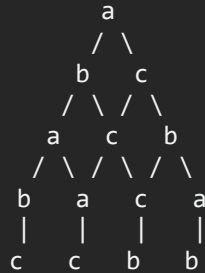


1- $(12 \text{ choose } 4,4,4) = 12! / (4!4!4!) = 27,720$

2-



3- (i)

The total number of ways to choose 2 items from 12 is:

$$12 \text{ choose } 2 = 12! / (2!10!) = 66$$

The number of ways to choose 2 defective items from 4 is:

$$4 \text{ choose } 2 = 4! / (2!2!) = 6$$

$$\text{So, } P(A) = 6/66 = 1/11$$

The number of ways to choose 2 non-defective items from 8 (12-4) is:

$$8 \text{ choose } 2 = 8! / (2!6!) = 28$$

$$\text{So, } P(B) = 28/66 = 14/33$$

(ii)

the probability that both items are non-defective is $28/66 = 14/33$.

the probability that at least one item is defective is:

$$1 - 14/33 = 19/33$$

4- (i)

The total number of ways to choose 3 items from 15 is:

$$15 \text{ choose } 3 = 15! / (3!12!) = 455$$

The number of ways to choose 3 non-defective items from the 10 (15-5) non-defective items is:

$$10 \text{ choose } 3 = 10! / (3!7!) = 120$$

So, the probability that none of the three selected items is defective is:

$$120/455 = 24/91$$

(ii)

$$3 \times 10 \times 9 = 270$$

the probability of choosing exactly one defective item is:

$$270/455 = 54/91$$

(iii)

The number of ways to choose 3 non-defective items from the 10 (15-5) non-defective items is:

$$10 \text{ choose } 3 = 10! / (3!7!) = 120$$

So, the probability that none of the three items is defective is:

$$120/455 = 24/91$$

Therefore, the probability that at least one item of the three items is defective is:

$$1 - 24/91 = 67/91$$

5-

$$P(A \cup B) = p(A) + p(B) - p(A \cap B)$$

$$= 10/30 + 15/30 + 5/30 = 20/30$$

6-

$$P(A^c) = 1 - 3/8 = 5/8$$

$$P(B^c) = 1 - 1/2 = 1/2$$

$$P(A \cup B) = 3/8 + 1/2 - 1/2 = 3/8$$

$$\text{Then ; } P(A^c \cap B^c) = 1 - P(A \cup B) = 1 - 3/8 = 5/8$$

$$(A \cap B) = 1/2, \text{ so } (A \cap B)^c = 1 - 1/2 = 1/2.$$

$$P(A \cap B^c) = P(B^c) - P((A \cap B)^c)$$

We know that $P(B^c) = 1/2$ and $(A \cap B)^c = 1/2$, so:

$$P(A \cap B^c) = 1/2 - 1/2 = 0$$

$$P(B \cap A^c) = P(B) - P((A \cap B)^c)$$

We know that $P(B) = 1/2$ and $(A \cap B)^c = 1/2$, so:

$$P(B \cap A^c) = 1/2 - 1/2 = 0$$

7-

$$P(\text{at least one } 7) = 1 - P(\text{no } 7\text{'s in three rolls})$$

$$= 1 - (30/36)^3$$

$$= 1 - 0.5787$$

$$= 0.4213$$

The probability is 0.4213 or 42.13%.

8-

$$\sum P(x) = 1$$

$$k^2 - 8 = 1$$

$$k^2 = 9$$

$$k = \pm 3$$

9-

$$P(A' \cap B') = P((A \cup B)')$$

$$P(A \cup B) = 0.35 + 0.45 = 0.8$$

$$P(A' \cap B') = P((A \cup B)') = 1 - P(A \cup B) = 1 - 0.8 = 0.2$$