1. A bag contains 2 yellow, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

A. $\frac{1}{2}$

B. $\frac{10}{21}$

C. $\frac{9}{11}$

D. $\frac{7}{11}$

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Here is the answer and explanation

Answer : Option B

Explanation :

Total number of balls = 2 + 3 + 2 = 7

Let S be the sample space.

n(S) = Total number of ways of drawing 2 balls out of 7 = ${}^7C_2$

Let E = Event of drawing 2 balls , none of them is blue.

n(E) = Number of ways of drawing 2 balls , none of them is blue

= Number of ways of drawing 2 balls from the total 5 (=7-2) balls = ${}^5C_2$

(∵ There are two blue balls in the total 7 balls. Total number of non-blue balls = 7 - 2 = 5)

$$P(E) = \frac{n(E)}{n(S)} = \frac{{}^5C_2}{{}^7C_2} = \frac{\left(\frac{5 \times 4}{2 \times 1}\right)}{\left(\frac{7 \times 6}{2 \times 1}\right)} = \frac{5 \times 4}{7 \times 6} = \frac{10}{21}$$

2. A die is rolled twice. What is the probability of getting a sum equal to 9?

A. $\frac{2}{3}$

B. $\frac{2}{9}$

C. $\frac{1}{3}$

D. $\frac{1}{9}$

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Here is the answer and explanation

Answer : Option D

Explanation :

Total number of outcomes possible when a die is rolled = 6 (∵ any one face out of the 6 faces)

Hence, total number of outcomes possible when a die is rolled twice, n(S) = 6 × 6 = 36

E = Getting a sum of 9 when the two dice fall = {(3, 6), {4, 5}, {5, 4}, (6, 3)}

Hence, n(E) = 4

$$P(E) = \frac{n(E)}{n(S)} = \frac{4}{36} = \frac{1}{9}$$

3. Three coins are tossed. What is the probability of getting at most two tails?

A. $\frac{7}{8}$

B. $\frac{1}{8}$

C. $\frac{1}{2}$

D. $\frac{1}{7}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Solution 1

Total number of outcomes possible when a coin is tossed = 2 (∵ Head or Tail)

Hence, total number of outcomes possible when 3 coins are tossed, n(S) = 2 × 2 × 2 = 8

(∵ i.e., S = {TTT, TTH, THT, HTT, THH, HTH, HHT, HHH})

E = event of getting at most two Tails = {TTH, THT, HTT, THH, HTH, HHT, HHH}

Hence, n(E) = 7

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

Solution 2

If n fair coins are tossed,

Total number of outcomes in the sample space = 2^n

The probability of getting exactly r-number of heads when n coins are tossed = $\frac{^nC_r}{2^n}$

The same formula can be used for Tails as well.

Here n = 3

P(At most two tails)

= P(0 Tail in 3 trials) + P(1 Tail in 3 trials) + P(2 Tail in 3 trials)

$$= \frac{^3C_0}{2^3} + \frac{^3C_1}{2^3} + \frac{^3C_2}{2^3} = \frac{(^3C_0 + {^3C_1} + {^3C_2})}{2^3} = \frac{(1+3+3)}{2^3} = \frac{7}{8}$$

Solution 3 (Using Binomial Probability distribution)

In a binomial experiment, The probability of achieving exactly r successes in n trials can be given by

P (r successes in n trials) = $\binom{n}{r} p^r q^{n-r}$

where p = probability of success in one trial

q = 1 - p = probability of failure in one trial

$$\binom{n}{r} = {^nC_r} = \frac{n!}{(r!)(n-r)!} = \frac{n(n-1)(n-2)\cdots(n-r+1)}{r!}$$

(Read More ...)

