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Date _____
Algebra II

Determining Independence

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

A=Male
B=Techno

	Preferred Music Style			Total
	Techno	Rap	Country	
Female	54	25	27	106
Male	36	40	18	94
Total	90	65	45	200

For this group of students, do these data suggest that gender and preferred music styles are independent of each other? Justify your answer.

Not Independent

$$P(A \cap B) = P(A) \cdot P(B)$$

$$\frac{36}{200} = \frac{94}{200} \cdot \frac{90}{200}$$

$$\frac{9}{50} = \frac{423}{2000} \quad \times$$

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

$$\frac{94}{200} = \frac{36}{90}$$

$$\frac{47}{100} = \frac{2}{5} \quad \times$$

Not Independent

2. At a local mall, 125 people were asked how they choose to pay for their merchandise. The data is shown in the table below:

	Credit Card	Cash	Total
Male	40	10	50
Female	60	15	75
Total	100	25	125

Does the data suggest that the gender and type of payment are independent of each other? Explain your answer.

A=Male
B=Credit card

$$P(A \cap B) = P(A) \cdot P(B)$$

$$\frac{40}{125} = \frac{50}{125} \cdot \frac{100}{125}$$

$$\frac{8}{25} = \frac{4}{25} \quad \checkmark$$

Independent

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

$$\frac{50}{125} = \frac{40}{100}$$

$$\frac{2}{5} = \frac{2}{5} \quad \checkmark$$

Independent

3. One-hundred employees of a company were asked their opinion on paying high salaries to the CEO. Their responses are summarized in the following contingency table.

A = male
B = In Favor

	In Favor	Against	Total
Male	15	45	60
Female	4	36	40
Total	19	81	100

Based on the data, are gender and opinion on salaries independent of each other? Justify your answer.

Not independent

$$P(A|B) = P(A) \cdot P(B)$$

$$\frac{15}{100} = \frac{60}{100} \cdot \frac{19}{100}$$

$$\frac{3}{20} = \frac{57}{500} \quad \times$$

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

$$\frac{60}{100} = \frac{15}{19}$$

$$\frac{3}{5} = \frac{15}{19} \quad \times$$

Not Independent

4. Juan and Felipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below.

	Juan Wins	Felipe Wins	Total
Short Practice Time	8	10	18
Long Practice Time	15	12	27
Total	23	22	45

A = Felipe Wins
B = long practice time

Given that the practice time was long, determine the exact probability that Felipe wins the next match. Determine whether or not the two events "Felipe wins" and "long practice time" are independent. Justify your answer.

Not Independent

$$P(A|B) = \frac{12}{27}$$

$$P(A|B) = P(A) \cdot P(B)$$

$$\frac{12}{27} = \frac{22}{45} \cdot \frac{27}{45}$$

$$\frac{4}{9} \neq \frac{22}{15}$$

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

$$\frac{22}{45} = \frac{12}{27}$$

$$\frac{22}{45} \neq \frac{4}{9}$$

Not Independent

5. The results of a survey of the student body at Central High School about television viewing preferences are shown below.

A = male
B = reality

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

Not Independent

$$P(A|B) = P(A) \cdot P(B)$$

$$\frac{70}{490} = \frac{230}{490} \cdot \frac{180}{490}$$

$$\frac{1}{7} \neq \frac{414}{2401}$$

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

$$\frac{230}{490} = \frac{70}{180}$$

$$\frac{23}{49} \neq \frac{7}{18}$$

Not Independent

6. The following table represents the food preferences of students in a high school. Are the events "a student prefers chicken nuggets" and "a student is in 10th grade" independent of each other? Justify your answer.

	Pizza	Chicken Nuggets	Cheeseburger	total
9 th	112	87	93	292
10 th	140	52	43	235
11 th	100	82	71	253
12 th	119	102	72	293
total	471	323	279	1073

$$P(A \cap B) \neq P(A) \cdot P(B)$$

$$\frac{52}{1073} \neq \frac{323}{1073} \cdot \frac{235}{1073}$$

Not Independent

7. The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses. Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

	Wear Glasses	Don't Wear Glasses	
Blue Eyes	0.14	0.26	.4
Brown Eyes	0.11	0.24	.35
Green Eyes	0.10	0.15	.25
	.35	.65	1

$$P(A \cap B) = P(A) \cdot P(B)$$

$$\frac{.14}{1} = \frac{.4}{1} \cdot \frac{.35}{1}$$

$$.14 = .14$$

Independent

8. A study was done at West Apple High School analyzing the student lateness and Regents Exam results. It was found that 32% of the students arrive to school late and 72% pass their Regents Exams. 14% of the students arrive late and pass their Regents Exams. Are the events "student is late" and "student passes Regents Exams" independent of each other? Justify your answer.

	Late	Not Late	
pass	14	58	72
not pass	18	10	28
	32	68	100

$$P(A \cap B) \neq P(A) \cdot P(B)$$

$$\frac{14}{100} \neq \frac{32}{100} \cdot \frac{72}{100}$$

$$\frac{7}{50} \neq \frac{144}{625}$$

Not Independent