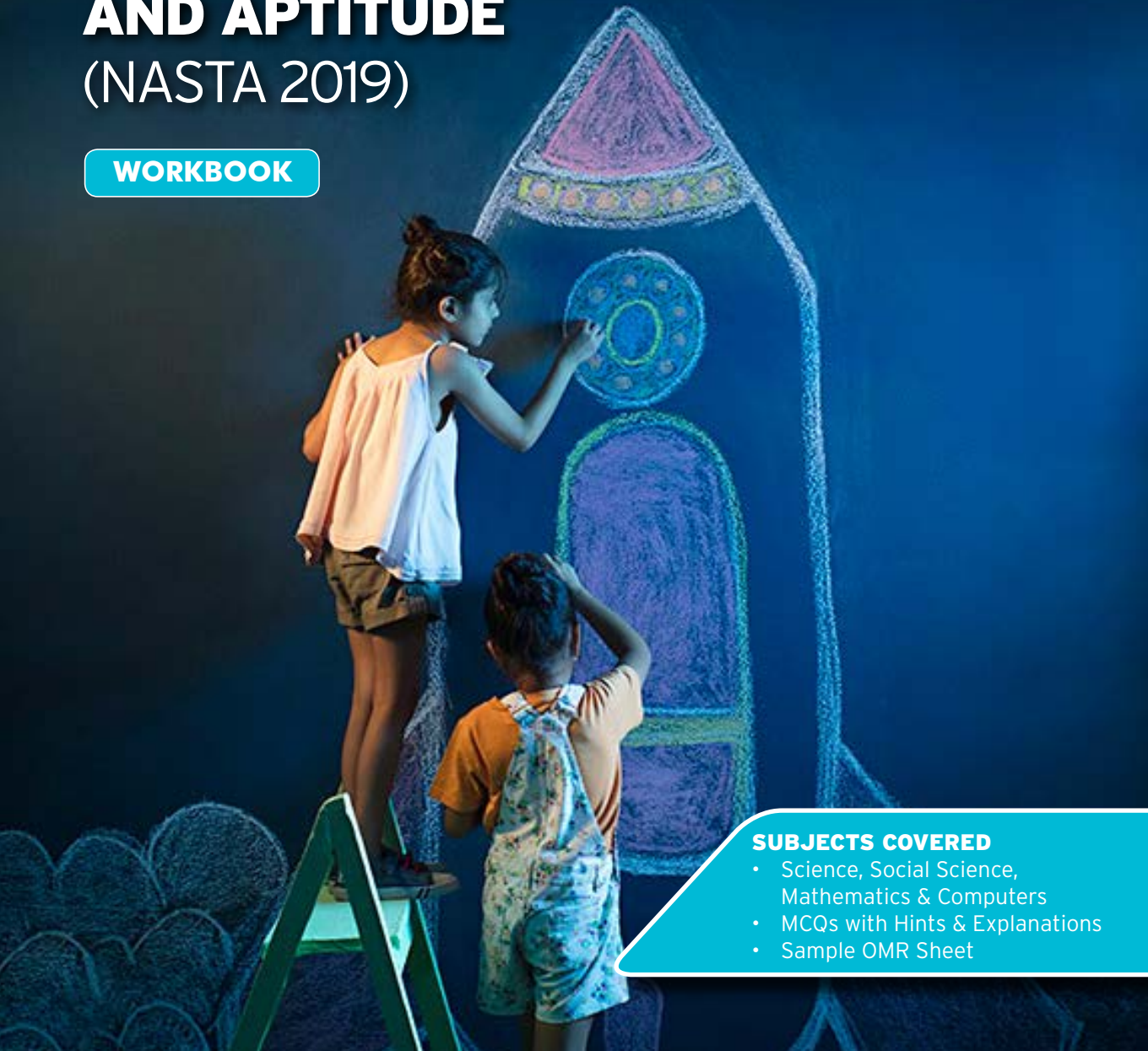


NATIONAL ASSESSMENT FOR SCIENTIFIC TEMPERAMENT AND APTITUDE (NASTA 2019)

WORKBOOK



SUBJECTS COVERED

- Science, Social Science, Mathematics & Computers
- MCQs with Hints & Explanations
- Sample OMR Sheet

UNLOCK THE HIDDEN SCIENTIST IN YOUR CHILD WITH KAMP

WHY SCIENTIFIC TEMPERAMENT IS IMPORTANT FOR YOUR CHILD?

Scientific temperament refers to an individual's attitude of logical and rational thinking. An individual is considered to have scientific temper if s/he employs a scientific method of decision-making in everyday life. The term was first coined by India's first Prime Minister, Jawaharlal Nehru, in his book 'The Discovery of India'.

"A Statement on Scientific Temper" prepared by a group of scholars and issued on behalf of the Nehru Centre, Bombay, in July 1981, mentions that "Scientific Temper involves the acceptance, amongst others, on the following premises:

1. The method of science provides a viable method of acquiring knowledge;
2. The human problems can be understood and solved in terms of knowledge gained through the application of the method of science;
3. The fullest use of the method of science in everyday life and in every aspect of human endeavour from ethics to politics and economics is essential for ensuring human survival and progress; and
4. That one should accept knowledge gained through the application of the method of science as the closest approximation of truth at that time and question what is incompatible with such knowledge; and that one should from time to time re-examine the basic foundations of contemporary knowledge."

NATIONAL ASSESSMENT FOR SCIENTIFIC TEMPERAMENT AND APTITUDE (NASTA)

National Assessment for Scientific Temperament and Aptitude (NASTA) is designed and developed for the elementary to middle school students. It is an Attribute Based assessment as against only Subject Based Assessment.

NASTA ASSESSMENT PARAMETERS

PARAMETERS	CONTEXT
Observation and Precision	Students need to be able to develop the most basic skill in science done by using our five senses in surrounding environment. After making observations it is important to group objects according to a purpose. Measuring is important in collecting, comparing, and interpreting data.
Imagination, Creativity and Innovation	Students need to be able to think and work creatively in both digital and non-digital environments to develop unique and useful solutions.
Critical Thinking and Problem Solving	Students need the ability to think critically, which includes proficiency with comparing, contrasting, evaluating, synthesizing, and applying without instruction or supervision. Students need the ability to solve complex problems in real time.
Prediction and Interpretation	Students should be able to predict and interpret situation, events, findings based on multiple observations. An inference is a link between what is observed and what is already known. Whereas, prediction is an educated guess based on good observations and inferences about an observed event or prior knowledge.
Communication and Collaboration	Students must possess the ability to collaborate seamlessly in both physical and virtual spaces, with real and virtual partners globally. Students must be able to communicate not just with text or speech, but in multiple multimedia formats. They must be able to communicate visually through video and imagery as effectively as they do with text and speech.
Social Skills and Empathy	This includes adaptability, fiscal responsibility, personal accountability, environmental awareness, empathy, tolerance, and global awareness.

IMPORTANCE OF ASSESSMENT PARAMETERS

PARAMETERS	DEFINITION AND IMPORTANCE
Observation and Precision	Scientific observation is the central element of scientific method or process. One of the core skills of a science enthusiast is to make observation. Precision and accuracy are two important factors during the course of scientific measurements. Precision is how consistent results are when measurements are repeated.
Imagination, Creativity and Innovation	Imagination is about seeing the impossible, or unreal. Creativity is using imagination to unleash the potential of existing ideas in order to create and valuable ones. Innovation is taking existing, reliable systems and ideas and improving them. These skills serve as an important backbone while solving problems.
Critical Thinking and Problem Solving	Critical thinking and problem solving refer to the ability to use knowledge, facts, and data to effectively solve problems. Scientific scenarios require one to assess the environment, analyze a situation, design a solution, and ultimately win in a competitive scenario. Both critical thinking and creative thinking serve as important pillars for design thinking.
Prediction and Interpretation	A prediction, or forecast, is a statement about a future event. A prediction is often, but not always, based upon experience or knowledge. Interpretation on the other hand is the act of explaining, reframing, or otherwise showing your own understanding of something. Scientific skillsets require honing of both predictability and interpretability skills to extrapolate findings or provide plausible reasons for an observation.
Communication and Collaboration	Collaboration and communication are interpersonal skills that help people work well with one another. These skills involve being able to read the vast number of verbal and nonverbal cues that we all use to communicate our ideas and emotions. In today's working environment, it is important that we proactively share ideas and knowledge to solve the complex and challenging problems that we encounter.
Social Skills and Empathy	Empathy and social skills allow us to function cohesively. We are continuously working towards examining and improving our world. While doing so, we end up judging or critically evaluating others. Empathy and social skills help us to be open-minded and develop a balance between self-confidence and understanding different perspectives.