Here, n = 3

p = probability of getting a Tail = 1/2

q = probability of getting a Head = 1/2

P(At most two tails)

= P(0 Tail in 3 trials) + P(1 Tail in 3 trials) + P(2 Tail in 3 trials)

$$= \binom{3}{0}\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^{3-0} + \binom{3}{1}\left(\frac{1}{2}\right)^1\left(\frac{1}{2}\right)^{3-1} + \binom{3}{2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^{3-2}$$

$$= \binom{3}{0}\left(\frac{1}{2}\right)^3 + \binom{3}{1}\left(\frac{1}{2}\right)^3 + \binom{3}{2}\left(\frac{1}{2}\right)^3 = \left[\binom{3}{0} + \binom{3}{1} + \binom{3}{2}\right]\left(\frac{1}{2}\right)^3 = 7\left(\frac{1}{2^3}\right) = \frac{7}{8}$$

4. When tossing two coins once, what is the probability of heads on both the coins?

A. $\frac{1}{4}$ B. $\frac{1}{2}$

C. $\frac{3}{4}$ D. None of these

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Here is the answer and explanation

Answer : Option A

Explanation :

Solution 1

Total number of outcomes possible when a coin is tossed = 2 (∵ Head or Tail)

Hence, total number of outcomes possible when two coins are tossed, n(S) = 2 × 2 = 4

(∵ Here, S = {HH, HT, TH, TT})

E = event of getting heads on both the coins = {HH}

Hence, n(E) = 1

$$P(E) = \frac{n(E)}{n(S)} = \frac{1}{4}$$

Solution 2

If n fair coins are tossed,

Total number of outcomes in the sample space = 2^n

The probability of getting exactly r-number of heads when n coins are tossed = $\frac{{}^{n}C_{r}}{2^n}$

Here n = 2, r = 2

$$P(\text{Exactly two Heads}) = \frac{{}^{2}C_{2}}{2^2} = \frac{1}{4}$$

Solution 3 (Using Binomial Probability distribution)

In a binomial experiment, The probability of achieving exactly r successes in n trials can be given by

P (r successes in n trials) = $\binom{n}{r} p^r q^{n-r}$

where p = probability of success in one trial

q = 1 - p = probability of failure in one trial

$\binom{n}{r} = {}^nC_r = \frac{n!}{(r!)(n-r)!} = \frac{n(n-1)(n-2)\cdots(n-r+1)}{r!}$

(Read More ...)

Here, n = 2

p = probability of getting a Head = 1/2

q = probability of getting a Tail = 1/2

$P(2 \text{ Heads in } 2 \text{ Trials}) = \binom{2}{2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^{2-2} = \frac{1}{4}$

5. What is the probability of getting a number less than 4 when a die is rolled?

A. $\frac{1}{2}$

B. $\frac{1}{6}$

C. $\frac{1}{3}$

D. $\frac{1}{4}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of outcomes possible when a die is rolled = 6 ($\because$ any one face out of the 6 faces)
i.e., n(S) = 6

E = Getting a number less than 4 = {1, 2, 3}
Hence, n(E) = 3

$P(E) = \frac{n(E)}{n(S)} = \frac{3}{6} = \frac{1}{2}$

6. A bag contains 4 black, 5 yellow and 6 green balls. Three balls are drawn at random from the bag. What is the probability that all of them are yellow?

A. $\frac{2}{91}$

B. $\frac{1}{81}$

C. $\frac{1}{8}$

D. $\frac{2}{81}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of balls = 4 + 5 + 6 = 15

Let S be the sample space.
n(S) = Total number of ways of drawing 3 balls out of 15 = $^{15}C_3$

Let E = Event of drawing 3 balls, all of them are yellow.
n(E) = Number of ways of drawing 3 balls, all of them are yellow
= Number of ways of drawing 3 balls from the total 5 = $^{5}C_3$
(∵ there are 5 yellow balls in the total balls)

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

$$= \frac{^{5}C_3}{^{15}C_3} = \frac{^{5}C_2}{^{15}C_3}$$ [∵ $^{n}C_r = {^{n}C_{(n-r)}}$. So $^{5}C_3 = {^{5}C_2}$. Applying this for the ease of calculation]

$$= \frac{\left(\frac{5 \times 4}{2 \times 1}\right)}{\left(\frac{15 \times 14 \times 13}{3 \times 2 \times 1}\right)} = \frac{5 \times 4}{\left(\frac{15 \times 14 \times 13}{3}\right)} = \frac{5 \times 4}{5 \times 14 \times 13} = \frac{4}{14 \times 13} = \frac{2}{7 \times 13} = \frac{2}{91}$$

