Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- $p \approx 44/80 = \mathbf{0.55}$.

2.2

- $E = np = 150(0.2) = \mathbf{30}$.

2.3

- $E = np = 300(1/6) = \mathbf{50}$.

2.4

- **Random variation can give uneven counts in a small sample; more trials are needed** to judge the long-run pattern.

3.1

(a)

- $p \approx 18/240 = \mathbf{0.075}$.

(b)

- $E = np = 800(0.075) = \mathbf{60}$.

(c)

- **The rate is an estimate and can change; the actual count may differ** even if production stays similar.

3.2

(a)

- $p_A = 8/100 = \mathbf{0.08}$ and $p_B = 21/300 = \mathbf{0.07}$.
- B has the lower estimated rate, although the samples do not prove its true rate is lower.

(b)

- Pooled estimate $p = (8 + 21)/(100 + 300) = \mathbf{29/400}$.
- Expected count $E = np = 1200(29/400) = \mathbf{87}$.
- Accept sampling variation or a changed production mixture/rate as a limitation.

3.3

- Expected number = probability $\times$ number of trials $= 0.15 \times 60$.
- **9** trains.

3.4

(a)

- **Bea's**, because she made more spins.

(b)

- Combine the trials: $\dfrac{14 + 62}{50 + 200} = \dfrac{76}{250}$.
- **0.304**.