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KNOWLEDGE & AWARENESS MAPPING PLATFORM

OMR ANSWER SHEET - NASTA 2019

Use HB PENCIL / BALL POINT PEN (BLUE / BLACK) to write and darken the circles.
 CORRECT METHOD / सही तरीका  WRONG METHODS / गलत तरीके 

SCHOOL
KULDEEP INTERNATIONAL

PARTICIPANT'S NAME
AMIT

CLASS **SCHOOL CODE** **Roll No.** **ENROLLMENT NO.**
5 **10672 - Paper-1** **19100001** **1910015947**



MARK YOUR ANSWERS WITH HB PENCIL / BALL POINT PEN (BLUE / BLACK)																			
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FILL UP THE CONTACT DETAILS BELOW

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SECTION

A

SCIENCE

- Copper chloride is a light brown solid , which slowly absorbs moisture to form**
[A] Orange dihydrate
[B] Red dihydrate
[C] Blue-green dihydrate
[D] Blue dihydrate
- Why is calcium sulphate hemihydrates called Plaster of Paris?**
[A] Because it is found only in Paris.
[B] Because of its colour which is quite similar to People of Paris
[C] Because of its large deposits in Paris
[D] Because its first usage began in Paris
- 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. What volume of same solution of NaOH, is required to neutralise solution of 20ml of the given**
[A] 10 mL [B] 8 mL
[C] 20 mL [D] 25 mL
- Reaction between X and Y forms compound Z . X loses electron and Y gains electron. Which of the following properties is not shown by Z?**
[A] Has high melting point
[B] Has low melting point
[C] Conducts electricity in molten State
[D] occurs as solid
- Chlorine reacts with saturated hydrocarbons at room temperature in the**
[A] absence of sunlight
[B] presence of sunlight
[C] presence of water
[D] presence of hydrochloric acid
- Ethanol reacts with sodium and form two products . These are**
[A] Sodium ethanoate and hydrogen
[B] Sodium ethanoate and oxygen
[C] Sodium ethoxide and hydrogen
[D] Sodium ethoxide and oxygen
- Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms e.g. hydrogen. After the formation of four bonds , carbon attains the electronic configuration of**
[A] Helium [C] Argon
[B] Neon [D] Krypton
- What should be the minimum number of carbon atoms required in an alkene to exhibit isomerism?**
[A] Three [B] Four
[C] Five [D] Six
- The second member of alkyne homologous series is**
[A] Ethyne [B] Ethane
[C] Propyne [D] Ethene
- The only reptile with four chambered heart is**
[A] Snake [B] Turtle
[C] Lizard [D] Crocodile
- What prevent the backflow of blood in heart?**
[A] Septa [B] Valves
[C] Arteries [D] Veins
- The opening and closing of stomatal pore depends on**
[A] oxygen
[B] temperature
[C] water in guard cells
[D] concentration of CO₂ in stomata
- Inertia of a body that direct dependence on its**
[A] velocity [B] mass
[C] surface area [D] volume

14. The wavelength of a sound wave whose frequency is 220 Hz and speed is 440 ms in a given medium is

[A] 10 m [B] 2 m
[C] 0.2 m [D] None of these

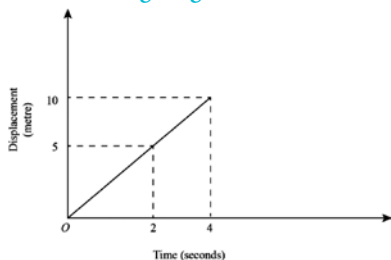
15. Weight of free fall object is

[A] mass of the object X gravitational acceleration
[B] Zero
[C] greater than rest object
[D] less than rest object

16. A student carries a bag weighing 5 kg from the ground floor to his class on the first floor that is 2 m high. The work done by the boy is

[A] 1 J [B] 10 J
[C] 100 J [D] 1000 J

17. Look at the figure given below:



It shows the displacement-time graph of an object of mass 2 kg. What will be the force required to move the object for the first 4 seconds?

[A] 4 N [B] Zero
[C] 12 N [D] 50 N

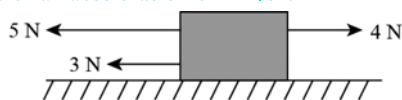
18. A ball of the mass m is moving in a horizontal direction at a velocity v . It collides with an identical ball moving at the same velocity but in the opposite direction and they get stick together. Which of the following will be the combined velocity of the balls after the collision?

[A] v [B] $v/3$
[C] 5 [D] 0

19. Which of the following statements exhibit Newton's third law of motion?

[A] Beating the carpet with a stick
[B] Car passengers are advised to wear seat belts
[C] The fielder moves his hands backwards while catching the ball in a cricket match
[D] The flight of jet aeroplanes

20. Teacher asks Riya to find the mass of the block of wood in the figure given below, if it is moving with an acceleration of 4 m/s^2 .



Which of the following should be the correct answer that Riya should get?

[A] 1 kg [B] 4 kg
[C] 5 kg [D] 2 kg

21. Jiya's teacher gives her two objects of different materials and asks her to put them in a tank of water and record her observation in a table. Jiya does the same and notes down her observations.

Object	Observation
M	Sinks in water
N	Floats in water

Which of the following represents the correct order of density of the given objects and water?

[A] Water > Object N > Object M
[B] Object N > Object M > water
[C] Object M > water > Object N
[D] None of these

22. Which of the following is the odd one out?

[A] Twinkling of stars
[B] Motion of planets around the sun
[C] Occurrence of tides in the oceans
[D] Motion of the moon around the earth

23. Riya's teacher gives her four cases given below:

Case 1: Buoyant force = 100 N; Weight of the Object = 90 N

Case 2: Buoyant force = 200 N; Weight of the Object = 170 N

Case 3: Buoyant force = 150 N; Weight of the Object = 900 N

Case 4: Buoyant force = 80 N; Weight of the Object = 100 N

She asks Riya in which of the above cases will the object sink. What do you think will Riya reply to her teacher?

[A] Case 1 [B] Case 4
[C] Case 2 [D] Case 3

24. The pH value of sodium chloride is

[A] 7.5 [B] 7.0
[C] 6.4 [D] 0



25. Covalent compounds are generally poor conductors of electricity because
- [A] They have too many ions
 - [B] They are inert
 - [C] They have no electrons
 - [D] They do not form ions
26. What is normal average blood pressure in humans (in mm of Hg)?
- [A] 130/60
 - [B] 120/80
 - [C] 140/70
 - [D] 140/ 90
27. Translocation utilizes energy (ATP) to transfer _____ into phloem tissue.
- [A] Potassium
 - [B] Lipid
 - [C] Fat
 - [D] Sugar
28. Four chambered heart is characteristics feature of:
- [A] Mammals
 - [B] Amphibians
 - [C] Fishes
 - [D] Reptiles
29. The acid produced in our stomach is
- [A] Hydrochloric acid
 - [B] Dilute nitric acid
 - [C] Nitric acid
 - [D] Sulphuric acid
30. The property of metals most important for making strings of musical instruments is
- [A] Hardness
 - [B] Malleability
 - [C] Ductility
 - [D] Sonorousness
31. The most abundant metal in earth's crust is
- [A] Sodium
 - [B] Aluminum
 - [C] Iron
 - [D] Calcium
32. The minimum number of carbon atoms a hydrocarbon should have to show isomerism is
- [A] six
 - [B] Three
 - [C] Five
 - [D] Four



SECTION

B

SOCIAL SCIENCE

- Which of the following habitats will have a rich biodiversity?**
[A] Rain forest [B] Lake
[C] River [D] Desert
- Which of the following statements is true about biodiversity?**
[A] Biodiversity includes only wildlife that are naturally interdependent.
[B] Biodiversity includes both wildlife and cultivated species that live independently in a habitat.
[C] Biodiversity includes a variety of both wildlife and cultivated species that live interdependently.
[D] Biodiversity includes a specific breed of both wildlife and cultivated species that live interdependently.
- Which of the following is a normal fauna specie?**
[A] Goat [B] Lion
[C] Elephant [D] Rhino
- Which of the following is the main reason for fast depleting flora and fauna?**
[A] Population growth and urbanization
[B] Climate Change
[C] Practice of hunting and gathering
[D] Poverty and hunger
- Suppose you are visiting your grandparents village. A construction company wants to clear a large tract of forest. What should be your first step to help?**
[A] By ignoring.
[B] By writing letter to the government.
[C] By publishing a newspaper article.
[D] By motivating the villagers to protect the trees and protest.
- How a small land holding affects the crop yield?**
[A] By reducing the crop yield since irrigation is not possible.
[C] By increasing the crop yield since additional labor is not required.
[B] By reducing the crop yield since mechanization is not possible. [D] By increasing the crop yield since chemical fertilizers are not required.
- During green revolution the agricultural produce of India increase manifold. But the means adopted to increase the agricultural produce proved unsustainable in the long-run. How the farmers incurred loses due to these practices?**
[A] The big farmers because of lower returns on investment on land and machinery.
[B] The middle farmers because of crop diversification.
[C] The small farmers because of shortage of water for irrigation.
[D] The landless labors because they lost on their work.
- Suppose you are visiting Punjab in the month of November Which of the following crops is most likely to be sown at this time?**
[A] Mustard [B] Maize
[C] Tea [D] Cotton
- Suppose you are a farmer in an hilly area. Which of the following types of farming you should practice to cause minimum environmental damage?**
[A] Plantation
[B] Shifting Agriculture
[C] Intensive farming
[D] Subsistence farming



