# RRB Group D Previous Year Paper (Held on: 18 Aug 2022 Shift 3)

RRB Group D • 2022 • 100 questions • 90 minutes • Answer key and solutions

**Take this paper as a timed mock test**

Practise under exam conditions, then review your answers after you submit.

**yourmocktest.com/pyq/rrb-group-d/rrb-group-d-previous-year-paper-held-on-18-aug-2022-shift-3**

Scan the QR code or click the link to open it.

## CBT

**Q1.** A car can cover 275 km in 5 hours. If its speed is reduced by 5 km/h, then how much time will the car take to cover a distance of 250 km?

**(a)** 5 hr
**(b)** 5 hr 30 min
**(c)** 4 hr 30 min
**(d)** 6 hr

**Q2.** In this question, a group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

| Number/symbol | 4 | % | 7 | 3 | # | • | 9 | @ | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Code | X | N | B | J | H | L | Y | F | R |

Conditions:

(i) If the first element is an even number and the last a number, the codes for these two (the first and the last elements) are to be interchanged.

(ii) If the first element is an odd number and the last an even number, the first and last elements are to be retained as it is (i.e first and last elements won't get coded).

Question: 7 * % 3 @ 6

**(a)** 7LNJF6
**(b)** BLN3FR
**(c)** BLNJFR
**(d)** 7YNJF6

**Q3.** Match the following:

| Substance | pH | | |
|---|---|---|---|
| i. | Lemon juice | a. | 14 |
| ii. | Gastric juice | b. | 1.2 |
| iii. | Milk of magnesia | c. | 2.2 |
| iv. | Sodium hydroxide solution | d. | 10 |

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

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**Q4.** Which of the following rules is used to determine the force on a current carrying conductor kept inside a magnetic field?

**(a)** Maxwell's corkscrew rule
**(b)** Fleming's left-hand rule
**(c)** Right hand thumb rule
**(d)** Fleming's right-hand rule

**Q5.** As of July 2022, PM-VIKAS is aligned to the 15^(th) Finance Commission cycle period up to _____ and is a Central Sector (CS) scheme under the Ministry of Minority Affairs.

**(a)** 2024-27
**(b)** 2025-26
**(c)** 2022-23
**(d)** 2021-23

**Q6.** Select the option that represents the letters that, when placed from left to right in the same sequence in the blanks below, will complete the letter series.

B _ X T _ _ H Y_ M B _ Z _ M

**(a)** BMHHTT
**(b)** MHBHTT
**(c)** HMBTHT
**(d)** TMHBHT

**Q7.** Select the set in which the numbers are related in the same way as are the numbers of the following sets.

(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13 - Operations on 13 such as adding/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 are not allowed.)

(80, 16, 20)

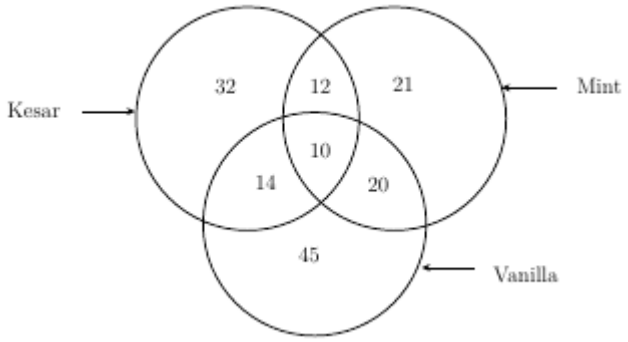
(144, 36, 24)

**(a)** (512, 25, 16)
**(b)** (122, 12, 6)
**(c)** (224, 36, 40)
**(d)** (189, 49, 27)

**Q8.** Find the roots of the equation $6p^2 - 5p - 6 = 0$.

**(a)** 3/4 and 3/2
**(b)** -2/3 and 3/2
**(c)** -1/3 and 4/3
**(d)** 2/3 and 2/3

**Q9.** Study the given diagram carefully and answer the following question. The numbers in different sections indicate the number of people who like different flavours of ice-cream.




How many people like Mint but NOT Kesar flavoured ice-cream?

**(a)** 51
**(b)** 21

**(c)** 33
**(d)** 41

**Q10.** When was Bandhan Bank formed?
**(a)** 2015
**(b)** 2017
**(c)** 2011
**(d)** 2013

**Q11.** Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order. Only two boxes are kept between G and B. B is kept at the bottom. C is kept on one of the positions above D. F is kept immediately above D. A is kept fifth from the bottom. E is kept at the top. How many boxes are kept between D and A?
**(a)** One
**(b)** Three
**(c)** Four
**(d)** Two

**Q12.** Article 243E of the Indian Constitution is related to which feature of Panchayat?
**(a)** Constitution of Panchayats
**(b)** Reservation of seat
**(c)** Composition of Panchayats
**(d)** Duration of Panchayat

**Q13.** A group of people contains men, women and children. If 40% of them are men, 35% are women and rest are children, and their average weights are 70 kg, 60 kg and 30 kg, respectively. The average weight of the group is:
**(a)** 45.5 kg
**(b)** 56.5 gm
**(c)** 45.5 gm
**(d)** 56.5 kg

**Q14.** Three statements are given, followed by two conclusions numbered I and II. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow's) from the statements

Statements:

1. All jokers are circuses.
2. All circuses are equestrians.
3. Some jokers are spectacles.

Conclusions:

I. Some equestrians are spectacles.

II. Some circuses are jokers.

**(a)** Only conclusion I follows
**(b)** Neither conclusion I nor II follows
**(c)** Only conclusion II follows
**(d)** Both conclusions I and II follow

**Q15.** Study the given number series and answer the question that follows.

2 6 7 4 9 3 6 5 1 9 5 2 4 5 9 4 2 3 7 1

How many even numbers are immediately preceded by an odd number and immediately followed by a prime number?

**(a)** 3
**(b)** 2
**(c)** 4
**(d)** 1

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**Q16.** Which of the following chemical reactions represents the chlor-alkali process?

