Homework №9

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12.10 (a) It is $0.083 + 0.789 = 0.872$.

(b) It should be $1 - 0.083 - 0.789 = 0.128$.

(c) It is $1 - 0.083 = 0.917$.

12.12 Notice that in models 1, 3, and 4, the probabilities do not add up to 1.

In model 1, we have $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{6}{7} < 1$.

In model 3, we have $\frac{1}{3} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{7}{6} > 1$.

In model 4, we have $1 + 1 + 2 + 1 + 1 + 2 = 8 > 1$.

Model 2 seems perfectly reasonable as $\frac{1}{3} + \frac{1}{6} + \frac{1}{6} + 0 + \frac{1}{6} + \frac{1}{6} = 1$.

Finally, we conclude that models 1, 3, and 4 are invalid while model 2 is valid.

12.13 (a) $A = \{4, 5, 6, 7, 8, 9\}$, $\mathrm{P}(A) = 6/10 = 0.6$.

(b) $B = \{0, 2, 4, 6, 8\}$, $\mathrm{P}(B) = 5/10 = 0.5$ (this assumes that $05 = 5$; otherwise $B = \{2, 4, 6, 8\}$and $\mathrm{P}(B) = 4/10 = 0.4$).

(c) A or $B = \{4, 5, 6, 7, 8, 9\} \cup \{0, 2, 4, 6, 8\} = \{0, 2, 4, 5, 6, 7, 8, 9\}$.

$\mathrm{P}(A \text{ or } B) = \mathrm{P}(A) + \mathrm{P}(A) - \mathrm{P}(A \cap B) = \frac{8}{10} = 0.8$.

The probability is not equal to $\mathrm{P}(A) + \mathrm{P}(B)$ as A and B are not disjoint.

12.15 (a) $P(Y \leq 0.6) = P(0 \leq Y \leq 0.6) = 0.6 - 0 = 0.6$.

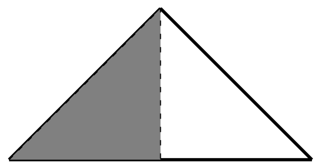
(b) $P(Y < 0.6) = P(0 \leq Y < 0.6) = 0.6 - 0 = 0.6$.

(c) $P(0.4 \leq Y \leq 0.8) = 0.8 - 0.4 = 0.4$.

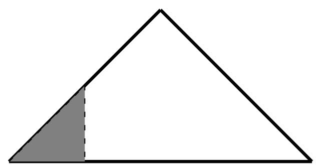
(d) $P(0.4 < Y \leq 0.8) = 0.8 - 0.4 = 0.4$.

12.16 (a) $S = \frac{ah}{2} = \frac{(2-0) \times 1}{2} = \frac{2}{2} = 1$.

(b) The probability is the half of the area of the triangle and therefore is $\frac{1}{2} = 0.5$.



(c) The probability is the eighth of the area of the triangle and therefore is $\frac{1}{8} = 0.125$.



12.17 (a) $\chi \geq 35$.

(b) Let's first find the z-score. We get $z = \frac{x - \mu}{\sigma} = \frac{35 - 25.3}{6.5} \approx 1.49$.
From the table A, we get that the corresponding area to the left is 0.9319. Finally, we get that the probability is $1 - 0.9319 = 0.0681 \approx 0.07$.

12.20 (a) Since currently I am not an active driver and spend most of my time on campus, I expect it to be less than 0.2. I predict it to be 0.05.

(b) As I stated in the part (a) of the exercise, I virtually do not drive and spend most of the time on campus. This is the primary reason why the chance is lower than the "average" probability of 0.2.

(c) That's the nature of a human. People hope that they won't be in an accident and are feared by a mere thought of being in it. Because of this, most people say that the chance of the accident is really low (below 0.2).

12.32 (c) $S = \{$MMMM, HMMM, MHMM, MMHM, MMMH, HMMH, HHMM, MHHM, MMHH, MHMH, HMHM, MHHH, HMHH, HHMH, HHHM, HHHH$\}$.

(b) $S = \{0, 1, 2, 3, 4\}$

12.34 (a) The probability would be P(some education beyond high school but no bachelor's degree) = $1 - 0.1 - 0.27 - 0.34 = 0.29$.

(b) The probability would be $1 - 0.1 = 0.9$.

12.37 (a) It would be $1 - 0.25 - 0.18 - 0.18 - 0.12 - 0.09 - 0.08 - 0.07 = 0.03$.

(b) It would be $1 - 0.25 - 0.18 = 0.57$.

12.47 (a) $S = \{$(Abby, Deborah), (Abby, Mei-Ling), (Abby, Sam), (Abby, Roberto), (Deborah, Mei-Ling), (Deborah, Sam), (Deborah, Roberto), (Mei-Ling, Sam), (Mei-Ling, Roberto), (Sam, Roberto)$\}$

(b) Each has the probability of $\frac{1}{10} = 0.1$.

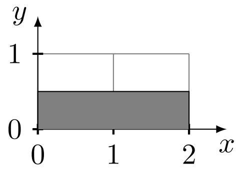
(c) Notice that Mei-Ling is chose in 4 out of 10 outcomes.

Therefore P(Mei-Ling is chosen) $= \frac{4}{10} = 0.4$.

(d) Notice that there are, in total, 3 pairs without Sam and Roberto (namely, (Abby, Deborah), (Abby, Mei-Ling), and (Deborah, Mei-Ling)).
Therefore, P(both people selected liked the course) $= \frac{3}{10} = 0.3$.

12.51 (a) The random variable Y is continuous.
This is because the set of possible values is the interval which means that the values can be decimals.

(b) The height has to be $\frac{1}{2}$ because the total area must be 1.
Below is the density curve.



(c) $P(Y \leq 1) = \dfrac{2 \times \frac{1}{2}}{2} = \dfrac{1}{2} = 0.5.$

12.52 (a) $P(0.5 < Y < 1.3) = (1.3 - 0.5) \times 0.5 = 0.8 \times 0.5 = 0.4.$

(b) $P(Y \geq 0.8) = (2 - 0.8) \times 0.5 = 1.2 \times 0.5 = 0.6.$