

Note: These are not sample questions, but questions that explore some of the concepts that may be used. The intention is that you should get prepared with the concepts rather than just focusing on a set of questions.

1. What are the total number of divisors of 600(including 1 and 600)?

- a) 24
- b) 40
- c) 16
- d) 20

2. What is the sum of the squares of the first 20 natural numbers (1 to 20)?

- a) 2870
- b) 2000
- c) 5650
- d) 44100

3. What is $\sum_{k=0}^{28} k^2 \binom{28}{k}$, where $\binom{28}{k}$ is the number of ways of choosing k items from 28 items?

- a) $406 * 2^{27}$
- b) $306 * 2^{26}$
- c) $28 * 2^{27}$
- d) $56 * 2^{27}$

4. What is $\sum_{k=0}^{28} 3^k \binom{28}{k}$ where $\binom{28}{k}$ is the number of ways of choosing k items from 28 items?

- a) 2^{56}
- b) $3 * 2^{27}$
- c) 3^{29}
- d) $3 * 4^{27}$

5. A call center agent has a list of 305 phone numbers of people in alphabetic order of names (but she does not have any of the names). She needs to quickly contact Deepak Sharma to convey a message to him. If each call takes 2 minutes to complete, and every call is answered, what is the minimum amount of time in which she can guarantee to deliver the message to Mr. Sharma.

- a) 18 minutes
- b) 610 minutes
- c) 206 minutes
- d) 34 minutes

6. The times taken by a phone operator to complete a call are 2,9,3,1,5 minutes respectively. What is the average time per call?

- a) 4 minutes
- b) 7 minutes
- c) 1 minutes
- d) 5 minutes

7. The times taken by a phone operator to complete a call are 2,9,3,1,5 minutes respectively. What is the median time per call?

- a) 5 minutes
- b) 7 minutes
- c) 1 minutes
- d) 4 minutes

8. Eric throws two dice, and his score is the sum of the values shown. Sandra throws one die, and her score is the square of the value shown. What is the probability that Sandra's score will be strictly higher than Eric's score?

- a) $137/216$
- b) $17/36$
- c) $173/216$
- d) $5/6$

9. What is the largest integer that divides all three numbers 23400,272304,205248 without leaving a remainder?

- a) 48
- b) 24
- c) 96
- d) 72

10. Of the 38 people in my office, 10 like to drink chocolate, 15 are cricket fans, and 20 neither like chocolate nor like cricket. How many people like both cricket and chocolate?

- a) 7
- b) 10
- c) 15
- d) 18

11. If $f(x) = 2x+2$ what is $f(f(3))$?

- a) 18
- b) 8
- c) 64
- d) 16

12. If $f(x) = 7x + 12$, what is $f^{-1}(x)$ (the inverse function)?

- a) $(x-12)/7$
- b) $7x+12$
- c) $1/(7x+12)$
- d) No inverse exists

13. A permutation is often represented by the cycles it has. For example, if we permute the numbers in the natural order to 2 3 1 5 4, this is represented as (1 3 2) (5 4). In this the (132) says that the first number has gone to the position 3, the third number has gone to the position 2, and the second number has gone to position 1, and (5 4) means that the fifth number has gone to position 4 and the fourth number has gone to position 5. The numbers with brackets are to be read cyclically.

If a number has not changed position, it is kept as a single cycle. Thus 5 2 1 3 4 is represented as (1345)(2).

We may apply permutations on itself If we apply the permutation (132)(54) once, we get 2 3 1 5 4. If we apply it again, we get 3 1 2 4 5 , or (1 2 3)(4) (5)

If we consider the permutation of 7 numbers (1457)(263), what is its order (how many times must it be applied before the numbers appear in their original order)?

- a) 12
- b) 7
- c) $7!$ (factorial of 7)
- d) 14

14. What is the maximum value of $x^3y^3 + 3x^*y$ when $x+y = 8$?

- a) 4144
- b) 256
- c) 8192
- d) 102

15. Two circles of radii 5 cm and 3 cm touch each other at A and also touch a line at B and C. The distance BC in cms is?

- a) 60
- b) 62
- c) 68
- d) 64

16. In Goa beach, there are three small picnic tables. Tables 1 and 2 each seat three people. Table 3 seats only one person, since two of its seats are broken. Akash, Babu, Chitra, David, Eesha, Farooq, and Govind all sit at seats at these picnic tables. Who sits with whom and at which table are determined by the following constraints?

- a) Chitra does not sit at the same table as Govind.
- b) Eesha does not sit at the same table as David.
- c) Farooq does not sit at the same table as Chitra.
- d) Akash does not sit at the same table as Babu.
- e) Govind does not sit at the same table as Farooq.