**(a)** NaHCO3 + H^+ → CO2 + H2O + Sodium salt of acid
**(b)** NaCl + H2O + CO2 + NH3 → NH4Cl + NaHCO3
**(c)** 2 NaCl (aq) + 2 H2O (1) → 2 NaOH (aq) + Cl2 (g) + H2 (g)
**(d)** Ca(OH)2 + Cl2 → CaOCl2 + H2O

**Q17.** If '+' means '÷', '-' means '×', '×' means '+', '÷' means '-', what will come in place of the question mark (?) in the following equation?

9 × 8 + 4 - 8 ÷ 5 = ?

**(a)** 23
**(b)** 18
**(c)** 20
**(d)** 35

**Q18.** The focal length of a diverging lens is 50 cm. The power of the lens is:

**(a)** -5 D
**(b)** -2 D
**(c)** 5 D
**(d)** 2 D

**Q19.** In which of the following years was a joint venture signed between the Government of India and Suzuki Motor Corporation, to launch the Maruti 800 car for the first time in India?

**(a)** 1986
**(b)** 1978
**(c)** 1998
**(d)** 1982

**Q20.** A magnesium ribbon burns with a dazzling flame in air (oxygen) and changes into a white substance 'X'. The X is:

**(a)** MgCO3
**(b)** Mg
**(c)** Mg(OH)2
**(d)** MgO

**Q21.** The current through horizontal straight wire flows from west to east. The direction of the magnetic field lines as viewed from the east end will be:

**(a)** anticlockwise in a plane perpendicular to the wire
**(b)** clockwise in a plane perpendicular to the wire
**(c)** anticlockwise in the plane of the wire
**(d)** clockwise in the plane of the wire

**Q22.** Which of the following has the largest atomic radius?

**(a)** Chlorine
**(b)** Fluorine
**(c)** Iodine
**(d)** Oxygen

**Q23.** Which state has become India's first state to launch AVGC (Animation, Visual Effects, Gaming, and Comics) Centre of Excellence?

**(a)** Karnataka
**(b)** Kerala
**(c)** Jharkhand
**(d)** Haryana

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**Q24.** Planets do not twinkle because

**(a)** they scatter less light
**(b)** they act as extended source of light
**(c)** they act as a point source of light
**(d)** they scatter more light

**Q25.** Which Article of the Constitution of India deals with duties of Prime Minister as respects the fumishing of information to the President, etc.?

**(a)** Article 78
**(b)** Article 73
**(c)** Article 69
**(d)** Article 62

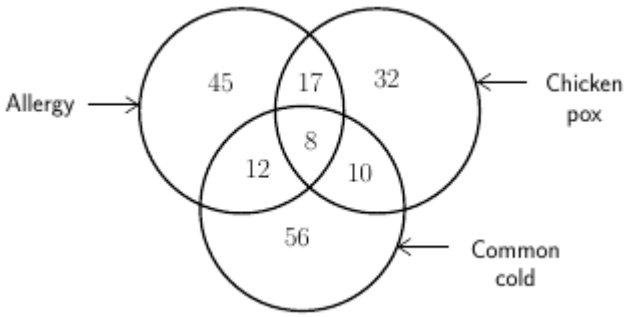
**Q26.** Which of the following pairs is NOT coprime?

**(a)** (17, 34)
**(b)** (11, 13)
**(c)** (15, 17)
**(d)** (17, 23)

**Q27.** In a certain code language, 'SIGMA' is written as 'FVTZN' and 'FNYRQ' is written as 'SALED'. How will 'ARJUN' be written in that language?

**(a)** WENAH
**(b)** BPWAH
**(c)** EWNAH
**(d)** NEWHA

**Q28.** Study the given diagram carefully and answer the following question. The numbers in different sections indicate the number of persons who have suffered from different diseases.




How many people have suffered from both Allergy and Chicken pox but NOT Common cold?

**(a)** 32
**(b)** 45
**(c)** 25
**(d)** 17

**Q29.** How will the plant be affected if the rate of respiration becomes more than the rate of photosynthesis?

**(a)** Plant growth will slow down.
**(b)** Plants will store a lot amount of food
**(c)** More food will be oxidised than that produced, and plant will starve and die.
**(d)** Plant growth will increase due to more energy produced.

**Q30.** Ramakrishna Mission was founded in 1897 by _____.

**(a)** Ramkrishna Paramhansa
**(b)** Dayanand Saraswati
**(c)** Swami Vivekanand
**(d)** Raja Ram Mohan Roy

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**Q31.** Which of the following is the storage carbohydrate in plants?

**(a)** Glucose
**(b)** Glycogen
**(c)** Starch
**(d)** Sucrose

**Q32.** The Constitution of India has ____ parts and ___ schedules.

**(a)** 12; 25
**(b)** 22; 10
**(c)** 25; 12
**(d)** 10; 22

**Q33.** A statement is given followed by two assumptions numbered I and II. You have to assume everything in the statement to be true and decide which of the given assumptions is/are implicit in the statement.

Statement:

Due to the failure of the main grid, power supply to many parts of the city was affected.

Assumptions:

I. The main grid is responsible for transmission of power to different parts of the city.

II. Most people have backup power installations at their homes to manage during times when power supply is disrupted.

**(a)** Both assumptions I and II are implicit
**(b)** Only assumption II is implicit
**(c)** Neither assumption I nor II is implicit
**(d)** Only assumption I is implicit

**Q34.** Which of the following is NOT a unit of heat energy?

**(a)** Calorie
**(b)** Watt second
**(c)** Kilowatt
**(d)** Joule

**Q35.** Which two banks have merged with Punjab National Bank in 2020?

**(a)** Syndicate Bank and Allahabad Bank
**(b)** Dena Bank and Vijaya Bank
**(c)** Oriental Bank of Commerce and United Bank of India
**(d)** Andhra Bank and Corporation Bank

**Q36.** Find the value of 325 × 5 + 31 × 21 - 22 × (63 - 52).

**(a)** 2044
**(b)** 2034
**(c)** 2024
**(d)** 2014

**Q37.** The bends formed in the river when river water erodes its banks on the outside of the channel are known as:

**(a)** Distributaries
**(b)** Braided channels
**(c)** Meanders
**(d)** Tributaries

**Q38.** Simplify $(8^2 \times 3^3)/\sqrt{64} \times \sqrt{81}$.

**(a)** 24
**(b)** 27
**(c)** 72
**(d)** 64

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**Q39.** The sum of the present ages of a father and his daughter is 80 years. Eight years ago, the father's age was seven times the age of his daughter. Eight years from now, what will be the daughter's age?

