1. a. $2^8 = 256$ outcomes

    b. $C(8, 4) = \dfrac{8 \cdot 7 \cdot 6 \cdot 5}{4 \cdot 3 \cdot 2 \cdot 1} = 70$ outcomes

2. a. $2^9 = 512$ outcomes

    b. $C(9,2) = \dfrac{9 \cdot 8}{2 \cdot 1} = 36$ outcomes

3. a. $C(7,5) + C(7,6) + C(7,7) =$

    $\quad\quad 21 + 7 + 1 = 29$ outcomes

    b. $2^7 - 29 = 128 - 29 = 99$ outcomes

4. a. $C(6,0) + C(6,1) + C(6,2) + C(6,3)$

    $\quad 1 + 6 + 15 + 20$

    $\quad 42$ outcomes

    b. $2^6 - 42 = 64 - 42 = 22$ outcomes

5. a. $2C(6,3) = \dfrac{2 \cdot 6 \cdot 5 \cdot 4}{3 \cdot 2 \cdot 1} = 40$ ways

    b. $2C(5,3) = \dfrac{2 \cdot 5 \cdot 4 \cdot 3}{3 \cdot 2 \cdot 1} = 20$ ways

6. $2 + 2C(4,3) + 2C(5,3) + 2C(6,3) =$

    $\quad\quad 2 + 8 + 20 + 40 = 70$ ways

7. $C(11,5) \cdot C(6,5) \cdot C(1,1) =$

    $\quad\quad 462 \cdot 6 \cdot 1 = 2772$ ways

8. $C(15,10) \cdot C(5,2) \cdot C(3,3) =$

    $\quad\quad 3003 \cdot 10 \cdot 1 = 30,030$ ways

9. $C(8,5) = \dfrac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = 56$ ways

10. $C(6,3) = \dfrac{6 \cdot 5 \cdot 4}{3 \cdot 2 \cdot 1} = 20$ ways

11. $C(7,2) = \dfrac{7 \cdot 6}{2 \cdot 1} = 21$ ways

12. $C(9,4) = \dfrac{9 \cdot 8 \cdot 7 \cdot 6}{4 \cdot 3 \cdot 2 \cdot 1} = 126$ ways

13. $C(5,2) \cdot C(4,2) =$

    $\quad\quad 10 \cdot 6 = 60$ ways

14. $C(3,1) \cdot C(4,1) =$

    $\quad\quad 3 \cdot 4 = 12$ ways

15. $C(6,2) = \dfrac{6 \cdot 5}{2 \cdot 1} = 15$ ways

16. $C(6,4) = \dfrac{6 \cdot 5 \cdot 4 \cdot 3}{4 \cdot 3 \cdot 2 \cdot 1} = 15$ ways

17. c. The two points where the combinations stop are the two points that make up the intersection B. Therefore, the sum of these two points will be the single combination.

    d. $C(8,3) + C(8,4) = C(9,4)$

    $\quad\quad 56 + 70 = 126$

18. Answer will vary

19. $C(8,3) = 56$ outcomes

20. $C(7,3) = 35$ arrangements

21. $C(10,6) - C(7,4) =$

$210 - 35 = 175$ ways

22. $C(7,3) = 35$ ways

23. **a.** $C(12,5) = 792$ samples

b. $C(7,5) = 21$ samples

c. $C(7,2) \cdot C(5,3) = 21 \cdot 10 = 210$ samples

d. $C(7,4) \cdot C(5,1) + 21 =$

$35 \cdot 5 + 21 = 196$ samples

24. **a.** $C(15,6) = 5005$ ways

b. $C(9,6) = 84$ ways

c. $C(6,2) \cdot C(9,4) = 15 \cdot 126 = 1890$ ways

d. $5005 - \left(84 + C(9,5) \cdot C(6,1)\right)$

$5005 - \left(84 + 126 \cdot 6\right)$

$5005 - \left(84 + 756\right)$

$5005 - 840$

4165 ways