# HINGA MUNA!!!

# IEE1-(Probability Statistics)
# Review Materials for MATH subject

**Arithmetic Mean (A. M.):**

$$A.M. = \frac{a_1 + a_2 + a_3 + \quad + a_n}{n}$$

**Median:**

Is the middle value when all data are arranged in increasing or decreasing order

**Mode :**

Is the value that occurs most frequently

**Range:**

**Range** = Maximum value — Minimum value

**Variance:**

The variance of a set of numbers is defined by

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

where $\bar{x}$ = A. M

**Standard Deviation:**

$$\text{Std. Deviation} = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}}$$

or

$$\text{Std. Deviation} = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

**Fundamental Principle:**

If an event can happen in any one of $n_1$ ways, and if when this has occurred another event can happen in any one of $n_2$ ways, then the number of ways in which both events can happen in the specified order is $n_1 n_2$.

In general for k events,

$$n_T = n_1 \cdot n_2 \cdot n_3 \cdots n_k$$

**Permutation (P):**

- grouping of things in a definite order.

To permute a set of things means to arrange them in a definite order

1. **Permutation of n different elements taken r at a time is**

$$_nP_r = \frac{n!}{(n-r)!}$$

Note: $_nP_r = P(n, r) = P_r^n$

Illustration:

For letters a, b, c, the no. of permutation taken 2 at a time is,

$$_3P_2 = \frac{3!}{(3-2)!} = 6$$

Another way:

ab, ba, ac, ca, bc, cb = 6

or by Fundamental Principle

$3 \cdot 2 = 6$

2. **Permutation of n different elements taken all (r = n) at a time is,**

$$_nP_n = n!$$

Illustration:

For a, b, c, the no. of permutation taken all at a time is,

$$_3P_3 = 3! = 6$$

Another way,

abc, acb, bac, bca, cba, cab = 6

or by Fundamental Principle,

$3 \cdot 2 \cdot 1 = 6$

3. **Permutations of n elements some of which are alike is,**

$$ {}_nP_{n-s} = \frac{n!}{[n-(n-s)]!} = \frac{n!}{s!} $$

where s is the number of times the element is repeated in the set.

Illustration:

For letter a, a, c the number of permutation taken all at a time is,

$$ P = \frac{n!}{s!} = \frac{3!}{2!} = 3 $$

Another way,

aac, aca, caa = 3

4. **Permutation of n elements not all different taken all at a time is,**

$$ P = \frac{n!}{n_1!\, n_2!\, n_3! \ldots . n_k!} $$

Where $n_1, n_2, n_3, n_k$ – number of elements which are alike

n - total no. of elements in a given set

5. **Theorem on Partitioning:**

The number of ways of partitioning a set of n objects into r cells with $n_1$ elements in the first cell, $n_2$ elements in the second cell and so forth is,

$$ \binom{n}{n_1, n_2, \ldots\ldots, n_r} = \frac{n!}{n_1!\, n_2! \ldots . n_r!} $$

where $n = n_1 + n_2 + \ldots\ldots\ldots\ldots + n_r$

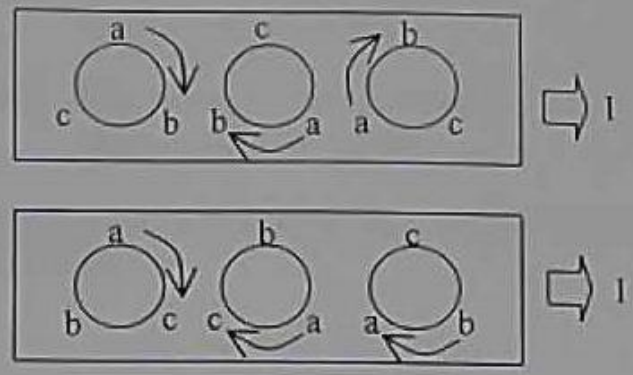
6. Cyclic Permutations:

The number of permutations of n different objects arranged in a circle is,

$$P_c = (n-1)!$$

Illustration:

For the letters a, b, c arranged in a circle,




$$P_c = 1 + 1 = 2$$

By Formula,

$$P_c = (3-1)! = 2! = 2 \quad 1 = 2$$

**Combination (C):**

- is a selection of things considered without regard to order.
- grouping of things where arrangement is immaterial

**1. The number of combinations of n objects taken r at a time is,**

$$_nC_r = \frac{_nP_r}{r!} = \frac{n!}{r!\,(n-r)!}$$

Note: $_nC_r = C(n,r) = C_r^n$

2. The number of combination of n objects taken all (n = r) at a time is,

$$_nC_n = 1$$

3. The number of combinations that can be made taking successively 1 at a time, 2 at a time, 3 at a time and so on up to n at a time.

$$C = {}_nC_1 + {}_nC_2 + {}_nC_3 + \ldots\ldots + {}_nC_n = 2^n - 1$$

**Probability (p):**

$$\text{Probability} = \frac{\text{No. of favorable outcomes}}{\text{No. of possible outcomes}}$$

Probability of Success + Probability of Failure = 1

1. **Probability in Single Event.** If an event can happen in h ways and can fail in f ways are equally likely, then in a single trial the probability will happen is given by,

$$p = \frac{h}{h+f}$$

and the probability that it will fail is given by,

$$q = \frac{f}{h+f}$$

2. **Mutually Exclusive Events.** Two or more events are mutually exclusive if not more than one of them can happen in a given trial.

