31-1

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I roll a fair die twice and obtain two numbers: X_1 = result of the first roll, X_2 = result of the second roll.

Problem a

(a) *Find the probability that $X_2 = 4$.*

First, we count up the outcomes in favor. If $X_2 = 4$, X_1 can equal any number. So the number of outcomes in favor for a fair die would be 6. Then divide it by the total number of outcomes.

$$p(X_2 = 4) = \frac{6}{36} = \frac{1}{6}$$

(b) *Find the probability that $X_1 + X_2 = 7$.*

Possibilities in favor are all combinations of X_1 and X_2 that equal 7, which is 6 total combinations.

$$p(X_1 + X_2 = 7) = \frac{6}{36} = \frac{1}{6}$$

(c) *Find the probability that $X_1 \neq X_2$ and $X_2 \geq 4$.*

Possibilities in favor are any combination of X_1 and X_2 where X_2 is greater than or equal to 4, and it isn't the same number as X_1. This gives a total of 15 different possibilities.

$$p(X_1 \neq X_2 and X_2 \geq 4) = \frac{15}{36} = \frac{5}{12}$$

Problem b

Let A and B be two events such that

$$P(A) = 0.4, P(B) = 0.7, P(A \cup B) = 0.9$$

(a) *Find $P(A \cap B)$*

$$P(A \cap B) = 0.2$$

(b) *Find* $P(A^c \cap B)$

$$P(A^c \cap B) = 0.5$$

(c) *Find* $P(A - B)$

$$P(A - B) = 0.2$$

(d) *Find* $P(A^c - B)$

$$P(A^c - B) = 0.1$$

(e) *Find* $P(A^c \cup B)$

$$P(A^c \cup B) = 0.6$$

(f) *Find* $P(A \cap (B \cup A^c))$

$$P(A \cap (B \cup A^c)) = 0$$

Problem e