Solution of Homework 1

Term 123

2-21.   a) Let S = the nonnegative integers from 0 to the largest integer that can be displayed by the scale.

Let X denote the weight.

A is the event that $X > 11$ B is the event that $X \leq 15$ C is the event that $8 \leq X < 12$

$S = \{0, 1, 2, 3, ...\}$

b) S

c) $11 < X \leq 15$ or $\{12, 13, 14, 15\}$

d) $X \leq 11$ or $\{0, 1, 2, ..., 11\}$

e) S

f) $A \cup C$ contains the values of X such that: $X \geq 8$

Thus $(A \cup C)'$ contains the values of X such that: $X < 8$ or $\{0, 1, 2, ..., 7\}$
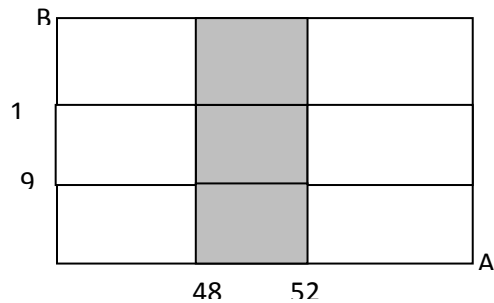
g) $\varnothing$

h) B' contains the values of X such that $X > 15$. Therefore, $B' \cap C$ is the empty set. They
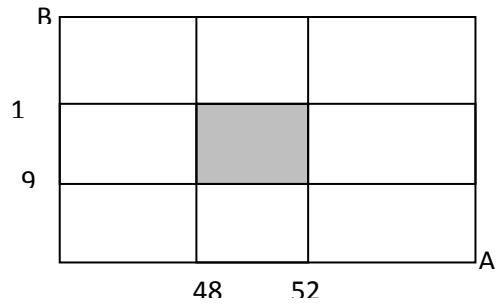
have no outcomes in common or $\varnothing$.

i) $B \cap C$ is the event $8 \leq X < 12$. Therefore, $A \cup (B \cap C)$ is the event $X \geq 8$ or $\{8, 9, 10, ...\}$
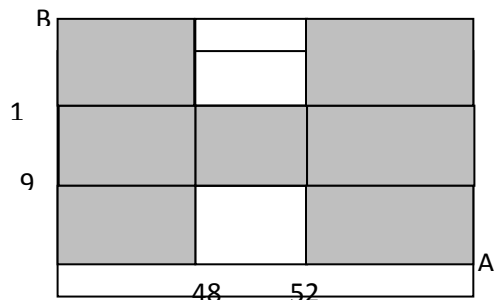
2-22.   a)
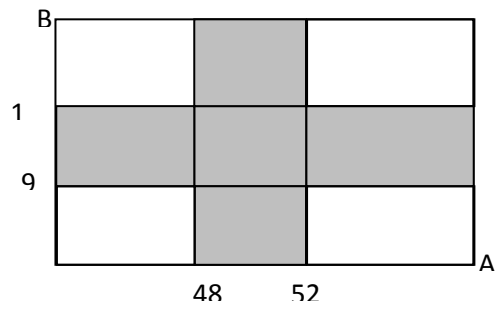
b)

c)

d)

e) If the events are mutually exclusive, then A∩B is the null set. Therefore, the process does not produce product parts with $X = 50$ cm and $Y = 10$ cm. The process would not be successful.

2-34. $2^{10} = 1024$

2-55.   a) P(A) = 0.5

b) P(B) = 0.7

c) P(A') = 0.5

d) P(A∪B) = 1

e) P(A∩B) = 0.2

2-58.   a) S = {1, 2, 3, 4, 5, 6}

b) 1/6

c) 2/6

d) 5/6

2.77.   a) 70/100 = 0.70

b) (79+86-70)/100 = 0.95

c) No, P(A∩B) ≠ 0

2-87.   a) P(A) = 85/100   b) P(B) = 80/100

c) P(A|B) = $\dfrac{P(A\cap B)}{P(B)} = \dfrac{70/100}{80/100} = \dfrac{7}{8}$

d) P(B|A) = $\dfrac{P(A\cap B)}{P(A)} = \dfrac{70/100}{85/100} = \dfrac{7}{8.5}$

2-107.   Let F denote the event that a connector fails and let W denote the event that a connector is wet.

$$P(F) = P(F|W)P(W) + P(F|W')P(W')$$
$$= (0.06)(0.10) + (0.02)(0.9) = 0.024$$

2-125.   a) $P(B \mid A) = 5/599 = 0.0067$

$P(B) = P(B|A)P(A) + P(B|A')P(A') = (4/599)(5/600) + (5/599)(595/600) = 0.0083$

As P(B | A) ≠ P(B), A and B are not independent.

b) A and B are independent.

2-147. Let G denote a product that received a good review. Let H, M, and P denote products that were high, moderate, and poor performers, respectively.

a)

$$P(G) = P(G|H)P(H) + P(G|M)P(M) + P(G|P)P(P)$$
$$= 0.95(0.40) + 0.60(0.35) + 0.10(0.25)$$
$$= 0.615$$

b) Using the result from part a.,

$$P(H|G) = \frac{P(G|H)P(H)}{P(G)} = \frac{0.95(0.40)}{0.615} = 0.618$$

c) $$P(H|G') = \frac{P(G'|H)P(H)}{P(G')} = \frac{0.05(0.40)}{1 - 0.615} = 0.052$$

2-154.   Continuous: a, c, d, f, h, i; Discrete: b, e, and g