11.5.1: Independent Events (Exercises)

SECTION 11.5 PROBLEM SET: INDEPENDENT EVENTS

The distribution of the number of fiction and non-fiction books checked out at a city's main library and at a smaller branch on a given day is as follows.

	MAIN (M)	BRANCH (B)	TOTAL
FICTION (F)	300	100	400
NON-FICTION (N)	150	50	200
TOTALS	450	150	600

Use this table to determine the following probabilities:

1. $P(F)$	2. $P(M\|F)$
3. $P(N\|B)$	4. Is the fact that a person checks out a fiction book independent of the main library? Use probabilities to justify your conclusion.

For a two-child family, let the events E, F, and G be as follows.

E: The family has at least one boy
F: The family has children of both sexes
G: The family's first born is a boy

5. Find the following. a. $P(E)$ b. $P(F)$ c. $P(E \cap F)$ d. Are E and F independent? Use probabilities to justify your conclusion.	6. Find the following. a. $P(F)$ b. $P(G)$ c. $P(F \cap G)$ d. Are F and G independent? Use probabilities to justify your conclusion.

Do the following problems involving independence.

7. If $P(E) = .6$, $P(F) = .2$, and E and F are independent, find $P(E$ and $F)$.	8. If $P(E) = .6$, $P(F) = .2$, and E and F are independent, find $P(E$ or $F)$.
9. If $P(E) = .9$, $P(F\|E) = .36$, and E and F are independent, find $P(F)$.	10. If $P(E) = .6$, $P(E$ or $F)$ = .8, and E and F are independent, find $P(F)$.
11. In a survey of 100 people, 40 were casual drinkers, and 60 did not drink. Of the ones who drank, 6 had minor headaches. Of the non-drinkers, 9 had minor headaches. Are the events "drinkers" and "had headaches" independent?	12. It is known that 80% of the people wear seat belts, and 5% of the people quit smoking last year. If 4% of the people who wear seat belts quit smoking, are the events, wearing a seat belt and quitting smoking, independent?
13. John's probability of passing statistics is 40%, and Linda's probability of passing the same course is 70%. If the two events are independent, find the following probabilities. a. $P($ both of them will pass statistics$)$ b. $P($at least one of them will pass statistics$)$	14. Jane is flying home for the Christmas holidays. She has to change planes twice. There is an 80% chance that she will make the first connection, and a 90% chance that she will make the second connection. If the two events are independent, find the probabilities: a. $P($ Jane will make both connections$)$ b. $P($Jane will make at least one connection$)$

For a three-child family, let the events E, F, and G be as follows.

E: The family has at least one boy
F: The family has children of both sexes
G: The family's first born is a boy

15. Find the following. a. $P(E)$ b. $P(F)$ c. $P(E \cap F)$ d. Are E and F independent?	16. Find the following. a. $P(F)$ b. $P(G)$ c. $P(F \cap G)$ d. Are F and G independent?

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17. $P(K\|D) = 0.7$, $P(D) = 0.25$ and $P(K) = 0.7$ a. Are events K and D independent? Use probabilities to justify your conclusion. b. Find $P(K \cap D)$	18. $P(R\|S) = 0.4$, $P(S) = 0.2$ and $P(R) = 0.3$ a. Are events R and S independent? Use probabilities to justify your conclusion. b. Find $P(R \cap S)$
19. At a college: 54% of students are female 25% of students are majoring in engineering. 15% of female students are majoring in engineering. Event E = student is majoring in engineering Event F = student is female a. Are events E and F independent? Use probabilities to justify your conclusion. b. Find $P(E \cap F)$	20. At a college: 54% of all students are female 60% of all students receive financial aid. 60% of female students receive financial aid. Event A = student receives financial aid Event F = student is female a. Are events A and F independent? Use probabilities to justify your conclusion. b. Find $P(A \cap F)$