Class: 9
Subject: Mathematics
Topic: Probability
No. of Questions: 20

Q1. Usha draws one card from a shuffled deck of 52 cards. What is the probability that she drew a club or a Queen?

Sol. Step1.
The card she drew is one of the following quit – spade, diamond, club, or heart, with all of them being equally likely (as there are the same number of each face)
The probability that she drew a club is therefore $\frac{1}{4}$
Step2.
There are 13 different card of each suit, so four of each face in the deck of 52. So probability that she drew a Queen is $\frac{4}{52} = \frac{1}{13}$
Step3.
We need to add these two probabilities since the question asked for the probability of getting a club OR a Queen
This gives us $\frac{1}{4} + \frac{1}{13} = \frac{17}{52}$
Step4.
But – There is another thing to keep track of. In our list, we've counted the Queen of twice,
-once as a club in the first component of the sum above,
-and second time as a Queen in the second component above.
We should only count it once, so we remove one of the times we count it.
The probability of a specific card chosen is $\frac{1}{52}$, so we subtract that to get the result
Step5.
The probability that she drew a club or a Queen = $\frac{17}{52} - \frac{1}{52} = \frac{4}{13}$

Q2. From among a group of 2 men, 5 women and 4 children, 4 individuals are selected randomly. What is the probability that exactly 2 among the chosen are children?

Sol. Step1.
The total number of people in the group is 11.
Step2.
We can select 4 individuals from among them in $^{11}C_4$ ways = $\frac{11\times(11-1)\times(11-2)\times(11-3)}{4\times3\times2\times1}$
= 330

Step3.
Here we want the probability that exactly 2 children among these chosen this means 2 of the chosen 4 are children and 2 are either men or women
Step4.
Now we need to figure out the number of ways of choosing 2 children from among 4 children. This is ${}^4C_2 = 6$
Step5.
We also need to find out the ways of choosing 2 men/women from among 7 men/women. This is ${}^7C_2 = 21$
Step6.
The probability that exactly 2 among the chosen 4 are children is therefore $\frac{21\times 6}{330} = \frac{126}{330}$

Q3. Priyanka is participating in a race. The probability that she will come first in the race is 0.25. The probability she will come second in the race is 0.1. The probability that she will come in 3rd is 0.5, and the probability that she will be 4th is 0.15. What is the probability that she will win 2nd position or better in the race?
(a) 0.25
(b) 0.45
(c) 0.4
(d) 0.35

Sol. D
Step1.
We are looking for the probability that she will come 2nd or better in the race
This is the probability that she will either win the race or be 2nd
Since she can be first or second, the probabilities can be added
Step2.
The probability that she will be first is 0.25
The probability that she will be in second place is 0.1
Step3.
Adding them, we get 0.25+0.1 = 0.35

Q4. Two dice are rolled. What is the probability that two numbers add up to a prime number?
(a) $\frac{15}{36}$
(b) $\frac{7}{36}$
(c) $\frac{12}{36}$
(d) $\frac{20}{36}$

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Sol. A

Step1.

The two dice that are rolled can show any of these values

Dice 1: 1, 2, 3, 4, 5, 6

Dice2: 1, 2, 3, 4, 5, 6

So we can get a total of 36 combinations between them (6 ×6)

Step2.

If we take one value from the list of possible values from each Dice. We get number ranging from 2 (when both Dice show 1) to 12 (when both dice show 6).

Let's enumerate the prime numbers between 2 and 12. They are 2, 3, 5, 7 and 11

We need to see in how many ways we can get each of these values

Let's put the value rolled by the dice as (x,y), where x is the value rolled by Dice 1 and y the value rolled by Dice2.

-2: The only way to get this is when we roll (1, 1). 1 possibility

-3: We can get this by (1,2) or (2,1). 2 possibilities.

-5: We can get this by(2,3), (3,2), (1,4) or (4,1). 4 possibilities.

-7: We can get this by (1,6), (2,5), (3,4), (4,3), (5,2), (6,1). 6 possibilities.

-11: We can get this by (5,6), or (6,5). 2 Possibilities

This gives us a total of 1+2+4+6+2 = 15 possible ways to get a prime number

Step3.

So the probability of getting the two numbers add up to a prime is $\frac{15}{36}$

Q5. Archana draws 4 cards out of a deck of 52 cards. What is the probability that she draws a King, a Jack, a 4 and a Queen?

(a) $\frac{64}{270725}$

(b) $\frac{3}{52}$

(c) $\frac{256}{270725}$

(d) $\frac{256}{22100}$

Sol. C

Step1.

There are 4 Kings in a deck of cards. At this point there are also 52 cards in the deck

Step2.

There are 4 jacks in a deck of cards. Now there are 51 cards remaining in the deck

Step3.

There are 4 4s in a deck of cards. Now there are 50 cards remaining in the deck

Step4.

There are 4 Queens in a deck of cards. Now there are 49 cards remaining in the deck

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Step5.

We can select 4 cards without replacement from a deck in ${}^{52}C_4$ ways = $\frac{52\times51\times50\times49}{4\times3\times2\times1}$

Step6.

So the answer is $\frac{4\times4\times4\times4}{\frac{52\times51\times50\times49}{4\times3\times2\times1}}$

Step 7.

Simplifying we get = $\frac{256}{270725}$

Q6. The Letters of the Word MATHEMATICS are rearranged in a random order. What is the probability that the letters have exactly 3 letters between them?

(a) $\frac{19}{120}$

(b) $\frac{16}{110}$

(c) $\frac{19}{105}$

(d) $\frac{14}{110}$

Sol. D

Step1.

The first step is finding out all the possible arrangements of the letters of the world MATHEMATICS.

Note that we are not intersect in "Unique" arrangement (In some kind of problem we would be), but just the total possible arrangement

Step2.

