

## Test Yourself 1

### A Q's

Q1  $\boxed{5} \times \boxed{4} \times \boxed{3} = 60$

(i)  $\boxed{1} \times \boxed{4} \times \boxed{3} = 12$

(ii)  $\boxed{3} \times \boxed{4} \times \boxed{3} = 36$

Q2 (i)  ${}^{11}P_4 = 330$

(ii)  $\binom{5}{2} \times \binom{6}{2} = 10 \times 15 = 150$

Q3

	1	2	3	4	5	6	
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)	(i) $P(\text{Total } 12) = \frac{1}{36}$
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)	(ii) $P(\text{Same No}) = \frac{6}{36} = \frac{1}{6}$
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)	(iii) $P(\text{Total } 12 \text{ or Same No})$
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)	$= \frac{1}{36} + \frac{6}{36} - \frac{1}{6}$
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)	$= \frac{6}{36} = \frac{1}{6}$
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)	

Q4 (i)  $1 - (0.35 + 0.1 + 0.25 + 0.15) = 0.15$

(ii)  $N^{\circ} 1$

(iii)  $200 \times 0.25 = 50 \text{ times}$

Q5 (i)  $6! = 720$

(ii)  $5! \times 2! = 240$

Q6 (i) (a)

(ii)  $P(H \text{ or } T) = \frac{10}{30} + \frac{12}{30} = \frac{22}{30} = \frac{11}{15}$

Q7 (i)  $P(2) = \frac{2}{6} = \frac{1}{3}$

(ii)  $P(2 \text{ on } 1^{\text{st}} \text{ 2 throws}) = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

(iii)  $P(2 \text{ on } 3^{\text{rd}} \text{ throw}) = \frac{2}{3} \times \frac{2}{3} \times \frac{1}{3} = \frac{4}{27}$

Q8 Blue = 6 Red = 4 Green = 3 Total = 13

$$P(1^{\text{st}} B, 2^{\text{nd}} R, 3^{\text{rd}} R \text{ or } G) = \frac{6}{13} \times \frac{4}{12} \times \frac{6}{11} = \frac{144}{1716} = \frac{12}{143}$$

Q9  $A = \{3, 6, 9, 12, 15, 18\}$   
 $B = \{4, 8, 12, 16, 20\}$

(i)  $P(A) = \frac{6}{20} = \frac{3}{10}$

(ii)  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$   
 $= \frac{6}{20} + \frac{5}{20} - \frac{1}{20} = \frac{10}{20} = \frac{1}{2}$

(iii)  $P(A \cap B)^c = \frac{14}{20}$

Q10 (i)  $P(\text{Girl } 17 \text{ or Boy } 16) = \frac{6}{25} + \frac{5}{25} = \frac{11}{25}$

(ii)  $P(16 \text{ given Girl}) = \frac{7}{13}$

(iii)  $P(\text{Both Boys } 16) = \frac{5}{25} \times \frac{4}{24} = \frac{20}{600} = \frac{1}{30}$

## B-Questions

Q1

(i)  $P(6) = \frac{1}{6}$   
(ii)  $P(6 \text{ on } 2^{\text{nd}} \text{ throw}) = \frac{5}{6} \times \frac{1}{6} = \frac{5}{36}$   
(iii)  $P(\text{either } 1^{\text{st}} \text{ or } 2^{\text{nd}}) = P(1^{\text{st}}) \text{ or } P(2^{\text{nd}})$   
 $= \frac{1}{6} + \frac{5}{36} = \frac{11}{36}$

Q2

(i)  $\binom{8}{4} = 70$   
(ii)  $\binom{7}{3} = 35$   
(iii) A and 3 others <sup>(not B)</sup>  $= \binom{6}{3} = 20$   
B and 3 others <sup>(not A)</sup>  $= \binom{6}{3} = 20$   
Total = 40

Q3

(i)  $7! = 5040$   
(ii)  $11 \times 11 \times 5 \times 4 \times 3 \times 2 \times 1 = 120$   
(iii)  $4 \times 5 \times 4 \times 3 \times 2 \times 1 \times 3 = 1440$

Q4

$\frac{240^\circ}{360} = \frac{2}{3}$        $\frac{180^\circ}{360} = \frac{1}{2}$

(i)  $P(6) = P[(2)(2)(2)] = \frac{2}{3} \times \frac{1}{2} \times \frac{2}{3} = \frac{4}{18} = \frac{2}{9}$

(ii)  $P(9) = P[(3)(3)(3)] = \frac{1}{3} \times \frac{1}{2} \times \frac{1}{3} = \frac{1}{18}$

