Based on Central Board of Secondary Education (CBSE) and NCTE

CTET/TET

Central & All States

Teacher Eligibility Test

MATH & SCIENCE

Solved Papers

Class (VI-VIII) Paper-II

Chief Editor
A.K. Mahajan
Computer Graphics By
Balkrishna Tripathi, Bhupendra Mishra
Editorial Office
12, Church Lane Prayagraj-211002
9415650134
Email : yctap12@gmail.com
website : www.yctbooks.com/www.yctfastbook.com/ www.yctbooksprime.com

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CONTENT

MATH & SCIENCE

Math & Science : Syllabus

I. Child Development and Pedagogy

(a) Child Development (Elementary School Child) - 15 Questions

- Concept of development and its relationship with learning
- Principles of the development of children
- Influence of Heredity & Environment
- Socialization processes: Social world & children (Teacher, Parents, Peers)
- Piaget, Kohlberg, and Vygotsky: constructs and critical perspectives
- Concepts of child-centered and progressive education
- Critical perspective of the construct of Intelligence
- Multi-Dimensional Intelligence
- Language & Thought
- Gender as a social construct; gender roles, gender-bias and educational practice
- Individual differences among learners, understanding differences based on diversity of language, caste, gender, community, religion, etc.
- The distinction between Assessment for learning and assessment of learning;
- School-Based Assessment, Continuous & Comprehensive Evaluation: perspective and practice
- Formulating appropriate questions for assessing readiness levels of learners; for enhancing learning and critical thinking in the classroom and for assessing learner achievement.

(b) Concept of Inclusive education and understanding children with special needs -5 Questions

- Addressing learners from diverse backgrounds including disadvantaged and deprived
- Addressing the needs of children with learning difficulties, 'impairment'
- Addressing the Talented, Creative, Specially abled Learners

(c) Learning and Pedagogy - 10 Questions

- How children think and learn; how and why children 'fail' to achieve success in school performance.
- Basic processes of teaching and learning; children's strategies of learning; learning as a social activity; social context of learning.
- Child as a problem solver and a 'scientific investigator'
- Alternative conceptions of learning in children, understanding children's 'errors' as significant steps in the learning process.
- Cognition & Emotions
- Motivation and learning
- Factors contributing to learning – personal & environmental

II. Language I Syllabus

(a) Language Comprehension - 15 Questions

- Reading unseen passages – two passages one prose or drama and one poem with questions on comprehension, inference, grammar and verbal ability (Prose passage may be literary, scientific, narrative or discursive)

(b) Pedagogy of Language Development - 15 Questions

- Learning and acquisition
- Principles of language Teaching
- Role of listening and speaking; function of language and how children use it as a tool
- A critical perspective on the role of grammar in learning a language for communicating ideas verbally and in written form;
- Challenges of teaching language in a diverse classroom; language difficulties, errors and disorders
- Language Skills
- Evaluating language comprehension and proficiency: speaking, listening, reading and writing
- Teaching-learning materials: Textbook, multimedia materials, multilingual resource of the classroom
- Remedial Teaching

III. Language – II Syllabus

(a) Comprehension - 15 Questions

- Two unseen prose passages (discursive or literary or narrative or scientific) with a question on comprehension, grammar, and verbal ability

(b) Pedagogy of Language Development - 15 Questions

- Learning and acquisition
- Principles of language Teaching
- Role of listening and speaking; function of language and how children use it as a tool
- A critical perspective on the role of grammar in learning a language for communicating ideas verbally and in written form;
- Challenges of teaching language in a diverse classroom; language difficulties, errors and disorders
- Language Skills
  - Evaluating language comprehension and proficiency: speaking, listening, reading and writing
  - Teaching-learning materials: Textbook, multimedia materials, multilingual resource of the classroom
  - Remedial Teaching

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- Nature of Mathematics/Logical thinking
- Place of Mathematics in Curriculum
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- Problem of Teaching

(ii) Science - 30 Questions

(a) **Content 20 Questions**

- Food
- Sources of food
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(b) Pedagogical issues - 10 Questions

- Nature & Structure of Sciences
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- Approaches/Integrated Approach
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- Innovation
- Text Material/Aids
- Evaluation - cognitive/psychomotor/affective
- Problems
- Remedial Teaching

Central Teacher Eligibility Test (CTET) 2021
Junior Level (Class VI-VIII)
Solved Paper with Explanation

(Exam Date : 21.01.2022)

1. The sum of squares of distinct common prime factors of 120, 210 and 330 is

(a) 34 (b) 38
(c) 39 (d) 46

Ans. (b) : The Prime factors of given numbers are-
$120 = 2 \times 2 \times 2 \times 3 \times 5$
$210 = 3 \times 7 \times 2 \times 5$
$330 = 2 \times 3 \times 5 \times 11$
Common factors are $= 2 \times 3 \times 5$
Sum of squares of common factors $= 2^2 + 3^2 + 5^2 = 38$

2. If the 9-digit number 985x3678y is divisible by 72, then what is the value of (3x + 2y) ?

(a) 16 (b) 18
(c) 20 (d) 24

Ans. (c) : Since the given number is divisible by 72. It must be divisible by 4, 8 and 9.
Since it is divisible by 4 therefore last two- digit must be divisible by 4. So possible value of y are 0, 4, & 8 since it is divisible by 8 therefore last three digit must be divisible by 8.

$985x3678y = 9 + 8 + 5 + x + 3 + 6 + 7 + 8 + y$
$= 46 + x + y$
$= 46 + x + 4$
$= 50 + x$

For x = 4 the value is
$= 50 + 4$
54 which is divisible by 9
x = 4
y = 4
(3x + 2y) …… (i)
Putting the value of x and y in equation (i)
$(3 \times 4 + 2 \times 4) = 20$

3. The value of

$$\frac{1\frac{3}{5} - \frac{2}{3} \div \frac{12}{13} + \frac{7}{5} \times \frac{1}{3}}{11\frac{1}{5} \div 9\frac{1}{3} \times 20\frac{1}{6}}$$ **is**

(a) $\frac{1}{18}$ (b) $\frac{1}{16}$
(c) $\frac{1}{80}$ (d) $\frac{1}{90}$

Ans. (a) :

$$\frac{1\frac{3}{5} - \frac{2}{3} \div \frac{12}{13} + \frac{7}{5} \times \frac{1}{3}}{11\frac{1}{5} \div 9\frac{1}{3} \times 20\frac{1}{6}}$$

$$= \frac{\frac{8}{5} - \frac{2}{3} \div \frac{12}{13} + \frac{7}{5} \times \frac{1}{3}}{\frac{56}{5} \div \frac{28}{3} \times \frac{121}{6}}$$

$$= \frac{\frac{8}{5} - \frac{2}{3} \times \frac{13}{12} + \frac{7}{15}}{\frac{56}{5} \times \frac{3}{28} \times \frac{121}{6}}$$

$$= \frac{\frac{8}{5} - \frac{13}{18} + \frac{7}{15}}{\frac{121}{5}}$$

$$= \frac{\frac{288 - 130 + 84}{180}}{\frac{121}{5}}$$

$$= \frac{242}{180} \times \frac{5}{121}$$

$$= \frac{1}{18}$$

4. If $3.4 + 2.025 + 9.36 - 3 \times (4.1003) = 3 - p$, then what is the value of p ?

(a) 0.4741 (b) 0.4841
(c) 0.5159 (d) 05249

Ans. (c) : $3.4 + 2.025 + 9.36 - 3 \times (4.1003) = 3 - p$
$3.4 + 2.025 + 9.36 - 12.3009 = 3 - p$
$14.785 - 12.3009 = 3 - p$
$2.4841 = 3 - p$
$p = 3 - 2.4841$
$p = 0.5159$

5. What is the sum of the cubes of the integers lying between – 5 and 6?

(a) 120 (b) 125
(c) 210 (d) 216

Ans. (b) : The numbers lying between – 5 and 6 are
– 4, –3, –2, –1, 0, 1, 2, 3, 4, 5
Now cubes of each of these numbers are –
$-4^3 = -64$
$-3^3 = -27$
$-2^3 = -8$
$-1^3 = -1$
$-0^3 = -0$
$1^3 = 1$
$2^3 = 8$
$3^3 = 27$

$4^3 = 64$
$5^3 = 125$
Now adding all cubes–
$(-64) + (-27) + (-8) + (-1) + 0 + 1 + 8 + 27 + 64 + 125$
$= 125$

6. If $0.000001275 = k \times 10^{-7}$, then the value of $\frac{k}{5}$ is

(a) 1.55 (b) 2.55
(c) 12.75 (d) 15.5

Ans. (b) : $0.000001275 = k \times 10^{-7}$

$$k = \frac{0.000001275}{10^{-7}}$$

$$k = 0.000001275 \times 10^7$$

$$k = 12.75$$

Then,

$$\frac{k}{5} = \frac{12.75}{5}$$

$$= 2.55$$

7. If x is added to each of the numbers 5, 11, 3 and 8, the number, so obtained in this order, are in proportion. What is the value of $\sqrt{(x+2)(4x-3)}$?

(a) 12 (b) 15
(c) 20 (d) 30

Ans. (b) : According to the question,

$$\frac{x+5}{x+11} = \frac{x+3}{x+8}$$

$$(x+8)(x+5) = (x+3)(x+11)$$

$$x^2 + 5x + 8x + 40 = x^2 + 11x + 3x + 33$$

$$13x + 40 = 14x + 33$$

$$x = 7$$

Then $\sqrt{(x+2)(4x-3)} = \sqrt{(7+2)(4\times 7-3)}$

$$= \sqrt{9 \times 25} = 3 \times 5 = 15$$

8. An article is marked 25% above its cost price. If a discount of 25% is given on the marked price, then there is a

(a) a loss of $5\frac{3}{4}\%$ (b) a loss of $6\frac{1}{4}\%$
(c) a gain of $6\frac{3}{4}\%$ (d) no gain no loss

Ans. (b) : Let C.P. be ₹100
Then MP = ₹125
Discount = 25%

$$SP = \frac{125 \times 75}{100}$$

SP = ₹93.75

$$\text{Loss\%} = \frac{CP - SP}{CP} \times 100$$

$$= \frac{100 - 93.75}{100} \times 100$$

$$= 6.25\% \text{ or } 6\frac{1}{4}\%$$

9. If $\frac{3x+10}{2} - 4x = 1 - \frac{5x-4}{6}$, then the value of (7x – 8) is

(a) –1 (b) 6
(c) –15 (d) 13

Ans. (b) : Given,

$$\frac{3x+10}{2} - 4x = 1 - \frac{5x-4}{6}$$

$$\frac{3x+10-8x}{2} = \frac{6-5x+4}{6}$$

$$10 - 5x = \frac{10-5x}{3}$$

$$30 - 15x = 10 - 5x$$

$$10x = 20$$

$$x = 2$$

So, $(7x - 8) = 7(2) - 8 = 6$

10. Let $P = 10x^2 - 8y^2 + 5xy$
$Q = 12xy + 10y^2 + 3x^2$
And $R = 8y^2 - 3x^2 + 4xy$
Then, (P–Q) + R =

(a) $4x^2 + 10y^2 - 3xy$ (b) $4x^2 - 10y^2 - 3xy$
(c) $4x^2 - 10y^2 + 7xy$ (d) $4x^2 - 26y^2 - 11xy$

Ans. (b) : (P – Q) + R
$= (10x^2 - 8y^2 + 5xy - 12xy - 10y^2 - 3x^2)$
$+ 8y^2 - 3x^2 + 4xy$
$= (7x^2 - 18y^2 - 7xy) + 8y^2 - 3x^2 + 4xy$
$= 4x^2 - 10y^2 - 3xy$

11. If $x = -2, y = 3, \text{and } z = -3$, then what is the value of $y^2x^3 + 2y^3 - 3x^2y^2 + 4xyz$?

(a) –36 (b) –54
(c) 36 (d) 54

Ans. (b) : Given,
$x = -2$
$y = 3$
$z = -3$
Then $y^2x^3 + 2y^3 - 3x^2y^2 + 4xyz$
$= 3^2(-2)^3 + 2(3)^3 - 3(-2)^2 3^2 + 4(-2) \times 3(-3)$
$= 9 \times (-8) + 2 \times 27 - 3 \times 4 \times 9 + 72$
$= -72 + 54 - 108 + 72$
$= -54$

12. One of the factors of $(a + b + c)^2 - (a + c - d)^2$ is

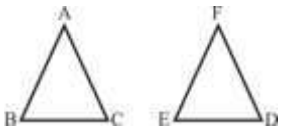
(a) b + c (b) 2a + b + c – d
(c) b + d (d) 2a – b + 2c – d

Ans. (c) : $(a + b + c)^2 - (a + c - d)^2$
Formula–
$(a^2 - b^2) = (a + b)(a - b)$
$\Rightarrow (a + b + c - a - c + d)(a + b + c + a + c - d)$
$= (b + d)(2a + 2c + b - d)$
One of the factor of given equation = b + d

13. If $\Delta ABC \cong \Delta FED$, then

(a) AB = DE (b) BC = FE
(c) $\angle B = \angle E$ (d) $\angle C = \angle F$

Ans. (c) :



If $\Delta ABC \cong \Delta FED$ then,

$\angle A = \angle F$ $\quad$ $AB = FE$

$\angle B = \angle E$ $\quad$ $BC = ED$

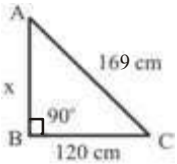
$\angle C = \angle D$ $\quad$ $AC = FD$

14. In ΔABC, $\angle B = 90°$, AC = 169cm, and BC = 120 cm. The length of AB (in cm) is

(a) 109 (b) 121

(c) 119 (d) 123

Ans. (c) :



By the Pythagoras theorem–

$AC^2 = AB^2 + BC^2$

$(169)^2 = x^2 + (120)^2$

$x^2 = (169)^2 - (120)^2$

$x^2 = (169+120)(169-120)$

$x^2 = 289 \times 49$

$x = 17 \times 7$

$x = 119$ cm.

15. Which of the following is not true?

(a) A right triangle can have at most one line of symmetry

(b) A parallelogram has no line of symmetry

(c) A circle has only one line of symmetry

(d) A rhombus is symmetrical about its diagonals

Ans. (c) : The option (c) is not true among the given options.

A circle has its diameter as the line of symmetry and a circle can have an infinite number of diameters. Hence a circle has infinite lines of symmetry, whereas the statements of all other options are true.

16. In $\Delta ABC, \angle A = (2x-5)°, \angle B = (5x+5)°$ and $\angle C = (3x+50)°$. Side BC is produced to D and CE is the bisector of $\angle ACD$. The measure of $\angle ECD$ is

(a) 45° (b) $45\frac{1}{2}°$

(c) 44° (d) $44\frac{1}{2}°$

Ans. (b) : Given,

$\angle A = (2x-5)°, \angle B = (5x+5)°$

and $\angle C = (3x+50)°$

Sum of angles of triangle is 180^o

Hence $\angle A + \angle B + \angle C = 180°$

$2x - 5 + 5x + 5 + 3x + 50 = 180^o$

$10x = 180 - 50$

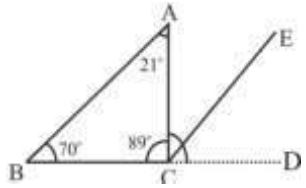
$10x = 130^o$

Now,

$\angle A = 2(13) - 5 = 21°$

$\angle B = 5(13) + 5 = 70°$

$\angle C = 3(13) + 50 = 89°$



In triangle sum of two apposite interior angle is equal to exterior angle

$\angle ACD = \angle A + \angle B$

$\angle ACD = 21 + 70 = 91°$

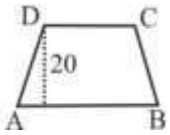
Therefore, $\angle ECD = 91/2$ or $45\frac{1}{2}°$.

17. ABCD is a trapezium in which AB || DC. The ratio of AB to DC is 2:1, and the distance between AB and DC is 20cm. If the area of the trapezium is 720cm^2, then the length of AB is

(a) 36 cm (b) 42 cm

(c) 48 cm (d) 54 cm

Ans. (c) :



Given ratio $\frac{AB}{DC} = \frac{2}{1} = \frac{2x}{x}$

Area of trapezium

$= \frac{1}{2} \times \text{Sum of parallel side} \times (\text{Distance between parallel sides})$

$720 = \frac{1}{2} \times \text{Sum of parallel sides} \times 20$

Sum of parallel side i.e. AB + DC = 72

$2x + x = 72$

$3x = 72$

$x = 24$

AB = $2x = 2 \times 24 = 48$ cm.

18. The volume of a right circular cylinder is 7392 cm^3 and its height is 12 cm. The area (in cm^2) of its base is (take $\pi = \frac{22}{7}$)

(a) 528 (b) 572

(c) 616 (d) 660

Ans. (c) : Given,

Volume of a right circular cylinder = 7392cm^3,

height = 12cm,

$\pi = \frac{22}{7}$

The volume of cylinder = $\pi r^2 h$

or

= area of base × height

7392 = area of base × 12

$\Rightarrow$ Area of base = 616 cm^2

19. Water is pouring into a cuboidal reservoir at the rate of 1200 liters per minute. The length, breadth and height of the reservoir are 24 m, 18 m and 10 m respectively. The number of hours, it will take to fill the reservoir, is

(a) 45 (b) 50
(c) 56 (d) 60

Ans. (d) : Given
length = 24 m
breadth = 18m
height = 10 m
rate = 1200 liter/minute
Volume of reservoir = length × breadth × height
$= 24 \times 18 \times 10$
$V = 4320\ m^3$
The number of hours, it will take to fill the reservoir

$$= \frac{\text{Volume}}{\text{Rate}}$$

$$= \frac{4320}{1200 \times 10^{-3} \times 60}$$

= 60 hours.

20. What is the mean of the range, median and mode of the data given below?
18, 7, 5, 10, 8, 12, 6, 8, 12, 14, 8, 18, 15, 9, 6

(a) 9 (b) 9.5
(c) 10 (d) 10.3

Ans. (c) : 18, 7, 5, 10, 8, 12, 6, 8, 12, 14, 8, 18, 15, 9, 6
Rearranging in increasing order–
5,6 ,6 ,7, 8, 8, 8, 9, 10, 12, 12, 14, 15, 18, 18
Here most frequent data is 8
$\therefore$ mode = 8
total no of term in given data
n = 15 (odd)

$$\text{Median} = \left(\frac{n+1}{2}\right)^{th}$$

$$= \left(\frac{15+1}{2}\right)^{th}$$

$$= 8^{th} \text{ term}$$

$$\text{Median} = 9$$

Now Range = Maximum value- Minimum value
$= 18 - 5$
Range = 13
Mean of Range, Mode and Median

$$= \frac{\text{Range} + \text{Mode} + \text{Median}}{3}$$

$$= \frac{8+9+13}{3}$$

= 10

21. Which of the following is the most appropriate strategy for introducing the concept of multiplication of two fractions in the middle school?

(a) The algorithm should be used to introduce the concept.
(b) The process should be visually represented.
(c) Multiplication as repeated addition should be emphasised.
(d) Multiplication as inverse of division should be emphasized.

Ans. (b) : Most appropriate strategy for introducing the concept of multiplication of two fractions in the middle school is that it should be visually represented.
- Multiplication as repeated addition become difficult for fraction and decimal numbers.
- Algorithm are used for a highly complicated and upper level calculations. Multiplication is basic scenario of mathematics.
- Visual representation are used in mathematics to help students solve problem and understand abstract ideas.

22. Which of the following would NOT qualify as a higher aim of teaching mathematics?

(a) To help students understand the basic structure of mathematics
(b) To enable students to identify relationships
(c) To train students in mechanical calculations
(d) To enable students to handle abstractions

Ans. (c) : The aim of teaching and learning Mathematics are to encourage and enable student to recognize that Mathematics permeates the world around us, appreciate the usefulness power and beauty of Mathematics, enjoy Mathematics and develop patience and persistence when solving problems. Mechanical calculations undoubtedly is a part of mathematics but it is not a higher aim. Its higher aim is to visualize the practicability of mathematics in a world around us.

23. "School curriculum should teach important mathematics". What does this statement mean?

(a) Mathematics should be taught to only those students who plan to pursue it in higher classes.
(b) Difficult concepts should be omitted for disinterested students.
(c) Students should be provided with context which highlights the need for mathematical concepts.
(d) The concepts which are tested in year-end examination must be taught in detail.

Ans. (c) : In school curriculum, students should be provided with context highlights the need for mathematical concepts by which students can easly understand the mathematical problem and solve them.

24. Identify the correct statement from among the following.

(a) Formal proofs are obtained only by inductive reasoning.
(b) Hypotheses are always formulated only through deductive logic.
(c) Conjectures have no role in construction of mathematical knowledge
(d) Counter-examples are helpful in assessing the validity of generalisations

Ans. (d): The option (d) is the correct statement from the following statements.
A counter example to an argument is a situation which shows that the argument can have true premises and a false conclusion. Counter examples are helpful in assessing the validity of generalization.

25. Which of the following is an example of mathematical modeling?
(a) Efficient usage of calculating devices.
(b) Setting up equations for a word Problem.
(c) Using mathematical 'tricks' to carry out long calculations.
(d) Making models of 3-D shapes.

Ans. (b) : Mathematical modeling involves to setup equations for a word problem.
Mathematical modeling is the process of describing a real world problem in mathematical terms, usually in the form of equations and then using these equation to help understand the orginal problem.

26. For a triangle to be isosceles, which of the following statements is true?
(a) "Two of its angles are equal" is a sufficient but not necessary condition.
(b) "Two of its angles are equal" is a necessary but not sufficient condition.
(c) "Two of its angles are equal" is both necessary and sufficient condition.
(d) "Two of its angles are equal" is neither sufficient nor necessary condition.

Ans. (c) : In geometry an Isosceles triangle is a triangle that has two equal sides and two equal angles.

27. Consider the following statements.
Statement A: If n is even, n^2 is even.
Statement B: If n^2 is not even, then n is not even.
Which of following statements is correct?
(a) B is contrapositive of A
(b) B is inverse of A
(c) B is converse A
(d) B is reverse of A

Ans. (a) : If n is even, n^2 is even,
Suppose that even number is 2
$n^2 = 2^2 = 4$
$\Rightarrow$ Satisfies the first statement
If n^2 is not even then n is not even number
Let us take 9
$(3)^2 = 9$ is not even number
$\Rightarrow$ Satisfies the second statement.
Hence, we can conclude that B is contrapositive of A.

