

SECI2143: Probability & Statistical Data Analysis

Assignment 2

member: Lai Yee Jen A20EC0061

Chong Tung Han A20EC0028

Tham Chuan Yew A20EC0166

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Question 1

(a) $P(A) + P(B) + P(C) = 0.08 + 0.29 + 0.34$
 $= 0.71$

(b) $P(C) + P(D) + P(E) = 0.34 + 0.17 + 0.12$
 $= 0.63$

(c) $1 - [P(A) + P(E)] = 1 - [0.08 + 0.12]$
 $= 1 - 0.2$
 $= 0.8$

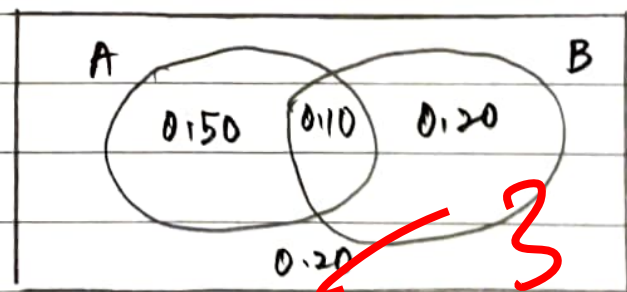
(d) $P(D) + P(A) = 0.17 + 0.08$
 $= 0.25$

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Question 2

(a) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
 $P(A \cap B) = P(A) + P(B) - P(A \cup B)$
 $= 0.60 + 0.30 - 0.80$
 $= 0.10$

(b)



(c) $P(A' \cap B) = 0.20$

(d) $P(A' \cap B') = 0.20$

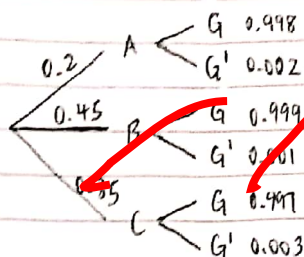
(e) $P(A' \cup B') = 0.90$

(f) $P(A \cap B') = 0.50$

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Q3 a)



$$b) P(G) = P(A \cap G) + P(B \cap G) + P(C \cap G) \\ = 0.2(0.998) + 0.45(0.999) + 0.35(0.997) \\ = 0.9981$$

$$c) P(B|G) = \frac{P(B \cap G)}{P(G)} \\ = \frac{0.45(0.999)}{0.9981} \\ = 0.4504$$

Q4 a) binomial random variable

$$b) P(Y=8) = b(8; 20, 0.7) \quad \text{let } Y = \text{number of banana flavor milk} \\ = \binom{20}{8} (0.7)^8 (0.3)^{12} \\ = 0.0039$$

$$c) P(7 \leq Y \leq 10) = b(7; 20, 0.7) + b(8; 20, 0.7) + b(9; 20, 0.7) + b(10; 20, 0.7) \\ = \binom{20}{7} (0.7)^7 (0.3)^{13} + 0.0039 + \binom{20}{9} (0.7)^9 (0.3)^{11} + \binom{20}{10} (0.7)^{10} (0.3)^{10} \\ = 0.0477$$

$$d) P(3 \leq W \leq 5) = b(3; 20, 0.3) + b(4; 20, 0.3) + b(5; 20, 0.3) \quad \text{Let } W = \text{number of kurma flavor milk} \\ = \binom{20}{3} (0.3)^3 (0.7)^{17} + \binom{20}{4} (0.3)^4 (0.7)^{16} + \binom{20}{5} (0.3)^5 (0.7)^{15} \\ = 0.3809$$

$$Q5 a) i) \text{ Let } X = \text{student pilot passes the written test} \\ P(X=3) = (1-0.7)^{3-1} (0.7) \\ = 0.063$$

$$ii) P(X < 4) = P(X=1) + P(X=2) + P(X=3) \\ = (1-0.7)^{1-1} (0.7) + (1-0.7)^{2-1} (0.7) + 0.063 \\ = 0.973$$

$$iii) P(X=5) = b^*(7; 5, 0.7) \\ = \binom{7-1}{5-1} (0.7)^5 (1-0.7)^{7-5} \\ = 0.2269$$

please give the calculated values. It has marks

0

b) mean = np
 $= 5(0.7)$
 $= 3.5$

variance = npq
 $= 5(0.7)(0.3)$
 $= 1.05$

Question 6

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a) $P(X < 35.8) + P(X > 36.2)$

$$Z = \frac{35.8 - 36}{0.1}$$

$$= -2$$

$$Z = \frac{36.2 - 36}{0.1}$$

$$= 2$$

$$P(Z < -2) = 0.0228$$

$$P(Z > 2) = 0.0228$$

$$P(X < 35.8) + P(X > 36.2) = 0.0228 + 0.0228$$

$$= 0.0456$$

b) $P(X=0)$

$$b(0; 16, 0.0456) = \binom{16}{0} (0.0456)^0 (0.9544)^{16}$$

$$= 0.4739$$

c) $P(X=1)$

$$b(1; 16, 0.0456) = \binom{16}{1} (0.0456)^1 (0.9544)^{15}$$

$$= 0.3623$$

d) $P(X < 35.8) + P(X > 36.2)$

$$Z = \frac{35.8 - 37}{0.4}$$

$$= -3$$

$$Z = \frac{36.2 - 37}{0.4}$$

$$= -2$$

$$P(Z < -3) = 0.0013$$

$$P(Z > -2) = 1 - 0.0228$$

$$= 0.9772$$

$$P(X < 35.8) + P(X > 36.2) = 0.0013 + 0.9772$$

$$= 0.9785$$

Question 7

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a) $P(20 < X < 40)$

$$Z = \frac{20 - 28}{8}$$

$$= -1$$

$$Z = \frac{40 - 28}{8}$$

$$= 1.5$$

$$P(Z > -1) = 1 - 0.1587$$

$$= 0.8413$$

$$P(Z > 1.5) = 1 - 0.9332$$

$$= 0.0668$$

$$P(20 < X < 40) = 0.8413 - 0.0668$$

$$= 0.7745$$

$$\text{Proportion} = 0.7745 \times 100\%$$

$$= 77.45\%$$

b) $P(X < 30)$

$$Z = \frac{30 - 28}{8}$$

$$= 0.25$$

$$P(Z < 0.25) = 0.5987$$

$$P(X < 30) = 0.5987$$

$$\text{Proportion} = 0.5987 \times 100\%$$

$$= 59.87\%$$

c) $P(Z) = 0.75$

$$P(Z \leq 0.67) = 0.75$$

$$\frac{x - 28}{8} = 0.67$$

$$x = 33.36$$

$$\therefore x \approx 33 \text{ days}$$