10. **Indian farmers suffered a lot of suppression during British rule. How did Britishers exploit the farmers?**
- [A] By forcing the farmers to grow cash crops and imposing high revenue.
 [C] By forcing them to work on British fields for free.
 [B] By not paying for the farm goods.
 [D] By exporting all of their produce at a high price.
11. **In the period of globalization, all farmers do not benefit equally. Who were in disadvantageous position and why?**
- [A] The big farmers because of their surplus produce.
 [B] The middle farmers because they could not compete with the increased export demand
 [C] The small farmers because they could not compete with the subsidized prices of international produce.
 [D] The landless labors because they lost on their work.
12. **Which of the following north-eastern state has the least forest area? What do you think is the reason for low forest area?**
- [A] Assam, because it has the maximum urbanization among the northeastern states
 [B] Nagaland because it is located close to Myanmar.
 [C] Meghalaya, because it receives very high rainfall.
 [D] Tripura because it is a small state.
13. **Chandaka Wildlife Sanctuary is located along which of the following rivers?**
- [A] Brahmaputra [B] Krishna
 [C] Palar [D] Mahanadi
14. **Which of the following statements provide a valid argument for India being a populous country?**
- [A] Because India has high population growth rate.
 [B] Because of high literacy rate in population.
 [C] India has high dependent population.
 [D] More than 16% of the world's population lives in just about 2% land.
15. **As on 2011, State X has a population of 325000 persons. Ten years before, the population stood at 297200. What is the population growth of State X?**
- [A] 11.52% [B] 10.75%
 [C] 9.35% [D] 8.11%
16. **State X has an area of 6822 sq. km², out of which only 60% is arable. The total population of this state is 325000 persons. What is the population density of State X?**
- [A] 79 persons per sq. km²
 [B] 63 persons per sq. km²
 [C] 57 persons per sq. km²
 [D] 48 persons per sq. km²
17. **Deforestation affects all wild life. However, it is most harmful to**
- [A] Small insects and worms
 [B] Large animals
 [C] Aquatic animals
 [D] birds
18. **Agricultural practices in an area depends primarily on**
- [A] The local climate
 [B] Local administration
 [C] The local climate and soil
 [D] Transportation facilities
19. **Wild life implies**
- [A] Only large animals found in the wild
 [B] Animals and birds found in the wild but not insects
 [C] All life forms found in the wild
 [D] Animals and birds found in the wild but not fishes
20. **Wild animals differ from their domestic counterparts mainly in**
- [A] Their food sources [B] Their sizes
 [C] Their coloration [D] Their sounds
21. **The proportion of forest cover in India at present is**
- [A] Well above required level
 [B] Just above required level
 [C] below required level
 [D] Undetermined
22. **From economic point of view as a whole, forests are**
- [A] An important part of the economy
 [B] A deterrent to the economy
 [C] Not relevant to the economy
 [D] Not determined if relevant to the economy
23. **Aquatic animals are**
- [A] Not affected by climate change
 [B] affected by climate change
 [C] Affected by climate change only in some areas
 [D] Mostly not affected by climate change

SECTION

C

MATHEMATICS

- Euclid's division lemma states "Given positive integers a and b , there exist unique integers q and r satisfying " $a=bq+r$ ". Which of the following is true for r ?
 [A] $r < a$ [C] $0 \leq r < b$
 [B] $r > a$ [D] $r = a$
- When two numbers m and n are divided by 3 and 4 respectively, leave remainders x and y respectively. The maximum value of $x+2y$ is _____.
 [A] 5 [B] 7
 [C] 8 [D] 11
- Which of the following represent the product of HCF and LCM for the numbers 20 and 25?
 [A] 50 [B] 40
 [C] 500 [D] 400
- The LCM of smallest two-digit composite number and largest one-digit prime number is _____.
 [A] 84 [B] 77
 [C] 99 [D] 70
- If two positive integers p and q can be expressed as $p = ab^2c$ and $q = a^3bc^2$, a , b , and c being prime numbers, then HCF (p , q) is _____.
 [A] abc [B] $a^3b^2c^2$
 [C] a^3bc^2 [D] ab^2c^2
- Two drums contain 210 litres of milk and 150 litres of milk respectively. The maximum capacity of a container, in litres, which can measure the milk of either drum in exact number of times is
 [A] 90 [C] 50
 [B] 70 [D] 30
- The decimal expansion of the rational number $\frac{41}{2^3 \times 5}$ will terminate after
 [A] 2 decimal places [B] 1 decimal place
 [C] 3 decimal places [D] 4 decimal places
- If α and β are the zeros of the polynomial $x^2 - 5x + 6$, then $\alpha + \frac{1}{\alpha} + \beta \frac{1}{\beta} = ?$
 [A] $\frac{6}{35}$ [C] $\frac{35}{6}$
 [B] 2 [D] $\frac{1}{2}$
- If α and β are zeros of the polynomial $x^2 - 9x + 20$ and $\alpha - \beta = 1$, find $\alpha^2 - \beta^2$.
 [A] 7 [B] 6
 [C] 9 [D] 8
- If α and β are zeros of the polynomial $x^2 - 6x - 7$, find α^3 and β^3
 [A] 267 [B] 252
 [C] 342 [D] 287
- Find the square root of the product of the zeros of the polynomial $x^2 - 12x + 32$.
 [A] 6 [B] $4\sqrt{2}$
 [C] $2\sqrt{2}$ [D] 8
- Find arithmetic mean of the zeros of the polynomial $x^2 - 12x + 32$.
 [A] 6 [B] 8
 [C] 5 [D] 4
- If arithmetic and geometric mean of the zeroes a polynomial are 5 and 4 respectively, then the polynomial is:
 [A] $x^2 - 10x + 16$ [B] $x^2 - 8x + 8$
 [C] $x^2 - 12x + 12$ [D] $2x^2 - 3x + 8$
- If one zero of the equations $x^2 - 7x + 10$ and $x^2 - 5x + 6$ is common, then the difference of other two zeros will be
 [A] 4 [B] 2
 [C] 8 [D] 5
- A teacher says that a quadratic polynomial $ax^2 + bx + c$ touches the x -axis at a single point.



Based on the statement, which of the following options is true?

- [A] The polynomial will have no zeroes.
 [B] The polynomial will have two zeroes.
 [C] The polynomial will have 1 zero.
 [D] The polynomial will have three zeroes.

16. The graph of a polynomial of degree n intersects the x -axis at $(k + 1)$ points, where k is a whole number. The relation between n and k is ____.

- [A] $k \leq n - 1$ [B] $k \leq n + 1$
 [C] $k \geq n - 1$ [D] $k \geq n + 1$

17. The sum of the zeroes of $2x^2 + 7x + 5$ is ____.

- [A] $-\frac{5}{2}$ [B] $-\frac{7}{2}$
 [C] $\frac{7}{2}$ [D] $\frac{5}{2}$

18. If α and -3 are the zeroes of the quadratic polynomial $2x^2 + 3kx + 9$, then which of the following options represents the values of α and k ?

- [A] $\alpha = -\frac{3}{2}, k = 6$ [B] $\alpha = \frac{3}{2}, k = 3$
 [C] $\alpha = \frac{3}{2}, k = 6$ [D] $\alpha = -\frac{3}{2}, k = 3$

19. The curve of a quadratic polynomial intersects the x -axis at two points equidistant from the origin. What can be concluded about the sum and the product of the zeroes?

- [A] The sum of the zeroes is zero and the product of the zeroes is positive.
 [B] The sum of the zeroes is zero and the product of the zeroes is also zero.
 [C] The sum of the zeroes is zero and the product of the zeroes is negative.
 [D] The sum of the zeroes is negative, and the product of the zeroes is also positive.

