

1. Find the odd man out:
1, 4, 27, 16, 125, 36, 216, 64, 729, 100
(a) 729 (b) 216
(c) 125 (d) 64
2. An athlete has to cover a distance of 6 Kms in 90 Minutes. He covers two-third of the distance in two-thirds of the total time. To cover the remaining distance in the remaining time, his speed should be ___ Km/Hr. ?
(a) 6 (b) 5
(c) 4 (d) 3
3. A and B can complete a work in 15 days. B and C can complete the same work in 20 days. If A, B and C together can finish it in 10 days, then A and C can complete the same work in ___ days.
(a) 12 (b) 16
(c) 10 (d) 8
4. If $2^x = (1024)^{1/5}$, what is the value of x ?
(a) 2 (b) 1
(c) 3 (d) 4
5. Two trains each 500 metres long, are running in opposite directions on parallel tracks. If their speeds are 50 km/hr and 40 km/hr respectively, the time taken by the slower train to pass the driver of the faster one is — seconds.
(a) 30 (b) 20
(c) 10 (d) 5
6. The speed of a boat in still water is 12 km/hr and the rate of current is 3 km/hr. The distance travelled downstream in 30 minutes is
(a) 10km (b) 8km
(c) 7.5km (d) 5km
7. Which one of the following is in built data structure of C language?
(a) Stack (b) Queue
(c) Linked List (d) Array
8. Which of the following operators in C language has right to left associativity:
(a) Binary Arithmetic
(b) Binary relational
(c) Unary Arithmetic
(d) Bitwise AND
9. The following in C language is valid
Variable = expression 1 ? expression 2: expression 3
It represents a (an)
(a) Unary Operator
(b) Binary Operator
(c) Ternary Operator
(d) Quaternary Operator
10. Which one of the following is incorrect in C language?
(a) #define LOWER=30
(b) #include<stdio.h>
(c) #include"xyz.h"
(d) #include<string.h>
11. If $a_1, b_1 > 0$ and if for all $n \geq 1$,
 $a_{n+1} = (a_n + b_n)/2$, $2/b_{n+1} = 1/a_n + 1/b_n$,
then
 $\langle a_n \rangle$ and $\langle b_n \rangle$ are
(a) Monotone sequence but not convergent
(b) Monotone sequences and convergent and converge to same limit
(c) Monotone sequences and convergent and converge to different limit
(d) (d) Monotone sequences and unbounded
12. If $\lim_{n \rightarrow \infty} a_n = 1$, then $\lim_{n \rightarrow \infty} S_n$ where
 $\langle S_n = \frac{a_1 + a_2 + \dots + a_n}{n} \rangle$ is
(a) 0 (b) 1
(c) $\frac{1}{n}$ (d) $n!$
13. The upper bound of the series $\sum_{n=0}^{\infty} (-1)^n x^{2n} / \{(1+x)(1+2x)(1+3x) \dots (1+nx)\}$, $x > 0$ is

