Stats & Probability Theory

Question # 1:-

Nuts with metric threads = 3

Nuts with U.S Threads = 12.

One is chosen randomly.

Let event A be one nut chosen.

$$P(A) = n(A)/n(S)$$

$$= \frac{\binom{3}{1}}{\binom{15}{1}} = \frac{3}{15} = \boxed{0.2} \quad n(S) = \binom{15}{1}$$

Question # 2:-

Two coins are tossed.

Let event A : one heads one tails.

$S = \{HH, HT, TH, TT\}$ $n(S) = 4$.

$$P(A) = \frac{n(A)}{n(S)}$$

$$= 2/4 = \boxed{0.5}$$

Question # 3:-

Given: A coin is tossed twice.

Let event A : at least one head.

$S = \{HH, HT, TH, TT\}$. $n(S) = 4$

$$P(A) = n(A)/n(S)$$

$$= 3/4 = \boxed{0.75}.$$

Question #5:-

Given: Industrial = 25
Mechanical = 10
Electrical = 10
Civil = 8. Total =

One person is randomly selected

a) An industrial engineering major

Let event (I) : industrial major

$$P(I) = n(I)/n(S)$$

$$= \frac{\binom{25}{1}\binom{28}{0}}{\binom{53}{1}}$$

$$= \boxed{0.47}$$

b) A civil engineer or an electrical major

Let event (B) : A civil or electrical major

$$P(B) = n(B)/n(S).$$

$$= \frac{\binom{8}{1}\binom{45}{0} + \binom{10}{1}\binom{43}{0}}{\binom{53}{1}}$$

$$= \boxed{0.33}$$

Question #6:-

Given: Poker hand consisting of 5 cards

Let event A: 2 aces and 3 Jacks

$$P(A) = n(A)/n(S)$$

$$= \frac{\binom{4}{2}\binom{4}{3}\binom{44}{0}}{\binom{52}{5}}$$

$$= \frac{(6)(4)(1)}{2598960}$$

$$= \boxed{0.00000092}$$

Question #7:-

Given: Red balls = 6.

Yellow balls = 5

Green balls = 3

One ball is drawn at random.

a) Green

Let event G be green ball drawn.

$$P(G) = n(G)/n(S)$$

$$= \frac{\binom{3}{1}\binom{11}{0}}{\binom{14}{1}}$$

$$= \boxed{0.21}$$

b) Not Yellow

Let event Y: not yellow.

$$P(Y) = n(Y)/n(S)$$

$$= \frac{\binom{6}{1}\binom{5}{0}\binom{3}{0} + \binom{6}{0}\binom{5}{0}\binom{3}{1}}{\binom{14}{1}}$$

$= \boxed{0.64}$

c) Red or Yellow.

Let event A be Red or Yellow

$P(A) = n(A)/n(S)$.

$$= \frac{\binom{6}{1}\binom{8}{0} + \binom{5}{1}\binom{9}{0}}{\binom{14}{1}}$$

$= \boxed{0.78}$.

Question # 8:-

Question #9:-

Given: Two dice are rolled once.

Let event A be score of 7.

S = {(1,1), (1,2), (1,3), (1,4), (1,5), (1,6),

S =	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

n(S) = 36.

A = {(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)}

P(A) = n(A)/n(S)

= 6/36

= 0.16

Question #10:-

2^3 =

Given: A coin is tossed 3 times.

Let event A be the sequence heads, tails, heads.

S = {H,H,H, H,H,T, H T, H, H,T,T, T,HH THT, TTH, TTT}

A = HTH.

P(A) = n(A)/n(S) = 1/8

= 0.125

Question No 11:-

Given 6 complex electronic systems.

2 chosen randomly.

a) Two are defective.

b) At least one will be defective.

c) Both are defective.

Let event C : at least one defective.

$$P(C) = n(C)/n(A) = \frac{\binom{2}{1}\binom{4}{1} + \binom{2}{2}\binom{4}{0}}{\binom{6}{2}}$$

= 9/15 = 0.6

Let event

P(D) = both defective.

$$P(D) = n(D)/n(S) = \frac{\binom{2}{2}\binom{4}{0}}{\binom{6}{2}}$$

= 0.06

b) Four are defective.

