Probability

Probability

Placement for All.. All for Placement

This Video Completely covers the problems on "Probability" which is more than sufficient for all kind of placement Exams eg: TCS/WIPRO/AMCAT/ELITMUS/CoCubes and all other placement Exams.

"Probability"by : Pratik Shrivastava(10 years of industry experience and awarded best Aptitude trainer)

Probability

Know About Factorials:

n! = n * (n-1) * (n-2) * (n-3) .....* 1

5! = 5 x 4 x 3 x 2 x 1 =120

Below factorials need to keep in mind:

0! = 1 7!=5040

1! = 1 8! =40320

2!= 2

3! = 6

4! = 24

5! =120

6! =720

Probability

Probability formulas:

P(E)= n(E)/n(S)

Where n(S) = total outcome

And n(E) = favorable outcome

Probability

Probability formulas:

P(E)= n(E)/n(S)

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

Event

Where n(S) = total outcome

And n(E) = favorable outcome

n(S): total outcome → Rain (Event)

n(E): fav. outcome → accident → wedding

Coin → H, T

$P(\text{Head}) = \frac{1}{2} = 50\%$

Cricket

$P(E) = \frac{4}{3} \times -1 \times$

$P(E) = 100\%$, $\frac{100}{100} = 1$

$0 \le P(E) \le 1$

* $P(E) = 0$ — Sun will rise from west

* $P(E) = 1$ — Universal truth: Sun rise East

Probability

nCr

- nCr is used to know number of ways to choose r objects from n number of objects. for example I have 3 balls b1,b2,b3 and I want to choose 2 out of them so how will i choose?
- I can either choose b1,b2 or b2,b3 or b3,b1. so that means i have 3 ways to choose. this same thing can be done using nCr here n=3 i.e toatal no of objects and r=2 i.e no of objects i need to to choose so putting values of n and r in formulae 3C2 =3!/(3–2)!.2!.=3

Probability

nCr ← combination

- nCr is used to know number of ways to choose r objects from n number of objects. for example I have 3 balls b1,b2,b3 and I want to choose 2 out of them so how will i choose?
- I can either choose b1,b2 or b2,b3 or b3,b1. so that means i have 3 ways to choose. this same thing can be done using nCr here n=3 i.e toatal no of objects and r=2 i.e no of objects i need to to choose so putting values of n and r in formulae 3C2 =3!/(3–2)!.2!.=3

$^3C_2$

$$^nC_r = \frac{n!}{r! \times (n-r)!}$$

$^3C_2 = \frac{3!}{2! \times (3-2)!} = \frac{6}{2 \times 1} = 3$

(*) $^{10}C_2 = \frac{n!}{2! \times (n-r)!} = \frac{10!}{2! \times 8!} = \frac{10 \times 9 \times 8!}{2 \times 8!} = 45$

45

(*) $^{52}C_2 = \frac{52!}{2! \times 50!} = \frac{26 \cancel{52} \times 51 \times \cancel{50}!}{\cancel{2} \times \cancel{50}!}$

1326

$26 \times (50+1) = 1300 + 26 = 1326$

Probability

Questions based on Coins:

Q1. If we toss a single coin in the air the probability of getting Head?

a. ½ b. 2/3 c. 1/3 d. 3/4

$P(E) = \frac{n(E)}{n(S)} = \frac{1}{2}$

$\{H, T\}$

Solutions:

50 coin:

Total outcome

(1) If you toss 1 coin : $2^1 = 2 = \{H, T\}$

(2) If you toss 2 coins or 1 coin twice : $2^2 = 4 = \{HH, TT, HT, TH\}$

(3) If you toss 3 coins or 1 coin 3 times = $2^3 = 8$]

Probability

Questions based on Coins:

Q2. If we toss three coins in the air the probability of getting 2Heads.

A. 1/16 B. ½ C. 3/16 D. 3/8 E. None

Solutions:

$2^3 = 8 = \{HHH, TTT, HTT, THH, HTH, THT, TTH, HHT\}$ 3

$P(2\ Head) = \frac{n(E)}{n(S)} = \frac{3}{8}$

Probability

Questions based on Coins:

Q3. If we toss three coins in the air the probability of getting atleast 2Heads.

A. 1/16 B. ½ C. 3/16 D. 3/8 E. None

Solutions:

Total outcome $2^3 = 8 = \{HHH, TTT, HTH, THT, HHT, TTH, THH, HTT\}$

$P(\text{min } 2\ Head) = \frac{n(E)}{n(S)} = \frac{4}{8} = \frac{1}{2}$

atleast 2 Head

= min^m . 2 Head

max^m - NO rest]

Probability

Questions based on Coins:

Q4. If we toss three coins in the air the probability of getting atmost 2Tail.