(iii)  $P(7) = P[(2, 2, 3) \text{ or } (2, 3, 2) \text{ or } (3, 2, 2)]$   
 $= \left(\frac{2}{3} \times \frac{1}{2} \times \frac{1}{3}\right) + \left(\frac{2}{3} \times \frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{1}{3} \times \frac{1}{2} \times \frac{2}{3}\right)$   
 $= \frac{2}{18} + \frac{4}{18} + \frac{2}{18} = \frac{8}{18} = \frac{4}{9}$

Q5 (i) L and M cannot happen at the same time  $L \cap M = \emptyset$

(ii) (a)  $\binom{22}{4} = 7315$

(b)  $\binom{21}{3} = 1330$

(c)  $P(\text{Janette Included}) = \frac{1330}{7315} = \frac{2}{11}$

Q6 (i)  $P(1^{\text{st}} 10c \text{ and } 2^{\text{nd}} 5c) = \frac{4}{6} \times \frac{2}{5} = \frac{8}{30} = \frac{4}{15}$

(ii)  $P(\text{worth } 15c) \Rightarrow P(1^{\text{st}} 10c \text{ and } 2^{\text{nd}} 5c \text{ or } 1^{\text{st}} 5c \text{ and } 2^{\text{nd}} 10c)$   
 $= \left(\frac{4}{6} \times \frac{2}{5}\right) + \left(\frac{2}{6} \times \frac{4}{5}\right)$   
 $= \frac{8}{30} + \frac{8}{30} = \frac{16}{30} = \frac{8}{15}$

(iii)  $P(20c) \Rightarrow P(1^{\text{st}} 10c \text{ and } 2^{\text{nd}} 10c)$   
 $= \frac{4}{6} \times \frac{3}{5} = \frac{12}{30} = \frac{2}{5}$

Q7 (i)  $x = 1 - [0.2 + 0.3 + 0.1]$   
 $x = 0.4$

(ii)  $P(A) = 0.2 + 0.3 = 0.5$

(iii)  $P(A \cup B) = 0.2 + 0.3 + 0.4 = 0.9$

(iv)  $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.3}{0.7} = \frac{3}{7}$

(v)  $P(A|B) = \frac{P(A \cap B)}{P_B}$

$$\frac{3}{7} = \frac{0.3}{0.7}$$

$$\frac{3}{7} = \frac{3}{7} \checkmark$$

Q8 (i)  $P(A) = \frac{20}{35} = \frac{4}{7}$

(ii)  $P(B) = \frac{26}{35}$

(iii)  $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{16}{26} = \frac{8}{13}$

(iv)  $P(A \cap B) = \frac{16}{35}$

(v)  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$   
 $= \frac{20}{35} + \frac{26}{35} - \frac{16}{35} = \frac{30}{35} = \frac{6}{7}$

$P(A \cap B) = P(B) \cdot P(A|B)$

$$\frac{16}{35} = \frac{26}{35} \times \frac{8}{13}$$

$$\frac{16}{35} = \frac{16}{35} \quad \checkmark$$

Because A and B are not mutually exclusive.

Q9 white = 4 red = 2 green = x

(i)  $P(2 \text{ Green}) = \frac{x}{6+x} \times \frac{x-1}{x+5}$

(ii)  $\frac{x}{6+x} \times \frac{x-1}{x+5} = \frac{4}{13}$

$$\frac{x^2 - x}{x^2 + 11x + 30} = \frac{4}{13}$$

$$13x^2 - 13x = 4x^2 + 44x + 120$$

$$9x^2 - 57x - 120 = 0$$

$$3x^2 - 19x - 40 = 0$$

$$(3x + 5)(x - 8) = 0$$

$$x = -\frac{5}{3} \quad x = 8$$

$$\text{Total} = 4 + 2 + 8 = 14$$

$$(iii) P(\text{not Green and not Green}) = \frac{6}{14} \times \frac{5}{13} = \frac{15}{91}$$

Q.10 (i)  $P(4 \text{ or } 6) = \frac{2}{6} = \frac{1}{3}$

(ii)  $P(1, 2, \dots) = \frac{2}{6} = \frac{1}{3}$

(iii) (a)  $\{3, 4, 5\}$  or  $\{5, 4, 3\}$  or  $\{2, 6, 4\}$   
or  $\{3, 5, 4\}$  or  $\{1, 6, 5\}$  or  $\{2, 5, 5\}$   
or  $\{3, 6, 3\}$  or  $\{5, 2, 5\}$  or  $\{5, 3, 4\}$   
or  $\{5, 6, 1\}$

(b) 10 ways

(iv) (a) 3 throws.