28. Which of the following statements is <u>true</u> regarding 'Geogebra'?
(a) It is an application of geometry in algebra
(b) It is a branch of mathematics dealing with geometry and algebra
(c) It is a specialized topic in geometry
(d) It is a software used in exploring geometry

Ans. (d) : Geogebra is a mathematics software for all level of education that brings together geometry, algebra, spreadsheet, graphing, statistics and calculus in one easy to use package. Geogebra is a software used in exploring geometry.
Geogebra is a rapidly expanding community of millions of users located in just about every country.

29. Which of the following statements is correct regarding teaching-learning of mathematics?
(a) Medium of instruction impacts mathematical understanding
(b) Gender impacts mathematical competency
(c) Teacher's belief about learners does not impact mathematical competency
(d) Mathematical ability is innate

Ans. (a) : Medium of instructions impacts mathematical understanding is correct regarding teaching- learning of mathematics.
The role that language plays in the teaching and learning of mathematics is one of some importance in the current literature in mathematics education. As children get older, language supports their ability to learn, to identify and to understand the symbolic nature of numerals.

30. Dyscalculia is characterized by
a. difficulty in understanding number concepts.
b. lack of an intuitive grasp of numbers.
c. inability to coordinate the verbal and spatial aspects of numbers.
d. inability to recognise alphabets.
(a) a and b (b) c and d
(c) a, b, and c (d) a and c

Ans. (c) : Dyscalculia is a specific learning difficulty characterized by a severe and persistent impairment in Mathematics, including difficulties using number and quantity, simple arithmetic and counting. Dyscalculia is not the same as the ordinary experience of "being bad at math".
Dyscalculia is characterized by $\Rightarrow$
(a) Difficulty in understanding number concepts.
(b) Lack of an intuitive grasp of numbers.
(c) Inability to coordinate the verbal and spatial aspect of numbers.

31. 'X' is a plant which is an autotroph as well as a heterotroph. What could 'X' be
(a) Pitcher plant (b) Algae
(c) Cuscuta (d) Fungi

Ans. (a) : The pitcher plant has both autotrophic and heterotrophic modes of nutrition. The pitcher plants performs photosynthesis which make it an autotrophic plant but it has also a partial heterotrophic mode of nutrition because pitcher plants grow on nitrogen deficient soil.

- Algae are a diverse group of aquatic organisms that have the ability to conduct photosynthesis.
- Cuscuta (also known as dodder) is a genus of over 201 species of yellow, orange or red parasitic plant.
- Fungi are eukaryotic organisms that includes microorganism such as yeast, mould and mushroom.

32. 'Z' is a microorganism present in the alimentary canal of human beings and other animals which aids in digestion of food. What is 'Z'

(a) Bacteria (b) Virus
(c) Algae (d) Fungi

Ans. (a) : 'Z' is a bacteria present in the alimentary canal of human beings and other animals which aids in digestion of food.
These bacteria help your body to break down big food molecules into useable components. The bacteria also produce vitamin and help protect the body from diseases. The whole population of bacteria in our bodies is called the human microbiome. The relationship between you and bacteria is symbiotic.

33. There are many steps involved in making wool from sheep. Which of the following represents the correct sequence of the steps?

(a) Shearing, scouring, sorting, dying, rolling into yarn, weaving.
(b) Scouring, sorting, shearing, dying, rolling into yarn, weaving.
(c) Sorting, scouring, shearing, rolling into yarn, dying, weaving.
(d) Shearing, scouring, dying, rolling into yarn, sorting, weaving.

Ans. (a) : The major steps necessary to process wool from the sheep to the fabric are shearing, cleaning and scouring, grading and sorting, dying, spinning or rolling into yarn, weaving and finishing.

34. Which of the following represents correct matching set of type of joints?

(A) Ball and socket joint	**(i) Arms and shoulders**
(B) Pivotal joint	**(ii) Jaw**
(C) Hinge joint	**(iii) Neck**
(D) Fixed joint	**(iv) Elbow**

(a) A-(i), B-(iii), C-(iv), D-(ii)
(b) A-(iii), B-(i), C-(ii), D-(iv)
(c) A-(ii), B-(iii), C-(i), D-(iv)
(d) A-(iv), B-(i), C-(ii), D-(iii)

Ans (a) :	
(A) Ball and socket joint	(i) Arms and shoulders
(B) Pivotal joint	(iii) Neck
(C) Hinge joint	(iv) Elbow
(D) Fixed joint	(ii) Jaw

35. Which of the following statements is correct?

(a) The unfertilized egg has one chromosome
(b) The unfertilized egg has 23 pairs of chromosome
(c) The unfertilized egg has one 'X' i.e. sex chromosome
(d) The unfertilized egg has 22 chromosome

Ans. (c) : Unfertilized egg is female gamete which is haploid. It contains one X chromosome i.e. sex chromosome. The sperm contain either an X or a Y chromosome. A male child (XY) is produced if the sperm containing a Y chromosome fuses with the egg. If the sperm containing an X chromosome fuses with the egg, than a female child (XX) is produced.

36. 'X' and 'Y' are elements which are highly reactive with air, hence stored in Kerosene. What could 'X' and 'Y' be?

(a) Phosphorus and Sodium
(b) Phosphorus and Sulphur
(c) Sodium and Potassium
(d) Sulphur and Potassium

Ans. (c) : Sodium and Potassium are highly reactive metals and react vigorously with the oxygen, carbon dioxide and moisture present in the air such that it may even cause a fire. To prevent this explosive reaction, these elements is kept immersed in kerosene because they doesn't react with kerosene.

37. 'X' is a synthetic fiber which resembles wool and is used to make shawls and sweaters and blankets. What could 'X' be?

(a) Rayon (b) Acrylic
(c) Nylon (d) Polyester

Ans. (b) : Acrylic is man-made fibre since, acrylic resembles wool so it is also known as artificial wool or synthetic wool. Acrylic is cheaper than natural wool and can be dye in various colours. Thus acrylic is very popular and taking the place of wool today. Acrylic is used in making sweaters, blanket and other many woolen clothes.

38. In which of the following situations, water cannot be used to extinguish fires?

(A) electrical fire
(B) burning of wood
(C) burning of petrol
(D) burning of paper

(a) A and B (b) A and C
(c) B and D (d) B and C

Ans. (b) : • Water is a good fire extinguisher. But water can not be used to extinguish electrical fires. This is because water is a good conductor of electricity. It can cause electric shock and can harm the person who is trying to put it off.
• We can not use water in case of oil fires. Oil floats over water and thus oil fires cannot be extinguished by using water. So situation A and C cannot be used to extinguish fires.

39. A compilation of data on population status of endangered species is

(a) Green data book (b) Brown data book
(c) Red data book (d) White data book

Ans. (c) : IUCN Red list of endangered species is the world most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of quantitative criteria to evaluate the extinction risk of thousands of species. The book containing this list is called red data book. So A compilation of data on population states of endangered species is red data book.

40. Metal 'P' displaces metal 'Q' from its salt solution but is not able to displace metal 'R' from its salt solution. Identify the least reactive metal.

(a) P
(b) Q
(c) R
(d) Cannot be determined

Ans. (b) : Metal P displaces metal Q from its salt solution so P is more reactive than Q
• Metal P can not displace metal R from its salt solution so R is more reactive than P.
So reactive order is
R > P > Q
So metal Q will be the least reactive metal.

41. Shyama is standing 1m away from a plane mirror and is observing her image. She takes two steps backwards. What change would she see in her image?

(a) The image increases in size but remains at the same distance from mirror
(b) The image remains the same size but moves further away from the mirror
(c) The image remains the same size but moves closer to the mirror
(d) The image increases in size and moves further away from the mirror

Ans. (b) : Plane mirrors: Plane mirrors are simply flat mirror without curves. These are polished surface coated with mercury such that they reflect most of the light falling on them.
The distance of the image behind the mirror is the same as the distance of the object in front of the mirror. From the given situation we can conclude that the size of image and object are equal and the distance of image increases as the distance of object increases from a plane mirror.
So, as Shayama takes two steps backwards then her image remains the same size but moves further away from the mirror.

42. A green cube with side of 0.25m, a red cube with side of 0.35 m and a yellow cube having side of 0.5 m are lying on a flat table. Which of them would exert more pressure on the table given that mass of all cubes is same.

(a) Green cube
(b) Red cube
(c) Yellow cube
(d) All will exert same pressure

Ans. (a) : Given the sides of cubes
Green Cube = 0.25m
Red Cube = 0.35m
Yellow Cube = 0.5m
We know that pressure is inversely proportional to the surface area of contact.
Therefore area of cubes = $(side)^2$
Green cube, area = $(0.25)^2 = 0.0625m^2$
Red cube, area = $(0.35)^2 = 0.1225m^2$
Yellow cube area = $(0.5)^2 = 0.25m^2$
Hence, pressure exert by green cube is more than other cubes.

43. Identify the <u>incorrect</u> statement from the following.

(a) sound can travel through vacuum
(b) The higher the frequency of vibration, higher is the pitch
(c) All vibratory motions are oscillations
(d) Sound in a flute is produced by the vibrating air-column

Ans. (a) : A medium is required for transmission of sound waves. Vacuum is an enclosed place in which there is no molecules or matter. Therefore sound cannot travel through vacuum where there is no molecule or atom to induce vibrations.

44. Which of the following sets comprises liquids which are good conductors of electricity?

(a) Lemon juice, vegetable oil, tap water
(b) Distilled water, shampoo, vinegar
(c) Lemon juice, vinegar, tap water
(d) Shampoo, vegetable oil, lemon juice

Ans. (c) : Some liquids are good conductors of electricity and some are poor conductors of electricity.
- Most liquid that conduct electricity are solution of acid bases and salts.
- The passage of a electric current through a conducting liquid cause chemical reaction. The resulting effect are called chemical effect of current

Example:- Lemon Juice, vinegar, tap water are good conductor of electricity.

45. Which of the following sets comprises physical changes?

(a) Shredding of paper, baking a cake, bursting of crackers
(b) Boiling of water, cooking of food, rusting of iron
(c) Burning of paper, setting of milk into curd, breaking a glass
(d) Breaking of glass, grinding wheat, boiling of water

Ans. (d) : Physical changes are changes affecting the form of a chemical substance, but not its chemical composition.
Example: Breaking of glass, grinding wheat, boiling of water.
- In chemical change the chemical composition of substance is changed.

46. Reva is driving from her office to her home. Which is 22km away. She travels at a speed of 48km per hour for 10 minutes. She stops for 15 minutes at a market to buy some items. She resumes her journey at a speed of 56 km per hour. What is her average speed for the entire journey?

(a) 33 km/h (b) 44 km/h
(c) 50 km/h (d) 52 km/h

Ans. (a):
Distance travelled by Reva in 10 minutes

$$\Rightarrow 48 \times \frac{10}{60} = 8\text{km}$$

Remaining Distance i.e. 22 – 8 = 14 km, travelled by Reva at a speed 56 km/h

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$\frac{22\text{km}}{\frac{10}{60}\text{h} + \frac{15}{60}\text{h} + \frac{14}{56}\text{h}} = 33\text{km/h}$$

47. Which of the following will not be helpful in the process of separating a mixture of chalk and water?
(a) Filtration (b) Decantation
(c) Sedimentation (d) Sublimation

Ans. (d) : The mixture of chalk and water can be separated by sedimentation, decantation or filtration process.
- Sublimation is the transition of a substance directly from the solid to the gas state without passing the liquid state.
- Decantation is a process for the separation of mixtures of immiscible liquids or of a liquid and a solid mixture such as suspension.

48. Given below are a few statements about the phenomenon of shadow formation of an object. Identify the correct statements.
(A) Size of shadow depends upon the distance between light source and the object.
(B) Position of shadow depends upon the direction of incident light.
(C) The colour of shadow depends upon the colour of object
(D) Shadow formation can be explained on the same concept as image-formation
(a) A and B (b) B and C
(c) C and D (d) A and D

Ans. (a) : The phenomenon of shadow formation of an object shows that–
- Size of shadow depend upon the distance between light source and the object if the light source is near the object then size of shadow will be short but the light source is away from the object then side of shadow will be large.
- Position of shadow depends upon the direction of incident light

Example: If the source of light is infrant of object then the shadow will be formed in backward.
If the source of light is in left of the object then the shadow will be formed in right of the object.
So, statement A and B both are correct.

49. Identify the correct statements from among the following
(a) The percolation rate of water in clayey soil is higher than that of loamy soil
(b) The percolation rate of water in loamy soil is higher than that of sandy soil
(c) The percolation rate of water in clayey soil is same as that of sandy soil
(d) The percolation rate of water in sandy soil is higher than that of clayey soil

Ans. (d) : Clay soil has very fine soil particles through which water cannot be easily percolated whereas in sandy soil, they have big soil particles so that water can be easily filtered or percolated.
This is the reason why there is low percolation rate in clay soil compared to sandy soil.
Hence, the percolation rate of water sandy soil is higher then that of clayey soil.

50. 'X' is a vitamin which is fat soluble and helps in keeping skin and eye healthy. 'Y' represents food items rich in this vitamin. Identify 'X' and 'Y'
(a) Vitamin D, Milk products
(b) Vitamin A, Citrus fruits
(c) Vitamin D, Citrus fruits
(d) Vitamin A, Yellow fruits

Ans. (d) : Vitamin A helps with the reproductive process, growth and development. It also keeps eyes and skin healthy and acts as an antioxidant.
Yellow fruits and vegetables in general are great sources of vitamin A and antioxidants that can combat certain kinds of cancer and are good for the heart and eyes.

51. Which of the following statements best describes nature of science?
(a) Science is about appreciation of nature
(b) Science is an individual pursuit
(c) Science is value-free and objective to the core
(d) Science is a social endeavour

Ans. (d) : Science is a social endeavor because it involves solution of various problem, satisfy various needs and sustainable development of society with the help of scientific knowledge.

52. What is the need for having a historically valid science curriculum?
(A) It helps understand how social factors influence the development of science.
(B) It helps the learner to view science as infallible.
(C) It helps learners appreciate how the concepts of science evolve with time.
(D) It helps to highlight achievement of western countries in science.
(a) (A) and (B) (B) only (D)
(c) Only (B) (d) (A) and (C)

Ans. (d) : Historical validity requires that science curriculum be informed by a historical perspective, enabling the learner to appreciate how the concepts of science evolve with time. It also help the learner to view science as a social enterprise and to understand how social factor influence the development of science.

53. According to NCF 2005, the pedagogic practices recommended at the upper primary stage are
(A) group discussion
(B) designing simple investigations
(C) verification of the theoretical principles
(a) (A) and (C) (b) (B) and (C)
(c) (A) and (B) (d) only (C)

Ans. (c) : According to NCF 2005, the pedagogic practices recommended at the upper primary stage are
- Group discussion
- Designing simple investigations

54. From the following statements about science, identify the one that is false.

(a) Scientific ideas are tentative.
(b) Technology has preceded science in the history of civilization.
(c) The scientific method is the only guide for conducting research.
(d) In science self-examination and skepticism is important.

Ans. (c) : When conducting research, scientists use the scientific method to collect measurable, empirical evidence in an experiment related to a hypothesis that is designed to support or contradict a scientific theory. For conducting research there can be various factors to guide scientist, for example the needs of society, correcting the wrong etc. Hence, scientific method is not only guide for conducting research.

55. Ashu was given individual task of measuring the body temperatures of at least five classmates. Following are the task specific indicators to assess Ashu.
Identify the undesirable indicator.

(a) Washes and wipes thermometer before use
(b) Jerks the thermometer to bring the level of mercury below 35°c.
(c) Draws conclusion that temperature of every person is exactly 37°c
(d) Show curiosity in finding information on how to measure temperature in dogs.

Ans. (c) : A thermometer is used to measure temperature of a person. The normal body temperature is 37°C but it is not necessary that every person have same temperature since they may have fever or cold.

56. A science teacher with in a constructivist framework would be in agreement to all of the following, except...

(a) Learnes's intuitive ideas always correspond with scientific knowledge.
(b) Learners come from diverse backgrounds and their perceptions and beliefs vary.
(c) Learners' ideas that they bring to classrooms are important.
(d) Learners' ideas are resistant to change by convertional teaching-learning.

Ans. (a) : A science teacher with in a constructivist framework would be in agreement to all of the following, except learnes's intuitive ideas always correspond with scientific knowledge. Ideas don't always shows scientific aspect, it shows the thinking skills of person.

57. To make your science classes more gender inclusive you may do all of the following, except

(a) Challenging stereotypes
(b) Selecting activities that emphasize co-operation and caring
(c) Teaching students to recognize gender inequalities
(d) Encouraging girls to be more competitive that boys.

Ans. (d) : To make your science classes more gender inclusive you may do all of the following, except encouraging girls to be more competitive that boys since inclusive class itself means all student in same class with equal teaching practices and upbringing the other students to same level.

58. A teacher brought into her classroom $\frac{1}{2}$kg flour, some warm water, sugar and yeast and asked following questions, Identify the questions that are divergent.
A) What do you think I am going to do with all these things?
B) Will sugar dissolve easily in warm water?
C) Will yeast dissolve in water?
D) Name some of the eatables that are baked?

(a) A and B (b) B and C
(c) A and C (d) B and C

Ans. (a) : The divergent questions are questions with no specific answer but rather exercises one's thinking ability about the topic which is being taught.
So the teacher may ask the question-
(A) What do you think I am going to do with all these things?
(B) Will sugar dissolve easily in warm water?
Note: A divergent question is a question with no specific answer, but rather exercises one's ability to think broadly about a certain topic.

59. The advantages of conducting field trips over using educational software is that
(A) it involves all the senses.
(B) it can cater to large groups.
(C) it can be arranged easily and quickly
(D) it gives individual attention.

(a) A and B (b) C and D
(c) A, B and C (d) A, B and D

Ans. (a) : The advantages of conducting field trips over using educational software is that it involves all the senses and it can cater to large groups.
Field trip provides the student with the opportunity of having first hand knowledge of happening in our environment. It helps to generate and sustain student interest in the subject.

60. What will be the sequence of your lesson planning using inquiry approach?
(A) Provide plenty of time for discussions before presenting the scientific terms
(B) Stimulate students interest
(C) Give opportunity for applications of the concepts and principles

(a) A, B, C (b) C, B, A
(c) C, A, B (d) B, A, C

Ans. (d) : The sequence of the lesson planning using inquiry approach is –
Stimulate students interest
↓
Provide plenty of time for discussions before presenting the scientific terms
↓
Give opportunity for applications of the concepts and principles.

Central Teacher Eligibility Test (CTET) 2021
Junior Level (Class VI-VIII)
Solved Paper with Explanation

(Exam Date : 17.01.2022)

1. The value of $\frac{\sqrt{768}\times\sqrt{3267}}{\sqrt{144}}$ is

(a) 198 (b) 128

(c) 132 (d) 134

Ans. (c) :

$$\frac{\sqrt{768}\times\sqrt{3267}}{\sqrt{144}}=\frac{\sqrt{768\times3267}}{\sqrt{144}}$$

$$\sqrt{\frac{(256\times3)\times(121\times27)}{12\times12}}=\sqrt{\frac{(16\times16\times3)\times(11\times11\times3\times3\times3)}{12\times12}}$$

$$=\frac{16\times11\times3\times3}{12}$$

$$=132$$

2. If $x=\frac{-2}{3}$ and $y=\frac{-3}{4}$, then $(x-y)^{-1}+\left(x^{-1}-y^{-1}\right)^{-1}$ is equal to

(a) –8 (b) –2

(c) $\frac{5}{12}$ (d) $\frac{7}{6}$

Ans. (*) :

$$x=-\frac{2}{3}\ \&\ y=-\frac{3}{4}$$

$$(x-y)^{-1}=\left[-\frac{2}{3}-\left(-\frac{3}{4}\right)\right]^{-1}$$

$$=\left[-\frac{2}{3}+\frac{3}{4}\right]^{-1}$$

$$=\left[\frac{-8+9}{12}\right]^{-1}$$

$$=\left[\frac{1}{12}\right]^{-1}$$

$$=12$$

$$x^{-1}=\left(\frac{-2}{3}\right)^{-1}=\frac{-3}{2}$$

$$y^{-1}=\left(\frac{-3}{4}\right)^{-1}=\frac{-4}{3}$$

$$(x^{-1}-y^{-1})^{-1}=\left[\left(\frac{-3}{2}\right)-\left(\frac{-4}{3}\right)\right]^{-1}$$

$$=\left[\frac{-9+8}{6}\right]^{-1}$$

$$=\left[\frac{-1}{6}\right]^{-1}$$

$$(x^{-1}-y^{-1})^{-1}=-6$$

$$(x-y)^{-1}+(x^{-1}-y^{-1})^{-1}=12+(-6)$$

$$=6$$

Note-This question deleted by commission.

3. If a = 360 and b = 900, then (LCM of a and b) ÷ (HCF of a and b) is equal to

(a) $\frac{5}{2}$ (b) 5

(c) 15 (d) 10

Ans. (d) : Factors of 360 = $2\times2\times2\times3\times3\times5$

Factors of 900 = $2\times2\times3\times3\times5\times5$

LCM of 360 and 900 = $2\times2\times2\times3\times3\times5\times5$

= 1800

HCF of 360 and 900 = $2\times2\times3\times3\times5=180$

So, $\frac{\text{LCM of a and b}}{\text{HCF of a and b}}=\frac{1800}{180}=10$

4. If a 6-digit number 43x82y is divisible by 72, then what is the value of $(2x-y)$?

(a) 8

(b) 10

(c) 12

(d) 14

Ans. (a) : If any number is divisible by 72 must be divisible by 8 & 9.

Number 43x82y is divisible by 72 so it will be also divisible by 8 & 9.

A number is divisible by 8 if last three digit is divisible by 8

In 43x 82y

82y must be divisible by 8

Then, y = 4

Number = 45x 824

If sum of digits is divisible by 9 then number will be also divisible by 9

Sum of digits = 4 + 3 + x + 8 + 2 + 4

= 21 + x

If x = 6

Sum of digits = 27, which is divisible by 9.