7. One card is randomly drawn from a pack of 52 cards. What is the probability that the card drawn is a face card(Jack, Queen or King)

A. $\frac{1}{13}$

B. $\frac{2}{13}$

C. $\frac{3}{13}$

D. $\frac{4}{13}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Total number of cards, n(S) = 52

Total number of face cards, n(E) = 12

$$P(E) = \frac{n(E)}{n(S)} = \frac{12}{52} = \frac{3}{13}$$

8. A dice is thrown. What is the probability that the number shown in the dice is divisible by 3?

A. $\frac{1}{6}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{2}$

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Here is the answer and explanation

Answer : Option B

Explanation :

Total number of outcomes possible when a die is rolled, n(S) = 6 ($\because$ 1 or 2 or 3 or 4 or 5 or 6)

E = Event that the number shown in the dice is divisible by 3 = {3, 6}

Hence, n(E) = 2

$$P(E) = \frac{n(E)}{n(S)} = \frac{2}{6} = \frac{1}{3}$$

9. John draws a card from a pack of cards. What is the probability that the card drawn is a card of black suit?

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{3}$

D. $\frac{1}{13}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of cards, n(S) = 52

Total number of black cards, n(E) = 26

$$P(E) = \frac{n(E)}{n(S)} = \frac{26}{52} = \frac{1}{2}$$

10. There are 15 boys and 10 girls in a class. If three students are selected at random, what is the probability that 1 girl and 2 boys are selected?

A. $\frac{1}{40}$

B. $\frac{1}{2}$

C. $\frac{21}{46}$

D. $\frac{7}{42}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Let S be the sample space.

n(S) = Total number of ways of selecting 3 students from 25 students = $^{25}C_3$

Let E = Event of selecting 1 girl and 2 boys

n(E) = Number of ways of selecting 1 girl and 2 boys

15 boys and 10 girls are there in a class.
We need to select 2 boys from 15 boys and 1 girl from 10 girls
Number of ways in which this can be done = $^{15}C_2 \times {}^{10}C_1$

Hence n(E) = $^{15}C_2 \times {}^{10}C_1$

$$P(E) = \frac{n(E)}{n(S)} = \frac{15_{C_2} \times 10_{C_1}}{25_{C_3}}$$

$$= \frac{\left(\frac{15 \times 14}{2 \times 1}\right) \times 10}{\left(\frac{25 \times 24 \times 23}{3 \times 2 \times 1}\right)} = \frac{15 \times 14 \times 10}{\left(\frac{25 \times 24 \times 23}{3}\right)} = \frac{15 \times 14 \times 10}{25 \times 8 \times 23} = \frac{3 \times 14 \times 10}{5 \times 8 \times 23}$$

$$= \frac{3 \times 14 \times 2}{8 \times 23} = \frac{3 \times 14}{4 \times 23} = \frac{3 \times 7}{2 \times 23} = \frac{21}{46}$$

11. What is the probability of selecting a prime number from 1,2,3,... 10 ?

A. $\frac{2}{5}$

B. $\frac{1}{5}$

C. $\frac{3}{5}$

D. $\frac{1}{7}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total count of numbers, n(S) = 10

Prime numbers in the given range are 2,3,5 and 7
Hence, total count of prime numbers in the given range, n(E) = 4

$$P(E) = \frac{n(E)}{n(S)} = \frac{4}{10} = \frac{2}{5}$$

12. 3 balls are drawn randomly from a bag contains 3 black, 5 red and 4 blue balls. What is the probability that the balls drawn contain balls of different colors?

A. $\frac{3}{11}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{2}{11}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of balls = 3 + 5 + 4 = 12

Let S be the sample space.

n(S) = Total number of ways of drawing 3 balls out of 12 = $^{12}C_3$

Let E = Event of drawing 3 different coloured balls

To get 3 different coloured balls,we need to select one black ball from 3 black balls, one red ball from 5 red balls, one blue ball from 4 blue balls

Number of ways in which this can be done = $^3C_1 \times {}^5C_1 \times {}^4C_1$

i.e., n(E) = $^3C_1 \times {}^5C_1 \times {}^4C_1$

$$P(E) = \frac{n(E)}{n(S)} = \frac{^3C_1 \times {}^5C_1 \times {}^4C_1}{^{12}C_3}$$

$$= \frac{3 \times 5 \times 4}{\left(\frac{12 \times 11 \times 10}{3 \times 2 \times 1}\right)} = \frac{3 \times 5 \times 4}{2 \times 11 \times 10} = \frac{3 \times 4}{2 \times 11 \times 2} = \frac{3}{11}$$

13. 5 coins are tossed together. What is the probability of getting exactly 2 heads?