20. The degree of the remainder obtained when a polynomial of degree n is divided by a polynomial of degree m is l . The greatest value that l can have is

- [A] $n + 1$ [B] $m + 1$
 [C] $m - 1$ [D] n

21. If α and β are the zeroes of the polynomial $x^2 - 5x + 4$. Which of the following represents a quadratic polynomial whose zeroes are α^2 and β^2 ?

- [A] $x^2 - 34x + 8$ [B] $x^2 - 8x + 4$
 [C] $x^2 - 17x + 16$ [D] $x^2 - 5x + 4$

22. A quadratic polynomial $x^2 - mx + n$ has zeroes α and β . Which of the following is the correct expression for $\alpha^2 + \beta^2$ in terms of m and n ?

- [A] $m^2 - 2n$ [B] $m + n$
 [C] $m - n$ [D] $m^2 - n$

23. When two numbers p and q are divided by 6 and 8 respectively, leave remainders m and n respectively. The maximum integer value of $(m + n)^2$ is ____.

- [A] 144 [B] 64
 [C] 121 [D] $m^2 - n$

24. The sum of the least and maximum value of the exponents in the prime factorization of 1176 is ____.

- [A] 1 [B] 2
 [C] 3 [D] 4

25. If $p = 2^3 \times 3$, $q = 2 \times 3 \times 5$, $r = 3^m \times 5$, LCM $(p, q, r) = 2^3 \times 3^2 \times 5$, $a = 2 \times 3^3$, $b = 2 \times 3^3 \times 5^3$, $c = 2^2 \times 3^4 \times 5^2$ and HCF $(a, b, c) = 2 \times 3^n$, then the value of $m + n$ is ____.

- [A] 2 [B] 3
 [C] 4 [D] 5

26. The product of HCF and LCM of smallest three-digit composite number and largest two-digit prime number is ____.

- [A] 9700 [B] 1
 [C] 970 [D] 97

27. If $m = \frac{27}{2 \times 5^2}$ and $n = \frac{13}{2^3 \times 5^2}$, the value of $m - n$ is ____.

- [A] 0.325 [B] 0.475
 [C] 0.185 [D] 0.345

28. A teacher asked the students to find a number between 1 and 50, which when divided by 3, 4 and 7 leaves remainder 2, 1, and 1 respectively. Responses of four students is given below.

Amit: The number is 23.
 Hemant: The number is 29.
 Yogesh: The number is 17.
 Arun: The number is 38.

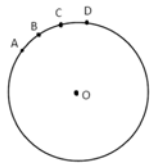
Who is correct?

- [A] Amit [B] Hemant
 [C] Yogesh [D] Arun

29. The number in the form of $\frac{m}{n}$, where q is a natural number, will always

- [A] an even number [B] an odd number
 [C] divisible by 3 [D] even or odd

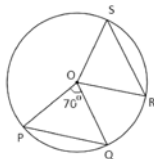
30. Observe the circle shown below.



Which of the following is a major arc?

- [A] ABC [B] BCD
[C] ACD [D] BAD

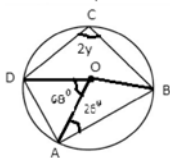
31. Look at the circle below.



The two chords PQ and RS are equal in length and $\angle POQ = 70^\circ$. What is the measure of $\angle ORS$?

- [A] 20° [B] 70°
[C] 55° [D] 110°

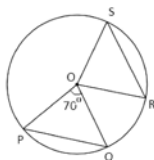
32. Observe the quadrilateral in the circle shown



If $\angle AOD = 68^\circ$, $\angle OAB = 26^\circ$, $\angle BCD = 2y$, what is the measure of y ?

- [A] 56° [B] 112°
[C] 98° [D] 49°

33. A circle is shown below.



If $PQ = RQ$ and $\angle PQR = 160^\circ$, what is the measure of ?

- [A] 80° [C] 30°
[B] 40° [D] 20°

34. The dimensions of a wooden box are 10 cm, 9 cm and 4 cm. How many such boxes can be packed in a metallic box of dimensions 60 cm, 32 cm and 27 cm?

- [A] 168 [C] 144
[B] 98 [D] 100

35. A pipe fills a tank of dimension 8 m, 3 m and 4 m at the rate of 160 litres per minute. How much time, in hours, will the pipe take to completely fill the tank?

- [A] 6 hours [B] 10 hours
[C] 160 hours [D] 600 hours

36. When air is filled into a hemispherical balloon, its radius increases from 5 cm to 15 cm. What is the ratio of the surface areas of the balloon in the two cases?

- [A] 1:2 [B] 1:3
[C] 1:4 [D] 1:9

37. Function f is described by the equation $f(x) = -x^2 + 7$. The value of $f(x)$ at $x = 1$ is

- [A] 8 [B] 6
[C] 7 [D] 9

38. If x is a finite real number, then the which of the following statements is true

- A There is always a real number $> x$
B There may not always be a real number $> x$
C Only for some real number x , there is always a real number $> x$
D There is no real number $> x$

39. $\sqrt{-1}$ is a

- [A] Real number = 1
[B] Real number = -1
[C] Not a real number
[D] Real number = 0

40. The number of real number contained in the interval $[-1,1]$ is

- [A] infinite [B] Very few
[C] Large but finite [D] Small

41. The equation $x^2 - 4x + 4b = 0$ has two real solutions for

- [A] All $b < 1$ [B] All $b > 1$
[C] $b = 1$ [D] $b = -1$

42. Express the algebraic expression $(x + 3)(x - 3) - (-x - 9)$ As a polynomial in x

- [A] $x^2 - x$ [C] $x^2 + 2x$
[B] $x^2 + x$ [D] $x^2 - 2x$

43. If $(x^2 - y^2) = 10$ and $(x + y) = 2$, then

- [A] $x = \frac{7}{2}, y = \frac{3}{2}$ [B] $x = -\frac{7}{2}, y = -\frac{3}{2}$
[C] $x = \frac{7}{2}, y = -\frac{3}{2}$ [D] $x = -\frac{7}{2}, y = \frac{3}{2}$



SECTION

D

DIGITAL LITERACY/IT

- Which of these is correct tag to start and end Java Script?**
[A] `<java script></Java Script>`
[B] `<script> ... </script>`
[C] `<jscript>.....</jscript>`
[D] `<Java>....</Java>`
- What is src tag is used for?**
[A] secure [B] Source
[C] URL [D] Section
- What type of script is Java Script?**
[A] Client Side Script
[B] Server side Script
[C] Language
[D] Client and Server
- What will be the output of :**
`var a=65;`
`var b= 90;`
`var c=0;`
`c=a+b;`
`document.write("Sum = "+c);`
[A] Answer=155 [B] Sum is 115
[C] sum = 155 [D] Sum = 155
- What is the correct Syntax to call an external java script file "callme.js"?**
[A] `<script src="callme.js">`
[B] `<script href="callme.js">`
[C] `<script name="callme.js">`
[D] `<script ref="callme.js">`
- Java Script is**
[A] Platform dependent
[B] Windows based
[C] Platform independent
[D] Browser based
- Which is the correct syntax to display a message "Welcome"**
[A] `alertbox("Welcome")`
[B] `msgbox("Welcome")`
[C] `alert("Welcome")`
[D] `msg("Welcome")`
- What is bgcolor used for?**
[A] Set color of the text of the current page
[B] Return background color of the current page
[C] set/return color of the text of the current page
[D] set/return background color of the current page
- What is a Node ?**
[A] Connected to computer
[B] Connected to internet
[C] Connected to mobile
[D] Component connected to a network
- What will the following syntax do?**
`var links = document.links;`
`for(var i = 0; i <links.length; i++)`
{
`document.write("
" + document.links[i]);`
}
[A] Display the current document
[B] Display the text of the document
[C] Display all the hyperlinks in the current document
[D] Display error
- What is the correct syntax to find the default PI value**
[A] `document.Math.PI`
[B] `document.PI`
[C] `Math.PI`
[D] `document.Math(PI)`
- What is a Client in a network?**
[A] A user
[B] A server
[C] Node computer that connects with server
[D] Sender

13. In Javascript, the word this refers to?

- [A] Current page
- [B] Current time
- [C] Current Date
- [D] Current Object

14. In HTML, which of the following will set the webpage background to green?

- [A] <background>green</background>
- [B] <body bg="color:green">
- [C] <body bgcolor="green">
- [D] <body backgroundcolor:green>

15. Horizontal line is basically a graphical image which acts as dividers and separates pages into sections. Which one of the following HTML tag allows inserting horizontal line?