So, value of x & y are 6 & 4 respectively

Now, $2x - y = 2 \times 6 - 4$

$= 8$

5. $\dfrac{\left(\frac{3}{4}\right)^{-3} \times \left(\frac{3}{8}\right)^{2} \div 3^{-2}}{\left(\frac{2}{3}\right)^{2} \times \left(\frac{4}{3}\right)^{-3}}$ **is equal to**

(a) 9 (b) 12

(c) 16 (d) 24

Ans. (c) :

$$\frac{\left(\frac{3}{4}\right)^{-3} \times \left(\frac{3}{8}\right)^{2} \div 3^{-2}}{\left(\frac{2}{3}\right)^{2} \times \left(\frac{4}{3}\right)^{-3}}$$

$$= \frac{\left(\frac{4}{3}\right)^{3} \times \left(\frac{3}{8}\right)^{2} \times 3^{2}}{\left(\frac{2}{3}\right)^{2} \times \left(\frac{3}{4}\right)^{3}}$$

$$= \left(\frac{4}{3}\right)^{3} \times \left(\frac{3}{8}\right)^{2} \times 3^{2} \times \left(\frac{3}{2}\right)^{2} \times \left(\frac{4}{3}\right)^{3}$$

$$= \left(\frac{4}{3}\right)^{6} \left(\frac{3}{8}\right)^{2} \times 3^{2} \times \left(\frac{3}{2}\right)^{2}$$

$$= \frac{4^6}{3^6} \times \left(\frac{3^6}{8^2}\right) \times \frac{1}{2^2}$$

$$= \frac{4^6}{8^2 \times 2^2}$$

$$= \frac{4 \times 4 \times 4 \times 4 \times 4 \times 4}{8 \times 8 \times 2 \times 2}$$

$$= \frac{64 \times 16 \times 4}{64 \times 4}$$

$$= 16$$

6. **One of the factors of** $25(x+y)^2 - 36(x-2y)^2$ **is**

(a) $7x + 11y$ (b) $17y - x$

(c) $11x + 7y$ (d) $11x - y$

Ans. (b) :

$25 (x + y)^2 - 36 (x - 2y)^2$

$= [5 (x + y)]^2 - [6(x - 2y)]^2$ $[\because a^2 - b^2 = (a + b)(a - b)]$

$= [5 (x + y) + 6 (x - 2y)] [5 (x + y) - 6 (x - 2y)]$

$= [5x + 5y + 6x - 12y] [5x + 5y - 6x + 12y]$

$= (11x - 7y) (17y - x)$

So factors of given problem are $(11x - 7y)$ & $(17y - x)$

Hence option (b) is correct

7. $\dfrac{(x^2-4)(x-1)(x+1)}{(x^2-3x+2)(x+2)}$ **is equal to**

(a) $x - 1$ (b) $x + 2$

(c) $x + 1$ (d) $x - 2$

Ans. (c) :

$$\frac{(x^2-4)(x-1)(x+1)}{(x^2-3x+2)(x+2)}$$

$$= \frac{(x^2-2^2)(x-1)(x+1)}{(x^2-2x-x+2)(x+2)}$$

$$= \frac{(x+2)(x-2)(x-1)(x+1)}{[x(x-2)-1(x-2)](x+2)}$$

$$= \frac{(x+2)(x-2)(x-1)(x+1)}{(x-2)(x-1)(x+2)}$$

$$= x + 1$$

8. **If** $5x - 6\left(x + \frac{1}{30}\right) = \frac{1}{3}(x+1)$**, then what is the value of** $(5x+6)$**?**

(a) 3 (b) 4

(c) 5 (d) 7

Ans. (b) :

$$5x - 6\left(x + \frac{1}{30}\right) = \frac{1}{3}(x+1)$$

$$5x - 6x - \frac{6}{30} = \frac{x}{3} + \frac{1}{3}$$

$$-x - \frac{1}{5} = \frac{x+1}{3}$$

$$\frac{-5x-1}{5} = \frac{x+1}{3}$$

$$-15x - 3 = 5x + 5$$

$$-15x - 5x = 5 + 3$$

$$-20x = 8$$

$$x = -\frac{8}{20}$$

The value of $5x + 6 = 5 \times \left(\frac{-8}{20}\right) + 6$

$= -2 + 6$

$= 4$

9. What is the constant term in the following product?

$$\left(2x^2-3x-\frac{9}{x}\right)\times\left(\frac{7}{x}-x\right)$$

(a) –9 (b) –12
(c) 12 (d) 16

Ans. (b) :

$$\left(2x^2-3x-\frac{9}{x}\right)\times\left(\frac{7}{x}-x\right)$$

$$=2x^2\times\frac{7}{x}-2x^3-3x\times\frac{7}{x}+3x^2-\frac{9}{x}\times\frac{7}{x}+9$$

$$=14x-2x^3-21+3x^2-\frac{63}{x^2}+9$$

Constant term = –21 + 9
= –12

10. After giving a discount of 15% on the marked price of an article, a shopkeeper still gains 19%. By what percent is the marked price above the cost price?

(a) 30% (b) 35%
(c) 38% (d) 40%

Ans. (d) :

Discount = 15%
Profit = 19%
Let cost price (CP) = 100

$$\text{Marked price (MP)} = \left(\frac{100+\text{gain}\%}{100-\text{Discount}\%}\right)\times \text{CP}$$

$$=\frac{100+19}{100-15}\times 100$$

$$=\frac{119}{85}\times 100$$

MP = 140

$$\text{Required percentage} = \frac{140-100}{100}\times 100$$

= 40%

11. If F, V and E represent the number of faces, number of vertices and the number of edges, respectively of a pyramid whose base is a pentagon, then what is the value of $(2V-3F+E)$?

(a) 3 (b) 4
(c) 5 (d) 6

Ans. (b) : A pentagonal pyramid has a base in the shape of a pentagon and triangular faces formed at side of the base.
Number of faces, F = 6
Number of vertices, V = 6
Number of edges, E = 10

$$2V-3F+E = 2\times 6-3\times 6+10$$
$$= 12-18+10$$
$$= 22-18$$
$$= 4$$

12. The length of the diagonals of a rhombus are 24cm and 70cm. What is the length of a side of the rhombus?

(a) 28 cm (b) 35 cm
(c) 37 cm (d) 47 cm

Ans. (c) : The length of side of Rhombus

$$=\sqrt{\left(\frac{24}{2}\right)^2+\left(\frac{70}{2}\right)^2}$$

$$=\sqrt{12^2+35^2}$$

$$=\sqrt{144+1225}$$

$$=\sqrt{1369}$$

$$=37\text{cm}$$

13. The interior angle of a regular polygon exceeds its exterior angle by 108°. The number of sides of the polygon is

(a) 8 (b) 9
(c) 10 (d) 12

Ans. (c) : Let interior angle and Exterior angles are I & E respectively

$$I + E = 180^\circ$$
$$I - E = 108$$
$$2I = 288$$
$$I = \frac{288}{2} = 144^\circ$$

$\because$ Interior angle of polygon

$$I = \frac{(n-2)\times 180}{n}$$

Where n = number of sides of polygon

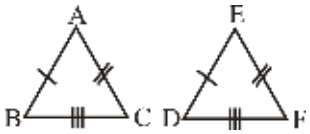
$$\frac{(n-2)\times 180}{n} = 144$$

$$\boxed{n = 10}$$

14. In ΔABC and ΔDEF, if
$AB=DE$, $AC=EF$ and $BC=DF$
Then which of the following is correct?

(a) $\Delta ABC \cong \Delta EFD$
(b) $\Delta ABC \cong \Delta DEF$
(c) $\Delta ABC \cong \Delta EDF$
(d) $\Delta ABC \cong \Delta FDE$

Ans. (c):



AB = DE

BC = DF

& AC = EF

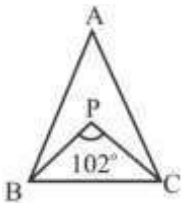
Hence by SSS congruency rule (if three sides of a triangle are equal to three side of another triangle) $\Delta ABC \cong \Delta EDF$

15. In ΔABC, the bisectors of ∠B and ∠C meet at a point P. If $\angle BPC = 102^{\circ}$, then what is the measure of ∠A ?

(a) 22º (b) 24º

(c) 28º (d) 32º

Ans. (b) :



Given,

$\angle BPC = 102^{\circ}$

$\angle PBC = \angle PCB$ (BP & CP are bisectors of ∠B & ∠C)

$\angle P + \angle PBC + \angle PCB = 180^{\circ}$

$\angle P + 2\angle PBC = 180^{\circ}$

$102 + 2\angle PBC = 180^{\circ}$

$$\angle PBC = \frac{180 - 102}{2} = 39^{\circ}$$

$\angle B = 2\angle PBC$ $\angle C = 2\angle PCB$

$= 2 \times 39^{\circ}$ $= 2 \times 39^{\circ}$

$\angle B = 78^{\circ}$ $\angle C = 78^{\circ}$

$\angle A = 180^{\circ} - (\angle B + \angle C)$

$= 180^{\circ} - (78 + 78)$

$= 180° - 156°$

$\boxed{\angle A = 24°}$

Shortcut-

$$\angle BPC = 90^{\circ} + \frac{\angle A}{2}$$

$$102^{\circ} = 90^{\circ} + \frac{\angle A}{2}$$

$$12^{\circ} = \frac{\angle A}{2}$$

$$\boxed{\angle A = 24^{\circ}}$$

16. The sum of mean, median and mode of the data:

11, 14, 9, 30, 35, 17, 19, 28, 23, 48, 36, 30 is

(a) 80.5 (b) 78.5

(c) 76 (d) 75

Ans. (a) : Given data,

11, 14, 9, 30, 35, 17, 19, 28, 23, 48, 36, 30

arrange them in ascending order

9, 11, 14, 17, 19, 23, 28, 30, 30, 35, 36, 48

$$\text{Mean} = \frac{9+11+14+17+19+23+28+30+30+35+36+48}{12}$$

$$= \frac{300}{12}$$

$= 25$

$$\text{Median} = \frac{1}{2}\left\{\left(\frac{12}{2}\right)^{\text{th}} \text{term} + \left(\frac{12+2}{2}\right)^{\text{th}} \text{term}\right\}$$

$$= \left[6^{\text{th}} \text{term} + 7^{\text{th}} \text{term}\right] \times \frac{1}{2}$$

$$= \frac{23+28}{2}$$

$= 25.5$

Mode = 30 (most repeating number)

Sum of mean, median & mode = 25 + 25.5 + 30

= 80.5

17. A box certains cards on which numbers 31, 32, 33,……,69 and 70 are written (only one number on one card). A card is drawn from the box without looking into the box. What is the probability that the number on the card drawn is <u>NOT</u> a prime number?

(a) $\frac{9}{40}$ (b) $\frac{19}{20}$

(c) $\frac{1}{5}$ (d) $\frac{31}{40}$

Ans. (d): Prime numbers between 31 & 70

31, 37, 41, 43, 47, 53, 59, 61, 67 = 9 numbers

Total numbers between 31 & 70 = 40

Probability that the number on card drawn is

$$\text{prime} = \frac{9}{40}$$

Probability that the number on card drawn is not

$$\text{prime} = 1 - \frac{9}{40}$$

$$= \frac{31}{40}$$

18. A wire is in the shape of a circle of area 154 cm^2. If it is bent in the form of a square, then what is the area of the square?

(Take $\pi = \frac{22}{7}$)

(a) 144 cm^2 (b) 169 cm^2

(c) 100 cm^2 (d) 121 cm^2

Ans. (d) : Given,

area of circle = 154 cm^2

$\pi r^2 = 154$

$\frac{22}{7} \times r^2 = 154$

$r^2 = \frac{154 \times 7}{22}$

$r = 7$ cm

It is bent further in form of square,

circumference of circle = circumference of square

$2\pi r = 4 \times a$

$2\pi \times 7 = 4 \times a$

$a = \frac{14\pi}{4}$

Area of square = $a^2 = \left(\frac{14\pi}{4}\right)^2$

$= \left(\frac{14 \times 22}{7 \times 4}\right)^2$

$= 11^2$

$= 121 cm^2$

19. The length, breadth and height of a cuboidal box are in the ratio 6 : 4: 3 and its volume is 4608 cm^3. Its lateral surface area (in cm^2) is

(a) 1152 (b) 1246

(c) 1104 (d) 960

Ans. (d) : Given,

$\ell : b : h = 6 : 4 : 3$

Let, $\ell = 6x$, $b = 4x$, $h = 3x$

Given, volume = 4608 cm^3

$\ell \times b \times h = 4608$

$6x \times 4x \times 3x = 4608$

$72x^3 = 4608$

$x^3 = \frac{4608}{72} = 64$

$x = \sqrt[3]{64} = 4$

Lateral surface area = $2(\ell h + bh)$

$\ell = 6x = 6 \times 4 = 24$

$b = 4x = 4 \times 4 = 16$

$h = 3x = 3 \times 4 = 12$

$= 2(\ell h + bh)$

$= 2h(\ell + b)$

$= 2 \times 12 \times (24 + 16) = 960 cm^2$

20. The volume of a right circular cylinder is 396 cm^3 and its height is 14cm. What is its curved surface area (in cm^2)? $\left(\text{Take } \pi = \frac{22}{7}\right)$

(a) 242 (b) 264

(c) 279 (d) 294

Ans. (b) : Given,

Volume of cylinder = 396 cm^3

$\pi r^2 h = 396$

$\pi \times r^2 \times 14 = 396$

$r^2 = \frac{396}{14 \times \pi} = \frac{396}{14 \times \frac{22}{7}} = \frac{396}{2 \times 22} = 9$

$\boxed{r = \sqrt{9} = 3}$ cm

Area of curved surface = $2\pi rh$

$= 2\pi \times 3 \times 14$

$= 2 \times \frac{22}{7} \times 3 \times 14$

$= 2 \times 22 \times 3 \times 2$

$= 264 cm^2$

21. Which of the following teaching learning resources in mathematics cannot be used for visually challenged students?

(a) Taylor's abacus (b) Tangram

(c) Geoboard (d) Geo-gebra

Ans. (d) : Geo-gebra can not be used for visually challenged students while Taylor's abacus, Tangram, Geoboard can be used for visually challenged students.

• Geo-gebra is one of the most innovative, open-code math software. It is an interactive geometry, algebra, statistics & calculus application. It uses an exploratory approach to teach concepts of geometry.

22. Which of the following is an example of teaching arithmetic using heuristics method according to National Curriculum Framework (2005)?

(a) Finding the sum of three or more digit numbers by column method of addition

(b) Rounding off numbers to the nearest multiples of ten in order to add, subtract or multiply etc.

(c) Teaching the use of electronic calculator to students

(d) Making students memorize multiplication tables for multiplying large numbers

Ans. (b) : A heuristic approach is a problem solving method that uses a practical method or various shortcuts in order to produce solutions that ease cognitive load of making a decision. According to NCF 2005 it includes examples like using trial and error, a rule of thumb, subtract or multiply rounding off numbers etc.

23. Which of the following methods/approaches is <u>NOT</u> regarding mathematics teaching?

(a) Analysis-Synthesis
(b) Rote Memorization
(c) Problem solving
(d) Deductive-Inductive

Ans. (b) : Teaching methods of mathematics include lecture, inductive, deductive, heuristic or discovery, problem solving, analytic, synthetic, laboratory & project method.

• Rote memorization method is not a method regarding mathematics teaching. It is used in subjects that needs memorization.

24. Which of the following is the best description of ideas of value based mathematics education?

(a) Mathematics education cannot be value free
(b) Mathematics education is the most valuable
(c) Value based mathematics education acknowledges and incorporates social, cultural and political values in teaching learning processes
(d) In mathematics examination, asking a value based question in the end develops moral values in students

Ans. (c) : Value based mathematics education acknowledges & incorporates social, cultural & political values in teaching learning process. Also the values of mathematics education are practical value, intellectual values, social values, moral values, disciplinary values, cultural values, international values, aesthetic values, vocational values & psychological values.

25. Which of the following sequence is correct for mathematical modeling?

(a) The mathematical model—Real life problem—The mathematical solution – The solution in real world
(b) Real life problem—The mathematical model –The mathematical solution—The solution in real world
(c) The mathematical model—Real life problem—The solution in real world—The mathematical solution
(d) The mathematical model—Real life problem—The mathematical solution—The solution in real world

Ans. (b) : Mathematical modelling is the process of describing a real world problem in mathematical terms, usually in the form of equations, & then using these equations both to help understand the original problem, and also to discover new features about the problem.

Sequence for mathematical modeling:-

Real life problem → The mathematical model → The mathematical solution→ The solution in real world

26. After the completion of topic "Parallelograms" in a mathematics class, a student says, "A square is also a rectangle and that a rectangle is also a special type of parallelogram". The student is at which level of geometric reasoning according to Van Hieles theory of geometrical development?

(a) Level 0 (Visualization/Recognition)
(b) Level 1 (Analysis)
(c) Level 2 (Relationships)
(d) Level 4 (Axiomatics)

Ans. (c) : According to Van Hieles theory of geometrical development, the student is at Level 2 (Relationships) of geometric reasoning.

Level 2 (Relationships)

• The students will be able to understand the relationships between the properties & figures.

• They can take part in informal deductive discussions & can discuss the different characteristics of figures which helps them in creating meaningful definitions.

27. Which of the following data sets <u>cannot</u> be represented using a pie chart?

(a) A record of change in temperature in a day
(b) Percentage of marks obtained by students in a class of 'n' number of students
(c) Ratio of number of students belonging to different states in a classroom
(d) Monthly expenditure of a family in various sectors

Ans. (a) : A pie chart is a circle divided into sectors that represent data as proportions of a whole. It encodes a category and a fractional quantity. A record of change in temperature in a day is not a fractional quantity hence it can not be represented on a pie chart.

28. Which of the following involves generalization from numbers and computation with the use of meaningful symbols?

(a) Geometric thinking (b) Algebraic thinking
(c) Statistical thinking (d) Numerical thinking

Ans. (b) : Algebraic thinking includes recognizing and analyzing patterns, studying & representing relationships, **making generalizations**, and analyzing how things change.

• Geometric thinking is the way in which students understand the spatial relationship between and within objects.

• Statistical thinking is the ability to understand a situation by accurately assessing probabilities, understanding variation and dealing effectively with uncertainty.

• Numerical thinking or reasoning focuses on students ability to think mathematically and apply his complex skills.

29. Which of the following is NOT an example of proportionality?

(a) 4 candies cost Rs.5, and so 10 candies cost Rs. 12.50

(b) Ravi's mother's age is two times that of Ravi's age at present, so when Ravi will be 30 years old, his mother will be 60 years old.

(c) A car covers 8km in 3 hours at a constant speed, it will cover 12 km in $4\frac{1}{2}$ hours.

(d) The ratio of number of teachers to that of students in a school has to be 2:30, so for 300 students, there has to be 20 teachers.

Ans. (b) : The term proportionality describes the relationship among variables that are in the same ratio. Among the given option in option (b) the relationship among ages are not proportional.

30. According to National Curriculum Framework (2005), which of the following is <u>LEAST</u> effective to enhance mathematics learning in the classroom?

1. Connecting concepts to real-life situations

2. Giving frequent tests

3. Using mathematical games and puzzles

4. Creating competition amongst learners

(a) 1 and 3 (b) 2 and 4

(c) 1, 3 and 4 (d) Only 3

Ans. (b) : NCF-2005, stated that the main goal of Mathematics education in schools is the mathematization of the child's thought processes.

Some specific aims of mathematics education:-

- Connecting concepts to real-life situations.
- Using mathematical games & puzzle.
- To apply mathematics in other subjects
- To prepare them for the learning mathematics of higher classes.

31. Match the items given in column A with that in column B

Column A (Deficiency of vitamin/mineral)	**Column B (Deficiency disease/disorder)**
A. Vitamin–A	(I) Goitre
B. Vitamin–B	(II) Anaemia
C. Vitamin–C	(III) Scurvy
D. Iron	(IV) Loss of vision
	(V) Beri-Beri
	(VI) Rickets

(a) A – IV, B – VI, C – V, D – II

(b) A – IV, B – V, C – III, D – II

(c) A – VI, B – V, C – III, D – I

(d) A – IV, B – I, C – III, D – II

Ans. (b) :

Deficiency of Vitamins/mineral		**Deficiency disease/ disorder**
A. Vitamin A	-	(iv) Loss of vision.
B. Vitamin B	-	(v) Beri-Beri.
C. Vitamin C	-	(iii) Scurvy.
D. Iron	-	(ii) Anaemia.
E. Vitamin D	-	(vi) Rickets.
F. Iodine	-	(i) Goitre.

32. Incomplete combustion of fuels produces a gas which is poisonous and reduces the oxygen carrying capacity of the blood. This gas is

(a) Carbon dioxide (b) Carbon monoxide

(c) Nitrogen oxide (d) Sulphur dioxide

Ans. (b) : During incomplete combustion of fuels the carbon is not completely oxidized so it will produce carbon monoxide (CO). Incomplete combustion of fuels are inefficiently and the carbon monoxide produced is health hazard.

Carbon monoxide is a very poisonous gas that reduces the oxygen-carrying capacity of the blood.

33. An object of mass 200 kg is sliding on a smooth horizontal frictionless surface with a constant velocity of 5m/s. The force required to keep the object moving with the same velocity is

(a) 10000 Newtons (b) 1000 Newtons

(c) 100 Newtons (d) Zero Newtons

Ans. (d) : Newton's first law states that if a body is at rest or moving at a constant velocity in a straight line. It will remain at rest or keep moving in a straight line at constant velocity unless an externat force is applied to it. Since body is moving on frictionless surface so friction force will be zero. Hence, force required to keep object moving with same velocity is zero.

34. Consider the following statements about a rainbow

1. It appears usually after the rains

2. At the time of rainbow the sun is high in the sky

3. To observe a rainbow the observer's back should be towards the sun.

4. In the formation of a rainbow the water droplets in the atmosphere act as a prism.

The correct statements are -

(a) 1, 2 and 3 (b) 1, 3 and 4

(c) 2, 3, 4 (d) 1, 2, 4

Ans. (b) : Rainbow–A rainbow is a meteorological phenomenon that is caused by reflection, total internal reflection and dispersion of light due to water droplets resulting in a spectrum of light appearing in the sky.

- It appears usually after the rains
- To observe a rainbow the observer's back should be towards the sun.
- In the formation of a rainbow the water droplets in the atmosphere act as a prism.
- Rainbows can only be seen in the sky when the sun is behind us.