- (a) $\log x$ (b) e^x
 (c) $\cos x$ (d) $\sin x$

14. The series $\sum_0^\infty \frac{1}{n(\log n)(\log \log n)^c}$ converges if
 (a) $0 < c < 1$ (b) $c > 1$
 (c) $-1 < c < 0$ (d) $c = 1$
15. If $\lim_{n \rightarrow \infty} \left(\frac{u_n}{v_n}\right) = l$, where $\langle u_n \rangle$ and $\langle v_n \rangle$ are strictly positive sequences and $l \neq 0$, then
 (a) $\sum u_n$ and $\sum v_n$ converges together
 (b) $\sum u_n$ diverges and $\sum v_n$ converges
 (c) $\sum u_n$ converges and $\sum v_n$ diverges
 (d) Neither $\sum u_n$ converges nor $\sum v_n$ diverges
16. Let $S_3 = \{1, (1,2)(1,3), (2,3), (1,2,3), (1,3,2)\}$ be a group and $H_1 = \{1, (1,2)\}$, $H_2 = \{1, (1,2,3), (1,3,2)\}$ be two subgroups. Then
 (a) S_3, H_1, H_2 are cyclic groups.
 (b) S_3 is cyclic and H_1, H_2 are not cyclic
 (c) S_3 is not cyclic, H_1, H_2 are cyclic subgroups of S_3
 (d) S_3, H_1, H_2 are non-cyclic .
17. Which of the following function is not periodic?
 (a) $y = \sin^2 x$ (b) $y = 1 + \tan x$
 (c) $y = x - [x]$ (d) $y = \sin x^2$
18. The centre of quotient group Q_8 is
 (a) $\{i, -1\}$ (b) $\{1, -1\}$
 (c) $\{1, -i\}$ (d) $(Z_4, +)$
19. Which one of the following is true?
 (a) Every bounded sequence is convergent.
 (b) Every Cauchy Sequence is bounded
 (c) Every bounded sequence is convergent but not Cauchy Sequence
 (d) Every convergent sequence is bounded as well as Cauchy Sequence
20. Given that $z \in C$, set of complex numbers, and integer $n > 0$, the roots of the equation $(z + 1)^{2n} + (z - 1)^{2n}$ are
 (a) integers
 (b) Rational numbers
 (c) Irrational Numbers
 (d) Is Purely imaginary numbers

21. The mapping $w = z^2$ maps
 (a) Every half plane to a half plane
 (b) Any circle onto a circle centred at zero
 (c) Square to a square
 (d) Circles centred at zero onto circles
22. For $z \in C$, the function e^z is
 (a) Periodic (b) Increasing
 (c) Odd (d) Even
23. A Ring with nonzero characteristic is
 (a) Z (b) Z_5
 (c) Q (d) R
24. If U and V are finite-dimensional vector space then U and V are isomorphic if and only if
 (a) $\text{Dim } V < \text{Dim } U$
 (b) $\text{Dim } V > \text{Dim } U$
 (c) $\text{Dim } V + \text{Dim } U = \text{Dim } V \cdot \text{Dim } U$
 (d) $\text{Dim } V = \text{Dim } U$
25. If f is a continuous function on $[a, b]$, then for at least one point x in $[a, b]$ such that $kf(x) = \int_a^b f(x)dx$, then value of k is
 (a) a (b) b
 (c) $b - a$ (d) $b + a$
26. Given the following :
 A. If $f(x)$ is a continuous function on the closed, bounded interval $[a, b]$, then f is integrable on $[a, b]$.
 B. If $f(x)$ is a uniformly continuous function on the closed, bounded interval $[a, b]$, then f is integrable on $[a, b]$.
 C. If $f(x)$ is continuous on the closed, bounded interval $[a, b]$ then f is uniformly continuous on $[a, b]$.
 Choose the **correct** answer from the options given below
 (a) A and B only
 (b) B and C only
 (c) A and C only
 (d) A, B and C only

27. Which one of the following is not Riemann-integrable on interval $[a, b]$?

- (a) Continuous function
- (b) Monotone function
- (c) Piecewise continuous
- (d) Dirichlet function

28. If g is Riemann-integrable on $[a, b]$ and $f(x) = g(x)$ except for finite number of points in $[a, b]$, then

- (a) f is Riemann-integrable and $\int_a^b f(x)dx = \int_a^b g(x)dx$
- (b) f is Riemann-integrable and $\int_a^b f(x)dx < \int_a^b g(x)dx$
- (c) f is Riemann-integrable and $\int_a^b f(x)dx > \int_a^b g(x)dx$
- (d) f is not Riemann-integrable

29. Which one of the following is not Cauchy Sequence?

- (a) $\langle (-1)^n/n \rangle$
- (b) $\langle 1/(n!) \rangle$
- (c) $\langle n + ((-1)^n/n) \rangle$
- (d) $\langle 1/n \rangle$