A. $\frac{1}{2}$

B. $\frac{5}{16}$

C. $\frac{4}{11}$

D. $\frac{7}{16}$

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Here is the answer and explanation

Answer : Option B

Explanation :

Solution 1

Total number of outcomes possible when a coin is tossed = 2 ($\because$ Head or Tail)

Hence, total number of outcomes possible when 5 coins are tossed, n(S) = 2^5

E = Event of getting exactly 2 heads when 5 coins are tossed

n(E) = Number of ways of getting exactly 2 heads when 5 coins are tossed = $^5C_2$

$$P(E) = \frac{n(E)}{n(S)} = \frac{^5C_2}{2^5} = \frac{\left(\frac{5 \times 4}{2 \times 1}\right)}{2^5} = \frac{5 \times 2}{2^5} = \frac{5}{2^4} = \frac{5}{16}$$

Solution 2

> If n fair coins are tossed,
>
> Total number of outcomes in the sample space = 2^n
>
> The probability of getting exactly r-number of heads when n coins are tossed = $\frac{^nC_r}{2^n}$

Here n = 5, r = 2

Hence, Required probability =

$$\frac{^nC_r}{2^n} = \frac{^5C_2}{2^5} = \frac{\left(\frac{5 \times 4}{2 \times 1}\right)}{2^5} = \frac{5 \times 2}{2^5} = \frac{5}{2^4} = \frac{5}{16}$$

Solution 3 (Using Binomial Probability distribution)

> In a binomial experiment, The probability of achieving exactly r successes in n trials can be given by
>
> **P (r successes in n trials) =** $\binom{n}{r} p^r q^{n-r}$
>
> where p = probability of success in one trial
>
> q = 1 - p = probability of failure in one trial
>
> $\binom{n}{r} = {}^nC_r = \frac{n!}{(r!)(n-r)!} = \frac{n(n-1)(n-2)\cdots(n-r+1)}{r!}$
>
> (Read More ...)

Here, n = 5

p = probability of getting a head = 1/2

q = probability of getting a tail = 1/2

$$P(\text{2 Heads in 5 Trials}) = \binom{n}{r} p^r q^{n-r}$$

$$= \binom{5}{2}\left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^{5-2} = \binom{5}{2}\left(\frac{1}{2}\right)^5 = \frac{5 \times 4}{2 \times 1}\left(\frac{1}{2}\right)^5 = \frac{10}{2^5} = \frac{5}{16}$$

14. What is the probability of drawing a "Queen" from a deck of 52 cards?

A. $\frac{1}{2}$

B. $\frac{1}{13}$

C. $\frac{1}{6}$

D. $\frac{1}{3}$

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Here is the answer and explanation

Answer : Option B

Explanation :

Total number of cards, n(S) = 52

Total number of "Queen" cards, n(E) = 4

$$P(E) = \frac{n(E)}{n(S)} = \frac{4}{52} = \frac{1}{13}$$

15. A card is randomly drawn from a deck of 52 cards. What is the probability getting an Ace or King or Queen?

A. $\frac{3}{13}$

B. $\frac{2}{13}$

C. $\frac{1}{13}$

D. $\frac{1}{2}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of cards = 52

Total number of Ace cards = 4

$$P(Ace) = \frac{4}{52} = \frac{1}{13}$$

Total number of King cards = 4

$P(\text{King}) = \frac{4}{52} = \frac{1}{13}$

Total number of Queen cards = 4

$P(\text{Queen}) = \frac{4}{52} = \frac{1}{13}$

Here, clearly the events of getting an Ace , King and Queen are mutually exclusive events.