35. Match the items of column I with that of column II

Column I	**Column II**
A. Algae	**I.Chlamydomonas**
B. Bacteria	**II. Amoeba**
C. Fungi	**III. Omicron**
D. Protozoa	**IV. Aspergillus**
	V.Lactobacillus

(a) A – I, B – V, C – IV, D – II
(b) A – I, B – III, C – IV, D – II
(c) A – IV, B – V, C – III, D – I
(d) A – I, B – V, C – III, D – II

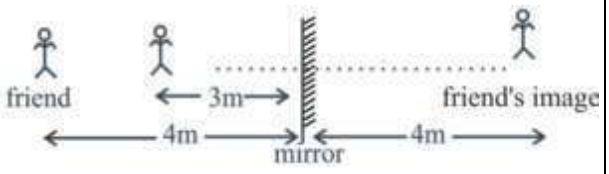
Ans. (a) : The correct match is as follows–

Chlamydomonas	- Algae
Aspergillus	- Fungi
Lacto bacillus	- Bacteria
Amoeba	- Protozoa
Omicron	- Virus

36. Suppose you are standing in front of plane mirror fixed on the wall of a gallery. You are at a distance of 3m and your friend is at a distance of 4m from the mirror. What is the distance between you and the image of your friends?

(a) 8 m (b) 7 m
(c) 6 m (d) 4 m

Ans. (b) :



Distance between you & image of your friend = 3 + 4 = 7m.

37. Select from the following, a planet of solar system which has highly tilted rotational axis as a result of which in its orbital motion appears to roll on its side.

(a) Mercury (b) Neptune
(c) Saturn (d) Uranus

Ans. (d) : Uranus is outer most planet of solar system rotates from east to west and it is tipped over on its side with an axial tilt of 98 degrees. So it has a highly tilted rotational axis, as a result of which in its orbital motion appears to roll on its side.

38. The speed of sound in air is 320 m/s. If the wavelength of a sound wave is 640 cm, its time period is

(a) 5 second (b) 2 second
(c) 0.5 second (d) 0.02 second

Ans. (d) : Given, v = 320 m/s

$\lambda = 640 \text{ cm} = 6.40 \text{ m}$

Wavelength (λ) = speed of sound (v) × Time peried (T)

$$6.40 = 320 \times T \qquad \left\{\because n = \frac{1}{T}\right\}$$

$$T = \frac{6.40}{320} = 0.02 \text{ second}$$

39. Aqueous solution of which one of the following oxides will turn blue litmus solution to red

(a) Copper oxide (b) Calcium oxide
(c) Sulphur dioxide (d) Magnesium oxide

Ans. (c) :

- Acids turn blue litmus paper to red.
- Bases turn litmus paper from red to blue.
- Sulphur dioxide is non-metallic acidic oxide so, sulphur dioxide will turn blue litmus to red. Because non-metallic oxides are acidic in nature.

40. Which of the statement is false in the context of chromium plating?
Chromium is used for electroplating because

(a) It has a dull appearance
(b) It does not corrode
(c) It resists scratches
(d) It is expensive to make the whole object out of it

Ans. (a) : Chromium metal has a shiny appearance and it does not corrode.

- Chromium metal is quite expensive and hence it is not economical to make whole object out of chromium.
- Chromium plating is done on many objects made of iron metal such as bicycle, handle bars, wheel rims, motorcycle parts etc.
- Chromium resists scratches.

Hence, the statement (a) is false in the context of chremium plating.

41. Match the following processes of crop cultivation in column A with the statement in column B

Column A	Column B
(a) Harvesting	(i) Water falls drop by drop directly near the roots
(b) Threshing	(ii) Growing different crops alternately
(c) Crop rotation	(iii) Cutting of crops after its maturation
(d) Drip system	(iv) Grain seeds separated from chaff

(a) $(a)-(iv),(b)-(iii),(c)-(i),(d)-(ii)$

(b) $(a)-(iii),(b)-(ii),(c)-(iv),(d)-(i)$

(c) $(a)-(iii),(b)-(iv),(c)-(ii),(d)-(i)$

(d) $(a)-(ii),(b)-(iv),(c)-(iii),(d)-(i)$

Ans. (c): Harvesting- Cutting of crops after its maturation.
Threshing- Grain seeds separated from chaff.
Crop rotation- Growing different crops alternately.
Drip system- Water falls drop by drop directly near the roots.

42. When human beings inhale oxygen during respiration, which of the following movement does <u>NOT</u> take place?

(a) The air is drawn in through the nostrils
(b) Ribs move out
(c) Diaphragm moves up
(d) Lungs expand

Ans. (c) : When human being inhale oxygen during respiration then following movements occurs–
(1) The air is drawn in through the nostrils
(2) Ribs move out
(3) Diaphragm moves downward towards the abdomen
(4) Lungs expand.

43. Choose the incorrect statement about xylem.

(a) It is a tissue.
(b) It is a pipe-like vessel.
(c) It transports food and nutrient from leaves to other parts.
(d) Transpiration produces suction pull in it.

Ans. (c) : Xylem is a specialized type of vascular tissues (pipe like vessel) created in vascular plants to transport water and nutrients from the roots of plants to the tip of leaves. In it, transpiration produces suction pull.

44. You have made a pinhole camera and you obtain the image of a distance building on its screen. The image formed on the screen is always:

(a) Real, inverted, coloured and highly diminished
(b) Real, erect, coloured and highly diminished
(c) Real, laterally inverted, coloured and diminished
(d) Virtual, erect, coloured and diminished

Ans. (a) : A pinhole camera is a simple camera that does not have any lens but with a tiny aperture effectively light proof box with a small hole in one side. Light from an object passes through the aperture and projects an inverted image on the opposite side of the box, The size of image depends on the distance between the object and the pinhole.
The image formed on screen is always real, inverted, coloured and highly diminished.

45. Select from the following, a metal which reacts with dil. H_2SO_4 but does not react with dil. HCl even on heating.

(a) Calcium (b) Iron
(c) Copper (d) Magnesium

Ans. (c) : Copper does not react with dilute hydrochloric acid (HCl) even on heating but reacts with dilute sulphuric acid (H_2SO_4). Copper has more reduction potential than hydrogen which means that copper is less reactive than hydrogen. Hence it can not displace hydrogen from non oxidizing HCl.

46. Consider the following statements about arteries

1. Arteries are the blood vessels which carry oxygen rich blood from the heart to all parts of the body at a high pressure
2. To ensure that the blood flows only from the heart to other body parts, the arteries have valves
3. The walls of the arteries are comparatively thin

The correct statement is/are

(a) Only 1 (b) Only 2
(c) 1 and 2 (d) 1 and 3

Ans. (a) : Arteries are blood vessels which carry oxygen rich blood from heart to all parts of body at high pressure.

- Usually arteries do not have valves but two arteries originating from right and left ventricles have valves to prevent back flow of blood i.e. to ensure that the blood flows only from the heart to other parts of body.
- Arteries have relatively thick muscular walls because blood pressure in them is high and they must adjust their diameter to maintain blood pressure and to control blood flow.

47. Consider the following characteristics of plants

1. Broad and flat leaves

2. Photosynthesis carried out by stems

3. Roots going very deep

4. Very little loss of water through transpiration

5. Cone shaped plants with sloping branches

The characteristics normally found in desert plants are

(a) 1, 2, 4 and 5 (b) 2, 3 and 4

(c) 1, 3 and 4 (d) 2, 3, 4 and 5

Ans. (b) : Characteristics of Desert Plants:-

- Leaves are very small or reduce to spines and hence they loss very little water through transpiration.
- Their roots grow very deep into the soil for absorbing water.
- In desert plants the leaves are reduced to spines so the process of photosynthesis is carried out by the stem.

Note:- The trees in mountain habitat are usually cone-shaped having sloping branches because of this shape the mountain trees make the rain water and snow slide off easily without damaging the branches and leaves.

48. Consider the following statements

1. In photosynthesis solar energy is converted into chemical energy.

2. In photosynthesis CO_2 and water are used.

3. In photosynthesis CO_2 is released and O_2 is consumed.

4. In photosynthesis O_2 is released and CO_2 is consumed.

5. Photosynthesis takes place both during day and night.

The correct statements are

(a) 1, 2 and 3

(b) 2, 3 and 4

(c) 1, 4 and 5

(d) 1, 2 and 4

Ans. (d) : Photosynthesis is the process in which solar energy is converted to chemical energy in the form of glucose.

- In Photosynthesis solar energy is converted into chemical energy.
- During Photosynthesis in green plants, light energy (solar) is captured and used to convert water, CO_2, and minerals into oxygen and energy-rich compounds like glucose.
- In Photosynthesis CO_2 is consumed and O_2 is released.
- Photosynthesis occur only during the day when there is the sunlight but plant respire through out the day and night.

49. Consider the following statements.

1. The small intestine is highly coiled and shorter than the large intestine.

2. Small intestine receives secretions from the liver and the pancreas.

3. Liver is the largest gland in the body which secretes bile juice.

4. The pancreatic juice acts on vitamins and change them into simpler forms

The correct statements are

(a) 1 and 2 (b) 2 and 3

(c) 4 and 1 (d) 1, 2 and 3

Ans. (b) : The small intestine is highly coiled and longer than the large intestine.

- Small intestine receives secretions from the liver and pancreas.
- Liver is the largest gland in the body which secretes bile juice.
- Pancreatic juice contains digestive enzymes that help to break down of carbohydrates, proteins and lipids in the chyme.

Hence, statement 2, and 3 are correct.

50. Match the items of column I with that of column II

Column I	**Column II**
A. Penicillin	**I. Robert Koch**
B. Small pox vaccine	**II. Gregor Mendel**
C. Fermentation	**III. Louis Pasteur**
D. Bacillus Anthracis	**IV. Alexander Fleming**
	V. Edward Jenner

(a) $A-IV, B-V, C-III, D-I$

(b) $A-IV, B-V, C-II, D-I$

(c) $A-IV, B-II, C-III, D-I$

(d) $A-V, B-IV, C-I, D-III$

Ans. (a):

A. Penicillin - (iv) Alexander fleming
B. Small pox vaccine - (v) Edward Jenner
C. Fermentation - (iii) Louis Pasteur
D. Bacillus Antnracis - (i) Robert Koch.

51. Which of the following statement (s) is/are individually true in respect of both magnetic lines of force and rays of light?

A. They are theoretical constructs.

B. They are visual representations that help in understanding physical phenomena.

(a) Only A (b) A and B
(c) Only B (d) Neither A nor B

Ans. (b) : Magnetic field lines are a visual representation of the invisible lines of for a magnetic field.

Magnetic field lines always begin from the north pole & end at the south pole.

• Both magnetic lines of force & rays of light are hypothetical constructs.

• The light emitted by a small localized source is represented by a collection of rays pointing radially outward from an idealized "point source".

52. Which of the following best explains the concept of cognitive validity of a science curriculum

(a) Focus on hands-on activities in curriculum
(b) Age-appropriateness of curricular materials
(c) Focus on continuous assessment
(d) Respect for constitutional value in curriculum

Ans. (b) : Cognitive validity of a science curriculum requires the content, process, language and pedagogical practices of the curriculum are age appropriate, and within the cognitive reach of the child.

53. Which of the following should be the hall-marks of a science curriculum at upper primary stage as per NCF-2005.

(a) Science should be introduced as separate disciplines like physics, chemistry and biology.
(b) Science content should be regarded as a diluted version of a secondary stage science.
(c) There should be a strict separation between academic and vocational streams.
(d) Scientific concepts should be arrived at mainly from activities and experiments.

Ans. (d) : Hall-marks of a science curriculum at upper primary stage as per NCF-2005 are to Engage learners in learning activities, science fairs, experiments and project work, learners' science congress, co-curricular activities etc to promote curiosity, inquisitiveness & creativity.

54. Which of the following strategies will <u>NOT</u> be helpful in bridging the rural-urban divide in Science Education?

(a) Reflecting rural life- styles in curriculum
(b) Dealing with issues like 'food' in the context of an agrarian economy.
(c) Organising science camps and exhibitions at cluster and block level.
(d) Basing rural school curriculum on relatively simpler concepts.

Ans. (d) : Simpler concept doesn't help out in filling the gap of rural-urban divide instead there should be inclusive curriculum for students in which they learn the same thing/concepts.

55. A teacher along with her class VII students is trying to understand how plants grow. They planted a number of tomato seeds at various depths and at various places in their school garden and took care of them. After some time, they observed that a few seeds began to develop as plants while others died out. The teacher asked the students to use their observations and think of the factors to due to which some seeds could not develop. Which process skill is likely to be developed through this exercise?

(a) Hypothesising (b) Predicting
(c) Classifying (d) Measuring

Ans. (a) : Hypothesising is an empirically testable proportion about some fact, behavior, relationship, or the like, usually based on theory, that states an expected outcome resulting from specific conditions or assumptions. The above mentioned situation depicts the same definition.

56. Read the following paragraph

In 1822, a man named Alexis St. Martin was badly hit by a shot-gun. The bullet had seriously damaged the chest wall and made a hole in his stomach. He was brought to an American army doctor William Beaumont who saved the patient but could not close the hole properly and left it bandaged. He used this as opportunity to see the inside of the stomach to some gain an understanding about the process of digestion?

Which of the following understanding (s) about development of scientific knowledge is conveyed in this paragraph

1. **Science proceeds systematically according to pre-determined steps**
2. **Science requires careful observation and creative response to situations**

(a) Only 1 (b) Only 2
(c) 1 and 2 (d) Neither 1 nor 2

Ans. (b) : According to this appropriate passage, the understanding conveyed about the development of scientific knowledge is that 'Science requires careful observation & creative response to situations'. Scientific knowledge is subject to revision and refinement as new data, or new ways to interpret existing data.

57. Which of the following is NOT a desirable practice in the context of teaching & learning of science?

(a) Examples and insights from other subjects are liberally used wherever required.
(b) Focus should be on getting the right answers from students and not on their incorrect responses.
(c) Free-play and open-investigations should be given due importance.
(d) Local context should be used for enhancing conceptual clarity.

Ans. (b) : Establishing & maintaining classroom environments that are learner centered-indentifying, confronting, and resolving preconceptions, and beginning instruction with what students know are some of the desirable practices of for science teaching.

- Focusing on getting the right or wrong answer is in context of memorization of subjects.

58. A teacher gives the example of flow of water from high pressure in a water tank to low pressure to explain the concept of potential difference to her students. Which pedagogic device is she using?

(a) argumentation
(b) analogy
(c) real artefact
(d) open-ended questioning

Ans. (b) : Teaching with Analogy is a learning model that provides guidelines to build linkages between something is already known and something new to learn or learn abstract concept through other concept that have learned before or daily life context.

59. A teacher is trying to introduce her class VII students to different kinds of soil. She begins by introducing the names of three kinds of soil i.e. sandy soils, clayey soil and loamy soil. She explains the properties of each soil in term of its particulate nature. She then demonstrates one sample of each kind of soil and shows the students the difference in percolation rate of an examples. How would you evaluate this approach from an inquiry oriented perspective?

(a) It is an effective approach that encourage inquiry.
(b) Demonstrating more soil samples would make the approach inquiry-oriented.
(c) It is not an effective approach for encouraging inquiry.
(d) Asking questions in the end would make the approach inquiry- oriented.

Ans. (c) : The given situation is not an effective approach for encouraging inquiry. It is teaching approach in which teacher his giving some particular information to students to learn about soil. It is a demonstration type of teaching.

60. 'A burning candle gets put out after some time of being covered with a glass jar.' Which of the following inference can be drawn from the above observation?

1. **Air is required for the burning of candle.**
2. **Oxygen is required for the burning of candles.**

(a) Only 1
(b) Only 2
(c) Both 1 & 2
(d) Neither 1 nor 2

Ans. (a) : CO_2 molecules are heavier than air. Because of this, they push the oxygen & other molecules in the air out of the way as they sink down over the flame & candle. When oxygen is pushed away from the wick, it can't react with the wax anymore. This makes the flame go out.

Central Teacher Eligibility Test (CTET) 2021
Junior Level (Class VI-VIII)
Solved Paper with Explanation

(Exam Date : 12.01.2022)

1. A rational number lying between $-\frac{5}{6}$ and $\frac{7}{9}$ is

(a) $-\frac{24}{25}$ (b) $-\frac{22}{25}$

(c) $\frac{3}{4}$ (d) $\frac{4}{5}$

Ans. (c): $\frac{-5}{6} = -0.83$

$\frac{7}{9} = 0.77$

By options –

(a) $\frac{-24}{25} = -0.96$

(b) $\frac{-22}{25} = -0.88$

(c) $\frac{3}{4} = 0.75$

(d) $\frac{4}{5} = 0.8$

So, $\text{number}\,\frac{3}{4}\,\text{lies between}\,\frac{-5}{6}\,\text{and}\,\frac{7}{9}$

2. Which of the following is correct?

(a) If a^2 ends in 9, then a^3 ends in 7

(b) $\sqrt{0.9} = 0.3$

(c) The square of a prime number can be an even number

(d) If a^2 ends in 5, then a^3 ends in 25

Ans. (c): Now, prime number are 2, 3, 5, 7, 11

For Example,

$2^2 = 4$

Hence the square of a prime number can be even number

Thus 2 is the only prime number whose square is an even number.

3. The value of $[(2^{-1} \times 5^{-1}) \div 8^{-1}] \div [4^{-1} + 8^{-1}]^{-1}$ is.

(a) 24 (b) 30

(c) 40 (d) 48

Ans. (*): $\left[\left(2^{-1}\times 5^{-1}\right)\div 8^{-1}\right]\div\left[4^{-1}+8^{-1}\right]^{-1}$

$\frac{\left[\left(\frac{1}{2}\times\frac{1}{5}\right)\right]}{1/8}\div\left[\frac{1}{4}+\frac{1}{8}\right]^{-1}$

$\frac{8}{10}\div\left[\frac{2+1}{8}\right]^{-1}$

$\frac{8}{10}\div\left[\frac{3}{8}\right]^{-1}$

$= \frac{3}{10}$

Note:- The answere to this question has been considered as (b) by the commission.

4. If $\frac{\sqrt{675}}{\sqrt{9408}} = \frac{a}{b}$ then

Which of the following can be a value of (a + b)?

(a) 71 (b) 73

(c) 75 (d) 78

Ans. (a):

Given,

$\frac{\sqrt{675}}{\sqrt{9408}} = \frac{a}{b}$

$\sqrt{675} = \sqrt{5\times5\times3\times3\times3}$

$= 5\times3\sqrt{3}$

$= 15\sqrt{3}$

$\sqrt{9408} = \sqrt{2^6\times3\times7\times7}$

$= 56\sqrt{3}$

So, $\frac{15\sqrt{3}}{56\sqrt{3}} = \frac{a}{b}$

$\frac{15}{56} = \frac{a}{b}$

Hence, possible values of a & b can be,

a = 15, b = 56

Thus, value of (a + b) = 15 + 56 = 71

5. If $106480 = a^4 \times b \times c^3$

Where a, b and c are prime numbers then what is the value of (3a + 2b – c)?

(a) 3 (b) 4
(c) 5 (d) 6

Ans. (c) :

$\because$ $106480 = 2 \times 2 \times 2 \times 2 \times 5 \times 11 \times 11 \times 11$

$= (2)^4 \times 5 \times (11)^3$

$106480 = a^4 \times b \times c^3$ ..... (i)

$106480 = (2)^4 \times 5 \times (11)^3$ ..... (ii)

On comparing eq. (i) and (ii)

$a = 2 \quad b = 5 \quad c = 11$

$\therefore 3a + 2b - C$

$= 3 \times 2 + 2 \times 5 - 11$

$= 6 + 10 - 11$

$= 16 - 11$

$= 5$

6. If $9x^2 + 16y^2 = \frac{73}{4}$ and $xy = -\frac{1}{2}$ then one of the values of (3x + 4y) is

(a) $\frac{5}{2}$ (b) $\frac{3}{2}$

(c) $\frac{5}{8}$ (d) $\frac{3}{4}$

Ans. (a): $9x^2 + 16y^2 = \frac{73}{4}$ ————(i)

$xy = \frac{-1}{2}$ ————(ii)

$(3x + 4y)^2 = 9x^2 + 16y^2 + 2 \times 3x \times 4y$

$(3x + 4y)^2 = \frac{73}{4} + 24xy$

$(3x + 4y)^2 = \frac{73}{4} - 24 \times \frac{1}{2}$

$(3x + 4y)^2 = \frac{73 - 48}{4}$

$(3x + 4y)^2 = \frac{25}{4}$

$\boxed{(3x + 4y) = \frac{5}{2}}$

7. One factor common to $x^2 - 3x - 40$, $x^2 + 13x + 40$ and $x^2 + x - 20$ is

(a) x – 4 (b) x + 4

(c) x – 5 (d) x + 5

Ans. (d):

$x^2 - 3x - 40$	$x^2 + 13x + 40$	$x^2 + x - 20$
$x^2 - 8x + 5x - 40$	$x^2 + 8x + 5x + 40$	$x^2 + 5x - 4x - 20$
$x(x-8) + 5(x-8)$	$x(x+8) + 5(x+8)$	$x(x+5) - 4(x+5)$
$(x-8)(x+5)$	$(x+5)(x+8)$	$(x+5)(x-4)$

Hence from the above it is clear that (x + 5) is common factor.

8. The numerical coefficient of x in the product of the expressions (x – 5) and (y + 7) is

(a) –5 (b) 5

(c) –7 (d) 7

Ans. (d):

$(x - 5) \times (y + 7)$

$(xy + 7x - 5y - 35)$

$\therefore$ Numerical coefficient of x is 7.

9. The market price of an article is ₹ 625. A shopkeeper sells it by allowing 10% discount on its marked price.

If he gains 25% profit, then the cost price of the article is

(a) ₹ 350 (b) ₹ 375

(c) ₹ 400 (d) ₹ 450

Ans. (d):

Marked Price (MP) = ₹ 625

Discount (D) = 10%

Selling Price (SP) = Market Price (MP) $\left(\frac{100 - \text{Discount}}{100}\right)$

$= 625 \times \left(\frac{100 - 10}{100}\right)$

$= 625 \times 0.9$

Cost Price (CP) $= \frac{100 \times \text{Selling Price}}{100 + \text{gain}\,\%}$

$= \frac{100 \times 625 \times 0.9}{100 + 25}$

$= ₹450$

10. The value of y which satisfies the equation $\frac{3 - 5y}{23} = (y + 1) - (2y + 4)$, also satisfies which of the following equations?