The probability that some one or other of a set of mutually exclusive events will happen in a single trial is the sum of their separate probabilities of happening.

$$p = p_1 + p_2 + \ldots\ldots + p_n$$

3. **Independent Events.** Two or more events are said to be independent if the happening of one does not affect the happening of the others.

The probability that two or more independent events will happen is the product of their separate probabilities.

$$p = p_1 \cdot p_2 \cdot \ldots\ldots\ldots\ldots \cdot p_n$$

4. **Dependent Events.** Two or more events are said to be dependent if the happening of one effects the probability that the other will happen.

If $p_1$ is the probability that an event will happen, and after it has happened the second will occur with probability $p_2$, then the probability that the first event and then the second event will happen is the product $p_1 \cdot p_2$

5. **Probability for Repeated Trials (Binomial Density Distribution)**

$$p = {}_nC_r\, p_1^{\,r} (1 - p_1)^{n-r}$$

where $n$ = no. of trials

$r$ = no. of desired successful outcome

$p_1$ = probability of a successful outcome in a trial

**REE – Sept. 2005**

1. A survey conducted to determine the:
   SMOKERS: 56, 22.1, 47.6, 53.2, 48.1, 52.7, 34.4, 60.2, 43.8, 23.2, 13.8
   NON-SMOKERS: 28.6, 25.8, 26.4, 34.9, 29.8, 28.4, 36.5, 30.2, 30.6, 31.8, 41.6, 21.1,36, 37.9, 13.9
   Find the sample mean of the non-smoker and smoker.
   A. 29.56/42.28 B. 29.95/43.84 C. 30.23/41.37 D. 30.56/42.98

**REE – Apr. 2007**

2. You are given n = 5 measurements 0, 5, 1, 1, 3. Find the mode.
   A. 2 B. 3 C. 1 D. 1.5

**REE – Mar. 1998**

3. Given the following statistical data, determine the standard deviation.
   112 132 144 156 164 176 183 197
   A. 26.22 B. 27.53 C. 28.84 D. 30.15

4. If the sum of the squares of 10 numbers is 645 and their standard deviation is 2.87, find their arithmetic mean
   A. 6.5 B. 7.5 C. 8.5 D. 9.5

**REE – Sept. 2006**

5. You are given n = 5 measurements 2, 1, 1, 3, 5. Find the sample standard deviation.
   A. 1.928 B. 1.673 C. 2.176 D. 2.315

**REE – Sept. 2003**

6. You are given n = 5 measurements 2, 1, 1, 3, 5. What is the sample variance?
   A. 1.496 B. 2.24 C. 2.8 D. 2.4

**REE – Oct. 1993**

7. In a class of 40 students, 27 like Calculus and 25 like Chemistry. How many like both Calculus and Chemistry?
   A. 10 B. 11 C. 13 D. none of these

**REE – Sept. 2011**

8. A class of 40 took examination in Algebra and Trigonometry. If 30 passed Algebra, 36 passed Trigonometry, and 2 failed in both subjects, the number of students who passed the two subjects is
   A. 28 B. 30 C. 25 D. 23

**REE – Sept. 2001**

9. A survey of 500 television viewers produced the following results:
   285 watch football games
   195 watch hockey games
   115 watch basketball games
   45 watch football and basketball
   70 watch football and hockey
   50 watch hockey and basketball
   50 do not watch any of the three games
   How many watch football games only?
   A. 230 B. 200 C. 160 D. 190

**REE – Mar. 1998**

10. In a commercial survey involving 1,000 persons and brand reference, 120 were found to prefer brand X only, 200 prefer brand Y only, 150 prefer brand Z only, 370 prefer either brand X or Y but not Z, 450 prefer either brand Y or Z but not X, and 420 prefer either Z or X but not Y. How many persons have no brand preference satisfied with any of the three brands?
    A. 80 B. 230 C. 180 D. 130

**REE – Apr. 2005**

11. In a fuel company study each of 3 race cars is tested using 5 different brands of gasoline at 7 test sites located in different regions of the country. If 2 drivers are used in the study, the test runs are made once under each distinct set conditions, how many test are needed?
A. 210 B. 420 C. 10800 D. 1400