**(a)** 20 years
**(b)** 18 years
**(c)** 22 years
**(d)** 24 years

**Q40.** Based on the given statement, four conclusions are drawn. Find out which conclusion is true based on the statement.

Statement: $Y < O \leq G \leq K = U > L > P$

**(a)** O = P
**(b)** G = Y
**(c)** K > P
**(d)** Y > L

**Q41.** Where was the first Biosafety Level-3 (BSL-3) Containment Mobile Laboratory inaugurated in February 2022 to strengthen the healthcare infrastructure of South Asia?

**(a)** Pune
**(b)** Nagpur
**(c)** Nashik
**(d)** Mumbai

**Q42.** The HCF of 108 and 144 is _____

**(a)** 12
**(b)** 24
**(c)** 16
**(d)** 36

**Q43.** Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

64 : 81 :: 121 : 144 : 169 : ?

**(a)** 196
**(b)** 216
**(c)** 225
**(d)** 200

**Q44.** The parallel sides of a trapezium and its height are in an arithmetic progression with a common difference of 4. If the height is the highest term and the area of the trapezium is 160 sq, units, find the ratio of length of greatest parallel side to that of the smallest parallel side.

**(a)** 5 : 1
**(b)** 1 : 5
**(c)** 2 : 3
**(d)** 3 : 2

**Q45.** This question is based on the following 3-digit numbers.

543 769 552 342 245

(Example-697 - First digit = 6, second digit = 9 and third digit = 7)

If in each of the numbers, 1 is added to the first digit of every number, in how many numbers will the first digit be exactly divisible by the third digit of the same number?

**(a)** Three
**(b)** Five
**(c)** Two
**(d)** Four

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**Q46.** A sum, when invested at 12 1/2 % simple interest per annum, amounts to Rs. 8,250 after 2 years. What is the simple interest?

**(a)** Rs. 1,820
**(b)** Rs. 1,650
**(c)** Rs. 1,910
**(d)** Rs. 1,700

**Q47.** What is the nature of the roots of the quadratic equation $x^2 - 5x + 7 = 0$?

**(a)** Not real
**(b)** Real, rational, equal
**(c)** Real, irrational, unequal
**(d)** Real, rational, unequal

**Q48.** Some features of genes are mentioned below. Which option states the INCORRECT feature of genes?

**(a)** They do not undergo any change.
**(b)** They are segments of DNA.
**(c)** Each germ cell has one gene set.
**(d)** They control traits by producing proteins.

**Q49.** Which of the following famous churches of India is INCORRECTLY matched with its location?

**(a)** St. Paul Cathedral - Kolkata
**(b)** St. John in the Wilderness Church - Pondicherry
**(c)** Santa Cruz Basilica - Kochi
**(d)** Basilica of Bom Jesus - Goa

**Q50.** Select the INCORRECT option with reference to the Chipko Andolan.

**(a)** It involved the community in forest conservation efforts
**(b)** It forced the government to rethink their priorities in the use of forest produce
**(c)** It was a violent movement to save the trees
**(d)** People realised that forests are needed to maintain the quality of soil

**Q51.** The property/properties that must be possessed by a material to be chosen for making heating element of heating devices is are:

(i) high melting point
(ii) high resistivity
(iii) low resistance

**(a)** Only (i) and (ii)
**(b)** Only (i) and (iii)
**(c)** (i), (ii), (iii)
**(d)** Only (ii) and (iii)

**Q52.** The difference between the selling price on a discount of 32% and two successive discounts of 20% each on a certain bill is Rs. 25. Find the actual amount of the bill.

**(a)** Rs. 576
**(b)** Rs. 625
**(c)** Rs. 200
**(d)** Rs. 425

**Q53.** Find the number of sides in a regular polygon if its each interior angle is 160°.

**(a)** 17
**(b)** 14
**(c)** 18
**(d)** 15

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**Q54.** The magnification produced by a spherical mirror is -0.5. The image formed by the mirror is:

**(a)** real, inverted and diminished
**(b)** real, inverted and enlarged
**(c)** virtual, erect and diminished
**(d)** virtual, erect and enlarged

**Q55.** Raju and Raman can complete a piece of work in 12 days and 16 days, respectively. If they work on alternate days, starting with Raju, in how many days will the work be completed?

**(a)** 13 2/3 days
**(b)** 13 1/3 days
**(c)** 14 2/3 days
**(d)** 14 1/3 days

**Q56.** If '+' means '-', '-' means '÷', '÷' means '×' and '×' means '+', what will come in place of the question mark (?) in the following equation?

18 - 3 × 14 ÷ 2 + 12 = ?

**(a)** 24
**(b)** 22
**(c)** 19
**(d)** 21

**Q57.** Which languages are to be used for all or any of the official purposes of the State of Tripura as per the Tripura Official Languages Act, 1964?

**(a)** Konkani and English
**(b)** Bengali and Kokborok
**(c)** Telugu and Lepcha
**(d)** Hindi and Bengali

**Q58.** India is the third largest country in South Asia, with _____ of Earth's land area.

**(a)** 4.3%
**(b)** 2.3%
**(c)** 6.5%
**(d)** 5.7%

**Q59.** The sum of two numbers is 32 and one of them exceeds the other by 18. Find the greater number.

**(a)** 24
**(b)** 28
**(c)** 27
**(d)** 25

**Q60.** Which of the following numbers will replace the question mark (?) in the given series?

17, 30, 44, 59, 75,?

