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PROBABILITY

- **Probability:** Probability is that branch of mathematics which deals with the measure of uncertainty in various phenomenon that gives several results/out comes instead of a particular one.
- **Definition of probability:** Numerical measure of 'Uncertainty' and denoted by P(E).
- **Experiment:** An activity which produce some well defined outcomes
- **Random Experiment:** An experiment in which all possible outcomes are known but the results can not be predicted in advance.
- **Trial:** Performing an experiment.
- **Outcome:** Result of the trial
- **Equally likely outcomes:** Outcomes which have equal chances of occurrence.
- **Sample space :** Collection of all possible outcomes
- **Some special sample spaces:**

Coin tossed once $n(s) = 2 = 2^1$	$S = \{H, T\}$,
Coin tossed twice or two coins tossed simultaneously	$S = \{HH, HT, TH, TT\}$, $n(s) = 4 = 2^2$.
Coin tossed thrice or three coins tossed simultaneously	$S = \{HHH, HTH, HHT,$ $THH, TTT, TTH,$ $THT, HTT\}$, $n(s) = 8 = 2^3$.
Die is thrown once	$S = \{1, 2, 3, 4, 5, 6\}$, $n(s) = 6 = 6^1$.

Die is thrown
twice or two dice
are thrown
simultaneously

$S = \{(1,1), (1,2), (1,3),$
 $(1,4), (1,5), (1,6),$
 $(6,6)\}$, $n(s) = 36 = 6^2$.

- **Event:** Collection of some including no outcome or all outcomes from the sample space.

- **Probability of an event:**

$$P(E) = \frac{\text{no of outcomes favourable to the event}}{\text{Total no. of outcomes in the sample space}}$$

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

- **Sure Event:** If no. of outcomes favourable to the event is equal to no. of total outcomes of the sample space or an event whose probability is 1.
- **Impossible Event:** Having no outcome or an event whose probability is 0.
- **Range of Probability:** Probability of an event always lies between 0 and 1 (0 and 1 inclusive) i.e. $0 \leq P(E) \leq 1$.
- **Complementary Event:** Event which occurs only when E does not occur and denoted by \bar{E} .
Probability of a complementary Event
 $P(\bar{E}) = 1 - P(E)$
- **Sum of Probabilities:** Sum of all the probabilities is 1 i.e. $P(E_1) + P_1(E_2) + P(E_3) - +P(E_n) = 1$ and $P(E) + P(\bar{E}) = 1$.

CHECK YOUR PROGRESS:

- A die is thrown once. The probability of getting a prime number is :
(A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) $\frac{1}{6}$
- Two coins are tossed once. The Probability of getting atleast one head is :
(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D) 1
- A card is drawn from a pack of 52 cards. The probability that it is a face card, is :
(A) $\frac{4}{13}$ (B) $\frac{3}{13}$ (C) $\frac{2}{13}$ (D) $\frac{1}{13}$
- A pair of dice is thrown once. The probability of having a sum 11 on the two dice is :
(A) $\frac{1}{36}$ (B) $\frac{1}{12}$ (C) $\frac{1}{18}$ (D) $\frac{1}{9}$
- Which of the following cannot be the probability of an event-
(A) $\frac{2}{3}$ (B) 15% (C) 0.7 (D) 1.5
- A coin is thrown twice. Find the probability of getting one head.
- A die is thrown once. Find the probability of getting an even number.
- A card is drawn from a well-shuffled deck of 52 playing cards. Find the probability that it is not an ace.

STRETCH YOURSELF

- Cards marked with numbers 3, 4, 5 ... 19 are kept in a box and mixed thoroughly. If one card is drawn at random from the box, find the probability of getting.
(i) A prime number (ii) A perfect square
- A bag contains 12 balls out of which x are white. If 6 more white balls are put in the bag, the probability of getting a white ball becomes double. Find the value of x.
- Find the probability of getting 53 Sundays in a non leap year.
- If a number x is chosen from the numbers 1, 2, 3 and a number y is selected from the numbers 1, 4, 9, then find $P(xy < 9)$.

ANSWERS**CHECK YOUR PROGRESS :**

- A 2. C 3. B 4. C
- D 6. $\frac{1}{2}$ 7. $\frac{1}{2}$ 8. $\frac{12}{13}$

STRETCH YOURSELF :

- (i) $\frac{7}{17}$ (ii) $\frac{3}{17}$
- 3
- $\frac{1}{7}$
- $\frac{5}{9}$