ANSWERS → Exercise 3.13.

1. A bowl contains 3 white and 5 black balls.

a) P(white and black)
$= P(w) \times P(b|w)$
$= \frac{3}{8} \times \frac{5}{7}$
$= \frac{15}{56}$

b) P(black and black)
$= P(b) \times P(b|b)$
$= \frac{5}{8} \times \frac{4}{7}$
$= \frac{20}{56}$
$= \frac{5}{14}$

c) P(white and white)
$= P(w) \times P(w|w)$
$= \frac{3}{8} \times \frac{2}{7}$
$= \frac{6}{56}$
$= \frac{3}{28}$

2. A bag contains 4 nickels and 6 quarters

a) P(nickel and quarter)
$= P(n) \times P(q|n)$
$= \frac{4}{10} \times \frac{6}{9}$
$= \frac{2}{5} \times \frac{2}{3}$
$= \frac{4}{15}$

b) P(quarter and nickel)
$= P(q) \times P(n|q)$
$= \frac{6}{10} \times \frac{4}{9}$
$= \frac{3}{5} \times \frac{4}{9}$
$= \frac{12}{45}$
$= \frac{4}{15}$

c) P(quarter and quarter)
$= P(q) \times P(q|q)$
$= \frac{6}{10} \times \frac{5}{9}$
$= \frac{3}{5} \times \frac{5}{9}$
$= \frac{15}{45}$
$= \frac{1}{3}$

3. A box contains 6 black chips, 9 blue chips

a) P(black and blue)
$= P(\text{black}) \times P(\text{blue}|\text{black})$
$= \frac{6}{15} \times \frac{9}{14}$
$= \frac{2}{5} \times \frac{9}{14}$
$= \frac{18}{70}$
$= \frac{9}{35}$

b) P(blue and blue and blue)
$= P(b) \times P(b|b) \times P(b|2b)$
$= \frac{9}{15} \times \frac{8}{14} \times \frac{7}{13}$
$= \frac{3}{5} \times \frac{4}{7} \times \frac{7}{13}$
$= \frac{84}{455}$
$= \frac{12}{65}$

c) P(b and b and b and b and b and b and b)
$= P(b) \times P(b|b) \times P(b|2b) \times P(b|3b) \times P(b|4b) \times P(b|5b) \times P(b|6b)$
$= \frac{6}{15} \times \frac{5}{14} \times \frac{4}{13} \times \frac{3}{12} \times \frac{2}{11} \times \frac{1}{10} \times \frac{0}{9}$
$= 0$ IMPOSSIBLE!

4a) INDEPENDENT / DEPENDENT EVENTS.

Similarities	Differences.
• To get both you find the product of individual probabilities.	• Numerators / Denominators change if one event is dependent on another.

5. A box has 3 hockey and 6 football cards.

a) P(hockey and hockey)
$= P(h) \times P(h|h)$
$= \frac{3}{9} \times \frac{2}{8}$
$= \frac{1}{3} \times \frac{1}{4}$
$= \frac{1}{12}$

b) P(hockey and football)
$= P(h) \times P(f|h)$
$= \frac{3}{9} \times \frac{6}{8}$
$= \frac{1}{3} \times \frac{3}{4}$
$= \frac{3}{12}$
$= \frac{1}{4}$

6. A box contains 100 plugs, 5 are defective.

a) $P(\text{defective plug}) = \frac{5}{100} = \frac{1}{20}$

b) $P(\text{not defective}) = 1 - P(\text{defective}) = 1 - \frac{1}{20} = \frac{20}{20} - \frac{1}{20} = \frac{19}{20}$

c) P(defective and defective)

$= P(\text{defective}) \times P(\text{defective})$

$= \frac{5}{100} \times \frac{4}{99}$

$= \frac{1}{20} \times \frac{4}{99}$

$= \frac{4}{1980}$

$= \frac{1}{495}$

d) P(not defective and not defective)

$= 1 - P(\text{defective and defective})$

$= 1 - \frac{1}{495}$

$= \frac{495}{495} - \frac{1}{495}$

$= \frac{494}{495}$.

7. Class → 16 girls, 14 boys.

a) $P(\text{girl and girl}) = P(g) \times P(g|g)$

$= \frac{16}{30} \times \frac{15}{29}$

$= \frac{8}{15} \times \frac{15}{29}$

$= \frac{120}{435}$

$= \frac{8}{29}$

b) $P(\text{boy and boy}) = P(b) \times P(b|b)$

$= \frac{14}{30} \times \frac{13}{29}$

$= \frac{7}{15} \times \frac{13}{29}$

$= \frac{91}{435}$

c) $P(\text{boy and girl}) = P(b) \times P(g|b)$

$= \frac{14}{30} \times \frac{16}{29}$

$= \frac{7}{15} \times \frac{16}{29}$

$= \frac{112}{435}$ (only one way!)

$\frac{112}{435} \times 2 = \frac{224}{435}$

8. 24 Cards
- #'s 0 → 9
- 2 equilateral Δ's
- 3 rectangles
- 3 squares
- 4 parallelograms
- 2 circles

a) P(number and geometric figure)
= P(number) x P(geometric|#)
$= \frac{10}{24} \times \frac{14}{23}$
$= \frac{70}{276}$
$= \frac{35}{138}$

b) $P(\text{number and number}) = P(\#) \times P(\#|\#)$

$= \frac{10}{24} \times \frac{9}{23}$

$= \frac{5}{12} \times \frac{9}{23}$

$= \frac{45}{276}$

$= \frac{15}{92}$

c) $P(\Delta \text{ and } O) = P(\Delta) \times P(O|\Delta)$

$= \frac{2}{24} \times \frac{2}{23}$

$= \frac{1}{12} \times \frac{2}{23}$

$= \frac{2}{276}$

$= \frac{1}{138}$

d) P(parallel and even)

$= P(p) \times P(e|p)$

$= \frac{10}{24} \times \frac{5}{23}$

$= \frac{5}{12} \times \frac{5}{23}$

$= \frac{25}{276}$

e) P(figure without right angle and parallelogram)

$= P(\text{no right}) \times P(\text{parallelogram} | \text{no right})$

$= \frac{4}{24} \times \frac{7}{23}$

$= \frac{1}{6} \times \frac{7}{23}$

$= \frac{7}{138}$