**(a)** 111
**(b)** 102
**(c)** 92
**(d)** 85

**Q61.** Which of the following number will replace the question mark (?) and complete the given number series?

4, 5, 12, 39, 160,?

**(a)** 850
**(b)** 800
**(c)** 805
**(d)** 804

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**Q62.** In which of the following years was the first Republic Day of India celebrated?

**(a)** 1948
**(b)** 1949
**(c)** 1947
**(d)** 1950

**Q63.** Who has developed the Tamanna tool related to education in India?

**(a)** All India Council for Technical Education
**(b)** University Grants Commission
**(c)** Central Board of Secondary Education (CBSE) and National Council of Educational Research and Training (NCERT)
**(d)** Indian Certificate of Secondary Education

**Q64.** All 72 students of a class are standing in a row facing the north. Shalabh is standing at the extreme left end of the row. Only 8 students are standing between Shalabh and Kimaya. Virali is 26^(th) from the extreme right end of the row. How many students are standing between Virali and Kimaya?

**(a)** 37
**(b)** 36
**(c)** 35
**(d)** 38

**Q65.** From point X, a person walks 45 m towards the east. He then takes a left turn and walks 40 m. He then takes a right turn and walks 90 m. He then takes a right turn and walks 60 m. Finally, he takes a right turn and walks 135 m to reach point Y. How far and in which direction is point X from point Y? (All turns are 90 degree turns only)

**(a)** 20 m, North
**(b)** 15 m, North
**(c)** 20 m, South
**(d)** 15 m, South

**Q66.** The _____ DOES NOT function as an excretory organ in humans.

**(a)** small intestine
**(b)** skin
**(c)** large intestine
**(d)** lungs

**Q67.** If $d^2 + 1/(d^2) = 18$, and $d > 1/d$ then the value of $d^3 - 1/(d^3)$ is :

**(a)** 64
**(b)** 91
**(c)** 76
**(d)** 81

**Q68.** Carbon is able to form stable compounds because of:

**(a)** Its ability to form covalent bond
**(b)** its allotropic forms
**(c)** its smaller atomic size
**(d)** the presence of p-orbital

**Q69.** Simplify (1/3)^(-3)+(1/5)^(-4)+(1/15)^(-2).

**(a)** 856
**(b)** 756
**(c)** 877
**(d)** 777

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**Q70.** Mohit's salary is Rs. 15,000 per month. He spends Rs. 5,000 on house rent, Rs. 2,000 on bills and rest of the amount is his monthly savings. Find his savings in a year, if in the month of his birthday he spent his complete monthly saving for birthday celebration.

**(a)** Rs. 8,000
**(b)** Rs. 96,000
**(c)** Rs. 88,000
**(d)** Rs. 17,000

**Q71.** The 36^(th) National Games of India will take place in _____ cities of Gujarat between 27 September and 10 October 2022.

**(a)** six
**(b)** five
**(c)** eight
**(d)** four

**Q72.** Find the median class of:

| Class | 0-50 | 50-100 | 100-150 | 150-200 |
|---|---|---|---|---|
| Frequency | 12 | 15 | 13 | 10 |

**(a)** 100-150
**(b)** 150-200
**(c)** 0-50
**(d)** 50-100

**Q73.** Some effects of large production of biodegradable waste are mentioned below. Choose the INCORRECT statement.

**(a)** Amount of waste sent to landfills increases
**(b)** Gives out foul smell
**(c)** Act as breeding ground for mosquitoes and spread diseases
**(d)** Replenishment of soil nutrients

**Q74.** Each vowel in the word "EXPLAIN' is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. If each letter, thus formed, is arranged in alphabetical order, which letter will be third from the right end?

**(a)** Q
**(b)** O
**(c)** M
**(d)** Y

**Q75.** A shadow of a tower standing on a level ground is found to be 40 √3 meters longer when the Sun's altitude is 30° than when it is 60°. The height of the tower is:

**(a)** 50 m
**(b)** 60 m
**(c)** 70 m
**(d)** 40 m

**Q76.** Simplify: $6(x^3 - 2x^2 + 3x) - (x^3 + 2x - 3)$.

**(a)** $5x^3 - 12x^2 + 16x + 3$
**(b)** $5x^3 - 12x^2 + 16x - 3$
**(c)** $5x^3 + 12x^2 + 16x - 3$
**(d)** $5x^3 + 12x^2 + 16x + 3$

**Q77.** Umesh is standing facing the south-west direction. He then takes a 90° clockwise turn. After that, he takes a 135° clockwise turn. He finally takes a 90° anticlockwise turn. In which direction is he facing now?

**(a)** West
**(b)** North-west

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**(c)** North
**(d)** North-east

**Q78.** Compounds C2H6 and C3H8 are differ by _____ unit and belong to ____ series.
**(a)** CH2, heterogeneous
**(b)** CH3, homologous
**(c)** CH3, heterogeneous
**(d)** CH2, homologous

**Q79.** _____ aid (s) in the emulsification of fat.
**(a)** Bile salts
**(b)** Pepsin
**(c)** HCl
**(d)** Vit- K Trypsin

**Q80.** In a queue of travelers at the emigration counter facing north, Pankaj is 9^(th) from the extreme left end and Puja is 17^(th) from extreme right end. If the positions of Pankaj and Puja are interchanged, then the new position of Pankaj will be 15^(th) from the extreme left end. Find the number of travelers between Puja and Pankaj.
**(a)** 4
**(b)** 3
**(c)** 5
**(d)** 6

**Q81.** How many spherical solid marbles, each having a radius of 0.3 cm, can be made from a solid sphere having a radius of 6 cm?
**(a)** 7500
**(b)** 8000
**(c)** 8500
**(d)** 9000