**REE – Apr. 2012 / Feb. 2014**

12. The plate number of a vehicle consists of 5-alphanumeric sequence is arranged such that the first two characters are alphabet and the remaining 3 are digits. How many arrangements are possible if the first character is a vowel and repetitions are not allowed?
A. 90 B. 900 C. 9,000 D. 90,000

**REE – Apr. 2015**

13. How many even numbers of three digits can be made with the digits 0, 2, 3, 5, 7, 8, 9 if no digit is repeated?
A. 102 B. 126 C. 80 D. 90

**REE – Apr. 2007**

14. If a multiple-choice test consists of 5 questions each with 4 possible answers of which only 1 is correct, in how many different ways can a student check off one answer to each question?
A. 1,024 B. 1,440 C. 1,152 D. 576

**REE – May 2008**

15. If a multiple-choice test consists of 5 different questions each with 4 possible answers of which only 1 is correct, in how many ways can a student check off one answer to each question and get all the answers wrong?
A. 1024 B. 476 C. 243 D. 512

**REE – Apr. 2013**

16. In how many ways can 5 people be lined to get on a bus, if a certain 2 persons refuse to follow each other?
A. 36 B. 48 C. 96 D.72

**REE – April 2016 / April 2017**

17. In how many ways can 4 coins be tossed?
A. 8 B. 12 C. 16 D. 20

**REE – Apr. 2007**

18. How many distinct permutations can be made from the letters of the word infinity?
A. 1680 B. 6720 C.5040 D. 3360

19. Nine people are going on a skiing trip in 3 cars that will hold 2, 4 and 5 passengers, respectively. In how many ways is it possible to transport 9 people to the ski lodge using all cars?
A. 4563 B. 4536 C. 4410 D. 4210

20. In how many ways can 3 men and 3 women be seated at a round table if
A. no restriction is imposed?
A. 120 B. 240 C. 12 D. 72

B. 2 particular women must not sit together?
A. 120 B. 240 C. 12 D. 72

C. each women is to be between 2 men?
A. 120 B. 240 C. 12 D. 72

21. A man and his wife invite 8 of their friends to dinner. They are to be seated around a round table. How many seating arrangements can be made.

A. if the man and his wife are to sit side by side?

A. 3,628,800 B. 80,640 C. 40,320 D. 362,880

B. if the man and his wife sit opposite each other?

A. 3,628,800 B. 80,640 C. 40,320 D. 362,880

**REE – Apr. 1997**

22. Four different colored flags can be hung in a row to make coded signal. How many signals can be made if a signal consists of the display of one or more flags?

A. 64 B. 66 C. 68 D. 62

**REE – Sept. 2006**

23. In a printed circuit board may be purchased from 5 suppliers in how many ways can 3 suppliers be chosen from the 5?

A. 20 B. 5 C. 10 D. 68

24. From 7 engineers and 4 scientists, how many committees of seven people are possible if

A. no restriction is imposed?

A. 320 B. 340 C. 330 D. 350

B. with five engineers and 2 scientists?

A. 330 B. 126 C. 330 D. 152

C. with four engineers and three scientists if a certain scientist must be on the committee?

A. 330 B. 140 C. 105 D. 325

**REE – Apr. 2013/Feb. 2014**

25. Six non-parallel lines are drawn in a plane. What is the maximum number of point of intersections of these lines?
A. 20 B. 12 C. 8 D. 15

26. In how many ways can Mary invite one or more of his 8 friends to dinner?
A. 254 B. 255 C. 256 D. 257

27. How many groups of 2 or more girls can be formed from 8 girls?
A. 254 B. 247 C. 255 D. 246

**REE – Sept. 2010/Sept. 2014**

28. A political scientist asked a group of people how they felt about two political statements. Each person was to respond A (agree), N (neutral) or D (disagree) to each NN, ND, NA, DD, DN, DA, AA, AD, and AN. Assuming each response combination is equally likely, what is the probability that the person being interviewed agrees with exactly one of the two political policy statements?
A. 1/9 B. 2/5 C. 2/9 D. 4/9

**REE– Sept. 2012 / Apr. 2013**

29. In a single throw of a pair of dice, find the probability that the sum is 11.
A. 1/12 B. 1/16 C. 1/36 D. 1/18

**REE – Sept. 2008**

30. A pair of dice is tossed. Find the probability that one of the die is 2 if the sum is 6.
A. 4/36 B. 2/36 C. 5/36 D. 2/5

31. A card is drawn from a deck of deck 52 cards. Find the probability of drawing

A. a king or a queen

A. 1/52 B. 2/13 C. 1/13 D. 1/26

B. a king or a heart

A. 1/52 B. 1/13 C. 4/13 D. 2/13

**REE – Sept. 2008**

32. A single card is drawn from an ordinary deck of card 52 cards. Find the probability p that the card is face card and a heart.

