

HW 12-5

1. Answers will vary. Justification requires a minimum of 2 appropriate probabilities being equal. This answer is using rows. The events are independent because the following probabilities are the same.

$$P(\text{NY vaca given watched ad}) = \frac{300}{750} = .4 \text{ and}$$

$$P(\text{NY vaca given not watched ad}) = \frac{100}{250} = .4 \text{ and}$$

$$P(\text{NY vaca out of the whole population}) = \frac{400}{1000} = .4.$$

2. If the events are not independent, then their probabilities are different. The probability of an 11th grader having a job is not 30%.
3. If the events are independent, then one event doesn't change the probability of the other. So, knowing a randomly selected dog weighs more than 30 pounds does not change the probability it is in good health. So, the probability is also 80%.

4. Justifications will vary. The data does not suggest gender and preferred music styles are independent because the following probabilities are not the same.

The probability a female prefers Techno is $\frac{54}{106} \approx .509$. $= P(T|F)$

The probability a male prefers Techno is $\frac{36}{94} \approx .383$. $= P(T|M)$

5. Explanations will vary. The events are independent because the following probabilities are the same.

$P(\text{Uses computer given in math class}) = \frac{420}{700} \approx .6 = P(C|M)$

$P(\text{Uses computer given not in math class}) = \frac{180}{300} \approx .6 = P(C|No M)$

6. Explanations will vary. The events are not independent because the following probabilities are not the same.

$P(\text{Participates in e-a's given one knows}) = \frac{550}{800} \approx .69$

$P(\text{Participates in e-a's given one does not know}) = \frac{50}{200} \approx .25$

Can use
any of these
 $P(X)$
 $P(X|Y)$
 $P(X|Z)$

Name Key

Alg 2 HW 12-5

1. The following hypothetical 1000 two-way table was introduced in the previous homework.

	Plan to Vacation in New York Within the Next Year	Do Not Plan to Vacation in New York Within the Next Year	Total
Watched the Online Ad	300	450	750
Did Not Watch the Online Ad	100	150	250
Total	400	600	1,000

Are the events a randomly selected person watched the online ad and a randomly selected person plans to vacation in New York within the next year independent or not independent? Justify your answer using probabilities calculated from the table.

use def 2

$$\left\{ \begin{array}{l} P(V|A) = \frac{300}{750} = .4 \\ P(V|\text{not } A) = \frac{100}{250} = .4 \\ P(V) = \frac{400}{1000} = .4 \end{array} \right\}$$

Same probabilities
So independent.

$$\begin{aligned} P(A|V) &= .75 \\ P(A) &= .75 \\ P(A|\text{not } V) &= .75 \end{aligned}$$

2. A survey conducted at a local high school indicated that 30% of students have a job during the school year. If having a job and being in the 11th grade are not independent, what do you know about the probability that a randomly selected student who is in the 11th grade would have a job? Explain your answer.

Not independent means they have different probabilities. The probability of an 11th grader having a job is not 30%

3. Eighty percent of the dogs at a local kennel are in good health. If the events a randomly selected dog at this kennel is in good health and a randomly selected dog at this kennel weighs more than 30 pounds are independent, what do you know about the probability that a randomly selected dog that weighs more than 30 pounds will be in good health? Explain your answer.

know

$$\left\{ \begin{array}{l} P(G) = .80 \\ P(G|W) = .80 \end{array} \right\}$$

Because the 2 events are independent their probabilities will be equal.

80%

#8 from Fall 2015 Sample Questions.

4. The results of a poll of 200 students are shown in the table below:

	Preferred Music Style			Total
	Techno T	Rap	Country	
Female F	54	25	27	106
Male not F	36	40	18	94
Total	90	65	45	200

For this group of students, does this data suggest that gender and preferred music styles are independent of each other? (Explain) your answer. Justifications will vary.

we only 2

$$\begin{aligned} P(T) &= \frac{90}{200} = .45 \\ P(T|F) &= \frac{54}{106} \approx .509 \\ P(T|M) &= \frac{36}{94} \approx .383 \end{aligned}$$

Probabilities are not equal. So, not independent.

5. Use probabilities from the completed frequency table below to determine whether the two events uses a computer at least 3 times a week for school work and is taking a mathematics class are independent or not independent. Explain your answer.

