



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Assignment 2

**SECI2143 – 08 PROBABILITY & STATISTICAL
DATA ANALYSIS**

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Question 1

$$P(A) = 0.08$$

$$P(B) = 0.29$$

$$P(C) = 0.34$$

$$P(D) = 0.17$$

$$P(E) = 0.12$$

$$\begin{aligned} (a) \quad P(A \text{ or } B \text{ or } C) &= P(A) + P(B) + P(C) \\ &= 0.08 + 0.29 + 0.34 \\ &= 0.71 \end{aligned}$$

$$\begin{aligned} (b) \quad P(C \text{ or } D \text{ or } E) &= P(C) + P(D) + P(E) \\ &= 0.34 + 0.17 + 0.12 \\ &= 0.63 \end{aligned}$$

$$\begin{aligned} (c) \quad P(\bar{E} \text{ or } \bar{A}) &= 1 - P(E) - P(A) \\ &= 1 - 0.12 - 0.08 \\ &= 0.8 \end{aligned}$$

$$\begin{aligned} (d) \quad P(D \text{ or } A) &= P(A) + P(D) \\ &= 0.08 + 0.17 \\ &= 0.25 \end{aligned}$$

Question 2

$$P(A) = 0.60$$

$$P(B) = 0.30$$

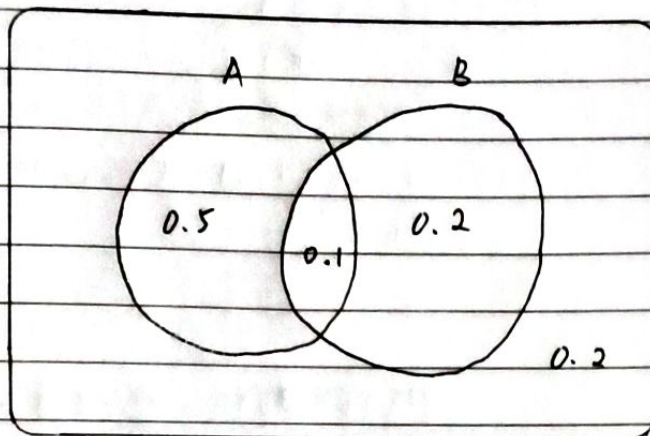
$$P(A \cup B) = 0.80$$

$$(a) P(A \cap B) = P(A) + P(B) - P(A \cup B)$$

$$= 0.6 + 0.3 - 0.8$$

$$= 0.1$$

(b)



$$(c) P(A' \cap B) = 0.2$$

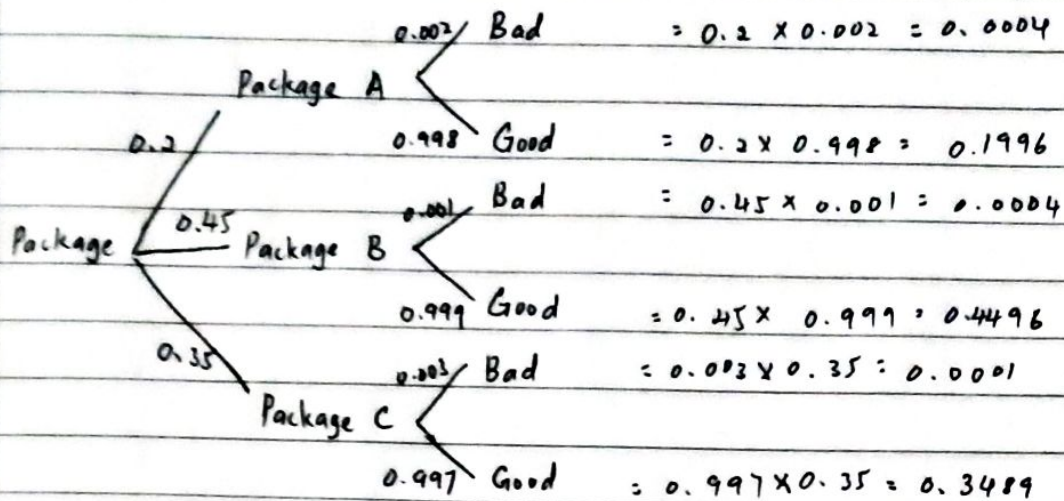
$$(d) P(A' \cap B') = 0.2$$

$$(e) P(A' \cup B') = 0.9$$

$$(f) P(A \cap B') = 0.5$$

Question 3

(a)



(b) $0.1996 + 0.4496 + 0.3489 = 0.9981$

(c)

$$\begin{aligned}
 P(B|G) &= \frac{P(B \cap G)}{P(G)} \\
 &= \frac{0.45 \times 0.999}{0.9981} \\
 &= 0.4504
 \end{aligned}$$

Assignment 2 PSDA.

