Section 4.2 #13

Red Die \ Green Die	1	2	3	4	5	6
1	△	△	△			
2	△	△				*
3	△				*	
4				*		
5			*			
6		*				

$n(S) = 6 \times 6 = 36$

a) Outcomes that add up to 8 are marked with *.

$n(E) = 5$

$Pr(E) = \frac{5}{36}$

≈ 0.14

b) Outcomes that sum to less than 5 are marked with △.

$n(E) = 6$ $\quad Pr(E) = \frac{6}{36} \approx 0.17$

Section 4.3

1 $n(S) = 13$

a) $E = \{1, 3, 5, 7, 9, 11, 13\}$

$n(E) = 7$

$Pr(E) = \frac{7}{13}$

≈ 0.54

b) $Pr(\text{even}) = 1 - Pr(\text{odd})$

≈ 0.46

c) $E = \{3, 6, 9, 12\}$

$n(E) = 4$

$Pr(E) = \frac{4}{13}$

≈ 0.31

d) $E = \{1, 3, 5, 6, 7, 9, 11, 12, 13\}$

$n(E) = 9$

$Pr(E) = \frac{9}{13}$

≈ 0.69

(3) $\boxed{\begin{array}{c|c} 5 & 4 \\ \text{red} & \text{white} \end{array}}$

$$n(S) = C(9,2)$$
$$= 36$$

a) $n(E) = C(5,2)$
$$= 10$$

$$Pr(E) = \frac{10}{36}$$
$$\approx 0.28$$

b) $n(E) = \boxed{C(5,1)} \times \boxed{C(4,1)} + \boxed{C(4,2)}$

\# ways to choose 1 red AND 1 white OR 2 white

$$= 5 \times 4 + 6$$
$$= 26$$

$$Pr(E) = \frac{26}{36}$$

$$\approx 0.72$$

Alternatively: $Pr(\text{at least 1 white}) = 1 - Pr(0 \text{ white})$
$$= 1 - Pr(2 \text{ red})$$
$$\approx 0.72$$

7

5 agree	4 disagree

$n(S) = C(9,3)$
$= 84$

$n(E) = \boxed{C(5,2)} \times \boxed{C(4,1)} + \boxed{C(5,3)}$

ways to choose 2 who agree AND Choose 1 disagree OR Choose 3 agree

$= 10 \times 4 + 10$
$= 50$

$Pr(E) = \frac{50}{84}$
≈ 0.60

(9)

6 senior	4 junior

$$n(S) = C(10,3) = 120$$

Let's calculate $\Pr(\text{no junior})$.

$$n(\text{no junior}) = C(6,3) = 20$$

\# of ways to choose 3 senior

$$\Pr(\text{no junior}) = \frac{20}{120} \approx 0.17$$

$$\Pr(\text{at least 1 junior}) = 1 - \Pr(\text{no junior}) \approx 0.83$$

(17) E: At least two were born on the same day.

E': All born on different days.

$$n(S) = \underbrace{\boxed{7}}_{\substack{\text{\# of options for 1st}\\\text{person's day}\\\text{(Sun-Sat)}}} \times \underbrace{\boxed{7}}_{\substack{\text{2nd}\\\text{person}}} \times \underbrace{\boxed{7}}_{\substack{\text{3rd}\\\text{person}}} = 343$$

$$n(E') = \underbrace{\boxed{7}}_{\substack{\text{1st}\\\text{person}}} \times \underbrace{\boxed{6}}_{\substack{\text{2nd}\\\text{person}\\\text{(must be}\\\text{differest}\\\text{than 1st}\\\text{person)}}} \times \underbrace{\boxed{5}}_{\substack{\text{3rd}\\\text{person}}} = 210$$

$$Pr(E') = \frac{n(E')}{n(S)}$$

$$= \frac{210}{343}$$

$$\approx 0.61$$

$$Pr(E) = 1 - Pr(E')$$

$$\approx 0.39$$

19 E: At least two choose same day.

E': All choose different days.