By Addition Theorem of Probability, we have

P(Ace or King or Queen) = P (Ace) + P (King)+ P(Queen)

$= \frac{1}{13} + \frac{1}{13} + \frac{1}{13} = \frac{3}{13}$

16. A card is randomly drawn from a deck of 52 cards. What is the probability getting a five of Spade or Club?

A. $\frac{1}{52}$

B. $\frac{1}{13}$

C. $\frac{1}{26}$

D. $\frac{1}{12}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Solution 1

Total number of cards, n(S) = 52

E = event of getting a five of Spade or Club

n(E) = 2 (∵ *a five of Club, a five of Spade = 2 cards)*

$P(E) = \frac{n(E)}{n(S)} = \frac{2}{52} = \frac{1}{26}$

Solution 2

Total number of cards = 52

Total number of Spade Cards of Number 5 = 1

Total number of Club Cards of Number 5 = 1

P(Spade Cards of Number 5) = $\frac{1}{52}$

P(Club Cards of Number 5) = $\frac{1}{52}$

Here, clearly the events are mutually exclusive events.

By Addition Theorem of Probability, we have

P(Spade Cards of Number 5 or Club Cards of Number 5)

= P(Spade Cards of Number 5) + P(Club Cards of Number 5)

$= \frac{1}{52} + \frac{1}{52} = \frac{1}{26}$

17. When two dice are rolled, what is the probability that the sum is either 7 or 11?

A. $\frac{1}{4}$

B. $\frac{2}{5}$

C. $\frac{1}{9}$

D. $\frac{2}{9}$

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Here is the answer and explanation

Answer : Option D

Explanation :

Total number of outcomes possible when a die is rolled = 6 (∵ any one face out of the 6 faces)

Hence, total number of outcomes possible when two dice are rolled = 6 × 6 = 36

To get a sum of 7, the following are the favourable cases.
(1, 6), (2, 5), {3, 4}, (4, 3), (5, 2), (6,1)

=> Number of ways in which we get a sum of 7 = 6

$$P(\text{a sum of } 7) = \frac{\text{Number of ways in which we get a sum of 7}}{\text{Total number of outcomes possible}} = \frac{6}{36}$$

To get a sum of 11, the following are the favourable cases.
(5, 6), (6, 5)

=> Number of ways in which we get a sum of 11 = 2

$$P(\text{a sum of } 11) = \frac{\text{Number of ways in which we get a sum of 11}}{\text{Total number of outcomes possible}} = \frac{2}{36}$$

Here, clearly the events are mutually exclusive events.

By Addition Theorem of Probability, we have

P(a sum of 7 or a sum of 11) = P(a sum of 7) + P(a sum of 11)

$= \frac{6}{36} + \frac{2}{36} = \frac{8}{36} = \frac{2}{9}$

18. A card is randomly drawn from a deck of 52 cards. What is the probability getting either a King or a Diamond?

A. $\frac{4}{13}$

B. $\frac{2}{13}$

C. $\frac{1}{3}$

D. $\frac{1}{2}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of cards = 52

Total Number of King Cards = 4

$$P(\text{King}) = \frac{4}{52}$$

Total Number of Diamond Cards = 13

$$P(\text{Diamond}) = \frac{13}{52}$$

Total Number of Cards which are both King and Diamond = 1

$$P(\text{King and Diamond}) = \frac{1}{52}$$

Here a card can be both a Diamond card and a King. Hence these are not mutually exclusive events.

(Reference : mutually exclusive events) . By Addition Theorem of Probability, we have

P(King or a Diamond) = P(King) + P(Diamond) – P(King and Diamond)

$$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$$

19. John and Dani go for an interview for two vacancies. The probability for the selection of John is 1/3 and whereas the probability for the selection of Dani is 1/5. What is the probability that none of them are selected?

A. $\frac{3}{5}$

B. $\frac{7}{12}$

C. $\frac{8}{15}$

D. $\frac{1}{5}$

Hide Answer | Notebook | Discuss

Here is the answer and explanation

Answer : Option C

Explanation :

Let A = the event that John is selected and B = the event that Dani is selected.

