S.CP.A.4: Conditional Probability

1 Consider the data in the table below.

	Right Handed	Left Handed
Male	87	13
Female	89	11

What is the probability that a randomly selected person is male given the person is left handed?

1) $\dfrac{13}{200}$

2) $\dfrac{13}{100}$

3) $\dfrac{13}{50}$

4) $\dfrac{13}{24}$

2 The table below shows the food preferences of sports fans whose favorite sport is football or baseball.

Favorite Food to Eat While Watching Sports

	Wings	Pizza	Hot Dogs
Football	14	20	6
Baseball	6	12	42

The probability that a fan prefers pizza given that the fan prefers football is

1) $\dfrac{1}{2}$

2) $\dfrac{1}{5}$

3) $\dfrac{5}{8}$

4) $\dfrac{13}{25}$

3   The set of data in the table below shows the results of a survey on the number of messages that people of different ages text on their cell phones each month.

Text Messages per Month			
Age Group	0-10	11-50	Over 50
15-18	4	37	68
19-22	6	25	87
23-60	25	47	157

If a person from this survey is selected at random, what is the probability that the person texts over 50 messages per month given that the person is between the ages of 23 and 60?

1) $\dfrac{157}{229}$

2) $\dfrac{157}{312}$

3) $\dfrac{157}{384}$

4) $\dfrac{157}{456}$

4   A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program			
	Sports	Reality Show	Comedy Series
Senior	83	110	67
Freshmen	119	103	54

A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

5   Data collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	**One Sibling Jogs**	**Both Siblings Jog**
Student Does Not Jog	1168	1823	1380
Student Jogs	188	416	400

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer.

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

	Preferred Music Style		
	Techno	Rap	Country
Female	54	25	27
Male	36	40	18

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

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

	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.

8   Juan and Filipe 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
Short Practice Time	8	10
Long Practice Time	15	12

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

9   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.

	Wear Glasses	Don't Wear Glasses
Blue Eyes	0.14	0.26
Brown Eyes	0.11	0.24
Green Eyes	0.10	0.15

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

10   The table below shows the results of gender and music preference. Based on these data, determine if the events "the person is female" and "the person prefers classic rock" are independent of each other. Justify your answer.

	Rap	Techno	Classic Rock	Classical
Male	39	17	42	12
Female	17	37	36	15

11   A public radio station held a fund-raiser. The table below summarizes the donor category and method of donation.

		Donor Category	
		Supporter	Patron
Method of Donation	Phone calls	400	672
	Online	1200	2016

To the *nearest thousandth*, find the probability that a randomly selected donor was categorized as a supporter, given that the donation was made online. Do these data indicate that being a supporter is independent of donating online? Justify your answer.

12   A researcher wants to determine if nut allergies and milk allergies are related to each other. The researcher surveyed 1500 people and asked them if they are allergic to nuts or milk. The survey results are summarized in the table below.

	Allergic to Nuts	Not Allergic to Nuts
Allergic to Milk	3	42
Not Allergic to Milk	12	1443

Determine the probability that a randomly selected survey respondent is allergic to milk. Determine the probability that a randomly selected survey respondent is allergic to milk, given that the person is allergic to nuts. Based on the survey data, determine whether nut allergies and milk allergies are independent events. Justify your answer.

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Answer Section

1 ANS: 4

$$\frac{13}{13+11} = \frac{13}{24}$$

   REF: 012011aii

2 ANS: 1

$$\frac{20}{14+20+6} = \frac{1}{2}$$

   REF: 082303aii

3 ANS: 1

$$\frac{157}{25+47+157}$$

   REF: 081607aii

4 ANS:

$$\frac{103}{110+103} = \frac{103}{213}$$

   REF: 061825aii

5 ANS:

A student is more likely to jog if both siblings jog. 1 jogs: $\frac{416}{2239} \approx 0.19$. both jog: $\frac{400}{1780} \approx 0.22$

   REF: 061732aii

6 ANS:

Based on these data, the two events do not appear to be independent. $P(F) = \frac{106}{200} = 0.53$, while

$P(F|T) = \frac{54}{90} = 0.6$, $P(F|R) = \frac{25}{65} = 0.39$, and $P(F|C) = \frac{27}{45} = 0.6$. The probability of being female are not the same as the conditional probabilities. This suggests that the events are not independent.

   REF: fall1508aii

7 ANS:

No, because $P(M / R) \neq P(M)$

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

$$0.38 \neq 0.47$$

   REF: 011731aii

8 ANS:

$P(F|L) = \dfrac{12}{27}$ $P(F) = \dfrac{22}{45}$ Since $P(F|L) \neq P(F)$, the events are not independent.

REF: 061936aii

9 ANS:

Yes. $P(\text{Bl}) = P(\text{Bl}|\text{Gl})$

$$0.14 + 0.26 = \dfrac{.14}{.35}$$

$$.4 = .4$$

REF: 062229aii

10 ANS:

No, because $P(F/CR) \neq P(F)$

$$\dfrac{36}{42+36} \neq \dfrac{17+37+36+15}{39+17+42+12+17+37+36+15}$$

$$\dfrac{36}{78} \neq \dfrac{105}{215}$$

$$\dfrac{6}{13} \neq \dfrac{21}{43}$$

REF: 082231aii

11 ANS:

$\dfrac{1200}{1200+2016} \approx .373.$ Yes, because $\dfrac{1600}{4288} \approx .373$ also.

REF: 062334aii

12 ANS:

$\dfrac{3+42}{1500} = 3\%$ $\dfrac{3}{3+12} = 20\%$ No, because a person is more likely to be allergic milk if he is also allergic to nuts.

REF: 012433aii