$$n(S) = \underset{\substack{\text{\# of options}\\ \text{for 1st}\\ \text{organization's}\\ \text{date}\\ \text{(June1 - June 30)}}}{\boxed{30}} \times \underset{\substack{\text{2nd}\\ \text{org.}}}{\boxed{30}} \times \underset{\substack{\text{3rd}\\ \text{org.}}}{\boxed{30}} \times \underset{\substack{\text{4th}\\ \text{org.}}}{\boxed{30}} = 30^4$$

$$n(E') = \underset{\substack{\text{1st}\\ \text{org.}}}{\boxed{30}} \times \underset{\substack{\text{2nd}\\ \text{org.}\\ \text{(must be}\\ \text{different}\\ \text{than 1st org.)}}}{\boxed{29}} \times \underset{\substack{\text{3rd}\\ \text{org.}}}{\boxed{28}} \times \underset{\substack{\text{4th}\\ \text{org.}}}{\boxed{27}}$$

$$Pr(E') = \frac{n(E')}{n(S)}$$

$$= \frac{(30 \times 29 \times 28 \times 27)}{30^4}$$

$$\approx 0.81$$

$$Pr(E) = 1 - Pr(E')$$

$$\approx 0.19$$

(25) $$n(S) = \underbrace{\boxed{6}}_{\substack{\text{\# of}\\\text{options}\\\text{for}\\\text{1st roll}}} \times \underbrace{\boxed{6}}_{\substack{\text{2nd}\\\text{roll}}} \times \ldots \times \underbrace{\boxed{6}}_{\substack{\text{6th}\\\text{roll}}}$$

$$= 6^6$$

$$= 46656$$

$$n(E) = \underbrace{\boxed{C(6,2)}}_{\substack{\text{\# of ways}\\\text{to choose}\\\text{2 of 6 rolls}\\\text{to be a "5"}}} \times \underbrace{\boxed{5}}_{\substack{\text{\# of options}\\\text{for 1st}\\\text{non-5}\\(1,2,3,4,6)}} \times \underbrace{\boxed{5}}_{\substack{\text{2nd}\\\text{non-5}}} \times \underbrace{\boxed{5}}_{\substack{\text{3rd}\\\text{non-5}}} \times \underbrace{\boxed{5}}_{\substack{\text{4th}\\\text{non-5}}}$$

$$= 15 \times 5^4$$

$$= 9375$$

$$Pr(E) = \frac{9375}{46656}$$

$$\approx 0.20$$

(39) $n(S) = \underbrace{\boxed{5}}_{\text{\# of possible dinner plates (5 colours)}} \times \underbrace{\boxed{5}}_{\text{salad plates}} \times \underbrace{\boxed{5}}_{\text{bowls}}$

$= 125$

$n(E) = \underbrace{\boxed{5}}_{\text{\# of possible dinner plates}} \times \underbrace{\boxed{4}}_{\text{salad plates (different colour than dinner plate)}} \times \underbrace{\boxed{3}}_{\text{bowls}}$

$= 60$

$Pr(E) = \dfrac{60}{125}$

$= 0.48$

41 $n(S) = \boxed{5!}$ or $P(5,5)$ or $5 \times 4 \times 3 \times 2 \times 1$

\# of ways to order 5 people

$= 120$

Call the people M, W, C_1, C_2, C_3.
Glue M and W together to create one object: $\boxed{MW}$.

$n(E) = \boxed{4!} \times \boxed{2!}$

\# of ways to order the 4 objects $\boxed{MW}, C_1, C_2, C_3$

\# of ways to order M and W

$= 24 \times 2$

$= 48$

$Pr(E) = \dfrac{48}{120}$

$= 0.4$

43 $n(S) = \boxed{C(52,5)}$

\# of ways to choose 5 of 52 cards (unordered)

$n(E) = \boxed{13} \times \boxed{12} \times \boxed{C(4,3)} \times \boxed{C(4,2)}$

- 13: \# of options for denomination of the triple $(2, 3, \ldots, K, A)$
- 12: denomination of the pair (must be different than the triple)
- $C(4,3)$: suits for triple
- $C(4,2)$: suits for pair

$= 13 \times 12 \times 4 \times 6$

$= 3744$

$$Pr(E) = \frac{3744}{C(52,5)}$$

≈ 0.001

(45) $n(S) = \boxed{C(52,5)}$

# of ways
to choose
5 of 52
cards
(unordered)

$n(E) = \boxed{C(13,2)} \times \boxed{C(4,2)} \times \boxed{C(4,2)} \times \boxed{44}$

# of ways to choose denominations of the pairs (2, 3, ..., K, A)

suits for 1st pair

suits for 2nd pair

last card (denomination must be different than both pairs)
$52-4-4$

$= 78 \times 6 \times 6 \times 44$

$= 123552$

$$Pr(E) = \frac{123552}{C(52,5)}$$

≈ 0.05