Given that P(A) = 1/3 and P(B) = 1/5

We know that $\overline{A}$ is the event that A does not occur and $\overline{B}$ is the event that B does not occur

Probability that none of them are selected

$= P(\overline{A} \cap \overline{B})$ *(∵ Reference : Algebra of Events)*

$= P(\overline{A}).P(\overline{B})$ *(∵ Here A and B are Independent Events and refer theorem on independent events)*

$= [1 - P(A)][1 - P(B)]$

$= \left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{5}\right)$

$= \frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

20. John and Dani go for an interview for two vacancies. The probability for the selection of John is 1/3 and whereas the probability for the selection of Dani is 1/5. What is the probability that only one of them is selected?

A. $\frac{3}{5}$ B. None of these

C. $\frac{2}{5}$ D. $\frac{1}{5}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Let A = the event that John is selected and B = the event that Dani is selected.

Given that P(A) = 1/3 and P(B) = 1/5

We know that $\overline{A}$ is the event that A does not occur and $\overline{B}$ is the event that B does not occur

Probability that only one of them is selected

$= P[(A \cap \overline{B}) \cup (B \cap \overline{A})]$ *(∵ Reference : Algebra of Events)*

$= P(A \cap \overline{B}) + P(B \cap \overline{A})$ *(∵ Reference : Mutually Exclusive Events and Addition Theorem of Probability)*

$= P(A)P(\overline{B}) + P(B)P(\overline{A})$ *(∵ Here A and B are Independent Events and* refertheorem on independent events)

$= P(A)[1 - P(B)] + P(B)[1 - P(A)]$

$= \frac{1}{3}(1 - \frac{1}{5}) + \frac{1}{5}(1 - \frac{1}{3}) = \frac{1}{3} \times \frac{4}{5} + \frac{1}{5} \times \frac{2}{3} = \frac{4}{15} + \frac{2}{15} = \frac{2}{5}$

21. A letter is randomly taken from English alphabets. What is the probability that the letter selected is not a vowel?

A. $\frac{5}{25}$
B. $\frac{2}{25}$
C. $\frac{5}{26}$
D. $\frac{21}{26}$

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Here is the answer and explanation

Answer : Option D

Explanation :

Total number of alphabets, n(S) = 26

Total number of characters which are not vowels, n(E) = 21

$P(E) = \frac{n(E)}{n(S)} = \frac{21}{26}$

22. The probability A getting a job is 1/5 and that of B is 1/7 . What is the probability that only one of them gets a job?

A. $\frac{11}{35}$
B. $\frac{12}{35}$
C. $\frac{2}{7}$
D. $\frac{1}{7}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Let A = Event that A gets a job and B = Event that B gets a job

Given that P(A) = 1/5 and P(B) = 1/7

Probability that only one of them gets a job

$= P[(A \cap \bar{B}) \cup (B \cap \bar{A})]$ *(∵ Reference : Algebra of Events)*

$= P(A \cap \bar{B}) + P(B \cap \bar{A})$ *(∵ Reference : Mutually Exclusive Events and Addition Theorem of Probability)*

$= P(A)P(\bar{B}) + P(B)P(\bar{A})$ *(∵ Here A and B are Independent Events and refertheorem on independent events)*

$= P(A)[1 - P(B)] + P(B)[1 - P(A)]$

$= \frac{1}{5}(1 - \frac{1}{7}) + \frac{1}{7}(1 - \frac{1}{5}) = \frac{1}{5} \times \frac{6}{7} + \frac{1}{7} \times \frac{4}{5} = \frac{6}{35} + \frac{4}{35} = \frac{10}{35} = \frac{2}{7}$

23. A letter is chosen at random from the word 'ASSASSINATION'. What is the probability that it is a vowel?

A. $\frac{4}{13}$

B. $\frac{8}{13}$

C. $\frac{7}{13}$

D. $\frac{6}{13}$

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Here is the answer and explanation

Answer : Option D

Explanation :

Total Number of letters in the word ASSASSINATION, n(S) = 13

Total number of Vowels in the word ASSASSINATION, n(E) = 6 (∵ 3 'A', 2 'I', 1 'O')

Probability for getting a vowel, P(E) $= \frac{n(E)}{n(S)} = \frac{6}{13}$

24. A letter is chosen at random from the word 'ASSASSINATION'. What is the probability that it is a consonant?

A. $\frac{4}{13}$

B. $\frac{8}{13}$

C. $\frac{7}{13}$

D. $\frac{6}{13}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Total Number of letters in the word ASSASSINATION, n(S) = 13

Total number of consonants in the word ASSASSINATION = 7

$P(\text{consonant}) = \frac{7}{13}$

25. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

A. $\frac{1}{20}$

B. $\frac{9}{20}$

C. $\frac{4}{20}$

D. $\frac{1}{4}$

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Here is the answer and explanation

Answer : Option B

Explanation :

Solution 1

Total number of tickets, n(S)= 20

To get a multiple of 3 , the favorable cases are 3,9,6,12,15,18.