- [A] <h1>
- [B] <h2>
- [C] <hr>
- [D] <hr1>

16. Background of a HTML webpage can be modified to make it look better. Which one of the following types of file format is given in the following background attribute : <BODY BACKGROUND = "img.jpg">

- [A] Image in img format
- [B] Image in jpg format
- [C] Plane background without any file format
- [D] All of these

17. Faizal wants to change the background colour of a web page. Which one of the following Syntax he should use to change the background in black colour?

- [A] body {background-color: # 0000ff;}
- [B] body {background-color; # 00ff00;}
- [C] body {background-color; #ff0000;}
- [D] body {background-color; #000000;}

18. Poornima wish to set the shadow around a text on a webpage. Which of the following property she should use to set the text shadow around a text?

- [A] White space
- [B] text-shadow
- [C] text-decoration
- [D] text-transform

19. If Riya doesn't want to allow a floating div to the left side of an element, which CSS property will she use?

- [A] Clear
- [B] Margin
- [C] Padding
- [D] Float

20. Select the odd one out.

- [A] Satellite
- [B] Bluetooth
- [C] Cable Modem
- [D] DSL

21. Microsoft Edge is a

- [A] Computer
- [B] Browser
- [C] IP Address
- [D] Operating System

22. Identify using the following clues.

Clue 1- It is a network topology discovered by engineers at Ericsson.

Clue 2- It is used for exchanging data over short distances.

- [A] Bluetooth
- [B] Infrared
- [C] Fiber Optics
- [D] Ethernet

23. Search engine allows searching any information on the World Wide Web. Which one of the following is not a search engine?

- [A] Excite
- [B] Snap
- [C] Bing
- [D] None of these

24. Compact Disk is an optical disk that allows storing digital data. The capacity of a standard 120mm CD is up to?

- [A] 1000MB
- [B] 737 MB
- [C] 737 KB
- [D] 1000 KB

25. When we create, delete, modify files and folders, install new software, uninstall old software, the system's hard disk is likely to be?

- [A] Formatted
- [B] Fragmented
- [C] Defragmented
- [D] Swapped

26. Which of the following statement hold(s) true about the given device?



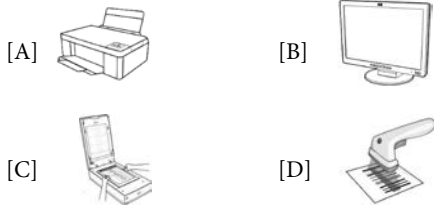
Statement 1: It is an electronic non-volatile computer storage device.

Statement 2: It is a variant of magnetic disk.

- [A] Both Statement 1 and Statement 2
- [C] Only Statement 2
- [B] Only Statement 1
- [D] Neither Statement 1 nor Statement 2



27. Terms DPI, PPM and spooling reassociated with which of the following I/O device?



28. Which of the following statement describes Streaming?

- [A] Breaking multimedia into packets before sending it to a web server such that the clients can view multimedia continuously.
- [B] Reducing the load time of a webpage by caching online content on the disk.
- [C] Playing audio files on the internet.
- [D] Buffering online data received using a codec before playing a multimedia element such that the multimedia can play uninterrupted.

29. Identify the software based on the descriptions given below.

Description1- It is a free software that contains advertisements, in order to generate revenue for its author.

Description2 - It includes games, toolbars and some utilities.

- [A] Adware
- [B] Shareware
- [C] Computer Virus
- [D] Open Source

30. In MS - PowerPoint for Mac, which of the following options will remove the background from an image (as shown)?



- [A]
- [B]
- [C]
- [D]



SECTION

E

LOGICAL REASONING

1. Arrange the words in alphabetical order and choose one that comes first

[A] Exhilarate [B] Ephemeral
[C] Entrench [D] Enthusiasm

2. Select a suitable figure from the Answer Figures that would replace the question mark (?).

Problem Figures:



(A) (B) (C) (D)

[A] 1

[C] 3

Answer Figures:



(1) (2) (3) (4) (5)

[B] 2

[D] 4 [E] 5

3. Select a suitable figure from the Answer Figures that would replace the question mark (?).

Problem Figures:



(A) (B) (C) (D)

[A] 1

[C] 3

Answer Figures:



(1) (2) (3) (4) (5)

[B] 2

[D] 4 [E] 5

4. Statements: P#Q, M•N\$P

Conclusions I: M@P

Conclusion II: N#Q

Where A@B implies A is greater than B

A•B means A is either greater than or equal to B

A\$B indicates A is equal to B

A*B suggests A is smaller than B

A#B implies A is either smaller or equal to B

Based on this information, which one is correct?

- [A] Only conclusion I is true
[B] Only conclusion II is true
[C] Either I or II is true
[D] Neither I nor II is true
[E] Both I and II are true

5. The numbers in the cell are following some pattern, either row-wise or column-wise. Identify that and insert the missing number.

5	6	7
3	4	5
345	460	?

- [A] 535 [B] 577
[C] 755 [D] 775

6. Match the columns

A	B
i. Teacher-Student communication	Lateral communication (LC)
ii. Teacher-Teacher communication	Downward Communication (DC)
iii. Student-Teacher communication	Upward Communication (UC)
iv. Student-Student communication	

- [A] i- LC, ii-DC, iii-UC, iv-UC
[B] i-UC, ii-LC, iii-LC, iv-DC
[C] i-DC, ii-LC, iii-UC, iv-LC
[D] i-DC, ii-DC, iii-UC, iv-LC





HINTS & EXPLANATION

SECTION-A SCIENCE

- 1 (C) Copper chloride is a light brown solid which slowly absorbs moisture to form blue-green dihydrate.
- 2 (C) Plaster of Paris gets its name from large gypsum deposits in Montmartre in Paris. So the origin of the name "Plaster of Paris" is the fact that the source material gypsum is found of large deposits in Montmartre in Paris.
- 3 D) 10 mL of NaOH require 8 mL of HCL for neutralisation . So 20 mL of NaOH require = $10 \times \frac{20}{8} = 25$ mL
- 4 (B) Since Z is formed from X and Y by complete transfer of electrons therefore Z should be ionic compound which must have high melting point and conductivity in molten state and occurs as solids.
- 5 (B) Chlorine shows photochemical substitution reactions with saturated hydrocarbons that occurs in the presence of sunlight.
- 6 (C) Ethanol (C_2H_5OH) reacts with sodium to form sodium ethoxide (C_2H_5ONa) along with liberation of hydrogen gas. $2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$
- 7 (B) Electronic configuration of carbon is 2, 4 hence it contains 4 valence electrons and after formation of 4 covalent bonds , it will get 4 electrons through them so total would be 10 electrons that is the atomic number of Neon gas.
- 8 (B) Minimum 4 carbon atoms are required for alkenes to show position isomerism(if there is no functional group other than the double bond)
- 9 (C) Alkyne is an organic compound with triple covalent bonds between 2 carbon atoms therefore first member of homologous series must have atleast 2 carbon atoms with one triple bond that is Propyne $CH_3-C \equiv CH$.
- 10 (D) The crocodile has the most complicated blood circulation of all vertebrates. They do have four chambers in their heart with two auricles and two ventricles which is very unusual in reptiles. This helps reduction in blood flow and saves oxygen.
- 11 (B) The pulmonary valve sits between the right ventricle and the pulmonary artery, Its role is to prevent backflow of blood into the right ventricle after it contracts. The aortic valve sits between the left ventricle and aorta and prevents backflow of blood
- 12 (C) Stomata are the tiny pores present on the leaf surface. Each stomatal pore is surrounded by two guard cells that assist in stomatal opening driven by turgidity of guard cells. When water flows in guard cells from epidermal cells , guard cells become turgid.
- 13 (B) Inertia of body has direct dependence on its mass. Higher the mass higher the inertia
- 14 (B) We know that $Velocity = Wavelength \times Frequency$
Given $Velocity = 440$ m /s $Frequency = 220$ Hz
So $Wavelength = 2$ m
- 15 (A) A freely falling object weight $F = mg$ where m = mass of the object and g = acceleration due to earth's gravity. An object in a lift which falls freely, weighs zero on the weighing machine , but its actual weight is still mg .
- 16 (C) $Mass = 5$ kg
 $Force = mg = 5 \times 10 = 50$ N
 $Work = Force \times displacement = 50 \times 2 = 100$ J
- 17 (B) "Since the displacement-time graph is a straight line, the object moves at a constant velocity. This means that the acceleration of the object is zero. Thus, no force is acting on the object."
- 18 (D) "The magnitude of the momentum of a ball of the mass moving at a velocity is
The two balls are moving in the opposite directions; so, one ball has a positive momentum and the other ball has a negative momentum. So, the total momentum before the collision is

By the law of the conservation of momentum, the total momentum of the two balls after the collision will also be zero. It means that they are stationary after the collision.