A. 1/4 B. 3/52 C. 1/13 D. 3/13

**REE – Apr. 2007**

33. Suppose a student is selected at random from 100 students, 30 are taking ME, 20 are taking EE and 10 are taking ME and EE. Find the probability that the student is taking EE or ME.

A. 1/10 B. 3/10 C. 1/5 D. 2/5

34. A bag contains 4 green balls and 7 blue balls. A ball is drawn and returned, then another ball is drawn. What is the probability that the first ball drawn is green and the second ball is blue?

A. 14/128 B. 28/110 C. 28/121 D. 28/127

**REE – Apr. 2007**

35. A class has 12 boys and 4 girls, suppose 3 students are selected at random from the class, find the probability that they are all boys.

A. 13/28 B. 9/28 C. 11/28 D. 5/28

**REE – Sept. 2006**

36. Two cards are drawn in succession from a deck without replacement. What is the probability that both cards are greater than 2 and less than 8?
A. 94/663 B. 93/663 C. 96/663 D. 95/663

**REE – Sept. 2006**

37. In a poker hand consisting 5 cards, find the probability of holding 4 hearts and 1 club.
A. 188/39984 B. 143/39984 C. 94/54145 D. 143/19992

**REE – Apr. 2005**

38. A box contains 2 blue socks and 2 white socks. Picking randomly, what is the probability that you will pick 2 socks of the same color?
A. 1/6 B. 1/3 C. 1/2 D. ¼

**REE – Sept. 2003**

39. Find the probability of drawing a heart and a spade in a standard deck of 52 cards.
A. $\frac{13}{102}$ B. $\frac{1}{26}$ C. $\frac{1}{51}$ D. $\frac{2}{103}$

**REE – April 2015**

40. A point is chosen at random inside the circle of diameter 8 in. What is the probability that it is at least 1 5 in away from the center of the circle?
A. 53/64 B. 55/64 C. 52/64 D. 56/64

**REE – Apr. 2003**

41. The probability that A hits a target is 1/3 and the probability that B hits a target is 1/5. They both fire at the target. Find the probability that one of them hits the target.
A. 7/15 B. 3/5 C. 2/5 D. 8/15

**REE – Sept. 2004**

42. A real estate agent has 8 master keys to open several new homes. Only 1 master key will open any given house. If 40% of these homes are usually left unlocked, what is the probability that the real estate agent can get into specific home if the agent selects 3 master keys at random before leaving the office?
A. 1/2 B. 3/4 C. 5/8 D. 8/15

**REE – Apr. 2004**

43. The probability that a patient recovers from a delicate heart operation is 0.9. What is the probability that exactly 5 out of 7 patients will survive?
A. 0.148 B. 0.1240 C. 0.128 D. 0.240

**REE – Sept. 2010 / Apr. 2013 / Feb. 2014**

44. From past experience, it is known 90% of one year old children can distinguish their mother's voice of a similar sounding female. A random sample one year's old are given this voice recognize test. Find the probability that all 20 children recognize their mother's voice.
A. 0.122 B. 0.500 C. 1.200 D. 0.222

**REE – Sept. 2012**

45. A fair coin is tossed three times. Find the probability that there will appear three heads.
A. 1/4 B. 1/2 C. 1/8 D. 1/6

**REE – Apr. 1996**

46. The probability that Ed hits a target is 1/4. He fires 6 times. Find the probability that he hits the target at least once.
A. 0.780 B. 0.740 C. 0.820 D. 0.800

**REE – Apr. 2004**

47. Determine the value of c so that f(x, y) = cxy represents joint probability distributions of the random variables X and Y, if the random number are x = 1, 2, 3 and y = 1, 2, 3.
A. 1/36 B. 1/18 C. 1/24 D. 1/12

**REE – Apr. 2008/Sept. 2012**

48. The mean duration of television commercials on a given network is 75 seconds, with a standard deviation of 20 seconds. Assume that duration time is approximately normally distributed. What is the approximate probability that a commercial will last less than 35 seconds?
A. 0.055 B. 0.025 C. 0.045 D. 0.035

**REE – Apr. 2013/Sept. 2014**

49. In a 15 multiple choice test questions, with five possible choices of which only one is correct, what is the standard deviation of getting a correct answer?
A. 1.55 B. 1.07 C. 1.50 D. 1.65

**REE – Apr. 2015**

50. A student did not study for his upcoming examination on which is 15 multiple choice test questions, with five possible choices of which only one is correct, what is the expected number of correct answers he can get?
A. 2 B. 3 C. 4 D. 5