3 Probability

1. $S = \{HHH, HHT, HTH, HTT, TTT, TTH, THT, THH\}$

a) $P(\text{at most one H}) = \frac{4}{8}$

b) $P(\text{exactly two Ts}) = \frac{3}{8}$

2. $S = \{\{1,3\}, \{1,7\}, \{1,11\}, \{1,13\}, \{3,7\}, \{3,11\}, \{3,13\}, \{7,11\}, \{7,13\}, \{11,13\}\}$

$P(\text{sum at least 15}) = \frac{4}{10}$

3.

first \ second	1	2	3	4
1	(1,1)	(1,2)	(1,3)	(1,4)
2	(2,1)	(2,2)	(2,3)	(2,4)
3	(3,1)	(3,2)	(3,3)	(3,4)
4	(4,1)	(4,2)	(4,3)	(4,4)

$n(S) = 16$

a) $P(\text{sum to 4}) = \frac{3}{16}$

b) $P(\text{sum to 3 or 4}) = \frac{5}{16}$

c) $P(\text{don't sum to 6}) = 1 - \frac{3}{16} = \frac{13}{16}$

4. $S = \{ \{A,B\}, \{A,C\}, \{A,D\}, \{B,C\}, \{B,D\}, \{C,D\} \}$

a) $P(\{A,C\}) = \frac{1}{6}$

b) $P(\text{one is B}) = \frac{3}{6}$

c) $P(\text{neither is D}) = \frac{3}{6}$

5. $E = \text{divisible by 3 or 5} = \{3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 5, 10, 20, 25\}$

$P(E) = \frac{14}{30}$

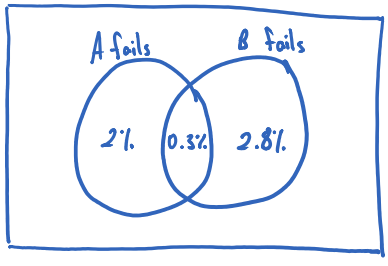
6. $n(S) = 37 + 41 + 98 + 55 = 231$

a) $P(\text{female}) = \frac{41 + 55}{231} = \frac{96}{231}$

b) $P(\text{male or on contract}) = \frac{37 + 98 + 41}{231} = \frac{176}{231}$

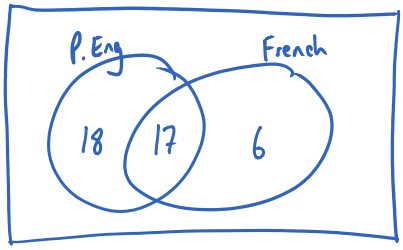
c) $P(\text{female and permanent}) = \frac{55}{231}$

7.



$P(\text{neither fails}) = 100\% - 2\% - 0.3\% - 2.8\%$
$= 94.9\%$

8.



$P(\text{P. Eng. but not French}) = \frac{18}{62}$

9. 26 letters in the alphabet
20 letters excluding D, F, I, O, Q, U

a) $\underline{18} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} = 7{,}200{,}000$

↑ also exclude W, Z

b) $\underline{1} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} = 400{,}000$

c) $\underline{18} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} \cdot \underline{20} \cdot \underline{9} = 6{,}480{,}000$

d) $n(\text{begin B or end 9}) = n(\text{begin B}) + n(\text{end 9}) - n(\text{begin B and end 9})$

$= 400{,}000 + 720{,}000 - 40{,}000$
$= 1{,}080{,}000$

$n(\text{begin B}) = \underline{1} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} = 400{,}000$

$n(\text{end 9}) = \underline{18} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} \cdot \underline{20} \cdot \underline{1} = 720{,}000$

$n(\text{begin B and end 9}) = \underline{1} \cdot \underline{10} \cdot \underline{20} \cdot \underline{10} \cdot \underline{20} \cdot \underline{1} = 40{,}000$

10. symbol set: $\{\underbrace{a, b, \cdots, z}_{26}, \underbrace{A, B, \cdots, Z}_{26}, \underbrace{0, 1, \cdots, 9}_{10}\}$

62 symbols

a) $P(\text{at least one number}) = 1 - P(\text{no numbers})$

$$= 1 - \frac{52^4}{62^4}$$

$$= 0.505$$

b) $P(\text{starts d or ends d}) = P(\text{starts d}) + P(\text{ends d}) - P(\text{starts d and ends d})$

$$= \frac{1 \cdot 62^3}{62^4} + \frac{62^3 \cdot 1}{62^4} - \frac{1 \cdot 62^2 \cdot 1}{62^4}$$

$$= 0.032$$