Which of the following is a list of people who could sit together at table 2?

- a) Govind, Eesha, Akash
- b) Babu, Farooq, Chitra
- c) Chitra, Govind, David.
- d) Farooq, David, Eesha.

17. There are a number of chocolates in a bag. If they were to be equally divided among 14 children, there are 10 chocolates left. If they were to be equally divided among 15 children, there are 8 chocolates left. Obviously, this can be satisfied if any multiple of 210 chocolates are added to the bag. What is the remainder when the minimum feasible number of chocolates in the bag is divided by 9?

- a) 2
- b) 5
- c) 4
- d) 6

18. Let $f(m,n) = 45*m + 36*n$, where m and n are integers (positive or negative) What is the minimum positive value for $f(m,n)$ for all values of m,n (this may be achieved for various values of m and n)?

- a) 9
- b) 6
- c) 5
- d) 18

19. What is the largest number that will divide 90207, 232585 and 127986 without leaving a remainder?

- a) 257
- b) 905
- c) 351
- d) 498

20. We have an equal arms two pan balance and need to weigh objects with integral weights in the range 1 to 40 kilo grams. We have a set of standard weights and can place the weights in any pan. . (i.e) some weights can be in a pan with objects and some weights can be in the other pan. The minimum number of standard weights required is:

- a) 4
- b) 10
- c) 5
- d) 6

21. A white cube (with six faces) is painted red on two different faces. How many different ways can this be done (two paintings are considered same if on a suitable rotation of the cube one painting can be carried to the other)?

- a) 2
- b) 15
- c) 4
- d) 30

22. How many divisors (including 1, but excluding 1000) are there for the number 1000?

- a) 15
- b) 16
- c) 31
- d) 10

23. In the polynomial $f(x) = 2x^4 - 49x^2 + 54$, what is the product of the roots, and what is the sum of the roots (Note that x^n denotes the x raised to the power n, or x multiplied by itself n times)?

- a) 27,0
- b) 54,2
- c) $49/2$, 54
- d) 49, 27

24. In the polynomial $f(x) = x^5 + ax^3 + bx^4 + cx + d$, all coefficients a, b, c, d are integers.

If $3 + \sqrt{7}$ is a root, which of the following must be also a root?(Note that x^n denotes the x raised to the power n, or x multiplied by itself n times. Also \sqrt{u} denotes the square root of u, or the number which when multiplied by itself, gives the number u)?

- a) $3 - \sqrt{7}$
- b) $3 + \sqrt{21}$
- c) 5
- d) $\sqrt{7} + \sqrt{3}$

25. If $3y + x > 2$ and $x + 2y < 3$, what can be said about the value of y?

- a) $y > -1$
- b) $y = -1$
- c) $y < -1$
- d) $y = 1$

26. If m is an odd integer and n an even integer, which of the following is definitely odd?

- a) $m+n$
- b) $(2m+n)(m-n)$
- c) $m^2 + m*n + n^2$
- d) $(m+n^2) + (m-n^2)$

27. If the price of an item is decreased by 10% and then increased by 10%, the net effect on the price of the item is:

- a) A decrease of 1%
- b) No change
- c) An increase of 1%
- d) A decrease of 99%

28. What is the sum of all even integers between 99 and 301?

- a) 20200
- b) 20000
- c) 40400
- d) 40000

29. There are 20 balls which are red, blue or green. If 7 balls are green and the sum of red balls and green balls is less than 13, at most how many red balls are there?

- a) 5
- b) 6
- c) 7
- d) 4

30. If n is the sum of two consecutive odd integers and less than 100, what is the greatest possibility of n ?

- a) 96
- b) 99
- c) 98
- d) 94

31. $x^2 < 1/100$, and $x < 0$. What is the tightest range in which x can lie?

- a) $-1/10 < x < 0$
- b) $-1/10 < x$
- c) $-1/10 < x < 1/10$
- d) $-1 < x < 0$

32. There are 4 boxes colored red, yellow, green and blue. If 2 boxes are selected, how many combinations are there for at least one green box or one red box to be selected?

