

9.1.1

a. $\frac{6!}{1!1!1!1!1!1!} = 720$

b. $\frac{8!}{2!} = \frac{40,320}{2} = \frac{5040}{2} = \frac{2520}{2} = 20,160$

c. $\frac{7!}{3!} = \frac{5040}{6} = 840$

9.1.3

a. $\frac{52!}{13!13!13!13!}$

b. $\frac{52!}{7!7!7!7!}$

9.1.4

a. 5^{20} ways, 1 Book to any of 5 Kids ... 20th book to any 5 Kids. $5 \times 5 \times 5 \dots \times 5$

b. $\frac{20!}{(4!)^5} = \frac{20!}{4!4!4!4!4!}$

9.2.2

a. $\boxed{\binom{20}{5}}$

$$\binom{n+m-1}{m-1} = \frac{15+6-1}{6-1} = \binom{20}{5}$$

b. $\binom{n+m-1}{m-1} = \frac{12+6-1}{6-1} = \boxed{\binom{17}{5}}$

c. $\boxed{\binom{20}{5} + \binom{19}{5} + \binom{18}{5}}$
 $\uparrow \quad \uparrow \quad \uparrow$
 0 superlooties 15c 25c

d. $\boxed{\binom{17}{5} + \binom{16}{5} + \binom{15}{5}}$
 $\uparrow \quad \uparrow \quad \uparrow$
 05c 15c 25c

9.2.4

$$\binom{n+m-1}{m-1}$$

a. $\frac{25+4-1}{4-1} = \boxed{\binom{28}{3}}$

b. $\boxed{\binom{23}{3}} \leftarrow 5 \text{ are quarters at least}$

c. $\sum_{i=0}^{10} \binom{28-i}{3} \leftarrow \text{Sum of quarters used up to 10}$

$$4.7018 \times 10^{-11}$$

4.2.5

a. $\boxed{\binom{57}{7}}$

b.

$$50 - 24 \checkmark 8 \cdot 3$$

$$= 26$$

$$\Rightarrow \binom{26+8-1}{8-1} = \boxed{\binom{33}{7}}$$

c.

~~$\binom{37}{7}$~~

at least
20 cases of
Coke $\rightarrow \boxed{\binom{36}{6}}$

9.3.1

a. $\boxed{\frac{60!}{(60-3)!}}$

b. $\boxed{\frac{60!}{(60-3)!3!}}$

c. $\boxed{\binom{60}{23} + \cancel{\binom{35}{20}} + \binom{15}{15}}$

9.3.5

a. 25^{10}

b. $\frac{10!}{1 \cdot (10-1)!} \Rightarrow 25 \cdot 24 \cdot 23 \cdot 22 \cdot 21 \cdot 20 \cdot 19 \cdot 18 \cdot 17 \cdot 16$

9.5.1

a. $\Rightarrow 4 \times 3^7$

b. $\Rightarrow 5 \leftarrow \text{All a's, a's b font, a's b back} \dots$

c. $= 5 \cdot 3 = 15$

d. $3^7 + 3^8$
 $\Rightarrow 3^7 + (3^8 \cdot 2)$

9.5.2

a. $2^{16} - 1$, all possibilities - 1 which is 0000...

b. $2^{16} - 2$ subtract 11111... and 00000...

c. $\Rightarrow \binom{16}{5} + \binom{2^4}{5} - \binom{4}{5}$

9.5.4

$$|A| + |B| + |C| - |A \cap B| - |B \cap C| - |A \cap C| + |A \cap B \cap C|$$

a.

$$60 + 40 + 24$$

$$124 - 20 - 8 - 12 + 4 = 88$$

b.

$$70 + 28 + 20$$

$$118 - 35 - 4 - 16 + 5 = 74$$

9.6.1

$$(a+b)^n = \sum_{k=0}^n \binom{n}{k} a^k b^{n-k}$$

a.

$$\Rightarrow (-3x + 4y)^7 = \binom{7}{3} (-3)^3 (4)^4 = -241920$$

b.

$$x^2 y^7, (5x - 4)^9$$

$$\Rightarrow \binom{9}{2} (5)^2 (-1)^7 = -900$$

c. $x^5 y^3, (3x - 4y)^8$

$$\Rightarrow \binom{8}{5} (3)^3 (-4)^3 = -870012$$

d. $x^6 y^1, (-2x - 5y)^7$

$$\Rightarrow \binom{7}{6} (-2)^6 (-5)^1 = -2240$$

9.6.2

$$(a+b)^n = \sum_{k=0}^n \binom{n}{k} a^k b^{n-k}$$

a.

$$a=3, b=-1$$

$$\Rightarrow (3+(-1))^n = \cancel{2^n} \boxed{2^n}$$

b.

$$a=2, b=0$$

$$\Rightarrow (2+0)^n = \boxed{2^n}$$