$$

$$= \frac{3}{5} = .6$$

Using the formula

Determine $P(B|A)$ using the following data:

$$\checkmark P(A) = .54$$

$$~~P(B) = .3~~$$

$$\checkmark P(A \cap B) = .216$$

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

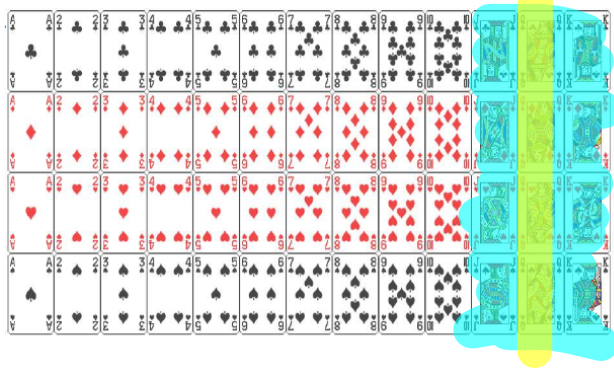
$$= \frac{.216}{.54}$$

$$P(B|A) = .4$$

What is the probability of drawing a Queen if you know that it is a face card?

face cards

$$\frac{4}{12} = \frac{1}{3} = .\overline{33}$$



In a class of students, the following data table summarizes how many students passed a test and complete the homework due the day of the test. What is the probability that a student completed the homework given that they passed the test?

$$\frac{15}{19} = .79$$

	Passed Test	Failed Test	
Completed HW	15	3	18
Did not Complete HW	4	6	10
	19	9	28

More Conditional From a table

The following table shows data collected about new born babies. What is the probability of picking a baby with brown eyes if you know the baby has a slow heart rate?

	Slow heart rate (<100 bpm)	Fast heart rate (>100 bpm)	
Brown eyes	6	2	8
Blue eyes	4	8	12
	10	10	20

$$\frac{6}{10} = \frac{3}{5} = .6$$

More Conditional From a table

The following table shows data collected about new born babies. What is the probability of picking a baby with a fast heart rate if you know the baby has blue eyes?

	Slow heart rate (<100 bpm)	Fast heart rate (>100 bpm)	
Brown eyes	6	2	8
Blue eyes	4	8	12
	10	10	20

Handwritten calculations:

$$\frac{8}{12} = \frac{2}{3} = .67$$

Name: _____ Date: _____

The Conditional Probability from Tables

The frequencies of the marbles in a bag are shown in the table.

$\frac{20}{26} = \frac{10}{13}$ 1. Find P(small) *not conditional*
 $\frac{2}{6} = \frac{1}{3}$ 2. Find P(green | large)

	GREEN	BLUE	
LARGE	2	4	6
SMALL	8	12	20
	10	16	26

A town planning committee is considering a new system for public transit. Residents of the town were randomly selected to answer two questions: "Do you work less than 5 miles from home?" and "Would you use the new system to get to work, if it were available?" The results are shown in the table below.

		Work less than 5 miles from home?		
		YES	NO	
Use new system?	YES	24	32	56
	NO	44	20	68

$\frac{24}{68}$ 3. If residents work less than 5 miles from home, what is the probability that they would use the new system?
 $\frac{32}{56}$ 4. If residents are willing to use the new system, what is the probability that they don't work less than 5 miles from home?

The table shows the results of a poll of randomly selected high school students who were asked if they prefer to hear all school announcements in the morning or afternoon.

	Underclassmen	Upperclassmen
Morning	8	14
Afternoon	18	10

_____ 5. Find P(Morning | Underclassmen)
 _____ 6. Find P(Afternoon | Upperclassmen)

The table shows the results of a customer satisfaction survey for a cellular service provider, by location of the customer. In the survey, customers were asked whether they would recommend a plan with the provider to a friend.

116/150
40/58

_____ 7. Find P(Yes)

_____ 8. Find P(Yes | Arlington)

_____ 9. Are the 2 probabilities the same?

	Arlington	Towson	Parkville	
Yes	40	35	41	116
No	18	10	6	34
	58	45	47	150

Roberto is the owner of a car dealership. He is assessing the success rates of his top three sales people in order to offer one of them a promotion. Over two months, for each attempted sale, he records whether the sales person made a successful sale or not. The results are shown in the cart below.

_____ 10. Find P(Successful | Becky)

_____ 11. Find P(Unsuccessful | Darrell)

	Successful	Unsuccessful
Becky	6	6
Raul	4	5
Darrell	6	9

Mrs. Koehler surveyed 430 men and 200 women about their vehicles. Of those surveyed, 160 men and 85 women said they own a blue vehicle.

_____ 12. If a randomly chosen person is a man, what is the probability of that person having a blue car?

_____ 13. P(Blue)

_____ 14. P(Women | Not Blue)

_____ 15. P(Men ∩ Not Blue)

	Blue	Not Blue
Men		
Women		

Name: _____ Date: _____

Conditional Probability

A random survey was taken to gather information about grade level and car ownership status of students at a school. This table shows the results of the survey.

Car Ownership by Grade			
	Owns a Car	Does Not Own a Car	TOTAL
Junior	6	10	16
Senior	12	8	20
TOTAL	18	18	36

- _____ 1. Find the probability that a randomly selected student will be a junior, given that the student owns a car.

- _____ 2. Find the probability that a randomly selected student will own a car, given that the student is a senior.

The table below shows numbers of registered voters by age in the United States in 2004 based on the census. Find each probability in decimal form.

Age	Registered Voters (in thousands)	Not Registered to Vote (in thousands)
18–24	14,334	13,474
25–44	49,371	32,763
45–64	51,659	19,355
65 and over	26,706	8,033

- _____ 3. Find the probability that a randomly selected person is registered to vote, given that the person is between the ages of 18 and 24.

- _____ 4. Find the probability that a randomly selected person is not registered to vote, given that they are 65 and over.

- _____ 5. Find the probability that a randomly selected person is between the ages of 45 and 64 and is not registered to vote.

A faculty advisor at Ridge High School surveyed 100 students about their preference for a social event. Of the 100 students surveyed, 50 were tenth graders and 50 were eleventh graders. Of the tenth graders, 30 chose a bowling party and 20 chose a dance. Of the eleventh graders, 20 chose a bowling party and 30 chose a dance.

6. Make a two way frequency table to represent the data.

	Bowling (B)	Dance (D)	
10 th graders (T)			
11 th graders (E)			

- _____ 7. Find $P(B)$.

- _____ 8. Find $P(B|T)$.

- _____ 9. Do you think that the probability of liking bowling is dependent on whether a student is in the 10th or 11th grade?
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