Exercise 11.3

Unit 11 · Basic Statistics

$$P(E) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}} \qquad P(\text{not } E) = 1 - P(E)$$

$$\text{Relative frequency} = \frac{\text{frequency of the event}}{\text{total number of trials}}$$

$$\text{Expected frequency} = \text{number of trials} \times \text{probability}$$

1 **A letter is chosen at random from the word ALLAH.**

Letters: A, L, L, A, H → 5 outcomes

(i) $P(\text{a vowel}) = \frac{2}{5}$ (A, A)

(ii) $P(\text{an H}) = \frac{1}{5}$

(iii) $P(\text{an L}) = \frac{2}{5}$

(iv) $P(\text{a consonant}) = \frac{3}{5}$ (L, L, H)

2 **A factory has 7000 jackets, 2000 shirts and 3000 trousers; 7 + 5 + 9 = 21 items are faulty.**

Total items = 7000 + 2000 + 3000 = 12,000

(i) $P(\text{trouser}) = \frac{3000}{12000} = \frac{1}{4}$

(ii) $P(\text{not a jacket}) = \frac{2000 + 3000}{12000} = \frac{5}{12}$

(iii) $P(\text{a faulty item}) = \frac{21}{12000} = \frac{7}{4000} = 0.00175$

In Q2 the item types are read from the working (jackets 7000, the others 2000 and 3000); please check against the book.

3 **A number wheel has 8 sectors, each with a flower name.**

(i) $P(\text{pointer stops at Rose}) = \frac{1}{8}$

(ii) $P(\text{pointer stops at a 4-letter flower name}) = \frac{1+1}{8} = \frac{1}{4}$

(iii) $P(\text{pointer does not stop at Marigold}) = \frac{8-1}{8} = \frac{7}{8}$

(iv) $P(\text{pointer stops at a 3-letter flower name}) = \frac{0}{8} = 0$ (impossible)

(v) $P(\text{pointer stops at a flower name}) = \frac{8}{8} = 1$ (certain)

4 **A decagonal die is labelled 4, 4, 4, 4, 5, 5, 6, 7, 8, 8.**

Total outcomes = 10

(i) $P(\text{a 4}) = \frac{4}{10} = \frac{2}{5}$

(ii) $P(\text{an even number}) = \frac{4+1+2}{10} = \frac{7}{10}$

(iii) $P(\text{a multiple of 4}) = \frac{4+2}{10} = \frac{3}{5}$

(iv) $P(\text{not a 7}) = \frac{9}{10}$

(v) $P(\text{an odd number}) = \frac{2+1}{10} = \frac{3}{10}$

(vi) $P(\text{a prime number}) = \frac{2+1}{10} = \frac{3}{10}$ (5, 5, 7)

(vii) $P(\text{the LCM of 4 and 8 (= 8)}) = \frac{2}{10} = \frac{1}{5}$

(viii) $P(\text{the HCF of 4 and 8 (= 4)}) = \frac{4}{10} = \frac{2}{5}$

(ix) $P(\text{a factor of 12}) = \frac{4+1}{10} = \frac{1}{2}$ (4s and 6)

5 **A one-digit whole number (0 to 9) is chosen at random.**

Total outcomes = 10

(i) P(less than 5) $= \frac{5}{10} = \frac{1}{2}$

(ii) P(greater than 10) $= \frac{0}{10} = 0$

(iii) P(not the largest one-digit number (9)) $= \frac{9}{10}$

(iv) P(the additive identity (0)) $= \frac{1}{10}$

(v) P(the HCF of 3 and 5 (= 1)) $= \frac{1}{10}$

(vi) P(the multiplicative identity (1)) $= \frac{1}{10}$

(vii) P(not a prime number) $= \frac{10 - 4}{10} = \frac{3}{5}$ (primes: 2, 3, 5, 7)

(viii) P(a factor of 9) $= \frac{3}{10}$ (1, 3, 9)

6 **A coin is tossed 10 times: 6 heads and 4 tails.**

Event	Frequency	Relative frequency
Head	6	6/10 = 3/5
Tail	4	4/10 = 2/5

(i) Expected heads in 520 tosses $= 520 \times \frac{3}{5} =$ **312**

(ii) Expected tails in 305 tosses $= 305 \times \frac{2}{5} =$ **122**

7 **A die is rolled 120 times.**

Number	Frequency	Relative frequency
1	15	15/120 = 1/8
2	25	25/120 = 5/24
3	15	15/120 = 1/8
4	20	20/120 = 1/6
5	30	30/120 = 1/4
6	15	15/120 = 1/8
	Σ = 120	

(i) Expected frequency of 6 in 6000 rolls $= 6000 \times \frac{1}{8} =$ **750**

(ii) Expected frequency of 1 in 3000 rolls $= 3000 \times \frac{1}{8} =$ **375**

(iii) Expected frequency of 2 in 400 rolls $= 400 \times \frac{5}{24} = 83.3 \approx$ **83**

8 **One girl is chosen at random from 6 sections (one from each, equally likely).**

(a) P(selecting the girl from Hazel section) $= \frac{1}{6}$

(b) P(not selecting the girl from Hazel section) $= 1 - \frac{1}{6} = \frac{5}{6}$

(c) $\frac{1}{6} + \frac{5}{6} = \frac{1+5}{6} = 1$

An event and its complement always add up to 1.

(d) Expected frequency (Orchid section, 6 trials) $= 6 \times \frac{1}{6} =$ **1**

(e) Expected frequency (Teal section, 60 trials) $= 60 \times \frac{1}{6} =$ **10**