30. The volume generated by revolving the area enclosed by the loop of the curve $y^4 = x(4 - x)$ about x -axis is

- (a) π^2
- (b) $2\pi^2$
- (c) $3\pi^2$
- (d) $4\pi^2$

31. The oblique asymptote(s) of the curve $y = x^3/(x^2 - 1)$

- (a) $y = x$
- (b) $y = 2x$
- (c) $y = -x$
- (d) $y = -2x$

32. The condition for the line $x \cos \alpha + y \sin \alpha = p$ to touch the curve $\left(\frac{x}{a}\right)^3 + \left(\frac{y}{b}\right)^3 = 1$ is $(a \cos \alpha)^t + (b \sin \alpha)^t = p^t$ where t is equal to

- (a) $3/2$
- (b) $1/2$
- (c) 2
- (d) 3

33. The conic section

$$9x^2 + 24xy + 16y^2 - 2x + 14y + 1 = 0$$

is a ...

- (a) Circle
- (b) Ellipse
- (c) Hyperbola
- (d) Parabola

34. The reflection of point $(3, 2)$ in the line $y = x$ is

- (a) $(2, 3)$
- (b) $(2, 5)$
- (c) $(5, 3)$
- (d) $(5, 5)$

35. The diagonalization of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ gives the diagonal matrix:

- (a) Diagonal $(-1, -5)$
- (b) diagonal $(1, -5)$
- (c) Diagonal $(1, 5)$
- (d) Diagonal $(-1, 5)$

36. Non trivial solutions of the system of linear equations

$$\begin{aligned} x_1 + 2x_2 + 3x_3 &= 0 \\ 2x_1 + x_2 + 3x_3 &= 0 \\ 3x_1 + 2x_2 + x_3 &= 0 \end{aligned}$$

is

- (a) $x_1 = x_2 = x_3 = k$
- (b) $x_1 = -x_2 = x_3 = k$
- (c) $x_1 = x_2 = -x_3 = k$
- (d) $x_1 = -x_2 = -x_3 = k$

37. The inverse of a matrix

$$\begin{bmatrix} 1 & 3 & 3 \\ 1 & 3 & 4 \\ 1 & 4 & 3 \end{bmatrix} \text{ is } \begin{bmatrix} u & x & x \\ y & 0 & v \\ y & v & 0 \end{bmatrix} \text{ where the value of}$$

- (a) $(-3, -1)$
- (b) $(3, 1)$
- (c) $(1, 3)$
- (d) $(-1, -3)$

38. If $w = \log t$ where

$$t^2 = (x-1)^2 + (y-1)^2 + (z-1)^2$$

then $\frac{\partial}{\partial x} \left(\frac{\partial w}{\partial x} \right) + \frac{\partial}{\partial y} \left(\frac{\partial w}{\partial y} \right) + \frac{\partial}{\partial z} \left(\frac{\partial w}{\partial z} \right)$ is equal to

- (a) 1
- (b) $1/t$
- (c) $1/t^2$
- (d) 0

39. If $F(u) = f(x, y, z)$ be a homogeneous function of degree n then $x \left(\frac{\partial u}{\partial x} \right) + y \left(\frac{\partial u}{\partial y} \right) + z \left(\frac{\partial u}{\partial z} \right) = t$ where t is

- (a) $n[F(u)/F'(u)]$
- (b) $n[F'(u)/F(u)]$
- (c) $\left(\frac{1}{n}\right) [F(u)/F'(u)]$
- (d) $[F(u)/F'(u)]$

40. If $\cos \alpha + \cos \beta + \cos \gamma = \sin \alpha + \sin \beta + \sin \gamma = 0$
then $\cos 2\alpha + \cos 2\beta + \cos 2\gamma =$
(a) 0 (b) 1
(c) -1 (d) None of these

Passage - 1

Read the given passage and answer the question that follow Coronaviruses are a large family of viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome and Severe Acute Respiratory Syndrome. A novel coronavirus is a new strain that has not been previously identified in humans. Coronaviruses are zoonotic, meaning they are transmitted between animals and people. Detailed investigations found that SARS was transmitted from civet cats to humans and MERS from dromedary camels to humans. Several known coronaviruses are circulating in animals that have not yet infected humans. Common signs of infection include respiratory symptoms, fever, cough, shortness of breath and breathing difficulties. In more severe cases, the infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death. To prevent infection spread include regular hand washing, covering mouth and nose when coughing and sneezing, thoroughly cooking meat and eggs. Avoid close contact with anyone showing symptoms of respiratory illness such as coughing and sneezing.