A. 1/16 B. ½ C. 3/16 D. 11/16 E. 7/8

Solutions:

Total outcome $= 2^3 = 8 = \{HHH, TTT, HTH, THT, HHT, THT, TTH, HTT\}$

$P(E) = \frac{n(E)}{n(S)} = \frac{7}{8}$

atmost → maxim 2 tail

min. no restrictions = 0

0T, 1T, 2T

Probability

Questions based on Coins:

Q5. A fair coin is tossed 4 times. What is the probability of getting at least 2 tails?

A. 1/16 B. ½ C. 3/16 D. 11/16 E. 3/8

Solutions:

[16 outcomes]

$P(E) = \frac{n(E)}{n(S)} = \frac{11}{16}$

Total outcome $= 2^4 = 16$

$n(S) = 16$

atleast 2 tail

[min: 2 tails
max: no restrication]

{THHH, HTHH, HHTH, HHHT, HHHH}

16 − 5 = 11 outcomes

5 outcomes: 0 or 1 tails

atleast 2 tails → 2 tails & 3 tails & 4 tails

Probability

Directions (6 – 8): A bag contains 6 red balls and 8 green balls. Two balls are drawn at random one after one with replacement.

What is the probability that-

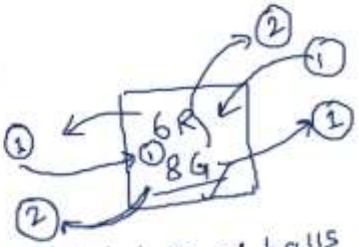
[With replacement] [Balls]

Q6. Both the balls are green

(a) 13/49 (b) 15/49 (c) 16/49 (d) 17/49 (e) None of these

$P(E) = \frac{n(E)}{n(S)} = \frac{{}^8C_1}{{}^{14}C_1} \times \frac{{}^8C_1}{{}^{14}C_1}$

$= \frac{8}{14} \times \frac{8}{14} = \frac{16}{49}$



Total no of balls = 14

${}^nC_r$ ← x → And, + ↗

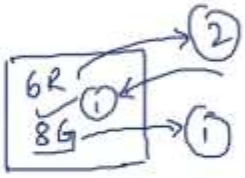
Probability

Directions (6 – 8): A bag contains 6 red balls and 8 green balls.

Two balls are drawn at random one after one with replacement. What is the probability that-

Q7) First one is green and second one is red

(a) 16/49 (b) 14/49 (c) 11/49 (d) 12/49 (e) None of these



$P(E) = \frac{n(E)}{n(S)} \Rightarrow P(1G) \times P(2R)$

$\Rightarrow \frac{{}^8C_1}{{}^{14}C_1} \times \frac{{}^6C_1}{{}^{14}C_1} \Rightarrow \frac{48}{7 \cancel{14}} \times \frac{6}{\cancel{14}\ 7} \Rightarrow \frac{12}{49}$

Total no of balls = 14

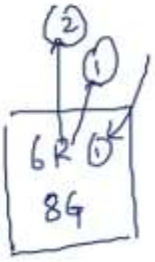
Probability

Directions (6 – 8): A bag contains 6 red balls and 8 green balls. Two balls are drawn at random one after one with replacement.

What is the probability that-

Q8. Both the balls are red

(a) 14/49 (b) 9/49 (c) 11/49 (d) 12/49 (e) None of these



$P(\text{Both Red}) = \frac{n(E)}{n(S)}$

$= \frac{{}^6C_1}{{}^{14}C_1} \times \frac{{}^6C_1}{{}^{14}C_1} = \frac{36}{7 \cancel{14}} \times \frac{6}{\cancel{14}\ 7} = \frac{9}{49}$

$\frac{6!}{1! \times 5!} = \frac{6 \times \cancel{5!}}{\cancel{5!}}$

$^6C_1 = 6$

$^nC_1 = n$

Total = 14

Probability

V.V.I

Q9) From a group of 3 men, 4 women and 2 children, 4 people are to be chosen to form a committee. What is the probability that the committee contains at least 1 each of men, women and children?