Thus, the combined velocity of balls after the collision is zero.”

- 19 (D) Jet aeroplanes work on the principle of action and reaction. In a modern jet aircraft, the hot gases produced by the rapid burning of fuel rush out of a jet at the rear end at a great speed. The equal and opposite reaction of the backward going gases pushes the aircraft forward at a great speed. All other examples can be explained using other Newton’s law of motion.
- 20 (A)
- 21 (C) “Object M sinks, it means that the object is denser than water. Object N floats on water, which implies that the density of object N is less than the density of water.
So, the correct order of density is
Object M > water > Object N
- 22 (A) The gravitational force of the earth is responsible for the motion of planets around the sun, the occurrence of tides in the oceans and the motion of the moon around the earth, whereas the twinkling of the stars is due to atmospheric refraction.
- 23 (B) “If the buoyant force exerted by the liquid is less than the weight of the object, the object will sink in the liquid.
Therefore, the object will sink in the ‘Case 3 liquid’ because the buoyant force is 80 N and the weight of the object is 100 N.”
24. (B)
25. (D) Ions are necessary for a substance to be a good electrical conductor
26. (B) The average normal blood pressure in humans (in mm of Hg)
27. (D) 28. (D) 29. (A)
30. (D) The quality of the sound of the instrument depends on Sonorousness
31. (B)
32. (D) Isomerism requires four carbon atoms in a hydrocarbon

SECTION-B SOCIAL SCIENCE

1. A Because rain forests support wider variety of flora and fauna.
2. C Because flora and fauna must coexist to survive.
3. A Because goats are widely seen than others.

4. A Because population growth and urbanization puts pressure on the natural resources. Poverty and hunger is an outcome of population growth and urbanization only.
5. D Because local support helps in putting pressure on the administration and in seeking additional support from public and media.
6. B Because small holding makes the use of advanced technology in farming impossible.
7. C Because green revolution demanded high irrigation that depleted the water resources.
8. A Because mustard is a rabi crop and grown in Punjab.
9. A Because plantations are established by creating terraces on slopes and are more profitable.
10. A Because Britishers needed indigo for their factories in Britain.
11. C Because small farmers have a very less profit margin and therefore suffered significantly.
12. A Because urbanization spreads at the expense of forest area.
13. D Because Chandaka Wildlife Sanctuary is located in Odisha and Mahanadi is in Odisha
14. D Because it reflects high population density and pressure on resources.
15. C $\text{Population growth} = [(325000 - 297200) / 297200] \times 100$
16. D $\text{Population density} = (\text{Total population} / \text{Area}) = 325000 / 6822$
17. (B) Large animals require large habitats; deforestation reduces their habitat
18. (C) Both local climate and soil properties determine what crops can be grown.
19. (C) Wild life includes all life forms found in the wild
20. (A) Wild animals differ from their domestic counterparts mainly in their food sources; unlike domestic animals, wild animals have to gather their own food,
21. (C) The forest cover in India in most parts is below stipulated level.
22. (A) Forests are an important part of the economy for their both direct and indirect contributions
23. (B) All aquatic animals are affected by climate change to varying degrees in one way or another, like due to warming

SECTION-C MATHEMATICS

1. C “Euclid’s division lemma states that:
Given positive integers a and b , there exist



unique integers q and r satisfying $a = bq + r$ where $0 \leq r < b$.

So, we get the remainder lies between 0 or more than 0 and less than b ."

- 2 C It is given that when a number "m" is divided by 3, it leaves x as remainder. By applying Euclid's division lemma, we get, $0 < x < 3$. So, the maximum value of x is 2.

Also, It is given that when a number "n" is divided by 4, it leaves y as remainder. By applying Euclid's division lemma, we get, $0 < y < 4$. So, the maximum value of y is 3.

Now,

$$\begin{aligned} x + 2y &= 2 + 2(3) \\ &= 2 + 6 \\ &= 8 \end{aligned}$$

So, the maximum value of $x + 2y$ is 8.

- 3 C We know that, $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$
Here, the given numbers are 20 and 25.
So, the product of HCF and LCM of the numbers 20 and 25.
Now, $20 \times 25 = 500$

- 4 D Smallest two-digit composite number is 10
Largest one-digit prime number is 7
Now, LCM of 7 and 10 is 70.

- 5 A We have, $p = ab^2c$ and $q = a^3bc^2$
We know that the HCF is highest common factor.

Now, we have abc common in the integers p and q .

So, HCF (p, q) is abc .

- 6 D Clearly, the maximum capacity of the container is the HCF of 210 and 150 in litres. So, let us find the HCF of 210 and 150.

We have, the prime factors of 210 as:

$$210 = 2 \times 3 \times 5 \times 7$$

We have, the prime factors of 150 as:

$$150 = 2 \times 3 \times 5 \times 5$$

Now, the common factor in 210 and 150 is $2 \times 3 \times 5$

Therefore, 30 is the HCF of 210 and 150.

So, the maximum capacity of the container is 30 litres:

- 7 C We have the rational number as $\frac{41}{2^3 \times 5}$.

Now, to find the decimal expansion of $\frac{41}{2^3 \times 5}$ divide numerator and denominator by 5^2

$$\begin{aligned} &= \frac{41 \times 5^2}{2^3 \times 5 \times 5^2} \\ &= \frac{41 \times 25}{10^3} \end{aligned}$$

$$\begin{aligned} &= \frac{1025}{1000} \\ &= 1.025 \end{aligned}$$

Hence, the decimal expansion of the rational number $\frac{41}{2^3 \times 5}$ will terminate after 3 decimal places.

- 8 C α and β are the zeros of the polynomial $x^2 + 5x + 6$.
So,
 $\alpha + \beta = 5$ (Sum of the zeroes)
 $\alpha\beta = 6$ (Product of the zeroes)
We have,

$$\begin{aligned} \frac{1}{\alpha} + \alpha + \beta + \frac{1}{\beta} &= \frac{\beta + \alpha^2\beta + \alpha\beta^2 + \alpha}{\alpha\beta} \\ &= \frac{\alpha\beta(\alpha + \beta) + (\alpha + \beta)}{\alpha\beta} \\ &= \frac{(\alpha\beta + 1)(\alpha + \beta)}{\alpha\beta} \\ &= \frac{7 \times 5}{6} \\ &= \frac{35}{6} \end{aligned}$$

- 9 C We have α and β are zeros of the polynomial $x^2 - 9x + 20$.

So, $\alpha + \beta = 9$ and it is given that $\alpha - \beta = 1$.

We need to find the value of $\alpha^2 + \beta^2$.

$$\begin{aligned} \alpha^2 - \beta^2 &= (\alpha + \beta)(\alpha - \beta) \\ &= 9 \times 1 \\ &= 9 \end{aligned}$$

- 10 C We have α and β are zeros of the polynomial $x^2 - 6x - 7$.

So, $\alpha + \beta = 6$ and $\alpha\beta = -7$

$$\begin{aligned} \alpha^3 + \beta^3 &= (\alpha + \beta)(\alpha^2 + \beta^2 - \alpha\beta) \\ &= (\alpha + \beta)((\alpha + \beta)^2 - 3\alpha\beta) \\ &= 6(36 + 21) \\ &= 6 \times 57 \\ &= 342 \end{aligned}$$

- 11 B We have the polynomial $x^2 - 12x + 32$

The product of the zeroes of a polynomial $ax^2 + bx + c$ is $\frac{c}{a}$.

So, product of zeroes is $\frac{32}{1} = 32$.

Square root of the product of zeroes is $\sqrt{32}$ or $4\sqrt{2}$.