	Uses a Computer at Least 3 Times a Week for Schoolwork C	Does Not Use a Computer at Least 3 Times a Week for Schoolwork not C	Total
In a Mathematics Class m	420	280	700
Not in a Mathematics Class not m	200	120	320
Total	600	400	1,000

we only 2

$$\begin{aligned} P(C|m) &= \frac{420}{700} = .6 \\ P(C|not m) &= \frac{200}{320} = .625 \\ P(C) &= \frac{600}{1000} = .6 \end{aligned}$$

Probabilities are the same, so the 2 events are independent.

or

$$P(m) = \frac{700}{1000} = .7$$

$$P(m|C) = \frac{420}{600} = .7$$

6. Use probabilities from the completed frequency table below to determine whether the two events participates in extracurricular activities and know what I want to do after high school are independent or not independent. Explain your answer.

	Participates in Extracurricular Activities E	Does Not Participate in Extracurricular Activities not E	Total
Know What I Want to Do After High School A	550	250	800
Do Not Know What I Want to Do After High School not A	50	150	200
Total	600	400	1,000

only 2

$$\begin{aligned} P(E|A) &= \frac{550}{800} = .6875 \\ P(E|not A) &= \frac{50}{200} = .25 \\ P(E) &= \frac{600}{1000} = .6 \end{aligned}$$

Probabilities are different so, not independent.

Day 6 More Conditional Probability & Independence & Introduction to Venn DiagramsWarm-up:

If you know the probability that a randomly selected student from your school plans to attend a college or university after graduation, and you also know the probability that a randomly selected student from your school has a job, what would it mean for these two events to be independent?

These two events being independent means knowing that a student plans to attend a college doesn't influence another student having a job. One event does not affect the other.

NOTE: If 2 events are NOT independent, that does NOT mean they are dependent or that 1 causes the other. There may be many reasons why 2 events are not independent. Not independent \neq Dependent.

1. An automobile company has two factories assembling its cars. The company is interested in whether consumers rate cars produced at one factory more highly than cars produced at the other factory. Factory B assembles 55% of the cars. A recent survey indicated that 65% of the cars made by this company (both factories combined) were highly rated. This same survey indicated that 10% of all cars made by this company were both made at Factory A and were not highly rated.

- a. Create a hypothetical 1000 two-way table based on the results of this survey by filling in the table below.

	Car Was Highly Rated by Consumers	Car Was Not Highly Rated by Consumers	Total
Factory A	350	100	450
Factory B	300	250	550
Total	650	350	1000

- b. Are the events (of a car's rating by consumers and which factory it was produced at) independent events? Justify using conditional probabilities.

$$\left\{ \begin{array}{l} P(HR) = 650/1000 = .65 \\ P(HR|A) = 350/450 = .778 \\ P(HR|B) = 300/550 = .545 \end{array} \right.$$

$$\text{or } \begin{array}{l} P(A|HR) \\ P(A) \\ P(A|\text{Not } HR) \end{array}$$

Not Independent

2. Sean's team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are (From June 2016 Regents)

- (1) independent
- (2) dependent

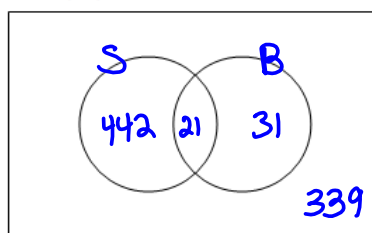
- (3) mutually exclusive
- (4) complements

$$\begin{aligned} P(R) &= 40\% \\ \cancel{P(P)} &= \cancel{50\%} \\ P(R|P) &= 40\% \end{aligned}$$

A Venn diagram represents mathematical or logical sets visually as circles or closed curves within an enclosing rectangle (the universal set), common elements of the sets being represented by the areas of overlap among the circles.

Warm-up:

- 442 students participate in organized Sports but do not play in the Band
- 31 students play in the band but do not participate in organized sports
- 21 students participate in organized sports and play in the band
- 339 students neither participate in organized sports nor play in the band



1. What does the outer rectangle represent?

Entire population

2. What do the S and B labels represent?

S = Students in sports
B = Students in Band

3. Why do the circles overlap and what does the overlapping part represent?

Bk some students do both (B ∩ S)

4. How many students participate in organized sports?

$$442 + 21 = 463$$

5. How many students play in the band?

$$31 + 21 = 52$$

6. How many students do not participate in organized sports?

$$339 + 31 = 370$$

7. How many students participate in organized sports or play in the band? Remember 'or' means sports or band or Both.)

$$442 + 21 + 31 = 494$$

8. How many students are in the high school?

$$494 + 339 = 833$$

QUIZ