Math 207
Introduction to Statistics

Warmup Exercises: Independence

Multiplication Rule:

- $P(A \text{ and } B) = P(A)\,P(B \mid A)$.
- If A and B are independent, then $P(A \text{ and } B) = P(A)\,P(B)$.

Events A and B are independent if and only if $P(B|A) = P(B)$. This is true if and only if $P(B|A) = P(B)$. In other words, knowing A doesn't change the chance of B; knowing B doesn't change the chance of A.

1. Sets of paper tickets are shown below. Each ticket has a number on the left and a shape on the right. For each set of tickets, Determine if number and shape are independent or dependent.

a) 1△ 1□ 1□ 1★ 5△ 5□ 5□ 5★

b) 1△ 1□ 1□ 1★ 5△ 5□ 5★ 5★

c) 1△ 1□ 1★ 1○ 5△ 5□ 5★ 5○

d) 9△ 9△ 9△ 9△ 3□ 3□ 3□ 3□

2. Referring to the polio vaccine trials, are the events A and B independent or dependent?

a) A = a randomly selected subject is from a high-income family
B = a randomly selected subject will get polio

b) A = a randomly selected subject is from a high-income family
B = the parents of the randomly selected subject will consent to their child getting the vaccine

c) A = a randomly selected subject will be diagnosed with polio
B = the medical examiner will know that the patient received the vaccine

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3. Are the two events independent or dependent.

a) A = it will snow on 21 December
B = the high temp on 21 December will be 31° F

b) A = it will snow on 21 December
B = 21 December will be a Saturday

c) A = it will snow on 21 December
B = the next coin flip will be tails

4. Are the two events independent or dependent.

a) A = first card drawn will be a ♡
B = first card drawn will be a 10

b) A = first card drawn will be a face card
B = first card drawn will be a king

c) A = first card drawn will be a ♣
B = second card drawn will be a ♣

d) A = first card drawn will be a ♣
B = second card drawn will be a ♢

Solutions: 1.a) independent; b) dependent; c) independent; d) dependent. 2. all are dependent.
3.a) dependent; b) independent; c) independent 4.a) independent; b) dependent; c) dependent; d) dependent

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