- 12 A Let the two zeroes of the polynomial be α and $d\beta$.

$$\alpha + \beta = -\frac{b}{a} = 12$$

$$\text{Arithmetic mean } \frac{\alpha + \beta}{2} = \frac{12}{2} = 6$$

- 13 A Let the two zeroes of the polynomial be α and β .
 Arithmetic mean $\frac{\alpha + \beta}{2} = 5$
 $\alpha + \beta = 10$
 Geometric mean $\sqrt{\alpha\beta} = 4$
 $\alpha\beta = 16$
 A polynomial can be written as:
 $x^2 - (\alpha + \beta)x + \alpha\beta$
 $x^2 - 10x + 16$
- 14 B Let the two zeroes of the polynomial $x^2 - 7x + 10$ be α and β .
 $\alpha + \beta = -\frac{b}{a} = 7$
 Let the two zeroes of the polynomial $x^2 - 5x + 6$ be α and γ .
 $\alpha + \gamma = -\frac{b}{a} = 5$
 $(\alpha + \beta) - (\alpha + \gamma) = \beta - \gamma = 7 - 5 = 2$
- 15 C We know that if the graph of a quadratic polynomial meets the x-axis at a single point, then the polynomial has one zero.
- 16 A The graph of a polynomial of degree n intersects the x axis at most n points. So, the maximum value of $(k + 1)$ is n .
 So, we have
 $(k + 1) \leq n$
 $\Rightarrow k \leq n - 1$
- 17 B The sum of zeroes of a quadratic polynomial is given by,
 Sum of zeroes = $\frac{(\text{Coefficient of } x)}{(\text{Coefficient of } x^2)}$
 The coefficient of x is 7 and the coefficient of x^2 is 2.
 So,
 Sum of zeroes = $-\frac{7}{2}$
 Therefore, the sum of zeroes is $-\frac{7}{2}$.
- 18 D Since α and -3 are the zeroes of the quadratic polynomial $2x^2 + 3kx + 9$,
 We know that for a quadratic polynomial $ax^2 + bx + c$, the product of zeroes is $\frac{c}{a}$, and sum of zeroes is $-\frac{b}{a}$. So, we have
 Product of zeroes = $\frac{9}{2}$
 $\alpha \times -3 = \frac{9}{2}$
 $\alpha = \frac{9}{2 \times -3}$
 $\alpha = \frac{-3}{2}$
 Sum of zeroes = $-\frac{b}{a}$
 $\Rightarrow \alpha - 3 = -\frac{3k}{2}$

$$\Rightarrow -\frac{3}{2} - 3 = -\frac{3k}{2} \left[\because \alpha = -\frac{3}{2} \right]$$

$$\Rightarrow -\frac{9}{2} = -\frac{3k}{2}$$

$$\Rightarrow k = 3$$

So, $\alpha = -\frac{3}{2}$ and $k = 3$

- 19 C Let α and $-\alpha$ be the two points on the x-axis equidistant from the origin that the graph of the polynomial intersects.
 Then, α and $-\alpha$ are the zeroes of the polynomial.
 We have,
 $\alpha + (-\alpha) = 0$
 And,
 $\alpha \times (-\alpha) = -\alpha^2 < 0$
- 20 C We know that the degree of the remainder obtained is less than the degree of the divisor. Since a polynomial of degree n is divided by a polynomial of degree m and the degree of the remainder is l , the greatest value that l can have is $m - 1$.
- 21 C For zeroes of the polynomial $x^2 - 5x + 4$, we have
 $x^2 - 5x + 4 = 0$
 $x^2 - 4x - x + 4 = 0$
 $x(x - 4) - 1(x - 4) = 0$
 $(x - 1)(x - 4) = 0$
 So, $x = 1$ and $x = 4$
 Therefore, $\alpha = 1$ and $\beta = 4$
 Now, $\alpha^2 = 1$ and $\beta^2 = 16$
 We know that a polynomial whose zeroes are α and β is given by $x^2 - (\alpha + \beta)x + \alpha\beta$. So, a polynomial whose zeroes are α^2 and β^2 is given by $x^2 - (\alpha^2 + \beta^2)x + \alpha^2\beta^2$.
 Hence, we have
 $x^2 - (1 + 16)x + (1)(16) \left[\because \alpha^2 = 1, \beta^2 = 16 \right]$
 $= x^2 - 17x + 16$
- 22 A We have, $x^2 - mx + n$ has zeroes α and β . So,
 Sum of zeroes $(\alpha + \beta) = -\frac{-m}{1} = m$
 Product of zeroes $(\alpha\beta) = \frac{n}{1} = n$
 Now, we can write $\alpha^2 + \beta^2$ as
 $(\alpha + \beta)^2 - 2\alpha\beta$
 $= (m)^2 - 2n$
 $= m^2 - 2n$
- 23 A It is given that when a number "p" is divided by 6, it leaves m as remainder. By applying Euclid's division lemma, we get, $0 \leq m < 6$. So, the maximum value of m is 5.



Also, it is given that when a number “ q ” is divided by 8, it leaves n as remainder. By applying Euclid’s division lemma, we get, $0 \leq n < 8$. So, the maximum value of n is 7.

$$\begin{aligned} \text{Now,} \\ (m+n)^2 &= (5+7)^2 \\ &= 12^2 \\ &= 144 \end{aligned}$$

- 24 D The prime factorisation of 1176 is $2 \times 2 \times 2 \times 3 \times 7 \times 7$
So, prime factorisation of 1176 = $2^3 \times 3^1 \times 7^2$
Now, the least exponent is 1 and the maximum exponent is 3.

Hence, the sum of the least and maximum value of the exponents in the prime factorisation of 1176 is $1 + 3 = 4$.

- 25 D We have, $p = 2^3 \times 3$, $q = 2 \times 3 \times 5$, $r = 3^m \times 5$,
LCM (p, q, r) = $2^3 \times 3^2 \times 5$
LCM of p, q and r is also $p = 2^3 \times 3^m \times 5$.
Comparing with the given LCM (p, q, r)
= $2 \times 3^2 \times 5$, we have $m = 2$.
Also, $a = 2 \times 3^3$, $b = 2 \times 3^3 \times 5^3$, and HCF (a, b, c)
= 2×3^m , HCF of a, b and c is also $p = 2 \times 3^3$
Comparing with the given HCF (a, b, c) = 2×3^n ,
we have $n = 3$.

$$\text{Now, } m + n = 2 + 3 = 5.$$

- 26 A “Smallest three-digit composite number 100, and largest two-digit prime number is 97.
Now, HCF of 100 and 97 is 1.
LCM of 100 and 97 is 9700.
So, product of HCF and LCM is 9700.”

- 27 B We have $m = \frac{27}{2 \times 5^2}$
Now, two find the decimal expansion of $\frac{27}{2 \times 5^2}$
divide numerator and denominator by 2

$$\begin{aligned} &= \frac{27 \times 2}{2^2 \times 5^2} \\ &= \frac{54}{10^2} \\ &= \frac{54}{100} \\ &= 0.54 \end{aligned}$$

$$\text{So, } m = 0.54$$

$$\text{We have } n = \frac{13}{2^3 \times 5^2}$$

Now, two find the decimal expansion of $\frac{13}{2^3 \times 5^2}$
divide numerator and denominator by 5.

$$\begin{aligned} &= \frac{13 \times 5}{2^3 \times 5^3} \\ &= \frac{65}{10^3} \\ &= \frac{65}{1000} \\ &= 0.065 \end{aligned}$$

$$\text{So, } m - n = 0.54 - 0.065 = 0.475$$

- 28 B A number which leaves a remainder 2, when divided by 3 is of the form $3p + 2$, where p is an integer. So, the number can be 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47.

A number which leaves a remainder 1, when divided by 4 is of the form $4q + 1$, where q is an integer. So, the number can be 5, 9, 13, 17, 21, 25, 29, 33, 37, 41, 45, 49.

A number which leaves a remainder 1, when divided by 7 is of the form $7r + 1$, where r is an integer.

So, the number can be 8, 15, 22, 29, 36, 43.

The common number in all the three scenarios is 29.

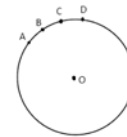
So, the number is 29.

- 29 B A number of the form $8q + 5$, where q is a natural number.

So, the number can be 13, 21, 29, 37, 45, 53, 61, 69, 77.

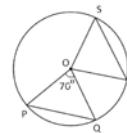
Clearly, we can see that all the numbers are odd. Hence, a number of the form $8q + 5$ will always an odd number.

- 30 D A circle is shown below.



Of all the choices, only BAD is a major arc

- 31 C A circle is shown below.



$\angle POQ = \angle ROS = 70^\circ$ [Equal chords of a circle subtend equal angles at the centre.]

As, $OR = OS$ [Radii of the Circle]

Therefore, $\angle ORS = \angle OSR$ [Angles opposite to the equal sides are equal]

Now,

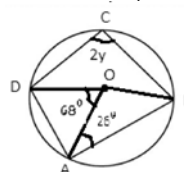
$$\angle ORS + \angle OSR + 70^\circ = 180^\circ$$

$$2\angle ORS + 70^\circ = 180^\circ$$

$$2\angle OSR = 110^\circ$$

$$\angle OSR = 55^\circ$$

- 32 D We have,



As, $OA = OD$ [Radii of the Circle]

Therefore, $\angle OAD = \angle ODA$ [Angles opposite to the equal sides are equal]

$$\begin{aligned}\angle AOD + \angle OAD + \angle ODA &= 180^\circ \\ 70^\circ + 2\angle ODA &= 180^\circ \\ 2\angle ODA &= 180^\circ - 68^\circ \\ \angle ODA &= 56^\circ\end{aligned}$$

So,

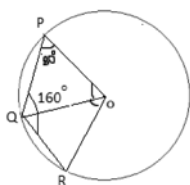
$$\begin{aligned}\angle BAD &= \angle BAO + \angle OAD \\ \angle BAD &= 26^\circ + 56^\circ \\ \angle BAD &= 82^\circ\end{aligned}$$

Now, the sum of either part of opposite angles of a cyclic quadrilateral is 180° .