**Q82.** A shopkeeper sells an item at a profit of 25% and dishonestly uses a weight that is 30% less than the actual weight. Find his total profit%.
**(a)** 78.57%
**(b)** 65.75%
**(c)** 42%
**(d)** 23%

**Q83.** The Dam Rehabilitation and Improvement Project was started in which year?
**(a)** 2009
**(b)** 2012
**(c)** 2021
**(d)** 2002

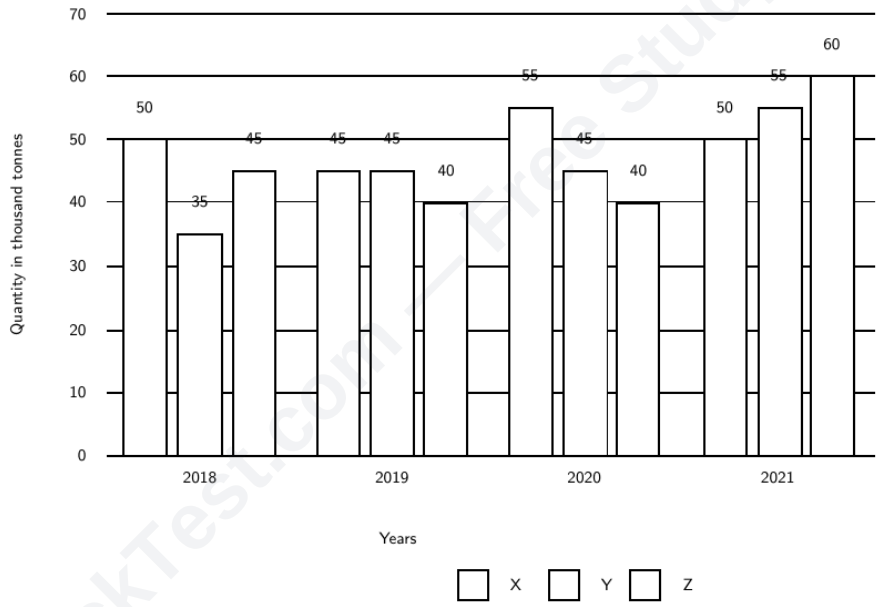
**Q84.** If '+' means '×', '×' means '÷', '÷' means '-', and '-' means '+', what will come in place of the question mark (?) in the following equation?
13 - 17 + 24 ÷ 54 × 18 + 28 × 14 = ?
**(a)** 380
**(b)** 510
**(c)** 415
**(d)** 225

**Q85.** The total surface area of a cylinder of diameter 10 cm is 330 square centimeters. Find the height of the cylinder?
**(a)** 10.5 cm
**(b)** 6.5 cm
**(c)** 5.5 cm

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**(d)** 2.5 cm

**Q86.** The bar graph given below shows the data on the production of milk products (in thousand tonnes) by three branches, X, Y and Z, of a dairy product company over the years. Study the graph and answer the question.




For which branch(es) of the dairy product company was the average production for the given 4 years the minimum?

**(a)** Branch Z
**(b)** Branch Y
**(c)** Branch X
**(d)** Branches Y and Z

**Q87.** Which of the following is an independent financial institution established in 1990 under an Act of the Indian Parliament, with the objective of assisting in the growth and development of Micro, Small and Medium Enterprises (MSMEs) sector?

**(a)** SIDBI
**(b)** NBFC
**(c)** MSS
**(d)** FSDC

**Q88.** If 40 : 35 :: 35 : x, find the value of x.

**(a)** 49/8
**(b)** 49/14
**(c)** 245/8
**(d)** 49/16

**Q89.** If 1 January 2011 was a Saturday, then what day of the week was 31 December 2011?

**(a)** Saturday
**(b)** Sunday
**(c)** Monday
**(d)** Friday

**Q90.** Five friends A, B, C, D and E are sitting in a straight row, facing north. A is not at the exact centre position of the row. C is second from one extreme end, while fourth from the other extreme end. B and D sit at the extreme ends of the row. Who sits at the exact centre position of the row?

**(a)** D
**(b)** E
**(c)** A
**(d)** C

**Q91.** Which of the following line(s) act as a normal to a spherical mirror?

(i) Line joining the pole and centre of curvature

(ii) Line joining the centre of curvature and point of incidence

(iii) Line joining focus and point of incidence

**(a)** Both (i) and (iii)
**(b)** (i), (ii) and (iii)
**(c)** Both (i) and (ii)
**(d)** Both (ii) and (iii)

**Q92.** What happens when sodium metal reacts with water?

**(a)** Chlorine gas and sodium hydroxide solution are produced.
**(b)** No reaction takes place.
**(c)** Only sodium hydroxide solution is produced.
**(d)** Hydrogen gas and sodium hydroxide solution are produced.

**Q93.** Some plants can also produce new plants from their roots. An example of such a plant is _____.

**(a)** Sweet Potato
**(b)** Cactus
**(c)** Ginger
**(d)** Bryophyllum

**Q94.** Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.

PORTUGAL : TROPLAGU : : URANUS : ARUSUN : : AMRITSAR : ?

**(a)** IRMARAST
**(b)** AATRRSMI
**(c)** TRRSMIAA
**(d)** TSMIRRAA

**Q95.** A statement is given, followed by four conclusions given in the options. Find out which conclusion is true based on the given statement.

Statement: $J \leq H \leq G = R > Z = E > D$

**(a)** $D > R$
**(b)** $J \leq G$
**(c)** $Z < D$
**(d)** $H > R$

**Q96.** Six friends, K, L, M, N, O and P are sitting around a circular table facing the centre of the table. O is second to the left of N. P is second to the right of K. M is to the immediate right of L. N and L are immediate neighbours. Who is sitting to the immediate right of P?

