Name *Key*

6-6 Lesson Master

SKILLS Objective D

1. A and B are two events in an experiment where $P(A) = 0.6$ and $P(A \cap B) = 0.2$. Find $P(B \mid A)$. $= \dfrac{P(A \cap B)}{P(A)}$

$\dfrac{0.2}{0.6} = 0.33$

2. A pair of fair 6-sided dice is tossed. Let $A = \{$the sum is 7$\}$ and $B = \{$3 appears on at least one die$\}$. Find:

Total $6 \times 6 = 36$

a. $P(A)$ $\dfrac{6}{36} = \dfrac{1}{6}$

b. $P(B)$ $\dfrac{11}{36}$

c. $P(A \cap B)$ $\dfrac{2}{36} = \dfrac{1}{18}$

d. $P(B \mid A)$ $\dfrac{2}{6} = \dfrac{1}{3}$

$\dfrac{P(Both)}{P(A)} = \dfrac{2/36}{6/36} = \dfrac{2}{6}$

e. $P(A \mid B)$ $\dfrac{2}{11}$

$\dfrac{P(Both)}{P(B)} = \dfrac{2/36}{11/36} = \dfrac{2}{11}$

Left margin table:

Event A	Event B
(1,6)	(3,1)
(2,5)	(3,2)
(3,3)	(3,3)
(3,4)	(3,4)
(4,3)	(3,5)
(5,2)	(3,6)
(6,1)	(1,3)
	(2,3)
	(4,3)
	(5,3)
	(6,3)

USES Objective I

In 3-5, a weighted die results in the following probability distribution.

Number	1	2	3	4	5	6
Probability	0.15	0.10	0.20	0.10	0.30	0.15

Let $A = \{1, 3, 5\}$, $B = \{2, 3, 4\}$, and $C = \{1, 3, 6\}$.

3. a. $P(A \mid C)$ $(0.15 + 0.2)/(0.15 + 0.20 + 0.15) = \boxed{0.7}$

b. $P(C \mid A)$ $\dfrac{(0.15 + 0.2)}{(0.15 + .2 + .3)} = \boxed{0.54}$

4. a. $P(B \mid C)$ $0.2/(0.15 + 0.2 + 0.15) = \boxed{0.4}$

b. $P(C \mid B)$ $0.2/(0.1 + 0.2 + 0.1) = \boxed{0.5}$

5. a. $P(A \mid B)$ $0.2/(0.1 + 0.2 + 0.1) = \boxed{0.5}$

b. $P(B \mid A)$ $0.2/(0.15 + 0.2 + 0.3) = \boxed{0.31}$

6. A software company's spam filter has a 98% accuracy identifying spam and a 93% accuracy identifying non-spam messages. The company estimates that 70% of all emails are spam.

a. Make a contingency table for this situation.

	Spam (70%)	Non-Spam (30%)
Identified as Spam	98%	7%
Identified as Non-spam	2%	93%
Total	100%	100%

b. A false positive results when the software identifies a legitimate e-mail message as spam. Find the probability a message is not spam even though it was identified as spam by the software.

$\dfrac{.021}{.707} = 2.97\%$

P(not spam given identified as spam)

$\dfrac{P(Both)}{P(identified\ as\ spam)} = \dfrac{(.30)(.07)}{(.70)(.98) + (.30)(.07)}$

Tree diagram:
- Spam (.70) → identified as spam (.98), identified as non-spam (.02)
- non-spam (.30) → identified as spam (.07), identified as non-spam (.93)