(a) 4/15 (b) 12/21 (c) 4/19 (d) 11/31 (e) None of these

$^nC_n = 1$

$^nC_1 = n$

Solution:

$n(S) = {}^9C_4$

1M & 2W & 1C

4 people

$= \frac{7 \cancel{8} 12}{3 \times 7 \times \cancel{8}} \Rightarrow \frac{12}{21}$

= 1 combination

$M \cancel{\&} 2W \cancel{\&} 1C) + (2M \cancel{\&} 1W \cancel{\&} 1C) + (1M \cancel{\&} 1W \cancel{\&} 2C)$

4 4 4

$^4C_2$

$\frac{4!}{2! \times 2!} \quad \frac{24}{4} \quad 6$

$n(E) \Rightarrow {}^3C_1 \times {}^4C_2 \times {}^2C_1 + {}^3C_2 \times {}^4C_1 \times {}^2C_1 + {}^3C_1 \times {}^4C_1 \times {}^2C_2$

$n(E) \Rightarrow 3 \times 6 \times 2 + 3 \times 4 \times 2 + 3 \times 4 \times 1$

$n(E) \Rightarrow 36 + 24 + 12 = 72$

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

$\frac{{}^9C_4}{9!} = \frac{3 \cancel{9} \times 8 \times 7 \times 6 \times \cancel{5!}}{\cancel{8} \times 24 \times \cancel{5!}} = \frac{72}{{}^9C_4} \Rightarrow$

$4! \times 5!$

Probability

Q10. There are 4 black balls and 6 white balls. 2 balls are drawn one by one without replacement. What is the probability that the balls are same in color?

(a) 9/21 (b) 8/17 (c) 5/14 (d) 7/15 (e) 9/19

Solution:

$$P\left([\text{Both are Black} + \text{Both are white}]\right) = \frac{n(E)}{n(S)}$$

4B, 6W

Total = 10

$4C_1 = 4$, $3C_1 = 3$

$$\Rightarrow \left[\frac{4C_1}{10C_1} \times \frac{3C_1}{9C_1} + \frac{6C_1}{10C_1} \times \frac{5C_1}{9C_1}\right]$$

$$\left[\frac{12}{90} + \frac{30}{90}\right] = \frac{42}{90} = \frac{7}{15}$$

Probability

Q11. A bag contains 6 white and 4 black balls .2 balls are drawn at random. Find the probability that they are of same colour

(a) 1/2 (b) 7/15 (c) 8/15 (d) 1/9

Solution:

$$P\left([\text{Both white} \text{ or } \text{Both Black}]\right) = \frac{n(E)}{n(S)}$$

6W, 4B

Total no = 10

$n(S) = {}^{10}C_2$

$${}^{10}C_2 = \frac{10!}{2! \times 8!} = \frac{10 \times 9 \times 8!}{2 \times 8!}$$

$$\Rightarrow \frac{{}^6C_2}{{}^{10}C_2} + \frac{{}^4C_2}{{}^{10}C_2}$$

$${}^6C_2 = \frac{6!}{2! \times 4!} = \frac{6 \times 5 \times 4!}{2 \times 4!}$$

$$\frac{15}{45} + \frac{6}{45} \Rightarrow \frac{21}{45} = \frac{7}{15}$$

Probability

Q12. A box contains 5 green, 4 yellow and 3 white marbles. Three marbles are drawn at random. What is the probability that all they are not of the same colour?

(a) 3/44 (b) 3/55

(c) 52/55 (d) 41/44

Explain

[1G 2Y + 1Y 2G + 1Y 2W + 1G 1Y 1W] → 5 min

Solution:

$\Rightarrow 1 - [\text{All are of same colour}] =$

$P(\text{all are of same colour}) = \frac{n(E)}{n(S)} \Rightarrow [3G + 3Y + 3W]$

5G, 4Y, 3W

Total: 12

$n(S) = {}^{12}C_3$

$$1 - \left[\frac{5C_3}{12C_3} + \frac{4C_3}{12C_3} + \frac{3C_3}{12C_3}\right]$$

$${}^{12}C_3 = \frac{12!}{3! \times 9!} = \frac{12 \times 11 \times 10 \times 9!}{6 \times 9!}$$

$$1 - \left[\frac{10}{220} + \frac{4}{220} + \frac{1}{220}\right] \Rightarrow 1 - \frac{15}{44} = \frac{41}{44}$$

$P(S) + P(\bar{S}) = 1$

$P(H) + P(\bar{H}) = 1$

50+ 50+

Probability

Q13. Ram Speaks Truth 40% of the time and Laxman Speaks truth 60% of the time. Percentage of cases Ram and Laxman are likely to contradict each other?