4) a) binomial random variable

b) $P(X=8)$

$$b(8; 20, 0.70) = \binom{20}{8} (0.70)^8 (0.3)^{12} \\ = 0.0039$$

c) $P(7 \leq X \leq 10) = b(7; 20, 0.70) + b(8; 20, 0.70) + b(9; 20, 0.70) + b(10; 20, 0.70)$

$$= \binom{20}{7} (0.7)^7 (0.3)^{13} + \binom{20}{8} (0.7)^8 (0.3)^{12} + \binom{20}{9} (0.7)^9 (0.3)^{11} + \binom{20}{10} (0.7)^{10} (0.3)^{10} \\ = 0.0010 + 0.0039 + 0.0120 + 0.0308 \\ = 0.0477$$

d) $P(3 \leq X \leq 5) = b(3; 20, 0.3) + b(4; 20, 0.3) + b(5; 20, 0.3)$

$$= \binom{20}{3} (0.3)^3 (0.7)^{17} + \binom{20}{4} (0.3)^4 (0.7)^{16} + \binom{20}{5} (0.3)^5 (0.7)^{15} \\ = 0.0716 + 0.1304 + 0.1789 \\ = 0.3809$$

5) $P = 0.7$

a) i) $P(3) = (1-0.7)^{3-1} (0.7)$
 $= 0.063$

ii) $P(X \leq 4) = (1-0.7)^{3-1} (0.7) + (1-0.7)^{2-1} (0.7) + (1-0.7)^{1-1} (0.7)$
 $= 0.063 + 0.21 + 0.7$
 $= 0.973$

iii) $P(12) = (1-0.7)^{12-1} (0.7)$
 $= 1.24 \times 10^{-6}$

b) $P(5) = (1-0.7)^{5-1} (0.7) = 0.00567$

$$\mu_r = 1/0.00567 = 176.37$$

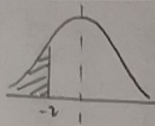
$$\sigma_r = \sqrt{\frac{(1-0.00567)}{(0.00567)^2}} = 175.87$$

Question 6

$$\mu = 36 \text{ kg}$$

$$\sigma = 0.1 \text{ kg}$$

$$(a) P(X < 35.8) = P\left(Z < \frac{35.8 - 36}{0.1}\right) \quad P(X > 36.2) = P\left(Z > \frac{36.2 - 36}{0.1}\right)$$



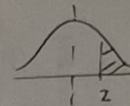
$$= P(Z < -2)$$

$$= 0.0228$$

$$= P(Z > 2)$$

$$= 1 - P(Z \leq 2)$$

$$= 1 - 0.9772 = 0.0228$$



$$\text{Probability} = 0.0228 + 0.0228 = 0.0456$$

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

$$= 0.4739$$

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

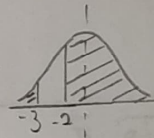
$$= 0.3623$$

$$(d) \mu = 37 \text{ kg} \quad \sigma = 0.4 \text{ kg}$$

$$P(X < 35.8) = P\left(Z < \frac{35.8 - 37}{0.4}\right)$$

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

$$= 0.0044$$



$$P(X > 36.2) = P\left(Z > \frac{36.2 - 37}{0.4}\right)$$

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

$$= P(Z < 2) = 0.9772$$

$$\text{probability} = 0.0044 + 0.9772$$

$$= 0.9816$$

Question 7

$\mu = 28$ days $\sigma = 8$ days

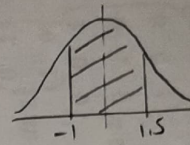
$$(a) P(20 < X < 40) = P\left(\frac{20-28}{8} < Z < \frac{40-28}{8}\right)$$

$$= P(-1 < Z < 1.5)$$

$$= P(Z > -1) + P(Z \leq 1.5)$$

$$= 0.3413 + 0.4332$$

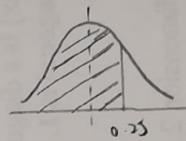
$$= 0.7745$$



$$(b) P(X < 30) = P\left(Z < \frac{30-28}{8}\right)$$

$$= P(Z < 0.25)$$

$$= 0.5987$$



$$(c) P(X > a) = 0.75$$

$$P\left(Z > \frac{a-28}{8}\right) = 0.75$$

$$P\left(Z < \frac{a-28}{8}\right) = 0.25$$

$$\frac{a-28}{8} = 0.675$$

$$a = 33.4$$

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