(a) 2y + 3 = 1 – y (b) 2y – 3 = y – 1

(c) 3y + 4 = y – 4 (d) 3y – 4 = y + 1

Ans. (c): $\frac{3 - 5y}{23} = (y + 1) - (2y + 4)$

$\frac{3 - 5y}{23} = y + 1 - 2y - 4$

$\frac{3 - 5y}{23} = -y - 3$

$3 - 5y = -23y - 69$

$18y = -72$

$\boxed{y = -4}$

Now from Options:

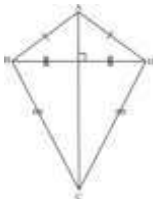
(a)	(b)	(c)	(d)
$2y+3=1-y$	$2y-3=y-1$	$3y+4=y-4$	$3y-4=y+1$
$3y=-2$	$y=-1+3$	$2y=-8$	$2y=5$
$y=-2/3$	$y=2$	$\boxed{y=-4}$	$\boxed{y=5/2}$

Hence option (c) is correct.

11. In quadrilateral ABCD,
AB = AD and DC = BC.
Which of the following is true for the quadrilateral ABCD?

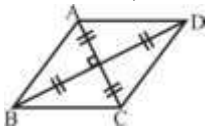
(a) Diagonals bisect each other.
(b) Diagonals bisect each other at right angles.
(c) Diagonals are perpendicular to each other.
(d) Diagonals are perpendicular to each other and are equal.

Ans. (c): Given, AB = AD, DC = BC
For Kite (quadrilateral) –



In quadrilateral ABCD, AB = AD & DC = BC
So following conclusion can be drawn,
(i) Diagonals AC & BD cannot bisect each other.
(ii) Diagonals are perpendicular to each other
(iii) Diagonals are not equal to each other.
(iv) Longer diagonal bisects the shorter one.
Types of Quadrilaterals –
1. Trapezium
2. Parallelogram
3. Squares
4. Rectangle
5. Rhombus
6. Kite

For Rhombus (Quadrilateral)–



- Has two diagonals
- Diagonals are perpendicular
- Diagonals bisect each other

12. Out of a pair of complementary angles, one is two-third of the other. What is the supplement of the smaller angle?

(a) 126° (b) 135°
(c) 144° (d) 153°

Ans. (c): Let one angle is x

According to complementary angles, $x+\frac{2}{3}x=90°$

$$\frac{5x}{3}=90^\circ$$

$$x=54^\circ$$

Smaller angle $=\frac{2}{3}x=\frac{2}{3}\times 54^\circ=36^\circ$

supplement of the 36° is $=180^\circ-36^\circ$

$=144^\circ$

13. Which of the following letters have rotational symmetry but no linear symmetry?

(a) M (b) N
(c) O (d) X

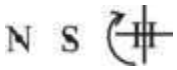
Ans. (b): Line or Linear Symmetry : Line symmetry is usually named by the line where you would put a mirror showing how the two sides of the shapes are reflections of each other.
For example –

 ⇒ Vertical line symmetry

 ⇒ Horizontal line symmetry

 ⇒ Both Vertical and Horizontal line symmetry

Rotational Symmetry – Rotational symmetry is when you have a shape that if you turn it you get the same thing.
The most common kind of rotational symmetry is half-turn symmetry.
For example

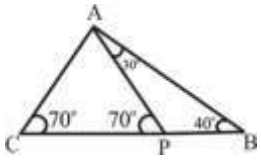


Rotate these letters in upside direction you will get the same.
'O' has rotational symmetry but it also has linear symmetry and 'N' has only rotational symmetry.

14. ABC is a triangle in which ∠C = 70°. If P is a point on side BC such that AP = AC and ∠BAP = 30°, then ∠B is equal to

(a) 70° (b) 60°
(c) 50° (d) 40°

Ans. (d):



Given
$\angle C = 70^\circ$
AP = AC

$\angle BAP = 30^o$

$\because$ AC = AP (given)

So, $\angle APC = 70^o$

$\angle APC = \angle PAB + \angle PBA$

(The exterior angle theorem states that the measure of an exterior angle is equal to sum of the measures of two interior angles of triangle)

$70^\circ = 30^\circ + \angle PBA$

$\boxed{\angle PBA = 40^\circ}$

15. ABC and DEF are two triangles such that AB = 5cm. BC = 6cm. AC = 4cm. DE = 6cm. EF = 4cm and DF = 5cm. Then, which of the following is true.

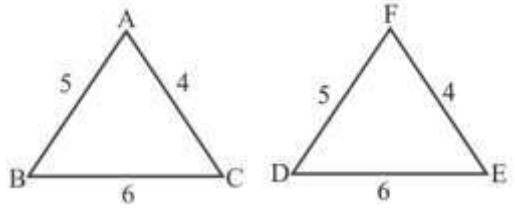
(a) $\Delta ABC \cong \Delta EDF$ (b) $\Delta ABC \cong \Delta DEF$

(c) $\Delta ABC \cong \Delta DEF$ (d) $\Delta ABC \cong \Delta FDE$

Ans. (d): Given

AB = 5cm BC = 6cm AC = 4cm

DE = 6cm EF = 4cm DF = 5cm



So, $\Delta ABC \cong \Delta FDE$

16. The base and the corresponding altitude of triangle are in the ratio 5:3 If its area is 120cm^2, then the altitude is

(a) 9 cm. (b) 12 cm.

(c) 15 cm. (d) 21 cm.

Ans. (b): Given, $\frac{b}{a} = \frac{5}{3}$

Let the base and altitude of triangle are 5x and 3x respectively.

Area = 120 cm^2

We know that,

Area of triangle = $\frac{1}{2} \times a$

$120 = \frac{1}{2} \times 5x \times 3x$

$240 = 15x^2$

$x^2 = 16$

$x = 4$

Hence the altitude (h) = 3x = 3 × 4 = 12 cm

17. The area of a trapezium is 2275 cm^2 and the distance between its parallel sides is 35 cm. if the parallel sides of trapezium are in the ratio 5:8, then the longer side among the parallel sides is:

(a) 64 cm. (b) 72 cm.

(c) 80 cm. (d) 88 cm.

Ans. (c): Lets parallel sides of trapezium = be 5x and 8x

Area of trapezium = $\frac{1}{2} \times$(summation of parallel side) × height

$2275 = \frac{1}{2} \times (5x + 8x) \times 35$

$2275 \times 2 = 13x \times 35$

$\boxed{x = 10}$

Longer side = 8x = 8 × 10 = 80 cm.

18. The capacity of a cylindrical tank is $\frac{1760}{7}$ m^3. If its depth is 3.2m, then what is the perimeter of its base? (Take $\pi = \frac{22}{7}$)

(a) 30 m (b) 35 m

(c) $\frac{230}{7}$ m (d) $\frac{220}{7}$ m

Ans. (d): Given, Capacity of cylindrical tank

$= \frac{1760}{7} m^3$

Volume of cylindrical tank = Capacity of cylindrical tank

$\pi r^2 h = \frac{1760}{7}$

$\frac{22}{7} \times r^2 \times 3.2 = \frac{1760}{7}$

$r^2 = 25$

$\boxed{r = 5}$

Hence perimeter of its base = 2πr

$= 2 \times \frac{22}{7} \times 5 = \frac{220}{7} m.$

19. A box contains balls bearing numbers 33, 34, 35, 36 ……, 58 59, one number on one ball. A ball is drawn at random from the box. What is the probability that the number on the ball drawn is a prime number?

(a) $\frac{2}{9}$ (b) $\frac{7}{27}$

(c) $\frac{1}{5}$ (d) $\frac{1}{3}$

Ans. (a): 33, 34, 35, 36 .....58, 59

Total number of elementary events = 27

Number on the ball drawn is prime number = 37, 41, 43, 47, 53, 59

Favorable number of elementary event = 6

Probability(P) (Number on the ball drawn is prime number)

$$= \frac{\text{Favourable number of elementary event}}{\text{Total number of elementary event}}$$

$$= \frac{6}{27} = \frac{2}{9}$$

20. If x, y and z are the median, mode and range, respectively of the data:
7, 5, 11, 2, 3, 20, 16, 23, 29, 23,
Then what is the value of (4x + y –z)?

(a) 47 (b) 50
(c) 53 (d) 60

Ans. (b): Data given 7, 5, 11, 2, 3, 20, 16, 23, 29, 23

At first put the numbers in order from least to greatest

2, 3, 5, 7, 11, 16, 20, 23, 23, 29

n = Total number = 10

n is even so median =

$$x = \frac{\left(\frac{x}{2}\right)^{th}\text{ term} + \left(\frac{x}{2}+1\right)^{th}\text{ term}}{2}$$

$$x = \frac{\left(\frac{10}{2}\right)^{th}\text{ term} + \left(\frac{10}{2}+1\right)^{th}\text{ term}}{2}$$

$$x = \frac{5^{th}\text{ term} + 6^{th}\text{ term}}{2}$$

$$x = \frac{11+16}{2}$$

$$x = \frac{27}{2}$$

Mode– Mode value is that observation which occurs at the maximum time or appears most often in a given set of data.

2, 3, 5, 7, 11, 16, 20, 23, 23, 29

From data we see that the number, occurs most often is 23.

So, Mode (y) = 23

Range– Difference between highest and lowest number, So,

Range (z) = 29 – 2
= 27

The value of = (4x + y – z)

$$= \left(4 \times \frac{27}{2} + 23 - 27\right)$$

= (54 + 23 – 27)
= (77 – 27)
= 50

21. According to National Curriculum Framework 2005 the place of mathematics education in the curricular framework is positional on twin concerns. These are:

(a) What mathematics education can do to engage the mind of every student and how it can strengthen the student's resources.
(b) What mathematics education can do to improve communication skills of every child and how it can make them employable.
(c) What mathematics education can do to control the dropout rate of children and how it can improve their scores.
(d) What mathematics education can do to prepare students for Olympiads and how it can help to choose right subject stream in higher classes.

Ans. (a): National Curriculum Frame work (NCF) 2005. Provides a guideline with which teachers and schools can choose and plan experiences that they think children should have.

NCF-2005 emphasizes that mathematics should be mandatory for every child and engaging every learners with a sense of success, while the same time offering conceptual challenges to the emerging mathematician.

Hence, according to NCF-2005, option (a) is correct.

22. Which of the following measures of central tendency is affected by the extremely large and extremely small values in the data?

(a) Mean (b) Harmonic Mean
(c) Median (d) Mode

Ans. (a): The mean is the measure of central tendency most likely to be affected by an extreme value.

Mean is the only measure of central tendency which depends on all the value as it derived from the sum of the values divided by the number of observation.

23. Consider the following questions:

(A). Five wheel rotations on a bike takes you 12 yards. How many wheel rotations will be required to go 60 yards?

(B). In a college, 5 out of every 8 seniors live in apartments. Out of 30 seniors how many are likely to live in apartment?

(C). John and Lisa were walking at the same speed. Lisa started first. When Lisa has walked 6 blocks. John has walked 2 blocks. How many blocks would John cover when Lisa has covered 12 blocks.

Choose the correct option.

(a) Question (A) requires proportional thinking while (B) is an example of a question on probability.

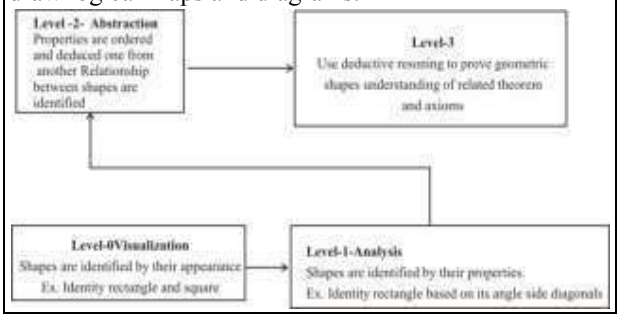
(b) Both questions (A) and (B) are an example of questions based on proportional thinking.
(c) Both questions (A) and (C) are an example of questions based on proportional thinking.
(d) Only question (C) is an example of question based on proportional thinking.

Ans. (b): Proportional reasoning involves thinking about relationship and making comparisons of quantities or values.
Both questions (A) and (B) are an example of questions based on proportional thinking.

24. A middle school mathematics teacher has completed the topic on types of quadrilaterals and their properties'. While summarizing the key points, one of her students responded, 'A square is both a rhombus and a rectangle'. The student is at which stage of geometric reasoning as per Van Hiele's theory of geometrical development?
(a) Level 2 (Relationships)
(b) Level 0 (Recognition)
(c) Level 1 (Analysis)
(d) Level 3 (Deduction)

Ans. (a): According to Van Hiele Theory – The theory has three aspects : the existence of levels, the properties of the levels, and the progress from one level to the next level.
Van – Hiele levels –
1. Level 0 (Visualisation or Recogniation)
2. Level 1 (Analysis)
3. Level 2 (Abstraction)
4. Level 3 (Deduction)
5. Level 4 (Rigor)

The question's statement follow the Level 2 (Abstraction or relationship), it says "pupils or students perceive relationship between properties and figures. They create meanigful definitions. They are able to give simple arguments to justify their reasoning. They can draw logical maps and diagrams.



25. Ms. Sushma is introducing the concept of "squares" (square numbers). She has planned three learning activities:
I. Give students 5 square tiles and ask if a square can be formed
II. Write square numbers on the blackboard and encouraging students to relate it to the other concepts that they have learnt before
III. Visually represent square numbers using squares of various dimensions
Help her order these activities in the BEST sequence to build the concept well.
(a) I, II, III (b) II, I, III
(c) I, III, II (d) III, II, I

Ans. (c): The best sequence to build concept well,
I, III, II

26. Which of the following is the <u>LEAST</u> effective way of developing algebraic thinking among learners?
(a) Exploring numerical situations, rather than just computing.
(b) Encouraging students to make their own generalizations.
(c) Solving linear equations in one variable and two variables.
(d) Asking the students to decide whether the following conjecture. "If we multiply any whole number by 2, the answer will be an even number" is true or false?

Ans. (c): Algebraic Reasoning introduced in the early grades develops into the ability to reason proficiently using equation, variables and function. Developing algebraic reasoning requires that teacher design mathematical tasks that include opportunities for, using problem-solving strategies.
In the four statements, the least effective way of developing algebraic thinking is solving linear equation in one variable and two variable.

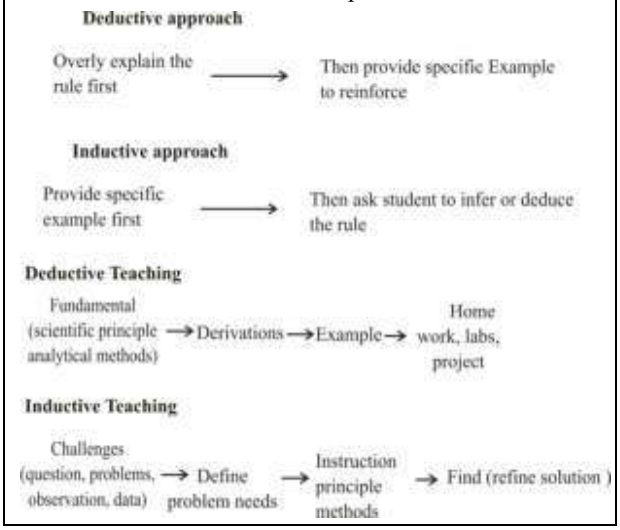
27. A middle school mathematics teacher poses the following situations to her students:
(a) I doubt that it will rain today.
(b) There is a 50-50 chance of India winning the toss in today's match.
(c) Chances are high that the prices of petrol will go down.
This type of discussion will be helpful to:
(a) Introduce the concept of estimation.
(b) Introduce the concept of probability.
(c) Introduce the concept of data handling.
(d) Enhance creative thinking in students.

Ans. (b): Concept of probability– A probability is a measure of the likelihood that a particular event will occur.
All the above statement based on the concept of probability.

28. To find the value of exponential number operation like $a^x \times a^y$ etc, the teacher first writes all the formulae on the black board and then instructs the students to solve many examples based on the formulae. This is an example of
(a) Inductive method of teaching
(b) Deductive method of teaching
(c) Scientific method of teaching
(d) Child centered method of teaching

Ans. (b): An inductive method of teaching and learning involves discovering new things by observation.

A deductive approach teacher taught the rules first, then the rules are used in examples and activities.



29. Ms. Sarita brought a dart board having concentric circles along with darts arrows, to her class. Which of the following is LEAST suited to be taught using this?

(a) Bar graph (b) Percentages
(c) Similarity of shapes (d) Probability

Ans. (b): Percentage topic is least suited to be taught using this.

30. In Mathematics Geogebra is:

(a) An interactive software for teaching geometry, algebra, statistics and calculus
(b) Software for geo-board related activities
(c) A software that helps to arrange large amount of data in spreadsheets and is used extensively by researchers
(d) It is a static software used by teachers for demonstrating various formal proofs in geometry and algebra.

Ans. (a): Geo-Gebra is an interactive software for teaching geometry, algebra, statistics and calculus application, intended for learning and teaching mathematics and science from primary school to university level.

Geo-Gebra helps the users to create activities incorporating multiple representations of mathematical concepts that are dynamically linked.

31. Which of the following is a pair of Rabi crops?

(a) Wheat, Mustard (b) Mustard, Paddy
(c) Paddy, Peas (d) Peas, Maize

Ans. (a): Rabi crops–Those that are sown around the retreating monsoon season which begins by October are called rabi or winter crops.

Rabi crops sown in October-November and harvested in April-May.

Major Rabi crops-are wheat, gram, peas, barley etc.

Kharif crops–Crops that are sown during the southwest monsoon season are called kharif or monsoon crops.

Kharif crops sown in June-July when rain first begin and harvested in September –October.

Rice, maize, pulses such as urad, moong dal, and millets are the key kharif crops.

Zaid crops –Grown between March-June between Rabi and Kharif crop seasons.

It is an early maturing crops.

Examples–Cucumber, Bitter Gourd, Pumpkin, Watermelon, Muskmelon, Moong Dal etc.

32. Read the statements and choose the correct option

Assertion (A): Taking boiled drinking water is an effective preventive measure against Hepatitis A

Reasoning (R): Hepatitis A is a bacterial disease which is primarily transmitted through water.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) A is true but R is false.
(d) R is true but A is false.

Ans. (c): Hepatitis A is an inflammation of the liver that can cause mild to severe illness. Hepatitis- A is a viral disease. This virus is transmitted through ingestion of contaminated food and water or through direct contact with an infectious person. Taking boiled drinking water is an effective preventive measure against Hepatitis A.

- The best way to prevent hepatitis A is through vaccination with hepatitis A vaccine. So, (A) is true but (R) is false.

33. An element 'X' reacts with oxygen to produce an oxide whose solution turns blue litmus red. Which of the following could be X.

(a) Sodium (b) Sulphur
(c) Helium (d) Copper

Ans. (b): Sulphur di-oxide (SO_2) solution is acidic in nature (Non-metallic oxides are acidic in nature). Hence, their solution will change the colour of blue litmus to red. Sodium oxide dissolves in water and forms an alkali, sodium hydroxide that turns red litmus to blue.

Note: Official answer is given by commission option (a).

34. Under which of the following conditions will the speed of sound in air be maximum?

(a) In dry air at 0°C (b) In moist air at 0°C

(c) In dry air at 20°C (d) In moist air at 40°C

Ans. (d): The speed of sound v is related with temperature T by following relation $v \propto \sqrt{T}$ it shows that speed of sound increases with temperature so speed will higher at 40^{o}C.

• The speed of sound v is related with density (ρ) of air by following relation

$$v \propto \frac{1}{\sqrt{\rho}}$$

It shows that speed of sound decrease with density of medium and vice versa, Humid air, the amount of water vapours increases and presence of water vapour reduces the density of air. Therefore speed will be higher in humid air than dry air.

35. Which of the following groups ALWAYS forms a virtual image of an object?

(a) Convex lens. Convex mirror, Plane mirror

(b) Convex mirror, Concave lens, Plane mirror

(c) Concave mirror, Convex lens, concave lens

(d) Convex mirror, Concave mirror, Plane mirror

Ans. (b): Convex mirror, concave lenses and plane mirror always forms a virtual image.

36. Which of the following is true of a book lying at rest on a table?

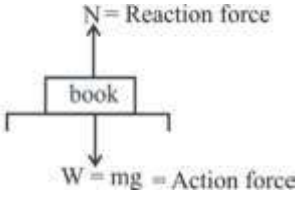
(a) Static friction is the only force acting on it

(b) Gravitational force is the only force acting on it.

(c) No force is acting on it.

(d) A pair of balanced forces is acting on it.

Ans. (d): Due to the gravitational force of the earth, the weight of the book act downwards direction on the table. similarly, a force equal to the weight of the book is applied on the book by the flat surface of the table. Due to this book remains stable on the flat surface of the table. So we can say that



A pair of balanced forces is acting on it.

37. Which of the following is purest form of carbon?

(a) Coke (b) Coal tar

(c) Coal gas (d) Charcoal

Ans. (a): Coke is a high carbon (90%) product obtained by the destructive distillation of coal. The amount of carbon content in coke is so high that it is said to be an almost pure form of carbon.

38. Which of the following is a group of single-celled organisms?

(a) Yeast, hydra, amoeba.

(b) Sea anemone, paramecium, bacteria.

(c) Yeast, amoeba, bacteria.

(d) Hydra, sea anemone, paramecium.

Ans. (c): Cellular organisms falls into two general categories, prokaryotic organisms and eukaryotic organisms. All prokaryotes are unicellular and are classified into bacteria and archaea.

Example of single – celled organisms → yeast, amoeba bacteria.

39. A family travelled from Delhi to Jaipur by car. The odometer of their car read 4157km at the start of the trip and 4436km at the end of the trip. If it took them 5 hours 10 minutes to complete this journey, what was the average speed?

(a) 48 km/h (b) 52 km/h

(c) 54 km/h (d) 60 km/h

Ans. (c): Average speed = $\frac{\text{Distance}}{\text{Time}}$

Time = 5 hours 10 min

$= 5 \text{ hrs} + \frac{10}{60} \text{ hrs}$

$= \frac{31}{6} \text{hrs}$

Distance = 4436 – 4157

= 279

Average speed = $\frac{279}{\frac{31}{6}}$

$= 54 \frac{\text{km}}{\text{hrs}}$

40. Which of the following phenomena can be attributed to rotation of earth?

A. Deviation of wind direction from exact north-south direction

B. Formation of day and night

C. Formation of seasons

D. Formation of eclipses

(a) A and B (b) B and D

(c) A and C (d) C and D

Ans. (a): As the earth spins on its axis, producing night and day. It also moves about the sun in an elliptical (elongated circle) orbit that requires about 365 days to complete. The earth's spin axis is tilted with respect to its orbital plane. This is what causes the seasons.