The answer to this is that there are 11 letters in this word, and therefore the letters can be arranged in 11! Ways i.e. 11 ×10×9× ….2 ×1 ways

To see this, take any of the letters – it can be in any of the possible 11 positions.

For each of these positions, a second letter can be in any of the other 10 position (11 minus the one taken up by the first letter)

So the two letters can appear in 11 ×10 combinations

For each of these 110 combinations, a third letter can be in any of the remaining 9 places, and so on

Step3.

Now we know the total number of arrangements (11!) possible, and need to look for the possible arrangements where the letters H and S have exactly 3 letters between them

Step4.

This can be seen by inspection

If H is in the first position (first letter of the world), then S would need to be in position 5 (since there are 3 letters between them)

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Similarly, if H is in the second position, then S would need to be in Position 6
There are 7 such position, the last one having H in the 7^{th} position and S being in the last position
Step5.
The same thing can be seen with S being before H. There are 7 such positions So the total number of position for the two letters where this conditions is met is 14
Now we have filled in 2 of the 11 letters with H and S in 14 ways
The remaining 9 letters can take any of the remaining 9 position for each of these
Since there are no restrictions on the remaining 9 letters, the number of possible arrangements of 9 letters 9 positions is 9! So the total ways to rearrange all the letters so that H and S
Have exactly 3 letters between them is 14 ×9!
Step6.
Now we can work out the probability of rearranging the letters of MATHEMAICS so that H and S have exactly 3 letters between them
P(arrangement) = $\frac{\text{Arrangement where the two letters have 3 letters between them}}{\text{Total possible arrangement of the letters of MATHEMATICS}} = \frac{14\times9!}{11!} = \frac{14}{110}$

Q7. What is the probability that an integer in the set 1, 2, 3...86 is divisible by 2 and not divisible by 3?
(a) $\frac{32}{83}$
(b) $\frac{27}{88}$
(c) $\frac{29}{86}$
(d) $\frac{30}{89}$

Sol. C

Q8. A coin is tossed 50 times with 17 head. Find the probability of getting a tail.

Sol. No. of head = 17
$\therefore$ No. of tail = 50-17 = 33
Total no. of trials = 50
$\therefore$ required prob = $\frac{33}{50}$

Q9. Find the probability of drawing a jack or an ace from a pack of playing cards.

Sol. Total number of cards= 52 as there are four jacks and four aces, the number of favorable cases = 8

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$\therefore$ The required probability $= \text{p} = \frac{8}{52} = \frac{2}{13}$

Q10. A coin is tossed twice. What is the probability that head will appear twice?

Sol. Here, the total number of cases = 4 i.e. HH, HT, TH, TT.
The number of favorable cases = 1 i.e. HH
$\therefore$ Required probability $= \text{p} = \frac{m}{n} = \frac{1}{4}$

Q11. Probability of an event can be
(a) -0.7
(b) $\frac{11}{9}$
(c) 1.001
(d) 0.6

Sol. (d) Probability of an event always lies between 0 and 1. (Both inclusive)

Q12. A coin is tossed 40 times and it showed tail 24 times. The probability of getting a head was
(a) $\frac{2}{5}$
(b) $\frac{3}{5}$
(c) $\frac{1}{2}$
(d) $\frac{17}{40}$

Sol. (a)
P (getting a head) = $\frac{40-24}{40} = \frac{16}{40} = \frac{2}{5}$

Q13. A bag contains 10 balls, out of which 4 balls are white and the others are non-white. The probability of getting a non-white ball is
(a) $\frac{2}{5}$
(b) $\frac{3}{5}$
(c) $\frac{1}{2}$
(d) $\frac{2}{3}$

Sol. (b)
Total no. of balls = 10

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No. of white balls = 4
No. of non-white balls = 10 – 4 = 6
So, required probability = $\frac{6}{10} = \frac{3}{5}$

Q14. If E is an event, then
(a) 0 < P (E) < 1
(b) 0 ≤ P (E) < 1
(c) 0 ≤ P(E) ≤ 1
(d) 0 < P (E) ≤ 1

Sol. (c)
0 ≤ P(E) ≤ 1

Q15. The probability of happening of an event is 37%. Then probability of the event is
(a) 37
(b) 0.037
(c) 3.7
(d) 0.37

Sol. (d)
Required prob = 37% = $\frac{37}{100} = .37$

Q16. If a coin was tossed 100 times, out of which 65 times we got head and 35 times tail. Then the probability of not getting a tail is
(a) 6.5
(b) 7.5
(c) 65
(d) 35

Sol. (c)
Required probability = $\frac{100-35}{100} = \frac{65}{100} = 0.65$

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Q17. Two dice are rolled simultaneously. Find the probability that they show different faces.

(a) $\frac{6}{5}$
(b) $\frac{1}{6}$
(c) $\frac{1}{3}$
(d) $\frac{5}{6}$

Sol. (d)

Q18. A bag contains 12 pencils, 3 sharpeners and 7 pens. If we take out one item from the bag at random, probability of drawing a pencil is

Sol. $\frac{6}{11}$

Directions: Each of these questions contains on Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.
(c) If Assertion is correct but Reason is incorrect.
(d) If Assertion is incorrect but Reason is correct.

Q19. Assertion: In class there are x boys and y girls, A student is selected at random, then the probability of selecting a girl is $\frac{y}{x}$

Reason: Probability of an event E of an experiment is ratio of the number of trials in which event E has happened to the total number of trials.

Sol. (d)

Assertive is false.

P (selecting a girl) = $\frac{y}{x+y}$

Q20. Assertion: Tossing a coin 50 times is called an event.

Reason: The possible outcomes of an experiment are called events.

Sol. (d)