(b)  $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$ .

## C Questions

$$\text{Q1 (i)} \quad P(R, R, R) \text{ or } P(G, G, G) \\ = \left(\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7}\right) + \left(\frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}\right) = \frac{5}{142} + \frac{1}{21} = \frac{7}{42} = \frac{1}{6}$$

$$\text{(ii)} \quad P(\text{At least 1R}) \Rightarrow 1 - P(\text{none red}) \\ = 1 - \left(\frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}\right) \\ = 1 - \frac{1}{21} = \frac{20}{21}$$

$$\text{(iii)} \quad P(\text{at least 1 Green}) = (GRR) \text{ or } (RGR) \text{ or } (RRG) \text{ or } (RRR) \\ = \left(\frac{4}{9} \times \frac{5}{8} \times \frac{4}{7}\right) + \left(\frac{5}{9} \times \frac{4}{8} \times \frac{4}{7}\right) + \left(\frac{5}{9} \times \frac{4}{8} \times \frac{4}{7}\right) + \frac{1}{6} \\ + \left(\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7}\right) \\ = \frac{25}{42}$$

$$\text{Q2 (i)} \quad \frac{8}{100} \times \frac{1}{10} = \frac{8}{1000} = \frac{1}{125}$$

$$\text{(ii)} \quad \frac{8}{100} \times \frac{9}{10} = \frac{72}{1000} = \frac{9}{125}$$

$$\text{(iii)} \quad \frac{92}{100} \times \frac{1}{10} = \frac{92}{1000} = \frac{23}{250}$$

Q3 (i) Equally Likely

(ii) The Probability of a second event is dependent on the outcome of the first event.

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$\text{(iii)(a)} \quad P(C|D) \quad P(C|D) = \frac{P(C \cap D)}{P(D)} \\ \frac{1}{5} = \frac{P(C \cap D)}{\frac{1}{3}} \\ \frac{1}{5} = P(C \cap D)$$

$$(b) \quad P(C \cup D) = P(C) + P(D) - P(C \cap D) \\ = \frac{8}{15} + \frac{1}{3} - \frac{1}{15} = \frac{12}{15} = \frac{4}{5}$$

$$(c) \quad P[(C \cup D)'] = 1 - P(C \cup D) = 1 - \frac{4}{5} = \frac{1}{5}$$

Q4

$$(i) \quad P(\text{not left}) = \frac{4}{5}$$

$$(ii) \quad P(\text{Blue and left}) = \frac{2}{5} \times \frac{1}{5} = \frac{2}{25}$$

$P(\text{one Blue \& left other, Blue \& not left})$

$$\Rightarrow \begin{aligned} & 1^{\text{st}} \text{ Blue \& left \& } 2^{\text{nd}} \text{ Blue \& not left or } 1^{\text{st}} \text{ Blue \& not left \& } 2^{\text{nd}} \text{ Blue \& left} \\ & = \frac{2}{5} \times \frac{1}{5} \times \frac{2}{5} \times \frac{4}{5} \quad \text{or} \quad \frac{2}{5} \times \frac{4}{5} \times \frac{2}{5} \times \frac{1}{5} \\ & \quad \frac{16}{625} \quad \quad \quad + \quad \quad \quad \frac{16}{625} = \frac{32}{625} \end{aligned}$$

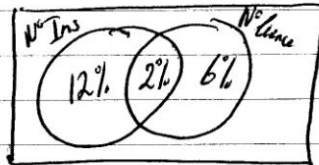
Q5

$$\text{No lns} = 14\%$$

$$\text{No licence} = 8\%$$

$$\text{neither} = 2\%$$

(i)



$$(ii) \quad P(\text{Drive Illegally}) = 12\% + 2\% + 6\% = 20\% = \frac{1}{5}$$

$$(iii) \quad P(\text{Licence but No lns}) = 12\%$$

$$\Rightarrow 12\% \text{ of } 300 = 36 \text{ people}$$



Q6 (i)  $P(\text{end } 4^{\text{th}} \text{ Move on R}) \Rightarrow 4 \text{ prime N}^{\circ}\text{s in a row}$

$$= \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12} = \frac{625}{20736} = 0.03014 \approx 0.030$$

(ii)  $P(\text{end } 4^{\text{th}} \text{ move}) \Rightarrow 4 \text{ prime N}^{\circ}\text{s or } 4 \text{ Not prime.}$

$$= \left( \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12} \times \frac{5}{12} \right) + \left( \frac{7}{12} \times \frac{7}{12} \times \frac{7}{12} \times \frac{7}{12} \right)$$
$$= 0.03014 + 0.11578 = 0.14592$$
$$= 0.146$$

