

- What is Integration?
- What is the opposite of Integration?
- What do you think is generally the problem with Integration?
- Can we make use of Integration in some principle of Physics?
- What is Differentiation?
- How do you find the maximum of a function $f(x)$?
- Draw a graph where the second order differential is zero.
- What is a point of inflection?
- Draw a graph which has a point of inflection.
- What is Hungarian Algorithm?
- What is Ant Colony Algorithm?
- What is the time complexity of an algorithm?
- Do you know about partial derivatives?
- What is the probability that on tossing a coin we get both heads? Are the two events independent?
- Describe Random Numbers. Why are Random Numbers generated in programming languages called pseudo-random?
- Describe an algorithm to generate numbers.
- What is probability? What is the probability that when you are married, your first child will be a boy? What is the probability that the first 3 children you have will be boys?
- What is a Prime Number?
- What is Descartes' rule in algebra?
- State Fermat's Last Theorem.
- What are Mersenne Primes?
- What is the value of zero raised to power zero?
- What do we mean by indeterminate form? List out the various indeterminate forms.
- Is $0.9999999\ldots = 1$? Can you prove it?
- Why is $0! = 1$?
- Why there is Nobel in mathematics? Do you think it is justified?
- What do you know about Fields Medal or Abel Prize?
- Can you explain the Monty Hall Problem?
- What is the difference between a Theorem and an Axiom?
- Among the sets N , Z and Q identify the one which is a Monoid, an Integral Domain and a Field.
- What is the difference between a Field and a Ring?
- What do we mean by Six Sigma? Explain
- What do we mean by a random variable?
- Random variable X is distributed as $N(a, b)$, and random variable Y is distributed as $N(c, d)$. What is the distribution of (1) $X+Y$, (2) $X-Y$, (3) $X*Y$, (4) X/Y ?
- What's the expectation of a uniform (a, b) distribution? What's its variance?

- In your bedroom you have a drawer with 2 red, 4 yellow, 6 purple, 8 brown, 10 white, 12 green, 14 black, 16 blue, 18 gray, and 20 orange socks. It is dark, so you cannot distinguish between the colours of the socks. How many socks do you need to take out of the drawer to be sure that you have at least three pairs of socks of the same colour?
- You have a rectangular chocolate bar, m by n tiles. You start breaking the chocolate bar, always along the lines, until you end up with mn pieces (i.e. all the tiles have been separated). You want to minimise the number of breaks. What's the best strategy?
- A student calls out an answer to a multiple choice question at random, A, B, C or D, until he is correct (say the correct answer is A). On average, how many times will he have to do this?
- Differentiate between stratified and cluster sampling?
- What do we mean by continuous and discrete distributions? Give examples for each.
- Give situations where Poisson distribution is applicable.
- Give situations where Exponential distribution applicable.
- Differentiate between descriptive statistics and inferential statistics
- What are the different types of measurements scales used in statistics?
- Differentiate between Type I and Type II errors.
- State the Central Limit Theorem.
- 3 persons attend an interview at a company where each person can be either selected or rejected. What is the number of ways of announcing the result?
- What types of relations are called functions? Give examples of relations which are not functions.
- At what points is an algebraic function discontinuous?
- At what points is the greatest integer function discontinuous?
- Write the algebraic expression for a transfer function.
- Explain why sine of an angle cannot take a value of more than 1?
- Is every continuous function differentiable? Explain
- If an event A is independent of itself then what is the probability of event A to take place?
- If correlation coefficient of variables x and y is equal, then what can we say about the the two lines of regression?
- At what point do two lines of regression intersect?
- If $f(x)$ and $g(x)$ are both continuous at $x=a$, then what is the condition for $f(x)/g(x)$ to be continuous at $x=a$?
- Is it true to say that the continuity of fg implies continuity of f and g ?
- Can a null relation be classified as transitive? Justify.
- Give examples of a one to one function and many to one function?
- What is Mean? Central Tendency? Mode?

- What are the types of Mean?
- Give one example each for the practical application of Arithmetic Mean, Geometric Mean and Harmonic Mean.
- What do you understand by Standard Deviation? Also write the formula.
- What term would come if you square the Standard Deviation?
- What is the difference between Bayesian and 'regular' statistics?
- State Cayley-Hamilton Theorem.
- How many zeros are there at the end of $100!$ in base 6?
- Why is 'e' so important in mathematics? What uses does it have in the real world?
- What is the difference between correlation and regression?
- What are Transcendental Numbers? Give some examples
- What is the difference between Euclidean and Non-Euclidean Geometry?
- What is the difference between a bar graph and a histogram? What are the similarities?
- What do we mean by contrapositive, converse and inverse of a given statement?
- There is a rectangle. Which way should it be rolled to give greater volume?
- If the perimeter of a rectangle is 20 cm, what is the distribution among length and breadth to maximize the volume?
- Draw the graph $y = x(x-5)$.
- What is Reynolds number? What does it signify?
- What is binomial and normal distribution?
- What is the inverse of a matrix?