

FORM 3 TERM 3

STRAND : STATISTICS AND PROBABILITY

TOPIC : Introduction to Probability

KEY POINTS : outcome of an experiment; concept of probability; terminology: event, certainty, change, fairness, possibility, risk; application of the probability formula; calculation of probability; range of values for probability; notation; probability in decision making; problem solving.

Probability

Probability is the likelihood of the occurrence of an event. The probability of event A is written $P(A)$. Probabilities are always numbers between 0 and 1, inclusive.

The four basic rules of probability:

- 1) For any event A, $0 < P(A) < 1$.
- 2) $P(\text{impossible event}) = 0$. Also written $P(\text{empty set}) = 0$ or $P(\emptyset) = 0$.
- 3) $P(\text{sure event}) = 1$. Also written $P(S) = 1$, where S is the sample set.
- 4) $P(\text{not A}) = 1 - P(A)$. Also written $P(\text{complement of A}) = 1 - P(A)$

Experiment in the study of probability, is the name given to any controlled and repeatable process.

Event is a set of possible outcomes resulting from a particular experiment.

Outcome is a single specific possible result of an experiment.

Experiment	Outcomes
Tossing a coin	Heads, Tails
Rolling a six sided die	1,2,3,4,5,6

Independent Events are not affected by previous Events.

A coin does not "know" it came up heads before...

... each toss of a coin is a perfect isolated event.



When rolling a pair of dice, one die does not affect the outcome of the other die ...

... each die is an isolated event.



Probability of an event happening = $\frac{\text{Number of ways it can happen}}{\text{Total Number of Outcomes}}$

Probability of getting a "Head" when tossing a coin?

$$P(\text{Head}) = \frac{\text{"Head"}}{\text{"Head and Tail"}} = \frac{1}{2}$$

Probability of rolling a "4" on a die?

$$P(4) = \frac{\text{"4"}}{\text{"1", "2", "3", "4", "5", "6"}} = \frac{1}{6}$$

- 1) A number is chosen at random from 1 to 10. Determine the probability of selecting an odd number.

- 2) A number is chosen at random from 1 to 25. Determine the probability of
 - a) selecting an even number that is greater than 13.
 - b) selecting a prime number.
 - c) selecting a composite number

- 3) A number is chosen at random from 1 to 10. Determine the probability of selecting a multiple of 2 or a multiple of 3.

- 4) When a die is tossed, determine the probability of obtaining
 - a) an even prime number
 - b) a number less than 4
 - c) divisors of 30

- 5) In a shirt factory, it is found that on the average, 28 in 30 of the shirts produced are good. Determine the probability of selecting a faulty shirt from the factory.

- 6) In a Mathematics test, the scores obtained by 12 students were 2, 3, 3, 4, 5, 5, 5, 6, 7, 7, 9, 10.
Calculate the probability that a student chosen at random scored:
 - a) exactly 3 marks
 - b) at least 5 marks

- 7) A letter is chosen from the word FLAGSTAFF. Determine the probability that it will be:
- a) L
 - b) A
 - c) F
- 8) What is the probability that a person has his birthday in a month beginning with the letter J?
- 9) A bag contains 45 green marbles and 15 red marbles. What is the probability of drawing :
- a) a green marble
 - b) red marble
- 10) One card is chosen from a pack of 52 cards. What is the probability that the card is
- a) a King
 - b) a black card

ANSWERS

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1) $P(\text{odd number}) = \frac{1}{2} = 0.5$

2) a) $P(\text{even number}) = \frac{6}{25} = 0.24$

b) $P(\text{prime number}) = \frac{9}{25} = 0.36$

c) $P(\text{composite number}) = \frac{15}{25} = \frac{3}{5} = 0.6$

3) $P(\text{multiple of 2 or 3}) = \frac{7}{10}$

4) a) $P(\text{even prime number}) = \frac{1}{12}$

b) $P(\text{less than 4}) = \frac{1}{2} = 0.5$

c) $P(\text{divisors of 30}) = \frac{5}{6} = 0.83$

5) $P(\text{faulty}) = \frac{2}{30} = \frac{1}{15} = 0.07$

6) a) $P(3 \text{ marks}) = \frac{2}{12} = \frac{1}{6} = 0.17$

b) $P(\geq 5 \text{ marks}) = \frac{8}{12} = \frac{2}{3} = 0.67$

7) a) $P(L) = \frac{1}{9}$

b) $P(A) = \frac{2}{9}$

c) $P(F) = \frac{3}{9} = \frac{1}{3}$

$$8) P(J) = \frac{3}{12} = \frac{1}{4}$$

$$9) \quad a) P(\text{green marble}) = \frac{45}{60} = 0.75$$

$$b) P(\text{red marble}) = \frac{15}{60} = \frac{1}{4} = 0.25$$

$$10) \quad a) P(\text{King}) = \frac{4}{52} = 0.077$$

$$b) P(\text{black card}) = \frac{26}{52} = 0.5$$