(a) 50% (b) 53% c) 52% (d) 60% [TCS NQT 2020]

Solution:

$R_T = \frac{40}{100} = \frac{2}{5}$ ✓

$R_L = \frac{60}{100} = \frac{3}{5}$ ✓

$L_T = \frac{60}{100} = \frac{3}{5}$ ✓

$L_L = \frac{40}{100} = \frac{2}{5}$ ✓

$\Rightarrow [R_T \times L_L + R_L \times L_T] \Rightarrow \frac{2}{5} \times \frac{2}{5} + \frac{3}{5} \times \frac{3}{5}$

$= \frac{4}{25} + \frac{9}{25} = \frac{13}{25}$ ✓

$\Rightarrow \frac{13}{25} \times 100$

$= 52\%$

Probability

Know About Cards:

(1) Total number of card are 52.

(2) There are 13 cards of each suit named Diamond, Hearts, Clubs and Spade.

(3) Out of which Hearts and diamonds are red cards.

(4) Spades and Clubs are black cards

(5) There are four face cards each in number four King, Queen and Jack

Black Suit Card- (26)

i) Spade (13)

ii) Club (13)

Red Suit Card–(26)

i) Diamond (13)

ii) Heart (13)

(6) Each Spade, Club, Diamond, Heart has 9 digit cards 2, 3, 4, 5, 6, 7, 8, 9 and 10

(7) There are 4 Honors cards each Spade, Club, Diamond, Heart contains 4 numbers of Honours cards Ace, King, Queen and Jack

Total face card : 12 and Total honor card : 16

Probability

Know About Cards: ✓

(1) Total number of card are 52. ✓

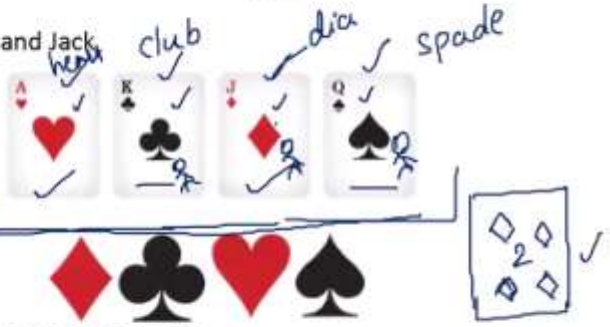
(2) There are 13 cards of each suit named Diamond, Hearts, Clubs and Spade.

(3) Out of which Hearts and diamonds are red cards.

(4) Spades and Clubs are black cards

(5) There are four face cards each in number four King, Queen and Jack

[Playing cards]



52 Cards

Black Suit Card- (26) → 2

i) Spade (13) → 4 → 3

ii) Club (13) → 4 → 3

Red Suit Card–(26) → 2

i) Diamond (13) → 4 → 3

ii) Heart (13) → 4 → 3

26B 26R

13(S) 13(C) 13(H) 13(D)

4 3 4 3 4 3 3 3

(6) Each Spade, Club, Diamond, Heart has 9 digit cards 2, 3, 4, 5, 6, 7, 8, 9 and 10

J K Q A

(7) There are 4 Honors cards each Spade, Club, Diamond, Heart contains 4 numbers of Honours cards Ace, King, Queen and Jack

Total face card : 12 and Total honor card : 16

Probability

Q14. Two cards are drawn at random from a pack of 52 cards.what is the probability that either both are black or both are queen?

A). 55/221 B)55/190 C)55/121 D)19/221

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

Placement

52

26B 26R

13 13 13 13

Q Q Q Q

J K Q A

Total no of cards = 52

$n(S) = {}^{52}C_2$

$P(\text{Both are Black} + \text{Both are Queen})$

twist

$\left[\frac{{}^{26}C_2}{{}^{52}C_2} + \frac{{}^{4}C_2}{{}^{52}C_2} - \frac{{}^{2}C_2}{{}^{52}C_2}\right]$

$\Rightarrow \frac{325}{1326} + \frac{6}{1326} - \frac{1}{1326}$

$\frac{330}{1326} = \frac{55}{221}$

Very very good :

$[{}^{52}C_2 = 1326]$

${}^{26}C_2 = \frac{26!}{2! \times 24!}$

13×25

$260 + 65$

325

$= \frac{26 \times 25 \times 24!}{2 \times 24!}$

Probability

Q15. One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card (Jack, Queen and King only)?