**(a)** N
**(b)** K
**(c)** O
**(d)** L

**Q97.** Consider the below statements and identify the correct answer.

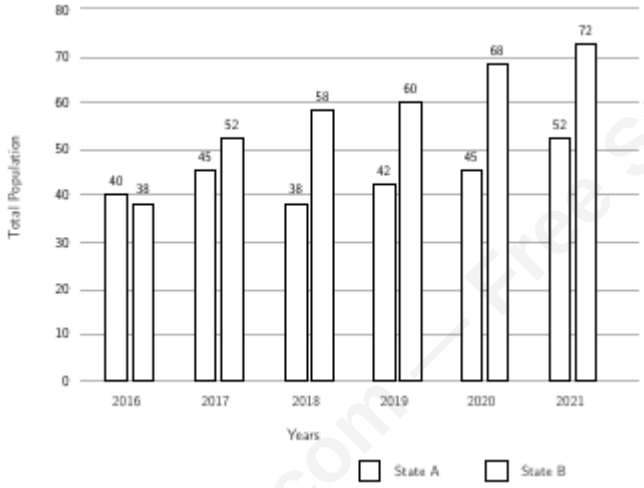
Statement I: Metallic character decreases across a period as we move from left to right.

Statement II: The effective nuclear charge acting on the valence shell elections increases across a period, the tendency to lose electrons will decrease.

**(a)** Both statements are correct. Statement I is correct explanation of Statement II.
**(b)** Both statements are correct. Statement II is correct explanation of Statement I.
**(c)** Only Statement II is correct.
**(d)** Only Statement I is correct.

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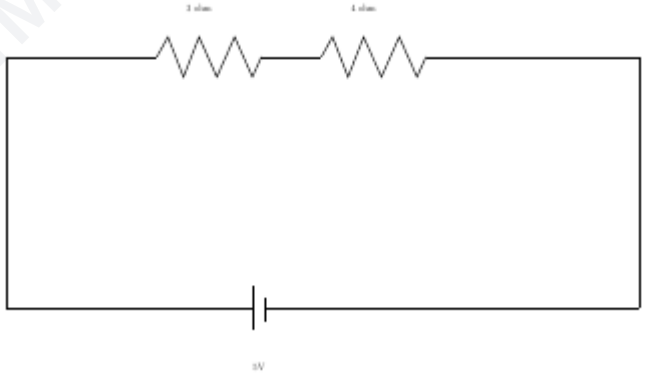
**Q98.** The bar graph given below shows the population of two states, A and B (in lakhs) over the years. Study the graph and answer the question.




What is the approximate average population of state B for all the given years?

**(a)** 65 lakhs
**(b)** 62 lakhs
**(c)** 58 lakhs
**(d)** 70 lakhs

**Q99.** The current across the 3 ohm resistance in the given circuit is:



**(a)** 7/5 A
**(b)** 5/3 A
**(c)** 3/5 A
**(d)** 5/7 A

**Q100.** The Scheme of Assistance to National Sports Federations (NSFs) has been extended to train and field national teams for national and international competitions between:

**(a)** 2022 and 2025
**(b)** 2021 and 2025
**(c)** 2022 and 2024
**(d)** 2022 and 2026

## ANSWER KEY

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

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | a | 52 | b | 53 | c | 54 | a | 55 | a | 56 | b | 57 | b | 58 | b | 59 | d | 60 | c |
| 61 | c | 62 | d | 63 | c | 64 | b | 65 | a | 66 | a | 67 | c | 68 | c | 69 | c | 70 | c |
| 71 | a | 72 | d | 73 | a | 74 | c | 75 | b | 76 | a | 77 | c | 78 | d | 79 | a | 80 | c |
| 81 | b | 82 | a | 83 | b | 84 | c | 85 | c | 86 | b | 87 | a | 88 | c | 89 | a | 90 | b |
| 91 | c | 92 | d | 93 | a | 94 | a | 95 | b | 96 | a | 97 | b | 98 | c | 99 | d | 100 | d |

## SOLUTIONS

**Q1. Answer: (a) 5 hr**

Shortcut Trick

Initial speed = 275 ÷ 5 = 55 km/h.

New speed = 55 − 5 = 50 km/h.

New time = New distance ÷ New speed = 250 ÷ 50 = 5 hours.

Therefore The correct answer is 5 hr.

Alternate Method

Given: Initial distance = 275 km, Initial time = 5 hr, Reduction in speed = 5 km/h, New distance = 250 km.

Formula Used: Speed = Distance ÷ Time; Time = Distance ÷ Speed

=> Initial Speed = 275 ÷ 5 = 55 km/h

=> Reduced Speed = 55 − 5 = 50 km/h

=> Time taken for 250 km = 250 ÷ 50

=> Time taken = 5 hours

Therefore The correct answer is 5 hr.

Additional Information

Speed-Distance Relationship

When time is constant, distance is directly proportional to speed (D1/D2 = S1/S2).

Average Speed

Average speed for the whole journey is Total Distance ÷ Total Time.

Unit Conversion

To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

**Q2. Answer: (a) 7LNJF6**

The given codes are as follows:

| Number/symbol | 4 | % | 7 | 3 | # | • | 9 | @ | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Code | X | N | B | J | H | L | Y | F | R |

Given question to be coded → 7 * % 3 @ 6

→ The second condition will be applied here as the first element is an odd number and the last an even number.

As per the condition, it will be coded as follows:

| Number/symbol | 7 | • | % | 3 | @ | 6 |
|---|---|---|---|---|---|---|
| Code | 7 | L | N | J | F | 6 |

Hence, the correct answer is "7LNJF6".

**Q3. Answer: (a) i - c, ii - b, iii - d, iv - a**

The correct answer is i - c, ii - b, iii - d, iv - a.

Key Points

• Lemon juice has a pH of around 2.2 which indicates its highly acidic nature. Hence, i matches with c.

• Gastric juice is extremely acidic with a pH of approximately 1.2. Hence, ii matches with b.

• Milk of magnesia is known to have a pH around 10, making it basic. Hence, iii matches with d.

