

Solutions

Exercises:

Challenge: $3\frac{5!}{2!2!} + 2(4)\frac{5!}{2!} + 5!$

1. $P(7) = \binom{10}{7} \left(\frac{1}{5}\right)^7 \left(\frac{4}{5}\right)^3 = 0.000786432$

$$P(x > 7) = \binom{10}{8} \left(\frac{1}{5}\right)^8 \left(\frac{4}{5}\right)^2 + \binom{10}{9} \left(\frac{1}{5}\right)^9 \left(\frac{4}{5}\right) + \left(\frac{1}{5}\right)^{10} = 0.000077926$$

2. (a) $P(0) = \binom{25}{0} (0.92)^{25}$

(b) $P(3) = \binom{25}{3} (0.08)^3 (0.92)^{22}$

(c) $P(1 \text{ or } 2) = \binom{25}{1} (0.08)^1 (0.92)^{24} + \binom{25}{2} (0.08)^2 (0.92)^{23}$

(d) $P(x > 3) = 1 - P(x \leq 3)$
 $= 1 - \left[\binom{25}{0} (0.08)^0 (0.92)^{25} + \binom{25}{1} (0.08)^1 (0.92)^{24} + \binom{25}{2} (0.08)^2 (0.92)^{23} + \binom{25}{3} (0.08)^3 (0.92)^{22} \right]$

3. $P(x = 35) = \frac{\binom{80}{35} \binom{100}{15}}{\binom{180}{50}}$

Problem Set

1. $P(x \geq 3) = 1 - P(x < 3) = 1 - \left[\binom{7}{0} (0.73)^7 + \binom{7}{1} (0.27)(0.73)^6 + \binom{7}{2} (0.27)^2 (0.73)^5 \right]$

2. $P(x > 5) = P(6) + P(7) + P(8) = \binom{8}{6} (0.86)^6 (0.14)^2 + \binom{8}{7} (0.86)^7 (0.14)^1 + \binom{8}{8} (0.86)^8$

3. (a) $P(x = 2) = \binom{10}{2} (1/15)^2 (14/15)^8$

(b) $P(x \leq 2) = \binom{10}{0} (14/15)^{10} + \binom{10}{1} (1/15)(14/15)^9 + \binom{10}{2} (1/15)^2 (14/15)^8$

(c) $P(x \geq 3) = 1 - P(x < 3) = 1 - [P(x < 2) + P(x = 2)]$
 $= 1 - \left[\binom{10}{0} (14/15)^{10} + \binom{10}{1} (1/15)(14/15)^9 + \binom{10}{2} (1/15)^2 (14/15)^8 \right]$

4. (a) $P(6) = \binom{12}{6} (0.75)^6 (0.25)^6$

(b) $P(9) = \binom{12}{9} (0.75)^9 (0.25)^3$

(c) $P(12) = \binom{12}{12} (0.75)^{12}$

5. (a) $P(x = 5) = \binom{5}{5} (0.25)^5$

(b) $P(x \geq 4) = P(x = 4) + P(x = 5) + \binom{5}{4} (0.25)^4 (0.75)^1 + \binom{5}{5} (0.25)^5$

(c) $P(x = 0) = \binom{5}{0} (0.75)^5$

(d) $P(x \leq 2) = \binom{5}{0} (0.75)^5 + \binom{5}{1} (0.25)^1 (0.75)^4 + \binom{5}{2} (0.25)^2 (0.75)^3$

$$6. P(x \leq 2) = \frac{\binom{90}{12} + \binom{90}{11} \binom{10}{1} + \binom{90}{10} \binom{10}{2}}{\binom{100}{12}}$$

$$7. (a) P(0) = \frac{\binom{276}{25}}{\binom{300}{25}}$$

$$(b) P(x = 3) = \frac{\binom{24}{3} \binom{276}{22}}{\binom{300}{25}}$$

$$(c) P(x = 1 \text{ or } 2) = \frac{\binom{24}{2} \binom{276}{23} + \binom{24}{1} \binom{276}{24}}{\binom{300}{25}}$$

$$(d) P(x > 3) = 1 - P(x \leq 3) = 1 - \left[\frac{\binom{276}{25}}{\binom{300}{25}} + \frac{\binom{24}{2} \binom{276}{23} + \binom{24}{1} \binom{276}{24}}{\binom{300}{25}} + \frac{\binom{24}{3} \binom{276}{22}}{\binom{300}{25}} \right]$$

$$8. P(x > 4) = \frac{\binom{15}{5} \binom{18}{2}}{\binom{33}{7}} + \frac{\binom{15}{6} \binom{18}{1}}{\binom{33}{7}} + \frac{\binom{15}{7}}{\binom{33}{7}}$$

$$9. (a) P(x = 0) = \frac{\binom{7}{4}}{\binom{10}{4}}$$

$$(b) P(x \leq 2) = \frac{\binom{7}{4} + \binom{3}{1} \binom{7}{3} + \binom{3}{2} \binom{7}{2}}{\binom{10}{4}}$$

$$10. P(x = 4) = \frac{\binom{10}{4}}{\binom{14}{4}}$$

$$11. P(g = 3) = \frac{\binom{5}{3}}{\binom{10}{3}}$$

$$12. P(5) = \frac{\binom{6}{5}}{\binom{10}{5}}$$

$$13. P(x < 2) = \frac{\binom{8}{0} \binom{12}{6} + \binom{8}{1} \binom{12}{5}}{\binom{20}{6}}$$