



Probability



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Probability:

It is a chance or happening of a particular event.

Basic Formula:

Probability = Favorable Outcomes / Total Outcomes

Points to Remember:

Given : A is an event and B is an event

Case 1 : When A and B i.e both should occur in a particular situation.

Then, Probability of both will be multiplied.

→ Probability of A * Probability of B.

(The key word is “AND”)

Case 2 : If a particular situation mentions that A or B can occur.

Then, Probability of both will be added.

→ Probability of A + Probability of B.

(The key word is “OR”)

Let us solve few examples:

1. If two coins are thrown simultaneously, what is the probability of getting at least one tail?

Total number of outcomes = { HH, HT, TH, TT } = 4

Favorable outcomes = { HT, TH, TT } = 3

Probability = $\frac{3}{4}$

2. If a die is thrown, what is the probability that the number is an even number?

Total outcomes = { 1, 2, 3, 4, 5, 6 }

Favorable outcomes = { 2, 4, 6 }

Probability = $\frac{3}{6} = \frac{1}{2}$

3. In a box there are 5 red balls, 3 blue balls and 2 green balls, what is the probability of choosing one ball is (i) Red (ii) Blue (iii) Green.

Case (i) Choosing a red ball

Total outcomes = 10

Favorable outcomes = 5

Probability of choosing a red ball = $5/10 = 1/2$

Case (ii) Choosing a blue ball

Total outcomes = 10

Favorable outcomes = 3

Probability of choosing a red ball = $3/10$

Case (ii) Choosing a green ball

Total outcomes = 10

Favorable outcomes = 2

Probability of choosing a red ball = $2/10 = 1/5$

4. If 3 coins are tossed simultaneously, what is the probability of getting at least two head or two tail.

Total outcomes = { HHH, HHT, HTH, HTT, THH, TTH, THT, TTT } = 8

Favorable outcomes for at least two heads = { HHH, HHT, HTH, THH } = 4

Favorable outcomes for at least two tails = { HTT, TTH, THT, TTT } = 4

Check the question, “or” is mentioned, therefore,
Probability of both will be added.

$$= 4/8 + 4/8 = 8/8 = 1$$

5. In a box there are 5 red balls, 3 blue balls and 2 green balls, what is the probability

(i) that two balls chosen are red

(ii) one ball is red and the second ball is green

(iii) two balls are of same color.

Case (I): It means, the first ball is red and the second ball is red.

The key word is “and”

Therefore, (Probability of first ball * Probability of second ball) = $(5/10) * (4/9) = 20/90 = 2/9$.

Note : Probability of second ball = $4/9$, this is because the first ball is already taken , so one ball will be taken from the total and it is a red ball, so 1 ball will be taken from favorable.

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It can also be calculated as, $5C2 / 10C2 = 2/9$

Case (ii) : the first ball is red and the second ball is green

Probability = $5/10 * 2/9 = 1/9$

Case (iii) : first ball is one color and the second ball is of the color similar to the first ball.

Therefore, it can two balls of red (or) two balls of blue (or) two balls of green.

Probability = $[(5/10)*(4/9) + (3/10)*(2/9) + (2/10)*(1/9)] = 14/45$.

6. How many four-digit odd numbers are there whose hundredth place is 6 and it is an odd number?

A. 450

B. 650

C. 950

D. 850

For these type of questions, first draw boxes.

Here, we need 4 digit numbers, so four boxes.

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Lets see the conditions given

(i)Hundredth place is 6

	6		
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(ii) its an odd number, so units place should take only odd values

			1,3,5,7,9
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(iii)Tens place does not have any condition, therefore, it can take all the values

		1,2,3,4,5,6,7,8,9,0	
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(iv)Thousand's place does not have any condition, but it is said that, it should be a 4 digit number, so it will take all the values except zero.

1,2,3,4,5,6,7,8,9			
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Lets see the no of ways it can take place

9 ways	1 way	10 ways	5 ways
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$$9 * 1 * 10 * 5 = 450 \text{ ways.}$$

Therefore, option A

7. In a class of 20 students, one half of the students are boys, if a teacher has to select 7 students and the first 6 are girls

Col A: What is the probability that the 7th student is a girl

Col B: 2/7

Given :

number of students = 20

Boys = 10

Girls = 10

6 girls already got selected.

So, remaining number of students = 14

remaining girls = 4

$$\begin{aligned} \text{Probability that the 7th student is a girl} &= \text{possible outcomes} / \text{Total number of outcomes} \\ &= 4 / 14 \\ &= 2/7 \end{aligned}$$

Therefore, both the columns are equal.

8. Given that a solid has 1 red color on one of its face and the probability of getting red is 1/8. When is it tossed twice, what is the probability of getting red always .

Its given : getting red is 1/8

If it is tossed one time , the probability of getting red = 1/8

If it is tossed second time , the probability of getting red = 1/8

Both should occur (it means AND) & both are independent events.

