

Ex 3.5

4 cards dealt.

$$\text{Q1 (i) } P(2 \text{ Queens}) = \frac{\binom{4}{2}}{\binom{52}{4}} = \frac{6}{270725}$$

$$\text{(ii) } P(4 \text{ Spades}) = \frac{\binom{13}{4}}{\binom{52}{4}} = \frac{11}{4165}$$

$$\text{(iii) } P(4 \text{ red}) = \frac{\binom{26}{4}}{\binom{52}{4}} = \frac{46}{833}$$

$$\begin{aligned} \text{(iv) } P(4 \text{ same suit}) &= P(4 \text{ Clubs, } 4 \text{ Hearts, } 4 \text{ Diamonds, } 4 \text{ Spades}) \\ &= \frac{\binom{13}{4} \times 4}{\binom{52}{4}} = \frac{44}{4165} \end{aligned}$$

$$\text{Q2 } \binom{11}{4} = 330$$

$$\text{(i) } P(2 \text{ m and } 2 \text{ w}) = \frac{\binom{6}{2} \times \binom{5}{2}}{330} = \frac{150}{330} = \frac{5}{11}$$

$$\text{(ii) } P(1 \text{ m and } 3 \text{ w}) = \frac{\binom{6}{1} \times \binom{5}{3}}{330} = \frac{2}{11}$$

$$\text{(iii) } P(\text{all women}) = \frac{\binom{5}{4}}{330} = \frac{5}{330} = \frac{1}{66}$$

Q3 16 5 Blue, 3 green, 6 red, 2 yellow

$$\text{choose } 4 = \binom{16}{4} = 1820$$

$$\text{(i) } P(4 \text{ Blue}) = \frac{\binom{5}{4}}{1820} = \frac{5}{1820} = \frac{1}{364}$$

$$\text{(ii) } P(4 \text{ Same Colour}) = P(\text{all Blue or all red}) = \frac{\binom{5}{4}}{1820} + \frac{\binom{6}{4}}{1820} = \frac{1}{91}$$

$$\begin{aligned} \text{(iii) } P(4 \text{ diff Colour}) &\Rightarrow \frac{P(1 \text{ B, } 1 \text{ G, } 1 \text{ R, } 1 \text{ Y})}{1820} = \frac{\binom{5}{1} \times \binom{3}{1} \times \binom{6}{1} \times \binom{2}{1}}{1820} \\ &= \frac{9}{91} \end{aligned}$$

$$(iv) P(2 \text{ Blue and 2 not Blue}) = \frac{\binom{5}{2} \times \binom{11}{2}}{1820} = \frac{55}{182}$$

Q4       $2 \rightarrow 10$       (4 Primes)

$$(i) P(\text{Both Prime}) = P(\text{1st Prime and 2nd Prime}) \\ = \frac{4}{9} \times \frac{4}{9} = \frac{16}{81}$$

$$(ii) 3 \text{ disco} = \binom{9}{3} = 84 \text{ ways}$$

$$P(3 \text{ odd or 3 even}) = \frac{\binom{4}{3} + \binom{5}{3}}{84} = \frac{1}{6}$$

Q5       $1 \rightarrow 9$

$$3 \text{ drawn} \Rightarrow \binom{9}{3} = 84 \text{ ways}$$

$$(i) P(8 \text{ not drawn}) = 1 - P(8 \text{ is drawn}) \\ = 1 - P(\text{1st or 2nd or 3rd is 8}) \\ = 1 - \left(\frac{1}{9} + \frac{1}{9} + \frac{1}{9}\right) \\ = 1 - \frac{1}{3} \\ = \frac{2}{3}$$

(or)  $P(8 \text{ not drawn}) \Rightarrow$  Take out 8 leaves 8 cards  
draw 3.  $= \binom{8}{3} = 56$

$$P(8 \text{ not drawn}) = \frac{56}{84} = \frac{2}{3}$$

$$(ii) P(\text{all odd}) = \frac{\binom{5}{3}}{84} = \frac{10}{84} = \frac{5}{42}$$