=> Number of ways in which we get a multiple of 3 = 6

$$P(\text{Multiple of 3}) = \frac{\text{Number of ways in which we get a sum of multiple of 3}}{\text{Total number of outcomes possible}} = \frac{6}{20}$$

To get a multiple of 5, the favorable cases are 5,10,15,20.

=> Number of ways in which we get a multiple of 5 = 4

$$P(\text{Multiple of 5}) = \frac{\text{Number of ways in which we get a multiple of 5}}{\text{Total number of outcomes possible}} = \frac{4}{20}$$

There are some cases where we get multiple of 3 and 5. the favorable case for this is 15

=> Number of ways in which we get a multiple of 3 and 5 = 1

$$P(\text{Multiple of 3 and 5}) = \frac{\text{Number of ways in which we get a multiple of 3 and 5}}{\text{Total number of outcomes possible}} = \frac{1}{20}$$

Here a number can be both a a multiple of 3 and 5. Hence these are not mutually exclusive events.

(Reference : mutually exclusive events) By Addition Theorem of Probability, we have

P(multiple of 3 or 5) = P(multiple of 3) + P(multiple of 5)- P(multiple of 3 and 5)

$$= \frac{6}{20} + \frac{4}{20} - \frac{1}{20} = \frac{9}{20}$$

Solution 2

Total number of tickets, n(S)= 20

To get a multiple of 3 or 5, the favorable cases are 3, 5, 6, 9, 10, 12,15,18, 20.

=>Number of ways in which we get a multiple of 3 or 5 = 9

$$P(\text{multiple of 3 or 5}) = \frac{\text{Number of ways in which we get a multiple of 3 or 5}}{\text{Total number of outcomes possible}} = \frac{9}{20}$$

26. One ball is picked up randomly from a bag containing 8 yellow, 7 blue and 6 black balls. What is the probability that it is neither yellow nor black?

A. $\frac{1}{3}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

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Here is the answer and explanation

Answer : Option A

Explanation :

Total number of balls, n(S) = 8 + 7 + 6 = 21

n(E) = Number of ways in which a ball can be selected which is neither yellow nor black

= 7 ($\because$ *there are only 7 balls which are neither yellow nor black)*

$$P(E) = \frac{n(E)}{n(S)} = \frac{7}{21} = \frac{1}{3}$$

27. Two cards are drawn together from a pack of 52 cards. The probability that one is a club and one is a diamond?

A. $\frac{13}{51}$

B. $\frac{1}{52}$

C. $\frac{13}{102}$

D. $\frac{1}{26}$

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Here is the answer and explanation

Answer : Option C

Explanation :

n(S) = Total number of ways of drawing 2 cards from 52 cards = ${}^{52}C_2$

Let E = event of getting 1 club and 1 diamond.

We know that there are 13 clubs and 13 diamonds in the total 52 cards.

Hence, n(E) = Number of ways of drawing one club from 13 and one diamond from 13

= ${}^{13}C_1 \times {}^{13}C_1$

$$P(E) = \frac{n(E)}{n(S)} = \frac{13_{C_1} \times 13_{C_1}}{52_{C_2}}$$

$$= \frac{13 \times 13}{(\frac{52 \times 51}{2})} = \frac{13 \times 13}{26 \times 51} = \frac{13}{2 \times 51} = \frac{13}{102}$$

28. Two cards are drawn together at random from a pack of 52 cards. What is the probability of both the cards being Queens?