- a) 5
- b) 6
- c) 9
- d) 1

33. All faces of a cube with an eight-meter edge are painted red. If the cube is cut into smaller cubes with a two-meter edge, how many of the two-meter cubes have paint on exactly one face?
- a) 24
 - b) 36
 - c) 48
 - d) 60
34. In a sequence of integers, $A(n) = A(n-1) - A(n-2)$, where $A(n)$ is the n th term in the sequence, n is an integer and $n \geq 3$, $A(1)=1, A(2)=1$. Calculate $S(1000)$, where $S(1000)$ is the sum of the first 1000 terms
- a) 1
 - b) -1
 - c) 2
 - d) 0
35. If $x^2 - 16 > 0$, which of the following must be true?
- a) $-4 > x$ or $x > 4$
 - b) $-4 < x < 4$
 - c) $x < 4$
 - d) $4 < x$
36. Two cyclists begin training on an oval racecourse at the same time. The professional cyclist completes each lap in 4 minutes; the novice takes 6 minutes to complete each lap. How many minutes after the start will both cyclists pass at exactly the same spot where they began to cycle?
- a) 12
 - b) 8
 - c) 10
 - d) 14
37. M, N, O and P are all different individuals. M is the daughter of N. N is the son of O. O is the father of P. Among the following statements, which one is true?
- a) If B is the daughter of N, then M and B are sisters
 - b) P and N are brothers
 - c) M is the daughter of P
 - d) If C is the granddaughter of O, then C and M are sisters.
38. What is the remainder when $6^{17} + 17^6$ is divided by 7?
- a) 0
 - b) 1
 - c) 3
 - d) 6

39. In base 7, a number is written only using the digits 0, 1, ...6. The number 21 in base 7 is equal to $2 \times 7 + 1 = 15$ in base 10. Similarly the number 135 in base 7 is $1 \times 7^2 + 3 \times 7 + 5 = 75$ in base 10. What is the sum of the base 7 numbers 1234 and 6543 in base 7?
- a) 11110
 - b) 11011
 - c) 10111
 - d) 11101
40. Akhilesh, Bernard, Catherine and Dinesh go for a picnic. In a weighing machine they try to find their weights. When Akhilesh stands on the machine, without his knowledge Bernard also climbs the machine and the weight shown was 132kg. When Bernard stands, without his knowledge Catherine also stands on the machine and the machine shows 130 kg. Similarly the weight of Catherine and Dinesh is found as 102 kg and that of Bernard and Dinesh is 116 kg. What is the weight of Dinesh?
- a) 44 kg
 - b) 58 kg
 - c) 78 kg
 - d) Cannot be determined from the given information
41. Roy is now 4 years older than Erik and 2 years older than Iris. If in 2 years, Roy will be twice as old as Erik, then in 2 years what would be Roy's age multiplied by Iris's age?
- a) 48
 - b) 28
 - c) 50
 - d) 52
42. X, Y, Z, and W are integers. The expression $X - Y - Z$ is even and the expression $Y - Z - W$ is odd. If X is even what must be true?
- a) W must be odd.
 - b) $Y - Z$ must be odd.
 - c) W must be even.
 - d) Z must be odd
43. How many four-digit numbers that do not contain the digits 3 or 6 are there?
- a) 3584
 - b) 4096
 - c) 5040
 - d) 7200
44. Tim and Elan are 90 km away from one another. They are starting to move towards each other simultaneously, Tim at a speed of 10 kmph and Elan at a speed of 5 kmph. If every hour they double their speeds, what is the distance that Tim will pass until he meets Elan?
- a) 60 km
 - b) 30 km
 - c) 45 km
 - d) 80 km

45. In a rectangular coordinate system, what is the area of a triangle whose vertices have the coordinates (4, 0), (6, 3), and (6, -3)?
- a) 6
 - b) 7.5
 - c) 7
 - d) 6.5
46. A drawer holds 4 red hats and 4 blue hats. What is the probability of getting exactly three red hats or exactly three blue hats when taking out 4 hats randomly out of the drawer and immediately returning every hat to the drawer before taking out the next?
- a) $1/2$
 - b) $1/8$
 - c) $1/4$
 - d) $3/8$
47. A gardener changed the size of his rectangle-shaped garden by increasing its length by 40% and decreasing its width by 20%. The area of the new garden:
- a) Has increased by 12%
 - b) Has increased by 20%
 - c) Has increased by 8%
 - d) Cannot be expressed in percentage terms without actual numbers
48. The prime factorization of integer N is $A \times A \times B \times C$, where A, B and C are all distinct prime integers. How many factors does N have?
- a) 12
 - b) 4
 - c) 6
 - d) 24
49. If N is an integer and $N > 2$, at most how many integers among $N+2$, $N+3$, $N+4$, $N+5$, $N+6$ and $N+7$ are prime integers?
- a) 2
 - b) 1
 - c) 3
 - d) 4
50. A turtle is crossing a field. What is the total distance (in meters) passed by the turtle?
Consider the following two statements to get the answer.
- (X) The average speed of the turtle is 2 meters per minute.
- (Y) Had the turtle walked 1 meter per minute faster than his average speed it would have finished the same path 40 minutes earlier.
- a) Both Statements X and Y are needed to get the answer
 - b) Statement X alone is enough to get the answer
 - c) Statement Y alone is enough to get the answer
 - d) Statements X and Y are together not enough to get the answer, and additional data is needed