• Sodium hydroxide solution is very basic with a pH of about 14. Hence, iv matches with a.

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Additional Information

• pH Scale:

• The pH scale measures how acidic or basic a substance is, ranging from 0 to 14.

• A pH less than 7 indicates acidity, whereas a pH greater than 7 indicates a base. A pH of 7 is considered neutral.

**Q4. Answer: (b) Fleming's left-hand rule**

The correct answer is Fleming's left-hand rule

Key Points

• Fleming's left-hand rule is used to determine the direction of the force on a current-carrying conductor placed inside a magnetic field.

• According to this rule, if you hold your left hand with the thumb, forefinger, and middle finger mutually perpendicular to each other, the thumb represents the direction of the force (motion), the forefinger represents the direction of the magnetic field, and the middle finger represents the direction of the current.

• This rule is particularly useful in motors where the direction of motion needs to be determined.

• It helps in understanding the relationship between the magnetic field, current, and the resulting force, which is crucial for designing and operating electric motors and generators.

Additional Information

• Maxwell's corkscrew rule is used to determine the direction of the magnetic field around a current-carrying conductor.

• Right hand thumb rule is used to determine the direction of the magnetic field in a current-carrying conductor.

• Fleming's right-hand rule is used to determine the direction of induced current when a conductor moves in a magnetic field.

• Both Fleming's rules (left-hand and right-hand) are essential for understanding electromagnetic induction and the functioning of electric motors and generators.

**Q5. Answer: (b) 2025-26**

The correct answer is 2025-26

Key Points

• As of July 2022, PM-VIKAS is aligned to the 15th Finance Commission cycle period up to 2025-26.

• PM-VIKAS is a Central Sector (CS) scheme under the Ministry of Minority Affairs.

• The scheme aims to enhance the livelihood opportunities for the minority communities by providing them with skill development and training programs.

• It focuses on promoting entrepreneurship among the minority communities and providing them with the necessary financial support.

• The scheme is part of the government's broader agenda to ensure inclusive growth and development for all sections of society.

Additional Information

• The 15th Finance Commission was constituted by the President of India in November 2017.

• It is tasked with making recommendations on the distribution of net proceeds of taxes between the Centre and the States for a five-year period starting from April 1, 2020.

• The Commission also recommends on various other fiscal matters to strengthen cooperative federalism in India.

• The Finance Commission's recommendations play a crucial role in ensuring a balanced allocation of resources and maintaining fiscal stability in the country.

• The 15th Finance Commission's recommendations are valid for the period from 2020-21 to 2025-26.

**Q6. Answer: (c) HMBTHT**

Let's check each option:

| **1** | **B** | **B** | **X** | **T** | **M** | **H** | **H** | **Y** | **H** | **M** | **B** | **T** | **Z** | **T** | **M** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | B | M | X | T | H | B | H | Y | H | M | B | T | Z | T | M |
| 3 | B | H | X | T | M | B | H | Y | T | M | B | H | Z | T | M |
| 4 | B | T | X | T | M | H | H | Y | B | M | B | H | Z | T | M |

Here, we can see that Option 3 follows a pattern → BHXTM, BHYTM, BHZTM

Hence, the correct answer is "HMBTHT".

**Q7. Answer: (d) (189, 49, 27)**

The logic followed here is:

Logic: First number = √Second number × Third number

(80, 16, 20)

→ 80 = √16 × 20

→ 80 = 4 × 20

(144, 36, 24)

→ 144 = √36 × 24

→ 144 = 6 × 24

Let's check each option,

1) (512, 25, 16)

→ 512 ≠ √25 × 16

2) (122, 12, 6)

→ 122 ≠ √12 × 6

3) (224, 36, 40)

→ 224 ≠ √36 × 40

4) (189, 49, 27)

→ 189 = √49 × 27

→ 189 = 7 × 27

→ 189 = 189 => Follows the logic.

Hence, the correct answer is "(189, 49, 27)".

**Q8. Answer: (b) -2/3 and 3/2**

Shortcut Trick

For the equation 6p2 − 5p − 6 = 0, find two numbers whose product is 6 × (−6) = −36 and sum is −5.

The numbers are −9 and +4.

Change the signs of these numbers to get +9 and −4.

Divide by the coefficient of p2 (which is 6): 9/6 and −4/6.

Simplify the fractions to get the roots: 3/2 and −2/3.

Therefore The correct answer is −2/3 and 3/2.

Alternate Method

Given:

The quadratic equation is 6p2 − 5p − 6 = 0.

Formula Used:

Factorization Method (Splitting the middle term): Split the term bp into two terms such that their product equals ac.

Calculations:

=> 6p2 − 9p + 4p − 6 = 0

=> 3p(2p − 3) + 2(2p − 3) = 0

=> (3p + 2)(2p − 3) = 0

Now, equating each factor to zero:

=> 3p + 2 = 0

=> 3p = −2

=> p = −2/3

And,

=> 2p − 3 = 0

=> 2p = 3

=> p = 3/2

Therefore The correct answer is −2/3 and 3/2.

Additional Information

Standard Quadratic Formula

For ap2 + bp + c = 0, roots are p = (−b ± √(b2 − 4ac)) / 2a.

Discriminant and Nature of Roots

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D = b2 − 4ac. If D > 0 and a perfect square, roots are real, rational, and unequal.

Sum and Product of Roots

Sum of roots = −b/a and Product of roots = c/a.

**Q9. Answer: (d) 41**

The number of people likes Mint but not Kesar flavoured ice-cream is shown below:

Hence, the correct answer is "41".

**Q10. Answer: (a) 2015**

The correct answer is 2015

Key Points

• Bandhan Bank was formed in the year 2015.

• It started as a micro-finance company and later received the banking license from the Reserve Bank of India.

• Bandhan Bank is headquartered in Kolkata, West Bengal.

• The bank primarily focuses on serving underbanked and underserved sections of the society.