- Deviation of wind direction from exact north-South direction by earth rotation on its axis. This deviation of wind flows due to earth's rotation is called the coriolis effect.
- An eclipse is formed when a celestial body is obscured by another. We know that eclipse occur when sun, moon and earth align in a straight line. The solar eclipse occurs when the moon comes in between the sun and the earth. So, A and B are correct.

41. A flower (rose) appears red in sunlight. Which colour would it appear in green light?

(a) Red (b) Black
(c) Green (d) Yellow

Ans. (b): A red rose appears red in white light because it absorbs all colors except red.
When a red rose comes in contact with green light, the rose absorbs the light of all colour and does not reflect light of any colour and appears black.
So, if you look a red flower (rose) in green light, it will look black.

42. What would happen respectively to the boiling and freezing points of water if salt is added to it?

(a) Both will increase
(b) Boiling point will increase but the freezing point will decrease
(c) Freezing point will increase but the boiling point will decrease
(d) Both will decrease

Ans. (b): Boiling and freezing points of water is colligative properties. The properties which depend on the number of the solute particle relative to total number of particles present in the solution is called colligative properties. The more salt added to water, the more you raise the boiling point. Freezing point depression is another colligative property that work same way. If we, add salt to water, you lower its freezing point as well as raise its boiling point.

43. Which of the following organs is NOT found in birds?

(a) Urinary – bladder (b) Intestine
(c) Liver (d) Kidney

Ans. (a): Following organs are absent in birds
(a) Gall bladder
(b) Urinary bladder
(c) Teeth
Birds lack a urinary bladder because the waste product mostly contains uric acid that is, they are uricotelic and excrete the waste along with the feces.

44. Most plants obtain nitrogen from soil in the following form

(a) Free nitrogen (b) Nitric acid
(c) Ammonia (d) Nitrates

Ans. (d): Most abundant gas in the atmosphere is nitrogen, but it is in very stable form and cannot be used by plants directly. Most of the plant absorb nitrogen from the soil as nitrates and then internally convert it to nitrite and ammonium forms. The process of conversion of nitrate to ammonium form in plant is called nitrate assimilation.

45. You are in a room whose geographical directions are not known to you. You are provided with 10 bar magnets. One pole of one of the magnets has been labeled for you. What is the minimum number of the labeled poles that you now require in order to be able to identify both the poles of all 10 magnets?

(a) None (b) One
(c) Two (d) Three

Ans. (a): If one pole of one of the magnets has been labeled, so the other side of that magnet must opposite of the labeled pole (either N or S). The remaining magnet's poles are identified by the attracting or repulsing properties of labeled magnets. (Opposite poles attract and similar poles repel to each other.) So, the labeled poles that you now require in order to be able to identify both the pole of all 10 magnets are zero.

46. Match the name of the acid given in column I with the corresponding food items in which they are found given in Column II

I	II
(a) Acetic acid	**(i)** Spinach
(b) Lactic acid	**(ii)** Lemons
(c) Oxalic acid	**(iii)** Curd
(d) Citric acid	**(iv)** Vinegar

(a) (a) – (iii); (b) – (i); (c) – (iv); (d) – (ii)
(b) (a) – (ii); (b) – (iii); (c) – (iv); (d) – (i)
(c) (a) – (iv); (b) – (i); (c) – (iii); (d) – (ii)
(d) (a) – (iv); (b) – (iii); (c) – (i); (d) – (ii)

Ans. (d):

I	II
(a) Acetic Acid	(iv) Vinegar
(b) Lactic Acid	(iii) Curd
(c) Oxalic Acid	(i) Spinach
(d) Citric Acid	(ii) Lemons

47. Which of the following substances is NOT used as a fertilizer?

(a) Ammonium Sulphate
(b) Potassium Nitrate
(c) Calcium Superphosphate
(d) Calcium Carbonate

Ans. (d): Ammonium Sulphate ($(NH_4)_2 \cdot SO_4$) is an inorganic compound with a number of commercial uses. The most common use is as a soil fertilizer since the chemical contains 21% (w/w) nitrogen and 24% (w/w) sulphur.

- Potassium nitrate (KNO_3) is a soluble source of two major essential plant nutrients. It is commonly used as fertilizer for high–volume crops that benefit from nitrate (NO_3) nutrition and a source of potassium free of chloride.
- Superphosphate is the first chemical fertilizer, calcium super phosphate is considered to be an uncomplicated fertilizer whose main component is phosphorus.
- Calcium carbonate ($CaCO_3$) does not used as a fertilizer. It is used as antacids by humans.

48. Which of the following states of India is most likely to be hit by a cyclone?

(a) Haryana (b) Madhya Pradesh
(c) Andhra Pradesh (d) UttaraKhand

Ans. (c): Four states (Tamil Nadu, Andhra Pradesh, Orissa and West Bengal) and one UT (Puducherry) one the east coast and one state (Gujrat) on the west coast are more vulnerable to cyclone hazards.

49. Which of the following pairs of organisms reproduce by budding?

(a) Hydra, Amoeba
(b) Amoeba, Paramecium
(c) Yeast, Hydra.
(d) Paramecium, Yeast

Ans. (c): Budding is a mode of asexual reproduction seen in Hydra and yeast. First a bud begins to form on the tubular parent body. The bud then develops a mouth and tentacles and detaches from its parent. The new Hydra is fully developed and will find a substrate for its attachment.

50. Which of the following metals can displace the rest from their salt solutions?

(a) Copper (b) Iron
(c) Silver (d) Zinc

Ans. (d): The reactivity series follows the order Al > Zn > Fe > Sn > Pb > Cu > Ag.
Aluminium metal is most reactive but from the given option Zinc (Zn) is more reactive from other three, so it can displace the rest from their salt solutions.

51. Ms. Priya wants to show students the relationship between vibrations and sound. Which of the following activities is MOST aligned with this lesson objective?

(a) Tapping a table and hearing the sound
(b) Plucking an elastic band and seeing the vibrations.
(c) Throwing a pebble in water and observing it
(d) Feeling the vibrations in your throat while speaking

Ans. (d): We can feel that speaking involves vibration. Vocal cards are stretchy flaps of skin in our throat that vibrate to make a sound. In order to speak we move air post our vocal cards must be in good shape for speech to sound clear and loud. This objective is most aligned to show the relationship between vibration and sound.

52. Your students have just entered grade 8. If students have largely mastered the concepts taught till grade 7 as per NCERT, which of the following will they most likely NOT be able to describe?

(a) Separation of fibers from cotton seeds
(b) Processing of synthetic fiber into different articles
(c) Processing of natural fibers into wool
(d) Process of rearing silkworms under laboratory conditions

Ans. (b): Most likely they will not be able to describe the processing of synthetic fiber into different articles.

53. Ms. Shilpa wanted to introduce the concept of 'lateral inversion' through an activity.
Which of the following activities will be MOST suitable for the purpose?

(a) Writing a word on a paper rotating it by 180 degrees.
(b) Reading a textbook using a mirror.
(c) Observing yourself in the mirror
(d) Showing the letter A on a mirror

Ans. (a): Lateral inversion is the real or apparent several of left and right. When the image of an object is erect but is inverted in the lateral side, it is called lateral inversion. In this context, Ms. Shilpa wanted to introduce the concept of 'lateral inversion' through an activity. Writing a word on a paper rotating it by 180 degrees will be MOST suitable for the purpose.

54. Which of the following best describes an open-ended question?

(a) Which type of bones is a human wrist made up of?
(b) Do all animals have bones?
(c) How do different animals move from one place to another?
(d) How is a pivot joint different from a hinge joint?

Ans. (c): Open–ended questions are broad and can be answered in detail. While closed-ended question are narrow in focus and usually answered with single word or a pick from limited multiple choice option.

55. Which of the following questions is BEST suited to develop deductive reasoning in students?

(a) Why does the diaphragm contract during inhalation?
(b) How are spiracles and tracheae comparable to nostrils?
(c) Plant is a living organism. Do plants respire?
(d) What will happen if food accidentally enters the trachea?

Ans. (c): Deductive reasoning is the process of inferring conclusions from known information (premises) based on formal logic rules, where conclusions are necessarily derived from the given information and there is no need to validate them by experiments.
Hence, example "Plant is a living organism. Do plants respire?" is best suited for developing deductive reasoning.

56. Which of the following is the MOST appropriate instructional aid for a teacher to INTRODUCE the concept of sedimentation?

(a) A filter paper
(b) Mixture of oil and water
(c) Dropping a stone in a glass of water
(d) A glass of muddy water

Ans. (d): The process of particles settling to the bottom of a body of water, is called sedimentation. Sedimentation is a process by which heavier impurities present in liquid normally water settle down at the bottom of the containers containing the mixture.
A glass of muddy water is most appropriate instructional aid for a teacher to introduce the concept of sedimentation.

57. Which of the following is BEST suited to be taught using a simulation software?

(a) Observing the distance travelled by a ball before coming to a halt on an uneven surface
(b) Effect of weighing different objects using a spring balance
(c) Effect of pushing chairs with and without rollers
(d) Observing the trajectory of a ball projected from a height

Ans. (d): Simulation software is based on the process of modeling a real phenomenon with a set of mathematical formulas. It is, essentially, a program that allows the user to observe an operation through simulation without actually performing that operation.
'Observing the trajectory of a ball projected from a height' is the best suited example to be taught using a simulation, software.

58. A 'hook' activity is the one which makes use of students' existing knowledge and generates interest. Which of the following would be the BEST "hook" for Ms. Saloni to use while introducing the topic of photosynthesis?

(a) What will happen if leaves are removed from plants?
(b) What are the different source of nutrients for autotrophs and heterotrophs?
(c) What are the factors required for photosynthesis?
(d) Have you seen plants that have non- green leaves?

Ans. (a): 'What will happen if leave are removal from plants' is the best hook for Ms. Saloni to use while introducing the topic of photosynthesis.

59. One of the students in the class said that the soil does not contain any moisture.
Which of the following remedial actions would be BEST suited to clarify this misconception?

(a) Placing a soil sample on a wooden plank.
(b) Comparing the weights of a soil sample before and after drying under sunlight.
(c) Collecting and examining a soil sample after rain.
(d) Mixing water and soil in a beaker followed by drying under sunlight.

Ans. (b): Soil does not contain any moisture this is misconception. Comparing the weight of soil sample before and after drying under sunlight is best suited to clarify this misconception.

60. Mr. Rakesh has taught the concept of chemical changes in his class. Which one of the following is the BEST example of an authentic task' which he can use to assess student?

(a) Asking students to burn a magnesium ribbon and observe the changes.
(b) Create a set up to pass gas through lime water:
(c) Make a protective solution that prevents rusting of iron.
(d) Create a cooling chamber that can maintain low temperatures for chemical changes.

Ans. (c): Make a protective solution that prevents rusting of iron is best example of an authentic task to understand the concept of chemical changes in his class.

Central Teacher Eligibility Test (CTET) 2021
Junior Level (Class VI-VIII)
Solved Paper with Explanation

(Exam Date : 11.01.2022)

1. Which of the following is <u>not</u> written correctly in the Roman Numerals?

(a) LXIX (b) XL

(c) XVV (d) XC

Ans. (c) : From the option's

XVV is not a Roman Numerals.

LXIX = 69

XL = 40

XC = 90

Some important Roman Numerical

1 – I

5 – V

10 – X

50 – L

100 – C

500 – D

1000 – M

2. $\frac{\text{LCM of } 40, 50 \text{ and } 60}{\text{HCF of } 40, 50 \text{ and } 60}$ **is equal to**

(a) 60 (b) 80

(c) 50 (d) 40

Ans. (a) : From the question

LCM of 40, 50, and 60

2	40, 50, 60
2	20, 25, 30
2	10, 25, 15
3	5, 25, 15
5	5, 25, 5
5	1, 5, 1
	1, 1, 1

$= 2\times2\times2\times3\times5\times5$

$= 8\times3\times25$

$= 24\times25$

$= 600$

HCF of 40, 50, and 60;

$40 = 2\times2\times2\times5$

$50 = 2\times5\times5$

$60 = 2\times2\times3\times5$

$= 2\times5=10$

So,

$$\frac{\text{LCM of } 40, 50 \text{ and } 60}{\text{HCF of } 40, 50 \text{ and } 60} = \frac{600}{10} = 60$$

Hence option (a) is correct answer.

3. If A and B are digits and (ABA) ×5 = 44B0, then values of A and B are

(a) A = 4, B = 2 (b) A = 2, B = 4

(c) A = 9, B = 8 (d) A = 8, B = 9

Ans. (d) : From the question

If (ABA)×5 = 44B0 ----(1)

A and B are digits,

Then putting the value of A=8, B=9 in equation (1)

LHS,

(ABA) × 5 = 898×5 = 4490

RHS,

4490 = 44B0

4490 = 4490

L.H.S R.H.S

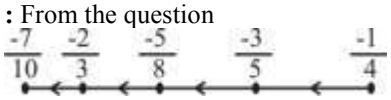
Hence option (d) is correct answer.

4. Which of the following number lie between the rational numbers $\frac{-7}{10}$ and $-\frac{1}{4}$?

(a) $\frac{5}{-8}, \frac{2}{3}, \frac{-3}{5}$ (b) $\frac{-2}{3}, \frac{-3}{5}, \frac{-3}{4}$

(c) $\frac{5}{-8}, \frac{-2}{3}, \frac{-3}{5}$ (d) $\frac{-3}{5}, 0, \frac{-1}{5}$

Ans. (c) : From the question



$\frac{-7}{10} = -0.7$, $\frac{-1}{4} = -0.25$

The rational number between $\frac{-7}{10}$,and $\frac{-1}{4}$ will be the answer.

$\frac{-2}{3} = -0.66, \frac{-3}{5} = -0.6, \frac{-5}{8} = -0.62$

5. Which least number must be subtracted from 3850 to make it a perfect square?

(a) 1 (b) 4

(c) 6 (d) 9

Ans. (c) : From the question

	62
6	38 50
+6	36
122	250
−2	244
124	6

To get perfect square we subtract 6 from 3850

3850 – 6 = 3844

3844 is the perfect square is 62.

Hence, option (c) is correct answer.

6. Values of m and n for which $2x^{m-3} + 3y^{2n-2} = 7$ is a linear equation in one variable, are

(a) m = 4, n = 2 (b) m = 3, n = 1.5

(c) m = 4, n = 1.5 (d) m = 3, n = 3

Ans. (b) : Equation $2x^{m-3} + 3y^{2n-2} = 7$ ------(1)

Linear equation

$ax + by + c = 0$ ------(2)$\rightarrow$ two variables

$\left.\begin{array}{l} ax + c = 0 \text{----(1)} \\ ay + c = 0 \text{----(2)} \end{array}\right]$ one variable

From the in equation---(1)

$m - 3 = 1$, $2x - 2 = 0$

$m = 4$, $1 = 1$

From the equation (2)

$m - 3 = 0$, $2n - 2 = 1$

$m = 3$, $2n = 3$

$n = 1.5$

7. When x is increased by 20%, it is equal to y and when y is decreased by 50%, it is equal to z. then what percent of x is equal to z?

(a) 80% (b) 60%

(c) 50% (d) 40%

Ans. (b) : According the question

When x is increased by 20%, it is equal to y,

$$\frac{x \times 120}{100} = y \text{---(1)}$$

When y is decreased by 50%, it is equal to z,

$$\frac{x \times 120}{100} \times \frac{50}{100} = z$$

$$\Rightarrow \frac{60x}{100} = z$$

Hence, 60% of x is equal to z.

8. To calculate the value of 196×206 a student expressed it in the form $200^2 + 200p - 24$. The value of $3p^3 - 28$ is

(a) 2 (b) –2

(c) –4 (d) 4

Ans. (c) :

$196 \times 206 = 40376$

So, $200^2 + 200p - 24 = 40376$

$40000 + 200P - 24 = 40376$

$200P = 40376 + 24 - 40{,}000$

$200P = 400$

$P = 2$

Hence, $P = 2$

Then value of $= 3p^3 - 28$

$= 3 \times 2^3 - 28$

$= 3 \times 8 - 28$

$= 24 - 28$

$= -4$

9. In the expression $(x + 1)(2x + 1) + (x + 2)(x - 1)$, if coefficient of x is k. then the value of $2k - 9$ is

(a) 4 (b) 3

(c) –3 (d) –1

Ans. (d) : According the question

$(x+1)(2x+1) + (x+2)(x-1) = 2x^2 + 3x + 1 + x^2 + x - 2$

$= 3x^2 + 4x - 1$

Coefficient of x is 4, k = 4

Then, $2k - 9 = 2 \times 4 - 9$

$= 8 - 9 = -1$

Hence option (d) is correct answer.

10. $\dfrac{5pq\left(p^2 - q^2\right)(p-1)}{\left(5p^2 - 25p + 20\right)\{2p(p+q)\}}$ is equal to

(a) $\dfrac{q(p-q)}{2(p-4)}$ (b) $\dfrac{p(p-q)}{2(p-4)}$

(c) $\dfrac{2(p-4)}{p(p-q)}$ (d) $\dfrac{2(p-4)}{q(p-q)}$

Ans. (a) : From the question

$$= \frac{5pq(p^2 - q^2)(p-1)}{(5p^2 - 25p + 20)\{2p(p+q)\}}$$

$$= \frac{5pq(p+q)(p-q)(p-1)}{(5p^2 - 20p - 5p + 20)\{2p(p+q)\}}$$

$$= \frac{5pq(p+q)(p-q)(p-1)}{\{5p(p-4) - 5(p-4)\}\{2p(p+q)\}}$$

$$= \frac{5pq(p+q)(p-q)(p-1)}{(5p-5)(p-4)\{2p(p+q)\}}$$

$$= \frac{5pq(p+q)(p-q)(p-1)}{5(p-1)(p-4)\{2p(p+q)\}}$$

$$= \frac{q(p-q)}{2(p-4)}$$

Hence option (a) is correct answer.

11. If x is the supplement of an angle 87°, then the value of $3x - 100^0$ is equal to

(a) 97° (b) 79°

(c) 197° (d) 179°

Ans. (d) : Supplement angle $x + y = 180^\circ$

$87^\circ + x = 180^\circ$, given $y = 87^\circ$

$x = 93^\circ$

Then of $3x - 100^\circ$,

$3 \times 93^\circ - 100^\circ$

$= 279^\circ - 100^\circ$

$= 179^\circ$

Hence option (d) is correct answer.

12. In ΔABC and ΔDEF, AB = 5 cm, AC = 7cm, $\angle A = 90^0$, FD=5cm, EF=7cm and $\angle F = 90^0$. Then

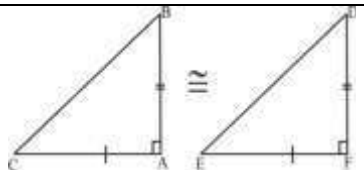
(a) $\Delta ABC \cong \Delta EDF$, by RHS congruence rule

(b) $\Delta ABC \cong \Delta FDE$, by RHS congruence rule

(c) $\Delta ABC \cong \Delta EDF$, by SAS congruence rule

(d) $\Delta ABC \cong \Delta FDE$, by SAS congruence rule

Ans. (d) : SAS (Side – Angle-Side):– If any two sides and the angle included between the sides of one triangle are equivalent to the corresponding two sides and the angle between the sides of the 2nd triangle, then two triangles are said to be congruent by SAS rule.



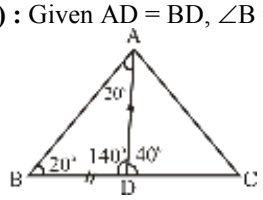
AB = FD = 5cm, AC = EF=7cm, $\angle A = \angle F = 90^0$

$\therefore$ Δ ABC $\cong$ Δ FDE, by SAS Congruence rule.

13. D is a point on the side BC of a triangle ABC such that $\angle B=20^0$ and AD = BD. Then $\angle ADC$: $\angle ADB$ is

(a) 2:5 (b) 5:2
(c) 2:7 (d) 7:2

Ans. (c) : Given AD = BD, $\angle B = \angle A = 20^o$



from ΔADB,

$\angle B + \angle A + \angle ADB = 180^o$

$20^o + 20^o + \angle ADB = 180^o$

$\boxed{\angle ADB = 140^o}$

And, $\angle ADB + \angle ADC = 180^o$ by straight line rule

$140^o + \angle ADC = 180^o$

$\angle ADC = 40^o$

Hence,

$\angle ADC : \angle ADB = 40 : 140$

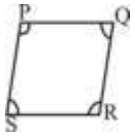
$= 2 : 7$

14. In a parallelogram PQRS, $\angle P = 7x–6^o$ and $\angle R = 5x–18^o$. Then the angles of the parallelogram are

(a) $78^o, 102^o, 78^o, 102^o$ (b) $92^o, 88^o, 92^o, 88^o$
(c) $60^o, 120^o, 60^o, 120^o$ (d) $50^o, 130^o, 50^o, 130^o$

Ans. (a) : Given $\angle P = 7x–6^o$ and $\angle R = 5x–18^o$

In parallelogram



$\angle P = \angle R$ …….(i)

$\angle S = \angle Q$

$\angle P + \angle Q = 180^o$, $\angle P = 7x–6^0$ …….(ii)

$\angle S + \angle R = 180^0$, $\angle R = 5x+18^0$ …….(iii)

Putting the value of angle $\angle P$ and $\angle R$ in equation (i)

$7x–6^0 = 5x+18^0$

$2x = 24^0$

$\boxed{x = 12^0}$

Putting value of $x = 12^0$ in equation (ii) and (iii)

$\angle P = 7x – 6^0$, $\angle R = 5x+18^0$

$= 7\times12 – 6$ $= 5\times12+18^0$

$= 84–6$ $\Rightarrow 60+18^0$

$\angle P = 78^0$ $\boxed{\angle R = 78^0}$

$\angle P + \angle Q = 180^0$ $\angle S+\angle R = 180^0$

$78^0 + \angle Q = 180^0$ $\angle S + 78^0 = 180^0$

$\boxed{\angle Q = 102^0}$ $\boxed{\angle S = 102^0}$

$\angle P = 78^0$, $\angle Q = 102^0$, $\angle R = 78^0$, $\angle S = 102^0$

Hence option (a) is correct answer.