41. The full form of SARS is
(a) Severe Acute Respiratory Syndrome
(b) Soft Acute Respiratory Syndrome
(c) Soft Accurate Respiratory Syndrome
(d) Severe Acute Respiratory System
42. MERS is spread from----- to humans.
(a) cat (b) Dog
(c) Camel (d) Monkey
43. According to the studies carried out so far, which of the following diseases is not directly caused by coronaviruses
(a) Cold (b) Cough

- (c) Pneumonia (d) Typhoid

44. To prevent infection spread include regular
(a) Bathing
(b) Hand washing
(c) Drinking warm water
(d) Coughing
45. Which of the following is correct statement?
(a) Several known coronaviruses are circulating in animals that have not yet infected humans
(b) Several unknown coronaviruses are circulating in animals that have not yet infected humans
(c) All coronaviruses that are circulating in animals have been found.
(d) Birds are also infected by coronavirus

Passage - 2

Read the given passage and answer the question that follows :

Many rivers in India are poisoned by tannery wastes. It is stated by a group that in the region around the Palar River, 35,000 hectares of farmland have been affected by tannery waste. Waste has reduced the yield of the once-fertile land by half. In the local population, there has been a significant increase in the incidence of health problems which result from drinking water polluted by tannery effluent. These conditions include gastrointestinal diseases and tuberculosis. The tannery workers themselves suffer from skin diseases, fever, eye inflammation, lung cancer and sterility.

Environmental activists and villagers in Kanpur, home of the largest tanneries in India, recently banded together and blocked a tannery drain that releases toxic effluent into the Ganges.

The action was prompted by the fact that effluent from leather tanneries, despite being polluted with chromium and other chemicals used in the tanning process, was being promoted as "treated" and safe for irrigating farmland. Environmentalists fear that the toxins from the tannery effluent are being passed through the food chain and

report that some villagers are already showing signs of poisoning

46. Which of the following is correct statement:
- (a) Tannery waste in the region around Palar river has reduced the yield of the once-fertile land by half.
 - (b) Tannery waste in the region around Palar river has not reduced the yield of land
 - (c) Tannery waste in the region around Palar river has increased the yield of the land by fifty percent
 - (d) Tannery waste in the region around Palar river has not reduced the yield of the land by half
47. -----has caused health problems in the local farmers.
- (a) Drinking polluted water
 - (b) Breathing polluted air.
 - (c) Eating adulterated food
 - (d) Drinking milk
48. The affluent from tannery industry is polluted with
- (a) Chromium
 - (b) Sulphur
 - (c) Potassium
 - (d) Chlorine
49. Villagers blocked a tannery drain that releases toxic effluent into the-----
- (a) Ganges
 - (b) Palar
 - (c) Land around Ganges
 - (d) Land around Palar
50. Environmentalists fear that the toxins from the tannery effluent are being passed to-----
- (a) Food Chain
 - (b) Eating shops
 - (c) Rural population
 - (d) Slum areas

Answer Key

1. B	2. C	3. A	4. A	5. B
6. C	7. D	8. C	9. C	10. A
11. B	12. B	13. B	14. B	15. A
16. A	17. D	18. B	19. D	20. D
21. D	22. A	23. D	24. D	25. C
26. D	27. D	28. B	29. D	30. B
31. A	32. A	33. D	34. A	35. D
36. D	37. A	38. C	39. A	40. A
41. A	42. C	43. D	44. B	45. A
46. A	47. A	48. A	49. A	50. A