MDM4U HW 7

Page 334-335: Q4, Q14, Q15, Q16. Q17

Page 340-343: Q2. Q4. Q7. Q14.

Sol. P 334-335:

Q4. Given $P(A) = 95\% = 0.95$.

$P(B) = 89\% = 0.89$.

a) $P(A \cap B) = P(A)P(B)$ since A and B are independent.

$= 0.95 \times 0.89$

$= 0.8455 = 84.55\%$

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

$= [1 - P(A)][1 - P(B)]$

$= [1 - 0.95][1 - 0.89] = 0.0055 = 0.55\%$

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

$= 0.95 + 0.89 - 0.8455 = 0.9945 = 99.45\%$

Q14. Let p be the maximum tolerable probability of failure of a relay.

Then $(1-p)^8 > 90\%$. since the eight relays are independent.

$1 - p > 0.9^{\frac{1}{8}}$

$\Rightarrow 1 - 0.9^{\frac{1}{8}} > p$. $\Rightarrow$ $p < 0.01308$, so the maximum tolerable probability of failure is 0.01308.

Q15. a) $A = H_1 \cap H_2 \cap H_3 \cap \cdots \cap H_n$.

$\because$ $H_1, H_2, H_3, \cdots,$ and H_n are independent events

where H_i represents the coin shows heads in the i^{th} toss. $i = 1, 2, 3, \cdots, n$.

$\therefore$ $P(A) = P(H_1 \cap H_2 \cap \cdots \cap H_n) = P(H_1)P(H_2)\cdots P(H_n)$

$= (\frac{1}{2})(\frac{1}{2}) \cdots (\frac{1}{2}) = (\frac{1}{2})^n$.

b) $P(A') = 1 - P(A) = 1 - (\frac{1}{2})^7$, for $n = 7$.

$= \frac{127}{128} \approx 0.9922$

Q16. Let A be the event of throwing a sum 7.

B be the event of throwing a double.

then $P(A \cup B) = P(A) + P(B)$

$= \frac{6}{36} + \frac{6}{36} = \frac{12}{36} = \frac{1}{3}$

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Since the six rolls are independent

So $P(E) = [1 - P(A \cup B)]^6$

$= (1 - \frac{1}{3})^6 = (\frac{2}{3})^6 = \frac{64}{729} \approx 0.088$

Q17. Given $P(W) = 40\% = 0.4$;

$P(A|W) = 15\% = 0.15$;

$P(A|W') = 70\% = 0.7$:

Find $P(A)$: where A is the event that Laurie will break par tomorrow.

Sol. $P(A) = P(W \cap A) + P(W' \cap A)$

$= P(W)P(A|W) + P(W')P(A|W')$

$= 0.4 \times 0.15 + (1-0.4) \times 0.70$

$= 0.48 = 48\%$

P340 Q2.

3 outfielders; 4 infielders; 1 pitcher; 1 catcher.

a) $P(A) = \frac{n(A)}{n(S)} = \frac{{}_1C_1}{{}_9C_1} = \frac{1}{9}$:

b) $P(B) = \frac{n(B)}{n(S)} = \frac{{}_3C_1}{{}_9C_1} = \frac{3}{9} = \frac{1}{3}$:

c) $P(A \cup B) = P(A) + P(B) = \frac{1}{9} + \frac{1}{3} = \frac{4}{9}$

Since A and B are mutually exclusive.

Q4.

a)

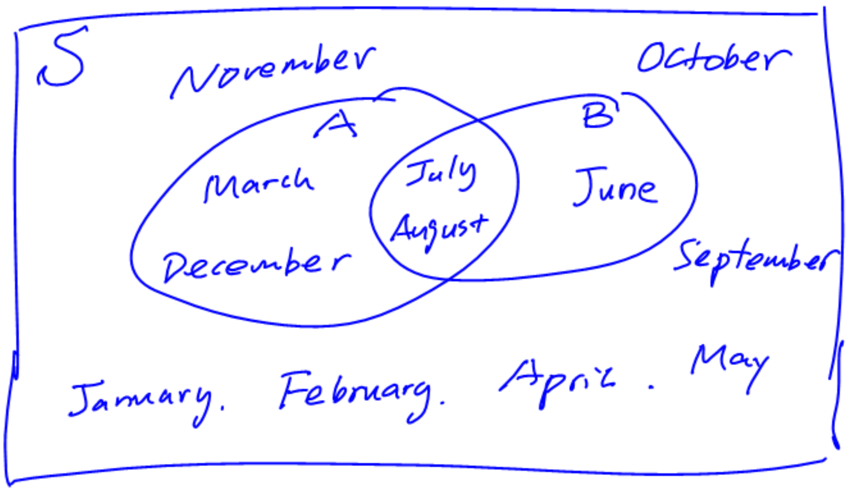
i) Since each of the four months:
July, August, March and December
has 31 days. so

$$P(A) = \frac{n(A)}{n(S)} = \frac{4 \times 31}{365} = \frac{124}{365}$$

ii) June has only 30 days.

$$P(B) = \frac{n(B)}{n(S)} = \frac{30 + 2 \times 31}{365} = \frac{92}{365}$$

b)



Q7.

Number of Tests	Number of Hamsters
0	10
1	6
2	4
3	3
4 or more	5
	28

a) $P(A) = \frac{3}{28}$; b) $P(B) = \frac{10+6}{28} = \frac{4}{7}$; c) $P(C) = \frac{6+4}{28} = \frac{5}{14}$;

$P(D) = \frac{10+5}{28} = \frac{15}{28}$;

Q14.

Let A be the event of exhibiting blue eyes.

B be the event of exhibiting white spots.

Given odds against "$A \cup B$" $= \frac{3}{1}$;

$P(A) = P(B)$; $P(A \cap B) = 10\% = 0.1 = \frac{1}{10}$

Find odds of A.

Sol. $\because$ odds against "$A \cup B$" $= \frac{3}{1}$.

$\therefore$ odds of "$A \cup B$" $= \frac{1}{3}$;

$P(A \cup B) = \frac{1}{1+3} = \frac{1}{4}$;

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

so $2P(A) = P(A \cup B) + P(A \cap B)$

$$P(A) = \frac{P(A \cup B) + P(A \cap B)}{2} = \frac{\frac{1}{4} + \frac{1}{10}}{2} = \frac{7}{40}$$

$= 0.175$