15. Number of faces, edges and vertices of a polyhedron are 7, 15 and x respectively. Then the value of 3x + 6 is equal to

(a) 28 (b) 36
(c) 14 (d) 18

Ans. (b) : No of Faces (F)= 7

No of Edges (E) =15

No of vertices (V) = x

Euler's formula:

No. of face + No. of vertices = No. of Edges + 2

F +V = E+2

7+x =15+2

x = 17–7

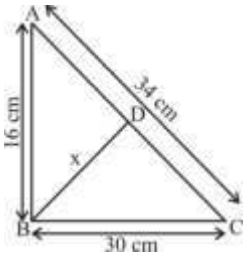
$\boxed{x = 10}$

Then $3x+6 = 3 \times 10 + 6 = 30 + 6 = 36$

16. The altitude corresponding to the longest side of the triangle with sides 30 cm, 34 cm and 16 cm is x. Then the value of (2x+5) (in cm) is

(a) $\frac{545}{17}$ (b) $\frac{554}{17}$
(c) $\frac{565}{17}$ (d) $\frac{556}{17}$

Ans. (c) :



$AC^2 = BC^2+AB^2$ it is a right angle

$$\frac{1}{x^2} = \frac{1}{BC^2} + \frac{1}{AB^2}$$

$$\frac{1}{x^2} = \frac{1}{30^2} + \frac{1}{16^2}$$

$$\frac{1}{x^2} = \frac{30^2+16^2}{30^2\times16^2}$$

$$x^2 = \frac{30^2 \times 16^2}{1156}$$

$$x = \frac{240}{17}$$

Then value of $= 2x + 5$

$$= \frac{2\times240}{17} + 5 = \frac{480+85}{17}$$

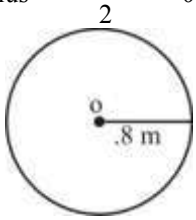
$$= \frac{565}{17}$$

Hence option (c) is correct answer.

17. The cost of polishing a circular table of diameter 1.6 m at the rate of Rs. 30 per m^2 is (Useπ=3.14) (approx)

(a) Rs. 60.30 (b) Rs. 62.20
(c) Rs.58.40 (d) Rs.62.30

Ans. (a) : radius $= \frac{\text{diameter}}{2} = 0.8\,\text{m}$



Radius of table = 0.8 m

Area of table = $\pi r^2 = \pi \times (0.8)^2 = 2.0096\ m^2$

The cost of polishing a circular table = 2.0096×30

$= ₹60.288$

$= 60.288 \approx ₹60.30$

Hence option (a) is correct answer.

18. Total surface area of a right circular cylinder is 748 cm^2 and circumference of its base is 44cm. Volume of the cylinder is $\left(\pi = \frac{22}{7}\right)$

(a) $1540cm^3$ (b) $2260cm^3$
(c) $2310cm^3$ (d) $3080cm^3$

Ans. (a) : According to question

$2\pi r\,(r + h) = 748$ ------(I)

$2\pi r = 44$ ------(II)

$\frac{2 \times 22 \times r}{7} = 44$

Radius of cylinder r = 7cm

Dividing equation (I) from (II)

$\frac{2\pi r(r+h)}{2\pi r} = \frac{748}{44}$

$r + h = 17$ (putting r = 7)

$\boxed{h = 10\,\text{cm}}$

Volume of cylinder = $\pi r^2 h$

$= \frac{22 \times 7 \times 7 \times 10}{7}$

$\Rightarrow 220 \times 7$

$= 1540\,cm^3$

Hence option (a) is correct answer.

19. A number is selected at random from the list of numbers 27, 28, 29 ....., 76,77,78 and 79. The probability that the selected number is divisible by both 2 and 3 is

(a) $\frac{9}{52}$ (b) $\frac{8}{52}$
(c) $\frac{8}{53}$ (d) $\frac{9}{53}$

Ans. (d) : In given number the number which is divisible by 2 and 3 (or by 6) is

30, 36, 42 , 48, 54, 60, 68, 74, 78

Number of possible out comes n (A) = 9

Total numbers of list n(S) = 53

$P(A) = \frac{\text{Number of possible out comes}}{\text{Total number of list}}$

$P(A) = \frac{9}{53}$

20. Mean of median and mode of the observations 37,43,35,45,50,43,38,30,43,40,36,38,43,47 and 38 is

(a) 39 (b) 40.5
(c) 41.5 (d) 41

Ans. (c) : Observations

37,43,35,45,50,43,38,30,43,40,36,38,43,47, 38

Arranging in increasing order

30,35,36,37,38,38,38,40,43,43,43,43,45,47,50,

Total number of observation (N = 15)

Mode of this observation = 43

Median of this observation $= \left(\frac{n+1}{2}\right)^{th}$ term

$= \left(\frac{15+1}{2}\right)^{th}$ term

$= 8^{th}$ term

$= 40$

Mean of median and mode

$= \frac{\text{mode} + \text{median}}{2}$

$= \frac{43 + 40}{2} = 41.5$

21. If a student finds difficulty in applying geometrical theorems to solve a given problem in geometry, then which is the most appropriate strategy that the teacher should adopt?

(a) Punish the student so that he/she does not repeat the mistake
(b) Ask the student to rote memorise the theorem
(c) Use multisensory models and teaching aids to help student understand various theorems and their applications
(d) Tell the student to copy the steps of solved problems from the black board and apply the method for similar problems

Ans. (c) : Multisensory instruction (method) is a way of teaching that engage more than one sense at a time. Using sight, hearing, movement, and touch gives students more than one way to connect with what they are learning.

If a student's difficulty in applying geometrical theorems to solve a given problem in geometry, then learner should use multisensory models and teaching aids to help student understand various theorems and their application for most appropriate strategy.

22. According to contemporary view about students errors in mathematics, which of the following is <u>no</u> longer valid

(a) They tell about student low IQ
(b) They are a part of learning/

(c) They are rich source of information for improving mathematics teaching
(d) They can guide the teacher in planning her class lesson.

Ans. (a) : Students low IQ is not contemporary view about students errors in mathematics.
In contemporary pedagogical thinking teaching should be related to vision of learning as being an active, reflexive and conscientious student placed in a position together information and use it in different context.

23. According to National Curriculum Framework (2005), which of the following are considered to make mathematics learning more joyful and interesting?
(a) Using textbooks full of colours and pictures.
(b) Using mnemonic techniques to help students memorize formulae.
(c) Including puzzles, stories and mathematical tricks in everyday lessons.
(d) Using computer based resources extensively for teaching.

Ans. (c) : By including puzzles, stories and mathematical tricks in every day lessons are considered to wakes mathematic learning more joyful and interesting.
According to NCF 2005 the learning is active and social in its character.

24. Which of the following is <u>NOT</u> an appropriate example of Mathematical modeling?
(a) Predicting the arrival of monsoon in a country.
(b) Using a model of solid cube to explain about its faces and edges.
(c) Estimating the volume of blood inside the body of a person.
(d) Finding the width and depth of a river at and unreachable place.

Ans. (b) : Using a model of solid cube to explain about its faces and edges is not appropriate example of mathematical modeling.
Mathematical modeling is the process of describing a real world problem in mathematical terms usually in the form of equations and then using these equations to help understanding the original problem.

25. Which of the following is the best way of incorporating ICT (Information and Communication Technology) in mathematics teaching?
(a) Showing power point slides with formulae and figures.
(b) Using internet videos to show the methods of solving difficult questions to students.
(c) Using mathematics specific computer applications like Geogebra and other simulation tools as teaching resources.
(d) Making examination question papers of mathematics with the help of computers.

Ans. (c) : The best way of incorporating ICT (Information and Communication Technology) in mathematics teaching by using mathematics specific computer applications like Geogebra and other simulation tools as teaching resources.

26. Read the following and choose the correct option.
Assertion (A): Various studies in India show that there is a high failure rate of students in mathematics.
Reason (R): As girls do not have mathematical abilities therefore maximum girls fail in mathematics.
(a) Both (A) and (R) are correct but (R) is not the correct reason for (A)
(b) Both (A) and (R) are correct but (R) is the correct reason for (A)
(c) Both (A) and (R) are incorrect
(d) (A) is correct but (R) is incorrect.

Ans. (d) : We can say that various studies done in India show that students have a high failure rate in maths. But its not true that girls do not have mathematical abilities. Even today girls are getting very good marks in math and moving ahead.

27. "Keshav has $4\frac{1}{2}$ meters of cloth. He needs $1\frac{1}{2}$ meters to make one shirt. How many shirts can be made in the given length of cloth, assuming there is no wastage?"
This question is an example of-
(a) Multiplication of fractions
(b) Addition of fractions
(c) Subtraction of fractions
(d) Division of fractions

Ans. (d) : It is an example of division of fractions.

$$\text{Keshav can make shirt} = \frac{\text{Total cloth (m)}}{\text{Per shirt cloth (m)}}$$

$$\frac{4\frac{1}{2}}{1\frac{1}{2}} = \frac{9}{3}\text{shirts} = 3\text{shirts}$$

28. For which of the figure given below, formula of Area cannot be arrived at using triangular and rectangular paper cuttings?
(a) A quadrilateral (b) A trapezium
(c) A parallelogram (d) a regular hexagon

Ans. (a) : A quadrilateral formula of area cannot be arrived at using triangular and rectangular paper.
- In a geometry, a quadrilateral can be defined as a closed, two dimensional shape which has four straight sides.

29. Which of the following tasks can help students develop the idea of central tendencies of a given numerical data?
(a) Collecting information about favourite TV serial from 100 people.

(b) Representing the information obtained above in using a pie chart.
(c) Classifying the marks obtained by 50 students on a 100 marks exam and grouping in the interval of 10.
(d) Solving problems related to mean mode and median given in the textbook.

Ans. (c) : Classifying the marks obtained by 50 students on a 100 marks exam and grouping in the interval of 10 is the task that can help student develop the Idea of central tendencies of giving numerical data.
The central tendency is defined as the number used to represent the center or middle of set of data values. The three commonly used measure of central tendency are the mean, median, and mode.

30. Which of the following example <u>cannot</u> be helpful to explain the concept of integers?
(a) Credit and debit statements in bank account.
(b) Various blood groups like A^+, AB^+, O^- etc
(c) Temperature going below and above 0^0C
(d) Slowing down of a vehicle as negative acceleration and speeding up as positive acceleration.

Ans. (b) : Various blood groups like A^+, AB^+, O^- etc cannot be helpful to explain the concept of integers because these are not an integers.
An integers is a whole number (not a fractional number) that can be positive, negative or zero.
Integer (z) = (–3, –2, –1, 0, 1, 2, 3 …..)

31. An object X sinks in liquids P and Q but floats in liquid R. Which of the following conclusions can be made from these observations?
(A) Density of X is more than density of P
(B) Density of X is less then density of R
(C) Density of P is equal to density of R
(D) Density of P is less than density of R
(a) A, B, C (b) A, B, D
(c) B, C, D (d) A, C, D

Ans. (b) : An object that has a higher density in comparison to the liquid then it will sink in the liquid. An object that has a lower density in comparison the liquid then it will float in the liquid.
Density of R is highest according to above statement but we can not say that density of P is equal to density of R.
Density of liquid R > X > P or Q.
So, conclusion A, B and D are correct.

32. Which fat soluble vitamin is necessary for good skin?
(a) Vitamin A (b) Vitamin C
(c) Vitamin B (d) Vitamin K

Ans. (a) : Vitamin A is fat soluble, vitamin, which is necessary for good skin.
The water soluble vitamins include vitamin C and vitamin B complex.
- Vitamins are group of organic compound that are needed for normal cell function, growth and development.

Vitamin A helps with the reproductive process, growth and development. It also keeps eyes and skin healthy and acts as an antioxidant.

33. After rain, impurities and suspended particles settle down. Which of the following process is responsible for this?
(a) Sedimentation (b) Loading
(c) Condensation (d) Distillation

Ans. (a) : Sedimentation is process responsible for impurities and suspended particles settle down after rain.
Loading is the process by which the mixture of liquids and liquids containing tiny impurities is separated by adding a chemical substance that attaches to the impurities and makes them heavier after that impurities settle down the bottom. So the correct answer is option (a).

34. Which of the following statements is correct
(A) Chemical changes are usually irreversible
(B) In a Physical change, there is always change in state
(a) A is true and B is false
(b) A is false and B is true
(c) Both A and B are true
(d) Both A and B are false

Ans. (a) : All Chemical changes are usually irreversible change. It cannot return to its original state.
Example – Milk to curd, wood burning.
Physical changes that involve a change of state of matter are all reversible. So in a physical change their is not always the change in state of matter.
Physical change does not result in the formation of new substances.
Ex. – Water to Ice.
So, A is true and B is false.

35. Which of the following feature do not help hydrophytes to stay to float in water?
(A) The stalks and stems have large tunnels
(B) Leaves have waxy coating
(C) Large circular disc shaped leaves
(D) Finger like and ribbon like leaves and stem
(a) A and C (b) A and B
(c) B and C (d) B and D

Ans. (a) : The feature that do not help hydrophytes to stay to float in water.
- The stalks and stems have large tunnels.
- Large circular disc shaped leaves.

Hydrophytic plants have several adaptations that allow to survive in water. The plants have air sacs or large spaces between the cells which provide buoyancy that allows the plant to float on top of the water.

36. Which of the following precautions are to be taken while storing bar magnets?
(a) Bar magnets should be stored in pairs such that like poles are on the same side.
(b) A pair of bar magnets should be separated by a wooden piece.
(c) The ends of bar magnets should be connected by soft iron pieces.
(d) They should be stored in wooden box.

Ans. (a) : Precautions are to be taken while storing bar magnets in such a way that bar magnets should be stored in pairs such that like poles are on the same side.
While storing bar magnets, they should be kept in pairs with their unlike poles on same side.
They must be separated by a piece of wood while two piece of soft iron should be placed across their ends.

37. X is the largest gland in our body. It secretes Y which is stored in Z, X, Y, Z are respectively
(a) Liver, Bile Juice, Pancreas.
(b) Pancreas, Pancreatic Juice, Gall bladder.
(c) Liver, Bile Juice, Gall bladder.
(d) Pancreas, Gastric Juice, Stomach.

Ans. (c) : Liver is the largest gland in our body. It secretes Bile Juice which is stored in Gall bladder. When a person eats, the gall bladder squeezes bile through the bile ducts, which connect the gall-bladder and lives to the small Intestine. The bile mixes with the fat in food.
The pancreas stores the pancreatic Juice containing several enzymes that break down carbohydrates, fats, and proteins in food.

38. Match the following organisms with their mode of nutrition

Mode of Nutrition	Organism
(a) Autotrophic	**(i) Mushroom**
(b) Holozoic	**(ii) Amoeba**
(c) Parasite	**(iii) Algae**
(d) Saprophytes	**(iv) Cuscuta**

(a) (a)-(iii), (b)-(ii), (c)-(iv),(d)-(i)
(b) (a)-(ii), (b)-(iii), (c)-(i),(d)-(iv)
(c) (a)-(iii), (b)-(iv), (c)-(i),(d)-(ii)
(d) (a)-(iv), (b)-(ii), (c)-(i),(d)-(iii)

Ans. (a) : (a) Autotrophic – (iii) Algae
(b) Holozoic – (ii) Amoeba
(c) Parasite – (iv) Cuscuta
(d) Saprophytes – (i) Mushroom

39. In the chemical reaction A + B → C, what can you say surely about nature of A, B and C?
(a) A and B are elements and C is a compound.
(b) A and B are compound and C is a mixture.
(c) A and B may be compound or elements and C is element.
(d) A and B may be element or compound, C is compound.

Ans. (d) : Chemical reaction A+B→ C
Chemical reaction is a process in which one or more substances also called reactants are converted into one or more different substances known as products.
So in above chemical equation A and B may be element or compound, C is product compound.

40. The factor on which the shadow formation of an object is not dependent on
(a) shape of an object
(b) distance of the object from source of light
(c) position of the object w.r.t. source of light
(d) colour of the object

Ans. (d) : The shadow formation of an object is not dependent on colour of the object.

41. A, B, C and D are indicators which give the following changes in acids and bases. Identify them

Indicator	Colour change in acid	Colour change in base
A	**no change**	**Reddish brown**
B	**colourless**	**pink**
C	**red**	**blue**
D	**dark pink**	**green**

(a) A – china rose, B – turmeric, C – blue litmus, D – phenolphthalein
(b) A – turmeric, B – china rose, C – blue litmus, D – phenolphthalein
(c) A – phenolphthalein, B – turmeric, C – red litmus, D – china rose
(d) A – turmeric, B – phenolphthalein, C – red litmus, D – china rose

Ans. (d):

Indicator	Colour change in acid	Colour change in base
Turmeric = A	no change	Reddish brown
Phenolphthalein = B	colour less	Pink
Red litmus = C	red	blue
China rose = D	dark pink	Green

42. Following observations are noted regarding four metals P,Q,R and S.
- **Q displaces P and S from their respective salt solutions**
- **P displaces S and R from their respective salt solutions**
- **S displaces only R from its salt solution**

Which is the second most reactive metal?
(a) P (b) Q
(c) R (d) S

Ans. (a) : • Q displaces P and S from their respective salt solutions.
• P displaces S and R from their respective salt solutions.
• S displaces only R from its salt solution.
So it can be conclude that,
Q > P > S > R
So, P is the second most reactivemetal.

43. A concave mirror and convex mirror are cut from same spherical glass ball but the aperture of concave mirror is more than the aperture of convex mirror. What can be said about their focal lengths?
(a) Focal length of concave mirror is more than that of convex mirror
(b) Focal length of convex mirror is more than that of concave mirror
(c) Both have same focal length
(d) Focal length cannot be compared with given information

Ans. (c) : A concave mirror and convex mirror are cut from same spherical glass ball so their focal length will be same. Focal length does not depend on aperture of the mirror.

44. Which of the following statements is true regarding sound waves?

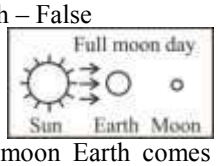
(a) Sound waves travel fastest in gases
(b) Human beings can hear sound whose frequency is 15000Hz
(c) Sound waves cannot be reflected
(d) The loudness of sound depends on the frequency of sound wave

Ans. (b) : The human can hear sound range is a commonly between as 20 to 20,000Hz.
So, human beings can hear sound whose frequency is 15000Hz.
Sound travel faster in solid medium and it is reflected by object where it strike.

45. Which of the following statements is <u>NOT</u> true regarding the moon?

(a) Rainbow cannot be seen on moon.
(b) The weight of an object is less on the moon as compared to that on the earth.
(c) On full moon day, moon comes between the sun and the earth.
(d) The periods of rotation and revolution of the moon are almost same.

Ans. (c) :
- Rainbow cannot be seen on moon – True
- The weight of an object is less on the moon as compared to that on the earth – True
- On full moon day, moon comes between the sun and the earth – False



In full moon Earth comes between sun and moon so given option c is wrong.
- The periods of rotation and revolution of the moon are almost same – True

46. Assertion (A)- Water can be used to extinguish fire caused by short circuit of an electrical appliance.
Reason (R)- Water lowers the ignition temperature of burning material

(a) (A) is true and (R) is correct explanation of
(b) (A) is true but (R) is not correct explanation of (A).
(c) (A) is false but (R) is true.
(d) Both (A) and (R) are false.

Ans. (c) : • Water cannot be used to extinguish fire caused by short circuit of an electrical appliance because water is electrically conductive so there is high changes of electric shock.
- Water lowers the ignition temperature of burning material.

So (A) is false but (R) is true.

47. Which of the following statements is true?
S_1–A soil with high percolation rate has low water holding capacity.
S_2–A soil with high percolation rate has low aeration.

(a) S_1 is true and S_2 is false
(b) S_1 is false and S_2 is true
(c) Both S_1 and S_2 are true
(d) Both S_1 and S_2 are false

Ans. (a) : Percolation is defined as the movement of water to and from the soil, and percolation rate is the time period in which movement of water occurs through soil.
When soil has a high percolation rate mean that there is a large space (aeration) between particles which is usually filled by air. So a soil with high per coalition rate has high aeration and also has low water holding capacity.
Ex. – Sandy soil
From the above it is clear that S_1 is true and S_2 is false.

48. Which of the following glands occur in pairs in human beings?

(a) Adrenal, thyroid (b) Pancreas, ovaries
(c) Pituitary, thyroid (d) Pituitary, pancreas

Ans. (a) : The thyroid glands are a paired set of adenomatous glands located in the neck at about the level of the fourth through eighth tracheal rings, lateral but adjacent to the trachea itself.
The suprarenal glands, also known as adrenal glands, belong to the endocrine system. They are a pair of triangular-shaped glands, each about 2 inch long and 1 inch wide, that sit on top of the kidneys.
With adrenal insufficiency the inability to increase cortisol production with stress can lead to an addisonian crisis.
- The thyroid gland is a vital hormone gland it play a major role in the metabolism growth and development of human body.

49. People usually put a round piece of cloth on their head before putting a heavy load. This is helpful because

(a) Pressure is decreased by increasing area of contact
(b) Pressure is decreased by decreasing the area of contact
(c) Force is decreased by increasing the area of contact
(d) Force is increased by decreasing area of contact

Ans. (a) : Pressure is decreased by increasing area of contact when people usually put a round piece of cloth on their head before putting a heavy load.
We know that when the surface is more, then pressure is less, as a result the pressure on their head get reduced.

50. 'X' is charged by 'Y'. It is found that 'X' obtains charge opposite to that of Y, the charging process could have been

(a) Friction or conduction
(b) Friction or induction
(c) Only conduction
(d) Conduction or induction

Ans. (b) : 'X' is charged by 'Y'. It is found that 'X' obtains charge opposite to that of Y, the charging process could have been friction or induction.

51. Which of the following does <u>NOT</u> align with the social constructivist model of science teaching and learning.

(a) Students collaborate with authoritative sources and among themselves to arrive at convincing scientific explanations.
(b) Science is interpreted as plausible explanations for phenomena which can be understood through argumentation.
(c) Students share their personal experiences and experiences of a phenomenon.
(d) Science is interpreted as a body of facts, laws and theories which can mainly be understood through personal experience.