Therefore, probability of getting red always when tossed twice = $1/8 * 1/8 = 1/64$

9. There are 20 colored pencils in a pencil stand. The probability of choosing a yellow pencil is 0.8. There are 6 yellow pencils without an eraser. What is the probability that a yellow pencil chosen is that which has an eraser?

Solution :

Total 20 colored pencils.
Probability of yellow pencil = $0.8 = 8/10 = 16/20$
So total 16 yellow pencils
It is given, 6 yellow pencil without eraser
so pencil with eraser = $16 - 6 = 10$

yellow pencil chosen with an eraser is $10/20 = 1/2$

10. There are five persons A, B, C, D, E. What are the possible combinations they are seated provided C and D always sit nearby?

Solution : CD always seated together so they can be treated as 1
Now we have only 4 members (A , B , CD , E) 4 way $\rightarrow 4! = 4 \times 3 \times 2 \times 1 = 24$ way

C and D can seat in two way $2! = 2 \times 1 = 2$ total ways
Therefore, the number of ways = $24 \times 2 = 48$ ways

11. In a box there are 8 red 7 blue and 6 green balls . One ball picked up randomly find the probability that it is neither red nor green?

p (the ball is neither red not green) = p (the ball is blue) = $7/21 = 1/3$

11. Given that, the probability that it won't rain tomorrow is 0.46
Col A: The probability that it will rain tomorrow at temperature of 85degree centigrade
Col B: 0.54

Solution:

Since we don't know the probability that it won't rain at a temperature of 85 degree centigrade, we cannot determine the value for Col A.

Answer : Option D (Relationship cannot be determined)

12. There are 1 badger and 1 panderer. If each badger has 6 flavors and each panderer has 3 flavors, then what is the total number of ways of selecting 4 flavors from badger and 1 flavor from panderer?

Solution :

Total number of flavors in badger is 6.

From the badger of 6 flavor, 4 flavors can be selected in ${}^6C_4 = 15$ ways.

Total number of flavors of panderer = 3.

From the panderer of 3 flavors, 1 can be selected in ${}^3C_1 = 3$ ways.

The total number of ways of selecting 4 flavors from badger and 1 flavor from panderer = $15 \times 3 = 45$ ways.

Answer : The total number of ways of selecting 4 flavors from badger and 1 flavor from panderer = 45 ways

13. 7 persons of whom are a and b , stand in a line for photograph , what is prob that exactly 2 ppl are present between a and b

__ _ A __ _ B __ _

For this we should consider all the cases,

A and B can shuffle among each other in 2 ways = 2

In between A and B , exactly two people should be there, the 1st person in between them can stand in 5 ways (because only 5 ppl are there), the second person can stand in 4 ways (because only 4 ppl are there)= 5×4

out of 7, 4 got placed.

Remaining 3 people need to be arranged.

We have various possibilities in that.

Either all 3 can stand before A = $3!$ (or)

All 3 can stand after B = $3!$ (or)

one can stand before A and 2 after B = $3 \text{ways} \times 2! = 3!$ (or)

two can stand before A and 1 after B = $3 \text{ways} \times 2 \text{ways} \times 1 \text{ way} = 3!$

Therefore, the remaining three people can stand in $3! + 3! + 3! + 3! = 4 (3!) = 24$

Hence, probability that exactly 2 ppl are standing between a and b = $2 \times 5 \times 4 \times 24 = 960$

14. There are two names given JOHNSON and JONES. If one letter is picked from both simultaneously at random, then find the probability that the letter is same?

Solution: From the words JOHNSON and JONES , the letters 'J' , 'O' , 'N' and 'S' occurs in both the word. What is the probability that either 'J' or 'O' or 'N' or 'S' is chosen?

The probability of choosing 'J' in JOHNSON is $\frac{1}{7}$ and probability of choosing 'J' from the letter JONES is $\frac{1}{5}$. Hence the probability that J is chosen from both the names = $\frac{1}{7} * \frac{1}{5} = \frac{1}{35}$

The probability of choosing 'O' in JOHNSON is $\frac{2}{7}$ and probability of choosing O from the letter JONES is $\frac{1}{5}$. Hence the probability that O is chosen from both the names = $\frac{2}{7} * \frac{1}{5} = \frac{2}{35}$

The probability of choosing 'N' in JOHNSON is $\frac{2}{7}$ and probability of choosing N from the letter JONES is $\frac{1}{5}$. Hence the probability that N is chosen from both the names = $\frac{2}{7} * \frac{1}{5} = \frac{2}{35}$

The probability of choosing 'S' in JOHNSON is $\frac{1}{7}$ and probability of choosing S from the letter JONES is $\frac{1}{5}$. Hence the probability that S is chosen from both the names = $\frac{1}{7} * \frac{1}{5} = \frac{1}{35}$

Hence the probability that either 'J' or 'O' or 'N' or 'S' is chosen,
$$= \frac{1}{35} + \frac{2}{35} + \frac{2}{35} + \frac{1}{35} = \frac{6}{35}.$$