Let event C : at least one defective.

$$P(C) = 2\frac{\binom{4}{1}\binom{2}{1} + \binom{4}{2}\binom{2}{0}}{\binom{6}{2}}$$

0.93

Let event d : both defective

$$P(d) = n(d)/n(s) = \frac{\binom{4}{2}\binom{2}{0}}{\binom{6}{2}}$$

= 0.4

Question # 12:-

Given: Two types of consoles

let them be H and T

Four customers in succession come

a) List the possibilities for preference arrangements.

HHHH ✓

HHHT

HHTH

HHTT

HTHH

HTHT

HTTH

HTTT

THHH

THHT

THTH

THTT

TTHH

TTHT

TTTH

TTTT ✓

b) Assign probabilities to the sample points

Each has posibilty 1/16.

c) Let event A : 4 customers prefer the same style.

$n(S) = 16.$

$n(A) = 2.$

$P(A) = n(A)/n(S) = 2/16. = \boxed{0.125}$

Question # 13:-

Given: 3 persons are to be selected.

men = 5, women = 3.

a) 1 men and women.

Let event A be 1 men and women.

$$P(A) = n(A)/n(S)$$

$$= \frac{\binom{5}{1}\binom{3}{2}}{\binom{8}{3}} = 15/56 = \boxed{0.26}$$

b) All = women.

Let event B: All women

$$P(B) = n(B)/n(S)$$

$$= \frac{\binom{3}{3}\binom{5}{0}}{\binom{8}{3}} = 5/56 = \boxed{0.08}$$

Question # 14:-

Given: Tank containing 10 fishes.

Yellow = 3 three are selected

Black = 7.

a) Exactly one yellow fish is selected.

$$P(A) = n(A)/n(S).$$

$$= \frac{\binom{3}{1}\binom{7}{2}}{\binom{10}{3}} = 63/120 = \boxed{0.525}$$

b) At most one yellow fish is selected.

$$P(B) = n(B)/n(S)$$

$$= \binom{3}{1}\binom{7}{2} + \binom{3}{}\binom{7}{2}$$

$= \boxed{0.81}$

c) At least one is yellow.

$P(C) = n(C)/n(S)$

$= \dfrac{\binom{3}{1}\binom{7}{2} + \binom{3}{2}\binom{7}{1} + \binom{3}{3}\binom{7}{0}}{\binom{10}{3}}$

$= \dfrac{63 + 21 + 1}{120}$

$= 85/120$

$= \boxed{0.70}$

Question #15:-

Given: Total apples = 15

Defective = 2.

Four are selected

a) Let event A : none are defective.

$P(A) = n(A)/n(S)$

$= \dfrac{\binom{13}{4}\binom{2}{0}}{\binom{15}{4}} = \dfrac{715}{1365} = \boxed{0.52}$

b) Let event B : At least one is defective.

$P(B) = n(B)/n(S)$

$= \dfrac{\binom{2}{1}\binom{13}{3} + \binom{2}{2}\binom{13}{2}}{\binom{15}{4}}$

$= \dfrac{2(286) + 78}{1365} = \dfrac{650}{1365} = \boxed{0.47}$

Question #16:-

Given: 12 paint shops
15 carpet shops.

In how many ways can she choose these two shops. She wants to buy paint & carpet.

$$\binom{12}{1}\binom{15}{1} = 180$$

Question # 17:-

Given: white = 15
black = 7
yellow = 8

3 balls are drawn at random.

a) Let event A: All are yellow

$$P(A) = n(A)/n(S)$$

$$= \frac{\binom{8}{3}\binom{22}{0}}{\binom{30}{3}} = \frac{56}{4060} = \boxed{0.013}$$

b) Let event B: All three same color.

$$P(B) = n(B)/n(S).$$

$$= \frac{\binom{15}{3}\binom{15}{0} + \binom{7}{3}\binom{23}{0} + \binom{8}{3}\binom{22}{0}}{\binom{30}{3}}$$

$$= \frac{455 + 35 + 56}{4060} = \boxed{0.13}$$

c) let event C : All different colors.

$$P(C) = n(C)/n(S)$$

$$= \frac{\binom{8}{1}\binom{7}{1}\binom{15}{1}}{\binom{30}{3}} = \boxed{0.20}$$

Question #18 :-

Given : 12 items.
4 are defective.
3 are ~~selected~~. drawn.

a)

let event b :

b) Exactly one is defective.

$$P(b) = n(b)/n(s).$$

$$= \frac{\binom{4}{1}\binom{8}{2}}{\binom{12}{3}}$$

$$= 112/220 = \boxed{0.509}$$