A. $\frac{1}{52}$

B. $\frac{1}{221}$

C. $\frac{2}{221}$

D. $\frac{1}{26}$

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Here is the answer and explanation

Answer : Option B

Explanation :

Solution 1

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n(S) = Total number of ways of drawing 2 cards from 52 cards = $^{52}C_2$

Let E = event of getting two Queens

We know that there are total 4 Queens in the 52 cards

Hence, n(E) = Number of ways of drawing 2 Queens out of 4= $^{4}C_2$

$$P(E) = \frac{n(E)}{n(S)} = \frac{^{4}C_2}{^{52}C_2}$$

$$= \frac{\left(\frac{4 \times 3}{2}\right)}{\left(\frac{52 \times 51}{2}\right)} = \frac{4 \times 3}{52 \times 51} = \frac{3}{13 \times 51} = \frac{1}{13 \times 17} = \frac{1}{221}$$

Solution 2

This problem can be solved using the concept of Conditional Probability

Let A be the event of getting a Queen in the first draw

Total number of Queens = 4

Total number of cards = 52

$$P(\text{Queen in first draw}) = \frac{4}{52}$$

Assume that the first event is happened. i.e., a Queen is already drawn in the first draw

and now B = event of getting a Queen in the second draw

Since 1 Queen is drawn in the first draw, Total number of Queens remaining = 3
Since 1 Queen is drawn in the first draw, Total number of cards = 52 - 1 = 51

$$P(\text{Queen in second draw}) = \frac{3}{51}$$

P(Queen in first draw and Queen in second draw) = P(Queen in first draw) × P(Queen in second draw)

$$= \frac{4}{52} \times \frac{3}{51} = \frac{1}{13} \times \frac{1}{17} = \frac{1}{221}$$

29. Two dice are rolled together. What is the probability of getting two numbers whose product is even?

A. $\frac{17}{36}$

B. $\frac{1}{3}$

C. $\frac{3}{4}$

D. $\frac{11}{25}$

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Here is the answer and explanation

Answer : Option C

Explanation :

Solution 1

Total number of outcomes possible when a die is rolled = 6 (∵ any one face out of the 6 faces)

Hence, Total number of outcomes possible when two dice are rolled, n(S) = 6 × 6 = 36

Let E = the event of getting two numbers whose product is even

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

Hence, n(E) = 27

$$P(E) = \frac{n(E)}{n(S)} = \frac{27}{36} = \frac{3}{4}$$

Solution 2

This problem can easily be solved if we know the following property of numbers

Multiplication Rules for Even and Odd Numbers

1. The product of even numbers is always even
2. The product of odd numbers is always odd
3. If there is at least one even number multiplied by any number of odd numbers, the product is always even

More ...

From these properties, we know that the product will be an odd number only when both dice get odd numbers in each. In rest of the cases, product will be even

Total number of outcomes possible when a die is rolled = 6

Total number of odd numbers = 3 ($\because$ 1 or 3 or 5)

$P(\text{Odd Number in first Die}) = \frac{3}{6} = \frac{1}{2}$

Similarly, $P(\text{Odd Number in second Die}) = \frac{1}{2}$

P(Odd product) = P(Odd number in first die and Odd Number in second die)

= P(Odd number in first die).P(Odd Number in second die) *($\because$ Here both these are Independent Events and refer theorem on independent events)*

$= \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$P(\text{Even product}) = 1 - P(\text{Odd product}) = 1 - \frac{1}{4} = \frac{3}{4}$

30. When two dice are tossed, what is the probability that the total score is a prime number?

A. $\frac{1}{4}$

B. $\frac{1}{3}$

C. $\frac{2}{3}$

D. $\frac{5}{12}$

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Here is the answer and explanation

Answer : Option D

Explanation :

Total number of outcomes possible when a die is rolled = 6 ($\because$ any one face out of the 6 faces)
Hence, Total number of outcomes possible when two dice are rolled, n(S) = 6 × 6 = 36

Prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 ... etc

Let E = the event that the total is a prime number
= {(1,1), (1,2), (1,4), (1,6), (2,1), (2,3), (2,5), (3,2), (3,4), (4,1), (4,3), (5,2), (5,6), (6,1), (6,5)}

Hence, n(E) = 15

$$P(E) = \frac{n(E)}{n(S)} = \frac{15}{36} = \frac{5}{12}$$