A) 3/13 B) 1/13 C) 3/52 D) 9/52 E) None of these

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

$n_{C_1} = n$

$\Rightarrow \frac{12_{C_1}}{52_{C_1}}$

$\Rightarrow \frac{12}{52} \Rightarrow \frac{3}{13}$

Total Cards = 52

$n(S) = 52_{C_1}$

$\frac{3}{13}$

26B 26R

13 13 13 13

J, Q, K

face = 3+3+3+3 = 12

Probability

Q16. Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart, is:

A) 3/20 B) 29/34 C) 47/100 D) 13/102 E) None of these

$\Rightarrow P(\text{one spade \& one heart}) = \frac{n(E)}{n(S)}$

$= \frac{13_{C_1} \times 13_{C_1}}{52_{C_2}}$

1326

$= \frac{13 \times 13}{1326} = \frac{13}{102}$

52 cards

$n(S) = 52_{C_2}$

52

26B 26R

(S)13 (C)13 13(D) 13(H)

Probability

Know About Dice:

- When we roll a dice the outcome will be 6^1: { 1,2,3,4,5,6 }
- When we roll two dice then the outcome will be $6^2 = 36$

	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)

Probability

Q17. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

A) 3/16 B) 1/8 C) ¾ D) ½ E) None of these

Solution:

Two dice, total outcome: $6^2 = 36$

Even no × Number: Even

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

$2 \times 3 = 6$

$2 \times 4 = 8$

$= \frac{27}{36} = \frac{3}{4}$

	1	2	3	4	5	6	
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)	→ 3
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)	→ 6
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)	→ 3
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)	→ 6
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)	→ 3
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)	→ 6

27

36

Probability

Q18. Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is odd?

A)3/16 B) 1/8 C) ¾ D) ½ E) None of these $(\frac{1}{4})$

Solution:

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

$= \frac{9}{36} = \frac{1}{4}$

Two dice, outcome: 36

Product as even no: 27

Product as odd no

36 − 27 = 9

	1	2	3	4	5	6	
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)	→ 3
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)	→ 0
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)	→ 3
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)	→ 0
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)	→ 3
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)	→ 0

9

Probability

Q19. Two dice are thrown simultaneously. What is the probability of getting one number divisible by 2 and other number divisible by 3.

A)9/52 B)11/52 C)13/52 D)None of these

Solution:

[Total outcome: $6^2 = 36$]

$P(E) = \frac{n(E)}{n(S)} = \frac{11}{36}$

* [1st no divisible by 2 & 2nd no divisible by 3]

$n(E) = 11$

fav. outcome = 11

	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)

Probability

Q20. Two finals are scheduled – The Wimbledon match and the World Cup Cricket at the same time. Anu wants to watch the Wimbledon finals and her brother Vinu wants to watch WCC final. They decide to roll a tetrahedral dice twice. The tetrahedral is numbered 1,2,3,4 on its four sides and all numbers are equally likely to appear. Anu rolls first and then Vinu rolls. If the number on the first roll is strictly greater than the number on the second roll, Anu wins and gets to watch Wimbledon. What is the probability that Anu will get to watch Wimbledon? [TCS NQT 2020]

A)7/16 B)9/16 C)3/8 D)1/2

* when you roll tetrahedral dice = {1, 2, 3, 4} := 4'
* " " " twice = 4^2 = 16

{(1,1) (1,2) (1,3) (1,4)
(2,1) (2,2) (2,3) (2,4)
(3,1) (3,2) (3,3) (3,4)
(4,1) (4,2) (4,3) (4,4)}

P(Anu will get to watch WM) = $\frac{n(E)}{n(S)}$

[(2,1) (3,1) (3,2)
(4,1) (4,2) (4,3)]

$= \frac{6}{16} = \frac{3}{8}$

Probability

Q21. Find the probability that a leap year chosen at random will have 53 Sundays.

a. 1/7 b. 2/7 c. 1/49 d. 3/7

[TCS NQT]

* A non-leap year: 365 days ⇒ 52 weeks + 1 odd day.
* A leap year: 366 days ⇒ 52 week + 2 odd days

[52 sunday]

1 week = 7 days

7) 365 (52
35
15
14
1

{(M,T), (T,W), (W,T), (T,F), (F,S), (S,S), (S,M)}

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

$= \frac{2}{7}$

Probability

Q22. Three dice are thrown together. Find the probability of getting a total of 5

a. 1/36 b. 3/36 c. 7/36 d. 9/216

When we roll 3 dice: $6^3 = 216$

$n(S) = 216$

$n(E) = \{(1,1,3), (1,3,1), (1,2,2), (2,2,1), (2,1,2), (3,1,1)\}$

$P(E) = \frac{n(E)}{n(S)} = \frac{6}{216} = \frac{1}{36}$