51. Given the following information, who is youngest?

C is younger than A
A is taller than B
C is older than B
C is younger than D
B is taller than C
A is older than D

- a) B
- b) A
- c) C
- d) D

52. Given the following information, which option must be true?

A occurs only if either B or C occurs.
B occurs only if both D and E occur.
F occurs only if C does not occur
G occurs only if both A and F occur

- a) G does not occur if D does not occur
- b) A occurs whenever F occurs
- c) F never occurs
- d) none of these

53. In how many ways can we distribute 10 identical looking pencils to 4 students so that each student gets at least one pencil?

- a) 84
- b) 5040
- c) 210
- d) None of these

54. Mr. and Mrs. Smith have invited 9 of their friends and their spouses for a party at the Waikiki Beach Resort. They stand for a group photograph. If Mr. Smith never stands next to Mrs. Smith (as he says they are always together otherwise), how many ways the group can be arranged in a row for the photograph?

- a) $18 \times 19 !$
- b) $20 !$
- c) $19 ! + 18 !$
- d) $2 \times 19 !$

55. If a lemon and an apple together cost Rs. 12.00, a tomato and a lemon cost Rs. 4.00 and an apple cost Rs. 8.00 more than a tomato or a lemon then which of the following can be the price of a lemon?

- a) Rs 2
- b) Rs 4
- c) Rs 1
- d) Rs 3

56. George does $\frac{3}{5}$ th of a piece of work in 9 days. He then calls in Paul, and they finish the work in 4 days. How long would Paul take to do the work by himself?

- a) 30
- b) 28
- c) 32
- d) 35

57. Two identical circles intersect so that their centres, and the points at which they intersect, form a square of side 1 cm. The area in sq. cm of the portion that is common to the two circles is:

- a) $(\pi/2) - 1$
- b) 4
- c) $\sqrt{2} - 1$
- d) $\sqrt{5}$

58. A semicircle is drawn with AB as its diameter. From C, a point on AB, a line perpendicular to AB is drawn, meeting the circumference of the semicircle at D. Given that AC = 2 cm and CD = 6 cm, the area of the semicircle (in sq. cm) will be:

- a) 50π
- b) 55π
- c) 31π
- d) 82π

59. The value of a scooter depreciates in such a way that its value at the end of each year is $\frac{3}{4}$ of its value at the beginning of the same year. If the initial value of the scooter is Rs. 40,000, what is its value at the end of 3 years?

- a) Rs16875
- b) Rs13435
- c) Rs 19000
- d) Rs23125

60. Raj earns 25% on an investment but loses 10% on another investment. If the ratio of the two investment is 3:5, what is the gain or loss on the two investment taken together?

- a) 3.125% gain
- b) 6.25% loss
- c) 13.125% loss
- d) 13.125% gain

61. Raj drives slowly along the perimeter of a rectangular park at 24 kmph and completes one full round in 4 minutes. If the ratio of the length to the breadth of the park is 3:2, what are its dimensions?

- a) 480m x 320m
- b) 150m x 100m
- c) 450m x 300m
- d) 100m x 100m

62. Lottery balls are numbered and coloured balls. In the famous Lotto, six numbered balls are drawn at random from 49 balls. In each ticket one needs to guess the six numbers that would be drawn. If no correct guesses are received the prize money is carried to the next draw. It is not uncommon to see prize money accumulating to several millions of dollars. An urn contains m white and n black balls. A ball is drawn at random and is put back into the urn along with k additional balls of the same colour as that of the ball drawn. A ball is again drawn at random. The probability of drawing a white ball now:

- a) Does not depend on k
- b) Increases with k
- c) Decreases with k
- d) Cannot be determined without additional information

63. In this question, A^B refers to A raised to the power B . Assume that the rate of consumption of coal by a locomotive engine varies as the square of its speed and is 1000 kg per hour when the speed is 60 km per hour, when in motion. If coal costs the railway company Rs. 15 per 100 kg and if the other expenses of running the train is Rs. 12 per hour, find a formula for the cost in paise per kilometer when the speed is S km per hour.

- a) 7
- b) 0
- c) 6
- d) None of the other 3 choices

64. a, b, c are non-negative integers such that $28a + 30b + 31c = 365$. Then $a + b + c$ is:

- a) 12
- b) less than or equal to 11
- c) greater than 13
- d) 13