Homework #4 Solutions

Problems 4.11, 4.18, 4.20, 4.21, 4.28, 4.96

Problem 4.11

(a) $S = \{0, 1, 2, \ldots, 24\}$ (in hours)
or $S = \{0, 1, \ldots, 1460\}$ in minutes
or $S = \{0, 1, \ldots, 86400\}$ in seconds
} each is discrete with rounding to nearest unit.

or $S = 0 - 24$ hours ← continuous sample space

(b) $S = \{0, 1, 2, \ldots\}$ any whole number

(c) $S = \{A, B, C, D, F\}$
or $S = \{A^+, A, A^-, B^+, B, B^-, C^+, C, C^-, D^+, D, D^-, F\}$
if willing to include sign modifiers

(d) $S = \{Yes, no\}$ (took math in last two years or not)
or $S = \{0, 1, 2\}$ (# of years students took math class)

Problem 4.18

P(forest) = 0.35
P(pasture) = 0.03

(a) P(not forested) = 1 − P(forested)
= 1 − .35 = .65

(b) P(forest or pasture) = P(forest ∪ pasture)
= P(forest) + P(pasture)
= .35 + .03
= .38

(c) P(something other than forest or pasture)
= 1 − P(forest or pasture)
= 1 − .38 = .62

Problem 4.20

(a) to be a valid assignment of probabilities we need both of these to be true:
1) all probabilities to be between 0–1
— this is true by inspection of the table ✓
2) total probability = 1
0 + .036 + .003 + .121 + .06 + .691 + .062 + .027
= 1 ✓

$A =$ "chosen person is Hispanic"

(b) $P(A) = P(\text{Asian} \cap \text{Hispanic}) + P(\text{Black} \cap \text{Hispanic})$
$+ P(\text{white} \cap \text{Hispanic}) + P(\text{other} \cap \text{Hispanic})$

$= 0 + .003 + .060 + .062$

$= .125$

(c) $B \equiv$ "person chosen is white"

so
$B^c \equiv$ "person chosen is not white" $\equiv$ "person is Asian, Black or other"

$P(B) = P(\text{White} \cap \text{Hispanic}) + P(\text{white} \cap \text{not Hispanic})$
$= .060 + .691 = .751$

$P(B^c) = 1 - P(B) = 1 - .751$
$= .249$

(d) $A^c \equiv$ "chosen person is not hispanic"

$\Rightarrow A^c \cap B =$ "chosen person is not hispanic and chosen person is white"

$P(A^c \cap B) = .691$ (from table)

Problem 4.21

To check independence we need to check

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

$$P(A) = .125, \quad P(B) = .751, \quad P(A \cap B) = .060$$

$$P(A)P(B) = (.125)(.751) = .0938 \neq .060 = P(A \cap B)$$

So A, B are not independent.

Problem 4.28

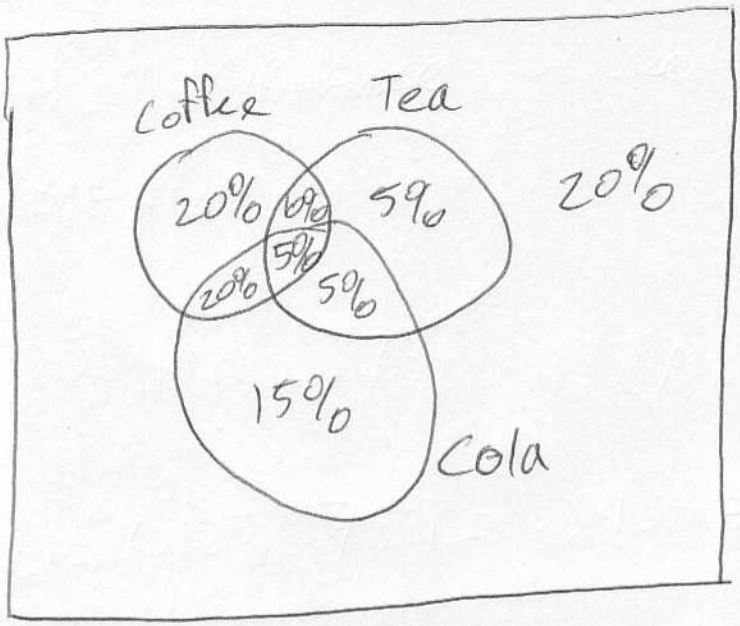
		second roll		
	1,1	1,2	1,3	1,4
	2,1	2,2	2,3	2,4
first roll	3,1	3,2	3,3	3,4
	4,1	4,2	4,3	4,4

Assuming dice are perfectly fair each outcome should be equally likely so $\frac{1}{16}$

$$P(\text{sum of faces} = 5) = P(4,1) + P(3,2) + P(2,3) + P(1,4)$$

$$= \frac{1}{16} + \frac{1}{16} + \frac{1}{16} + \frac{1}{16} = \frac{4}{16} = \frac{1}{4}$$

Problem 4.96



(a) proportion drinking only cola 15%

(b) drinking none of these 20%.