Ans. (d) : 'Science is interpreted as a body of facts, laws and theories which can mainly be understood through personal experience,' is not social constructivist model of science teaching and learning.

52. A Teacher is trying to teach the concept of good & bad conductors of electricity to class VI students. He begins by providing the definition of two terms. He then demonstrates how placing a good conductor like a safety pin between two ends of an open circuit consisting of a battery and a bulb completes it and bulb begins to glow. On the other hand, placing a poor conductor like a plastic scale does not complete the circuit and the bulb does not glow. He then invites the students turn-wise to his desk & asks them to themselves verify this. How would you evaluate the approach from an inquiry-oriented perspective?

(a) It is an effective approach that encourages inquiry.
(b) Demonstrating more examples of good and poor conductors would make the approach inquiry-oriented.
(c) It is not an effective approach for encouraging inquiry.
(d) Asking questions in the end would make the approach inquiry-oriented.

Ans. (c) : The approach from an inquiry-oriented perspective is not an effective approach for encouraging inquiry.

53. A teacher finds that her class VIII students have difficulty in comprehending that non-living objects like a table can exert force on other objects. She realises that this would cause a difficulty for them in understanding the concept of normal reaction (force). Engaging her students in which of the following activities would be helpful in making them understanding this concept?

(a) Playing tug of war
(b) Pressing on a spring kept on ground
(c) Weighing different objects on a pan balance
(d) Pulling a wheeled chair towards oneself

Ans. (b) : By pressing on a spring kept on ground is the best method to tell student about the concept of normal reaction (force). When we press the spring it goes down but an upward force acted upon it. This force is known as reaction force.

54. Which of the following statements best describes the statement- 'science is tentative'

(a) Science is developmental
(b) Science is predictive
(c) Science is a social activity
(d) Science proceeds linearly

Ans. (a) : Science is developmental is the best describes the statement science is tentative.
Conclusion in science are always "tentative" that doesn't mean they're "wrong". It means that scientific conclusion can be modified or replaced, when new evidence becomes available so we can say that science is development – because development is also a process of change with respect to time.

55. Which of the following is <u>NOT</u> a difficulty you would specifically associate with the interpretation of a text book diagram of solar eclipse formation?

(a) Depiction of three- dimensional phenomenon is two-dimensions.
(b) Understanding of the relative distances between the sun, the earth and the moon.
(c) Identification of the direction of gravitational force between the sun, the earth and the moon.
(d) Understanding of the relative sizes of the sun, the earth and the moon.

Ans. (c) : Identification of the direction of gravitational force between the sun, the earth and the moon is not difficult to interpret text book diagram of solar eclipse formation.
Note : The gravitational force is proportional to the masses of the objects and inversely proportional to the square of the distances.

$$\boxed{F = G\frac{M_1 . M_2}{R^2}}$$

where, G→ Gravitational constant

So, $\frac{\text{mass of sun}}{(\text{Sun moon distance})^2} = 8.9 \times 10^7 \text{ kg/m}^2$

And, $\frac{\text{mass of Earth}}{(\text{Earth moon distance})^2} = 4.0 \times 10^7 \text{ kg/m}^2$

Hence, the gravitational force between the sun and the moon is about twice that between the Earth and the Moon.

56. In the beginning of the 'motion and time' a teacher wishes her students to appreciate the need for standard units of distance, which of the following activities would be <u>most suitable</u> for the purpose?

(a) Students measure the length of their classroom in footsteps and share their results.
(b) Students use a metre scale to find out the length of their classroom.

(c) Students compare a metre scale with a 12-inch scale and note their observations.
(d) Students estimate the height of the door of their classroom in inches.

Ans. (a) : Students measure the length of their classroom in footsteps and share their results would be most suitable way in the beginning of the chapter "motion and time".

57. Which of the following statements best describes the relationship between science and technology?
(a) Scientific principles are discovered first and technological application happen later.
(b) Science is an open-ended exploration whereas technology is usually goal oriented.
(c) Technology implies the use of advanced equipments and whereas science is largely theoretical.
(d) Science was part of ancient human civilisation but technology is relatively recent.

Ans. (b) : Science is an open-ended exploration whereas technology is usually goal oriented, is best describes the relationship between science and technology.
Open-ended science exploration means that there is no pre-determined limitations and no fixed answer. Scientist simply follow their, imagination and go to any direction of their creativity.

58. A teacher along with his students is carrying out a study on germination of seeds. They task some dry seeds of different kinds and plant them in different physical conditions. They observe measure and discuss the growth over a period of time. During the course of the activity, teacher asks questions which require various process skills. The questions asked by the teacher are given in column I.
Match these with the appropriate process skills

Column I	Column II
(A) What are the differences between sees of different type	**(i)** communication
(B) Why do you think some seeds are growing more quickly than others?	**(ii)** predicting
(C) Draw a diagram to depict the changes in the seeds	**(iii)** observing
(D) Based on your observation what do you think would happen if we double the amount of water	**(iv)** hypothesising

(a) (A)-(ii), (B)-(i), (C)-(iv),(D)-(iii)
(b) (A)-(iii), (B)-(iv), (C)-(i),(D)-(ii)
(c) (A)-(iii), (B)-(iv), (C)-(ii),(D)-(i)
(d) (A)-(ii), (B)-(iii), (C)-(i),(D)-(iv)

Ans. (b) :

Column I	Column II
(A) What are the differences between sees of different type	(iii) observing
(B) Why do you think some seeds are growing more quickly than others?	(iv) hypothesising
(C) Draw a diagram to depict the changes in the seeds	(i) communication
(D) Based on your observation what do you think would happen if we double the amount of water	(ii) predicting

59. In an inquiry oriented class in which a class VII teacher is introducing the concepts of physical and chemical change, which of the following steps would precede the rest?
(a) Teacher defines and explains the meaning of a physical and chemical change
(b) Teacher explains and give examples of various reversible and irreversible changes
(c) Teacher exposes the students to various physical and chemical changes and asks them to reflect on the similarities and differences
(d) Teacher writes a chemical equation and asks students to identify the reactants and products

Ans. (c) : Teacher exposes the students to various physical and chemical changes and asks them to reflect on the similarities and differences, these steps would precede the rest.

60. Which of the following is desirable features of the textbook development process?
(a) We should strictly follow 'one nation, one textbook' norm.
(b) Actual process of writing of the textbooks should only involve practicing scientists.
(c) Intensive and wide- spread field trials of textbooks must be carried out.
(d) Textbook writing by individuals & NGOs must be discouraged.

Ans. (c) : Intensive and wide- spread field trials of textbooks must be carried out is a desirable features of the textbook development process.

Central Teacher Eligibility Test (CTET) 2021
Junior Level (Class VI-VIII)
Solved Paper with Explanation

(Exam Date : 10.01.2022)

1. If x is the sum of integers between –9 and –1 and y is the product of integers between –3 and 5, then what is the value of x + y?

(a) – 50 (b) – 45

(c) – 40 (d) – 35

Ans. (d) : x = (–8)+(–7)+(–6)+(–5)+(–4)+(–3)+(–2)
= –35 _____(i)
y = (–2)×(–1)×0×1×2×3×4
= 0 _____(ii)
From the equation (i) and (ii)
x + y = –35 – 0
= –35

2. The least number which must be subtracted from 893308 to obtain a perfect square is x. What is the sum of the digits of x?

(a) 13 (b) 14

(c) 15 (d) 17

Ans. (a) : For least perfect square of 893308

	945
9	893308
+9	–81
184	833
+4	-736
1885	9708
+5	–9428
	283

Now subtracting 283 from 893308 get perfect square

$$\begin{array}{r} 893308 \\ -\ \ 283 \\ \hline 893025 \end{array}$$

893025 is a perfect square of 945
So, x = 283,
Now the sum of digit of x is = 2 + 8 + 3 =13

3. If $x = 3^{127} \times 5^{121} \times 7^{16}$
$y = 3^{128} \times 5^{119} \times 7^{21}$ and
$z = 3^{126} \times 5^{120} \times 7^{19}$ then
HCF of x, y and z is

(a) $3^{127} \times 5^{119} \times 7^{19}$ (b) $3^{128} \times 5^{120} \times 7^{16}$

(c) $3^{126} \times 5^{119} \times 7^{16}$ (d) $3^{126} \times 5^{120} \times 7^{16}$

Ans. (c) : Given,
$x = 3^{127} \times 5^{121} \times 7^{16}$
$y = 3^{128} \times 5^{119} \times 7^{21}$
$z = 3^{126} \times 5^{120} \times 7^{19}$
HCF of x,y,z = $3^{126} \times 5^{119} \times 7^{16}$

4. Let

$$a = \frac{\frac{2}{3} \div \frac{-4}{5} + \frac{7}{12} + \frac{-11}{6}}{\frac{1}{9} + \frac{5}{3} \times \frac{-8}{15} + \frac{7}{27}}$$

Then the value of a is

(a) $\frac{675}{168}$ (b) $\frac{575}{168}$

(c) $\frac{675}{158}$ (d) $\frac{575}{158}$

Ans. (a) :

$$a = \frac{\frac{2}{3} \div \frac{-4}{5} + \frac{7}{12} + \frac{-11}{6}}{\frac{1}{9} + \frac{5}{3} \times \frac{-8}{15} + \frac{7}{27}}$$

$$a = \frac{\frac{2}{3} \times \frac{-5}{4} + \frac{7}{12} - \frac{11}{6}}{\frac{1}{9} + \frac{5}{3} \times \frac{-8}{15} + \frac{7}{27}}$$

$$= \frac{-\frac{5}{6} + \frac{7}{12} - \frac{11}{6}}{\frac{1}{9} - \frac{8}{9} + \frac{7}{27}} = \frac{\frac{-16}{6} + \frac{7}{12}}{\frac{-7}{9} + \frac{7}{27}}$$

$$= \frac{\frac{-32+7}{12}}{\frac{-21+7}{27}} = \frac{25}{12} \times \frac{27}{14} = \frac{675}{168}$$

5. If $x = \left(\frac{1}{2}\right)^{-2} \div \left(\frac{2}{3}\right)^{-3}$, then what is the reciprocal of x?

(a) $\frac{27}{32}$ (b) $\frac{32}{27}$

(c) $\frac{9}{16}$ (d) $\frac{16}{27}$

Ans. (a) :

$$x = \left(\frac{1}{2}\right)^{-2} \div \left(\frac{2}{3}\right)^{-3}$$

$$= \frac{1}{(2)^{-2}} \times \left(\frac{3}{2}\right)^{-3}$$

$$= 4 \times \frac{1}{\left(\frac{3}{2}\right)^3}$$

$$= 4 \times \frac{8}{27} = \frac{32}{27}$$

Reciprocal of $\frac{32}{27}$ is $\frac{27}{32}$

6. A factor common to both x^2-x-6 and x^2-5x+6 is-

(a) x+2 (b) x–3

(c) x+3 (d) x–2

Ans. (b) :

$x^2 - (3-2)x - 6$

$x^2 - 3x + 2x - 6$

$x(x-3) + 2(x-3)$

$(x+2)(x-3)$ .....(1)

Now,

$x^2 - 5x + 6$

$x^2 - (2+3)x + 6$

$x^2 - 2x - 3x + 6$

$x(x-2) - 3(x-2)$

$(x-3)(x-2)$ ……(2)

∵ From equation (1) & (2)

(x – 3) is a common factor of both equation.

7. What is the coefficient of x^2 in the product of $(\frac{2}{3}x^2 + \frac{5}{4}x - 3)$ and $(3x^2 + 4x + 1)$?

(a) $\frac{77}{12}$ (b) $-\frac{10}{3}$

(c) $\frac{43}{4}$ (d) $-\frac{5}{6}$

Ans. (b) :

$$\left(\frac{2}{3}x^2 + \frac{5}{4}x - 3\right) \times \left(3x^2 + 4x + 1\right)$$

$$= 2x^4 + \frac{8}{3}x^3 + \frac{2}{3}x^2 + \frac{15}{4}x^3 + 5x^2 + \frac{5}{4}x - 9x^2 - 12x - 3$$

coefficient of x^2 in product

$$= \frac{2}{3}x^2 + 5x^2 - 9x^2$$

$$= \frac{2}{3}x^2 - 4x^2$$

$$= -\frac{10}{3}x^2$$

Hence the coefficient is $-\frac{10}{3}$

8. If $\frac{2(3y-4)+6}{3y-(4+5y)} = \frac{3}{5}$ then the value of (9y+1) is

(a) –1 (b) $\frac{1}{2}$

(c) $\frac{3}{2}$ (d) –2

Ans. (b) : Given,

$$\frac{2(3y-4)+6}{3y-(4+5y)} = \frac{3}{5}$$

$$\frac{6y-8+6}{3y-4-5y} = \frac{3}{5}$$

$$\frac{6y-2}{-4-2y} = \frac{3}{5}$$

$5(6y-2) = 3(-4-2y)$

$30y-10 = -12-6y$

$36y = -12+10$

$36y = -2$

$$y = -\frac{1}{18}$$

Now, 9y+1

$$9\times(-\frac{1}{18}) + 1$$

$$-\frac{1}{2}+1$$

$$= \frac{1}{2}$$

9. If 2x – 3y = 5 and xy = 6, then what is the value of $(4x^2 + 9y^2)$?

(a) 70 (b) 61

(c) 86 (d) 97

Ans. (d) : $2x-3y = 5$

$(2x-3y)^2 = (5)^2$ (by squaring both side)

$4x^2+9y^2-12xy=25$

$4x^2+9y^2-12(6) = 25$ (putting xy = 6)

$25+72 = 4x^2+9y^2$

$4x^2+9y^2 = 97$

10. A sum of ₹x amounts to ₹18422.25 in $2\frac{1}{2}$ years at 10% p.a., interest compounding annually. What is the value of x?

(a) 15000 (b) 14500

(c) 14000 (d) 16500

Ans. (b) : Given–

Principal (P) = ₹x

Amount (A) = 18422.25

Rate (r) = 10%

Time (n) = $2\frac{1}{2}$ years

According to the question.

$$18422.25 = x\left[\left(1+\frac{10}{100}\right)^2 \times \left(1+\frac{1}{2}\times\frac{10}{100}\right)\right]$$

$$18422.25 = x\left[\frac{11}{10}\times\frac{11}{10}\times\frac{21}{20}\right]$$

$2000\times18422.25 = x\times2541$

$$x = \frac{36844500}{2541}$$

x = ₹14500

11. The area of a circular field is 15400m^2. What is the cost of fencing the field at ₹12.50 per m? (take $\pi = \frac{22}{7}$)

(a) ₹6600 (b) ₹8800
(c) ₹5500 (d) ₹4400

Ans. (c) :
The area of circular field is

$$\pi r^2 = 15400$$
$$\frac{22}{7} \times r^2 = 15400$$
$$r^2 = 7 \times 700$$
$$r = 70$$

The radius of circular field is 70 m.
Circumference

$$\therefore 2\pi r = 2 \times \frac{22}{7} \times 70 = 440\text{m}$$

The cost of fencing the field is

$\therefore$ 440 × 12.5 [Cost = ₹12.5/m]
= ₹5500

12. The curved surface area of a right circular cylinder of base radius 35cm is 2640cm^2. What is the volume of the cylinder? (take $\pi = \frac{22}{7}$)

(a) 38500 cm^3 (b) 42350 cm^3
(c) 44275 cm^3 (d) 46200 cm^3

Ans. (d) : Given,
For cylinder,
Curved surface area = $2\pi rh$
r = 35 cm

$$2 \times \frac{22}{7} \times 35 \times h = 2640$$
$$h = \frac{2640 \times 7}{2 \times 22 \times 35} = \frac{18480}{1540}$$
$$h = 12 \text{ cm}$$

Now, volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times 35 \times 35 \times 12$$
$$= \frac{323400}{7}$$
$$= 46,200 \text{ cm}^3$$

13. The perimeter of a parallelogram is 36 cm and the ratio between its two adjacent sides is 2:1. If the altitude corresponding to the smaller side is 10 cm, what is its area?

(a) 72 cm^2 (b) 60 cm^2
(c) 54 cm^2 (d) 90 cm^2

Ans. (b) : Given,
Perimeter of parallelogram = 2(l+b)
Ratio of two adjacent side = 2:1
Height = 10 cm
$\because$ Let the length of the adjacent side be 2x and x respectively.
Now, perimeter of parallelogram = 2(l+b)
2(2x+x) = 36
2(3x) = 36
6x = 36
x = 6
larger side = 2x = 2×6 = 12 cm
smaller side = 6 cm
So, area of parallelogram = Base (b) × Height (h)
= 6×10
= 60 cm^2

14. If F, E and V are respectively the number of faces, edges and vertices of a square pyramid, then which of the following statement is true?

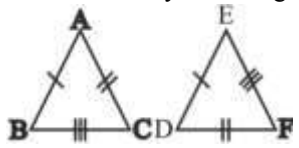
(a) 3F + 2E – 2V = 21 (b) 2F + 3E – 2V = 21
(c) 2F + E – V = 17 (d) 2F + E – V = 15

Ans. (a) : No. of Face of square pyramid, F = 5
No. of Edges of square pyramid, E = 8
No. of Vertices of square pyramid, V = 5
Now,
3F+2E–2V
3×5+2×8–2×5 = 15 + 16 – 10 = 21

15. In ΔABC and ΔDEF, if AB = DE, AC = EF and BC = FD, then

(a) ΔDEF ≅ ΔABC (b) ΔDEF ≅ ΔBAC
(c) ΔDEF ≅ ΔCAB (d) ΔDEF ≅ ΔBCA

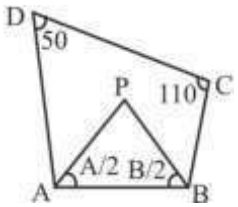
Ans. (b) : In ΔABC and DEF,
AB = DE
AC = EF
BC = FD
ΔDEF≅ΔBAC by SSS congruence rule



16. In a quadrilateral ABCD, ∠D = 50° and ∠C = 110°. The bisectors of ∠A and ∠B meet at the point P. The measure of ∠APB is

(a) 100° (b) 80°
(c) 70° (d) 60°

Ans. (b) :



Given,
A Quadrilateral ABCD
∠D = 50°
∠C = 110°
∠A + ∠B + ∠C + ∠D = 360°
{sum of Quadrilateral angle is 360°}
∠A + ∠B = 360° – ∠C – ∠D

$\angle A + \angle B = 360° - 110 - 50$

$\angle A + \angle B = 200$

$\frac{1}{2}\angle A + \frac{1}{2}\angle B = 100$

Now, in ΔABP

$\frac{1}{2}\angle A + \frac{1}{2}\angle B + \angle APB = 180°$

$100 + \angle APB = 180°$

$\angle APB = 180° - 100°$

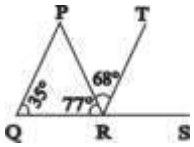
$\angle APB = 80°$

17. In ΔPQR, side QR is produced to S. RT is drawn parallel to QP. If ∠PRT = 68° and ∠PQR = 35°, then what is the difference between the angles QRP and TRS?

(a) 42° (b) 48°

(c) 52° (d) 54°

Ans. (a) :



In a ΔPQR, RT||QP

$\angle PRT = 68°$

$\angle PQR = \angle TRS = 35°$ (Corresponding Angle)

$\angle QRP + \angle PRT + \angle TRS = 180°$ {linear pair of angle}

$\angle QRP + 68^o + 35^o = 180$

$\angle QRP = 77°$

Now, $\angle QRP - \angle TRS$

$77° - 35°$

$= 42°$

18. The sum of all interior angles of a regular polygon is 1080°. What is the measure of its each exterior angle?

(a) 35° (b) 40°

(c) 45° (d) 30°

Ans. (c) : Sum of interior angles of a regular polygon

$= (n-2) \times 180°$

$1080 = (n-2)180$

$6 = n-2$

$n = 8$

Each interior angle of regular octagon, $\frac{1080}{8} = 135°$

So, each exterior angle is $\frac{360}{n} = \frac{360}{8} = 45°$

19. Number 40, 41, 42,…….129, 130 are written on cards, one number on one card, and put in a box. A card is drawn at random from the box. What is the probability that the number on the card drawn is divisible by 2, 3 and 4?

(a) $\frac{8}{91}$ (b) $\frac{2}{13}$

(c) $\frac{1}{13}$ (d) $\frac{11}{91}$

Ans. (c) : Total no. of cards in a box = n

$a + (n-1) = 130$

$40 + (n-1) \times 1 = 130$

$n - 1 = 90$

$n = 90 + 1$

$n = 91$

LCM of 2, 3, 4 is 12.

∴ No. of cards divisible by 2, 3, 4 = 48, 60, 72, 84, 96, 108, 120

$= 7$

Now, Probability that no. is divisible by 2, 3, 4

$= \frac{\text{favorable outcome}}{\text{Total no. of outcome}} = \frac{7}{91} = \frac{1}{13}$

20. If x, y and z are respectively the mean, mode and median of the data 7, 9, 19, 11, 10, 8, 7, 5, 7, 6, 9 and 10, then what is the value of (x+y–z)?

(a) 9.5 (b) 8

(c) 8.5 (d) 7.5

Ans. (d) : Given,

7,9,19,11,10,8,7,5,7,6,9,10

$\text{Mean} = \frac{\text{Sum of the observation}}{\text{Total no. of observation}}$

$x = \frac{7+9+19+11+10+8+7+5+7+6+9+10}{12}$

$x = 9$

Mode = most repeated number

$y = 7$

for median,

5,6,7,7,7,8,9,9,10,10,11,19

$z = \frac{\left(\frac{n}{2}\right)^{th} \text{ observation} + \left(\frac{n}{2}+1\right)^{th} \text{ observation}}{2}$

$z = \frac{6^{th} \text{ observation} + 7^{th} \text{ observation}}{2}$

$z = \frac{8+9}{2}$

$= \frac{17}{2} = 8.5$

Now, x + y – z

9 + 7 – 8.5

16 – 8.5 = 7.5

21. A middle school teacher gives her students the following question. 'In the given expression what number do you think belongs to the box' 9+3 = □+7

The common responses of her students were 12 and 19.

Which of the following statements is most appropriate for the given context?

(a) It is a misconception that arose because students were not viewing the symbol "=" as a symbol to indicate equivalence.

(b) The common answers given by most of the students are correct.