Q6 24 14 B and 10 G

3 birthdays  $\Rightarrow \binom{24}{3} = 2024$  ways

$$(i) P(3B \text{ or } 3G) = \frac{\binom{14}{3} + \binom{10}{3}}{2024} = \frac{11}{46}$$

$$(ii) P(\text{Birthdays on diff days}) = 1 \times \frac{6}{7} \times \frac{5}{7} = \frac{30}{49}$$

Q7

$$(i) \binom{10}{7} = 120 \text{ ways}$$

$$(ii) 1^{\text{st}} + 2^{\text{nd}} Q \text{ must be selected} \Rightarrow 8 \text{ left choose } 5 \\ = \binom{8}{5} = 56 \text{ ways}$$

$$(iii) P(\text{Both } 1^{\text{st}} + 2^{\text{nd}} Q) = \frac{56}{120} = \frac{7}{15}$$

$$(iv) P(\text{At least 1 of } Q1 \text{ or } Q2) = 1 - P(\text{Not } Q1 \text{ or } 2) \\ = 1 - \frac{8}{120} = \frac{14}{15} \quad \rightarrow \binom{8}{7} = 8$$

Q8

16 pupils

10 G

6 B

2 Selected  $\Rightarrow \binom{16}{2}$

3L

7R

1L

5R

= 120 ways

$$(i) P(1B \text{ and } 1G) = \frac{\binom{6}{1} \times \binom{10}{1}}{120} = \frac{60}{120} = \frac{1}{2}$$

$$(ii) P(1G(L) \text{ and } 1B(L)) = \frac{\binom{3}{1} \times \binom{1}{1}}{120} = \frac{3}{120} = \frac{1}{40}$$

$$(iii) P(2 \text{ Left Handed}) = P(2 \text{ Girls(L) or } 1B(L) \text{ and } 1G(L)) \\ = \frac{\binom{3}{2} + \binom{3}{1} \times \binom{1}{1}}{120} = \frac{3+3}{120} = \frac{6}{120} = \frac{1}{20}$$

4 ore (L)  $\Rightarrow$  12 left  
select 2

$$\begin{aligned} \text{(iv) } P(\text{at least 1 left}) &= 1 - P(\text{No left}) \\ &= 1 - \frac{\binom{12}{2}}{120} \\ &= 1 - \frac{66}{120} = \frac{9}{20} \end{aligned}$$

Q9 fair dice  $P(6) = \frac{1}{6}$     biased dice  $P(6) = \frac{2}{7}$  \*

$$P(\text{Exactly 2 Sixes}) = \text{6 on 1st and 6 on 2nd and Not 6 on 3rd}$$

or  
6 on 1st and NOT 6 on 2nd and 6 on 3rd

or  
Not 6 on 1st and 6 on 2nd and 6 on 3rd

$$= \left(\frac{1}{6} \times \frac{2}{7} \times \frac{5}{7}\right) + \left(\frac{1}{6} \times \frac{5}{7} \times \frac{2}{7}\right) + \left(\frac{5}{6} \times \frac{2}{7} \times \frac{2}{7}\right)$$

$$= \frac{10}{294} + \frac{10}{294} + \frac{20}{294} = \frac{40}{294} = \frac{20}{147}$$

Q10    A A C E L P P P

Draws 3 letters  $\Rightarrow \binom{8}{3} = 56$  ways

$$\text{(i) } P(\text{PEA in order}) = \frac{1}{56}$$

$$\text{(ii) } P(\text{PEA in any order}) = \frac{\binom{3}{3} \times \binom{1}{1} \times \binom{2}{2}}{56} = \frac{6}{56} = \frac{3}{28}$$

$$\text{(iii) } P(\text{The 3 letters exclude E and P}) = \frac{\binom{4}{3}}{56} = \frac{4}{56} = \frac{1}{14}$$

$$\text{(iv) } P(\text{all Constants or all Vowels}) = \frac{\binom{5}{3} + \binom{3}{3}}{56}$$

$$= \frac{11}{56}$$