So,

$$\begin{aligned}\angle BAD + \angle BCD &= 180^\circ \\ 82^\circ + 2y &= 180^\circ \\ 2y &= 180^\circ - 82^\circ \\ y &= 49^\circ\end{aligned}$$

- 33 D A circle is shown below.



In triangle POQ and ROQ,

$\angle POQ = \angle ROQ$ [Equal chords subtend equal angles at the centre]

$OQ = OQ$ [Radius of the circle]

$OP = OR$ [Radius of the circle]

Therefore, $\triangle POQ \cong \triangle ROQ$ [SAS Rule]

So, $\angle OQP = \angle OQR$ [CPCT]

$\angle PQR = \angle OQP + \angle OQR$

$\angle OQP = \angle OQR = 80^\circ$

Also, $\angle OQP = \angle OPQ$ [$OQ = OP$]

Now, In triangle POQ

$$\begin{aligned}\angle OQP + \angle OPQ + \angle POQ &= 180^\circ \\ 80^\circ + 80^\circ + \angle POQ &= 180^\circ \\ \angle POQ &= 180^\circ - 160^\circ \\ \angle POQ &= 20^\circ\end{aligned}$$

- 34 C The volume of the wooden box
 $= 10 \text{ cm} \times 9 \text{ cm} \times 4 \text{ cm}$
 $= 360 \text{ cm}^3$
 The volume of the metallic box
 $= 60 \text{ cm} \times 32 \text{ cm} \times 27 \text{ cm}$
 $= 51840 \text{ cm}^3$

Hence,

The number of boxes that can be fit in the metallic box $= 51840 \div 360 = 144$

- 35 B The volume of the tank is $8\text{m} \times 3\text{m} \times 4\text{m} = 96\text{m}^3$
 We know that $1\text{m}^3 = 1000$ litres .

So, the volume of the tank is 96000 litres.

The pipe fills the tank at the rate of 160 litres per minute.

Hence, the pipe will fill the tank in $96000 \div 160 = 600$ minutes or 10 hours.

- 36 D The surface area of the balloon before filling the air is $2\pi r^2$.

The surface area of the balloon before filling the air is $2\pi R^2$.

The ratio of the surface areas of the two balloons is $\frac{2\pi r^2}{2\pi R^2} = \frac{2\pi \times 5^2}{2\pi \times 15^2} = \frac{1}{9} = 1:9$

37. (B)
 38. (A) By induction, there is always a real number $> x$
 39. (C) $\sqrt{-1}$ is an imaginary number denoted by i
 40. (A) There are infinite number of real numbers in the interval $[-1,1]$
 41. (A) Apply formula for solution of quadratic equation
 42. (B) $x^2 - 9 + x + 9 = x^2 + x$
 43. (C) Substitute $y = 2-x$ from the second equation in the first equation

SECTION-D DIGITAL LITERACY

1. B Java Script starts and ends with `<script>` tag `</>` is always to close a tag
2. C The src attribute specifies the URL of an external script file.
3. D Java Script can be used for both client and server side
4. D Java Script display whatever is within the quote, as it is. Sum = will be printed as it is and since c is added to it, which has sum of a and b.
5. A src is used to call any external file
6. C "Java Script is a Platform independent language, it can work on any operating system
7. C alert tag is used to display any alert message in a box.
8. D bgcolor sets and returns the background color of the current page
9. D Node is a component connected to a network, example mobile phone
10. C The code will check all the hyperlink in the current document and display all the links.

11. (C) Math function is called to display the default PI value
12. (C) It is a node computer that establishes connection with the server, collects data from the user, sends it to the server, receives information
13. (D) this keyword is used for the current object, it is like a pointer to the current object
14. (C) The code c is correct
15. (C) <hr> tag is used to insert horizontal line
16. (B) Image in jpg format
17. (D) Code of black colour is correct in option D
18. (B) Text-shadow is a property used to set the text shadow.
19. (A) Clear is the correct option
20. (B) Bluetooth is not a network
21. (B) It is a browser
22. (A) Bluetooth is a radio communication technology that enables low-power distance wireless network phones, computers and devices. Two Bluetooth devices connect to each other by a process pressing a button or setting a menu option on the unit, a Bluetooth device will initiate a new connection.
23. (B) Excite and Infoseek both are search engine. So B is the correct option.
A standard 120 mm, 700 MB CD-ROM can actually hold about 737 MB (703 MiB)
24. (B) A standard 120 mm, 700 MB CD-ROM can actually hold about 737 MB (703 MiB)
25. (B) When we delete files from hard disk, gaps are created to be filled in by the new data. But, sometimes the new files don't get fit in these gaps, in such case some parts of the file is saved in these gaps and rest in other areas, this makes a hard disk fragmented.
26. (B) This is a flash drive and a non-volatile secondary storage device.
27. (A) In printing Dots Per Inch and Pages Per Minute are used to measure resolution of image printed and speed of a printer respectively. Spooling

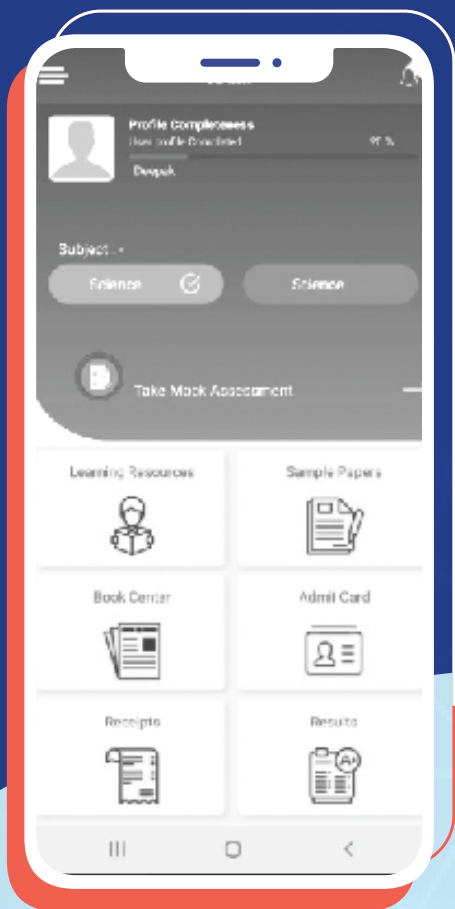
refers to putting printing jobs in a buffer, a special area in memory or on a disk where a device can access them when it is ready.

28. (D) Streaming is buffering of online data to play multimedia element.
29. (A) It is known as adware
30. (D) Remove background option is used for removing some portion of drawing which you do not want to appear in the picture.

SECTION-E LOGICAL REASONING

1. (D) Enthusiasm, Entrench, Ephemeral, Exhilarate
2. (B) Each one of the upper element is replaced by an element similar to the lower element(s), and each one of the lower elements is replaced by an element similar to the upper element(s).
3. (B) The upper element rotates through 180o, and its head gets inverted. The lower element gets vertically inverted.
4. (B) "Given statements: $P \leq Q, M \geq N = P$
Therefore, $M \geq N = P \rightarrow M \geq P \rightarrow M \bullet P$
Conclusion I, $M > P$ is not true
 $N = P \leq Q \rightarrow N \leq Q \rightarrow N \# Q$
Conclusion II is true.
5. (B) "In the first column: $3 \times 100 + 5 \times 9 = 345$
In the second column: $4 \times 100 + 6 \times 10 = 460$
Therefore, in the third column:
 $5 \times 100 + 7 \times 11 = 577$
6. (C) Teacher-Student communication is communication flowing from a higher level to a lower level. Teacher -Teacher communication is conversation flowing among people who are at the same level. Student-Teacher communication is flowing of information from lower level to higher level. Student-Student communication is communication flowing among people who are at the same level.





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Email id: info@kamp.res.in

Website: kamp.nistads.res.in

Phone: 9818928128

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Kamp Operations & Coordination Office:

A-100, Sector-65, Noida, Gautam Budhha Nagar, U.P 201301

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