(iii)  $P(\text{ends on } 5^{\text{th}} \text{ Move}) \Rightarrow \text{Impossible} = 0.$

Q7  $P(\text{Selects Correct}) = \text{Knows correct or guesses}$

$$= \frac{5}{8} + \frac{3}{8} \times \frac{1}{5}$$
$$= \frac{5}{8} + \frac{3}{40} = \frac{28}{40} = \frac{7}{10}$$

Q8 (i)  $P(B) = 0.4 \Rightarrow 0.1 + 0.05 + 0.05 + x = 0.4$

$$\Rightarrow \underline{x = 0.2}$$

$$P(C) = 0.35 \Rightarrow 0.05 + 0.05 + 0.05 + y = 0.35$$
$$\Rightarrow \underline{y = 0.2}$$

$$0.3 + 0.1 + 0.05 + 0.05 + 0.05 + 0.2 + 0.2 + z = 1$$
$$\Rightarrow \underline{z = 0.05}$$

(ii)  $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.15}{0.4} = \frac{3}{8}$

(iii)  $P(B|C) = \frac{P(B \cap C)}{P(C)} = \frac{0.1}{0.35} = \frac{2}{7}$

(iv)  $P[(A \cup B)^c] = 0.2 + 0.05 = 0.25$

$$(9) P(A \cup B \cup C) = 1 - 0.05 = 0.95$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$\frac{3}{8} = \frac{0.15}{0.4}$$

$$\frac{3}{8} = \frac{3}{8} \checkmark$$

$$\textcircled{Q9} (i) P(1, 6 \text{ a } 6) = 1 - P(\text{No } 6) \\ = 1 - \frac{5}{6} \times \frac{5}{6} = 1 - \frac{25}{36} = \frac{11}{36}$$

$$\textcircled{or} P(1 \text{ is a } 6) \Rightarrow 1^{\text{st}} 6 \text{ \& } 2^{\text{nd}} \text{ not } 6 \text{ or } 1^{\text{st}} \text{ not } 6 \text{ \& } 2^{\text{nd}} 6 \\ \left( \frac{1}{6} \times \frac{5}{6} \right) + \left( \frac{5}{6} \times \frac{1}{6} \right) + \left( \frac{1}{6} \times \frac{1}{6} \right) \\ \frac{5}{36} + \frac{5}{36} + \frac{1}{36} = \frac{11}{36}$$

$$(ii) P(\text{Sum of } 8) \Rightarrow P[(2, 6) \text{ or } (6, 2) \text{ or } (5, 3) \text{ or } (3, 5) \text{ or } (4, 4)] \\ = \left( \frac{1}{6} \times \frac{1}{6} \right) + \left( \frac{1}{6} \times \frac{1}{6} \right) + \left( \frac{1}{6} \times \frac{1}{6} \right) + \left( \frac{1}{6} \times \frac{1}{6} \right) + \left( \frac{1}{6} + \frac{1}{6} \right) \\ = \frac{5}{36}$$

$$(iii) P(\text{At least } 1, 6 \text{ and Total is } 8) \\ \Rightarrow (6, 2) \text{ or } (2, 6) \\ \left( \frac{1}{6} \times \frac{1}{6} \right) + \left( \frac{1}{6} \times \frac{1}{6} \right) = \frac{2}{36} = \frac{1}{18}$$

$$(iv) P(\text{At least } 1, 6 \text{ or Total } 8 \text{ or Both})$$

$$\textcircled{*} \frac{11}{36} + \frac{5}{36} - \frac{2}{36} = \frac{14}{36} = \frac{7}{18}$$

$$(v) P(\text{One } 6, \text{ given total } 8) = \frac{P(\text{One } 6 \cap \text{Total } 8)}{P(\text{Total } 8)} = \frac{2/36}{5/36} \\ = \frac{2}{36} \times \frac{36}{5} = \frac{2}{5}$$

$$\textcircled{10} \text{ (i) } P(\text{success at } 1.65) = 0.6 + (0.4)(0.6) + (0.4)(0.4)(0.6) \\ = 0.936$$

$$\text{(ii) } P(\text{Not Success at } 1.70) = 1 - P(\text{Success at } 1.70) \\ = 1 - [0.2 + (0.8)(0.2) + (0.8)(0.8)(0.2)] \\ = 1 - 0.488 \\ = 0.512$$

$$\text{(iii) } P(\text{height is } 1.60) = 1 - 0.936 = 0.064$$

$$\text{(iv) } P(\text{height is } 1.65) = (0.936)(0.512) = 0.479232 \\ = 0.479$$