Additional Information

• Bandhan Bank was incorporated on 23rd December 2014, and it commenced its banking operations on 23rd August 2015.

• As of now, Bandhan Bank has expanded its network across various states in India.

• It offers a wide range of banking products and services including savings and current accounts, fixed deposits, loans, and more.

• The bank's mission is to provide affordable banking services to the unbanked and underbanked population.

**Q11. Answer: (d) Two**

According to the given information,

1) Only two boxes are kept between G and B.

2) B is kept at the bottom.

3) A is kept fifth from the bottom.

4) E is kept at the top.

5) C is kept on one of the positions above D.

6) F is kept immediately above D.

Here, we can see that there are two boxes kept between D and A.

Hence, the correct answer is "Two".

**Q12. Answer: (d) Duration of Panchayat**

The correct answer is Duration of Panchayat

Key Points

• Article 243E of the Indian Constitution specifies the duration of Panchayats.

• The Article states that every Panchayat shall continue for five years from the date appointed for its first meeting.

• It also outlines that elections to constitute a Panchayat shall be completed before the expiration of its duration.

• In case of dissolution, elections must be held within six months from the date of dissolution.

Additional Information

• The Panchayati Raj system in India is a three-tier system of local self-government.

• The 73rd Amendment Act of 1992 added Part IX to the Constitution, which deals with the Panchayats and provides a detailed framework for their structure, elections, and powers.

• The amendment aimed to decentralize power and promote local governance in rural areas.

• The State Election Commission is responsible for conducting elections to the Panchayats.

• The duration of Panchayats ensures a stable governance structure at the local level and enables continuity in development activities.

**Q13. Answer: (d) 56.5 kg**

Shortcut Trick

Convert percentages into simplified ratios for Men : Women : Children → 40% : 35% : 25% = 8 : 7 : 5.

Total units in the group = 8 + 7 + 5 = 20 units.

Weighted average = [(8 × 70) + (7 × 60) + (5 × 30)] ÷ 20

Weighted average = (560 + 420 + 150) ÷ 20 = 1130 ÷ 20 = 56.5 kg.

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Therefore The correct answer is 56.5 kg.

Alternate Method

Given:

• Men = 40%, Average weight = 70 kg

• Women = 35%, Average weight = 60 kg

• Children = 100% − (40% + 35%) = 25%, Average weight = 30 kg

Formula Used:

Group Average = [(Σ n_i × w_i)] ÷ Total Quantity

Assume the total number of people is 100.

=> Total weight of Men = 40 × 70 = 2800 kg

=> Total weight of Women = 35 × 60 = 2100 kg

=> Total weight of Children = 25 × 30 = 750 kg

=> Combined weight of the group = 2800 + 2100 + 750 = 5650 kg

=> Average weight of the group = 5650 ÷ 100

=> Average weight = 56.5 kg

Therefore The correct answer is 56.5 kg.

Additional Information

Weighted Average

It is used when various components contribute different proportions to the final result. Formula: W = (w1x1 + w2x2 + ...) ÷ (w1 + w2 + ...).

Deviation Method

Instead of total calculation, assume an average (e.g., 60 kg) and sum the net deviations multiplied by their frequency/ratio to find the correction factor.

Percentage to Ratio

Calculations are often faster by reducing percentages to their simplest ratio form (e.g., 40%:35%:25% → 8:7:5) to keep numbers manageable.

**Q14. Answer: (d) Both conclusions I and II follow**

The least possible venn diagram is shown below:

Conclusions:

I. Some equestrians are spectacles → True (Since all jokers are equestrians (from the combination of Statements 1 and 2) and some jokers are spectacles (Statement 3), it logically follows that some equestrians (those who are jokers) are spectacles).

II. Some circuses are jokers → True (From Statement 1, we know that all jokers are circuses. This implies that at least some members of the set of circuses are jokers. Therefore, it logically follows that some circuses are jokers).

Hence, the correct answer is "Both conclusions I and II follow".

**Q15. Answer: (b) 2**

The given series is: 2 6 7 4 9 3 6 5 1 9 5 2 4 5 9 4 2 3 7 1

Even numbers which are immediately preceded by an odd number and immediately followed by a prime number is shown below:

=> 2 6 7 4 9 3 6 5 1 9 5 2 4 5 9 4 2 3 7 1

Here, we can see there are two such even numbers.

Hence, the correct answer is "2".

**Q16. Answer: (c) 2 NaCl (aq) + 2 H2O (1) → 2 NaOH (aq) + Cl2 (g) + H2 (g)**

The correct answer is 2 NaCl (aq) + 2 H2O (1) → 2 NaOH (aq) + Cl2 (g) + H2 (g)

Key Points

• The chlor-alkali process refers to the electrolysis of sodium chloride (NaCl) solution.

• In this process, sodium hydroxide (NaOH), chlorine gas (Cl2), and hydrogen gas (H2) are produced.

• The reaction involved in the chlor-alkali process is: 2 NaCl (aq) + 2 H2O (1) → 2 NaOH (aq) + Cl2 (g) + H2 (g).

• This process is significant in the chemical industry for producing essential chemicals like NaOH and Cl2.

Additional Information

• The chlor-alkali process is conducted in electrolytic cells, commonly using either mercury cells, diaphragm cells, or membrane cells.

• Chlorine gas produced in this process is used for water treatment, PVC production, and manufacturing of other chemicals.

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• Sodium hydroxide produced is used in soap making, paper production, and various other industrial processes.
• Hydrogen gas is often utilized as a clean fuel or in the production of ammonia for fertilizers.

**Q17. Answer: (c) 20**

| Sign | • | • | × | ÷ |
|---|---|---|---|---|
| Interchange with | ÷ | × | • | • |

Given equation: 9 × 8 + 4 - 8 ÷ 5 =?
The equation we get after interchanging the signs: 9 + 8 ÷ 4 × 8 - 5 =?
→ 9 + 8 ÷ 4 × 8 - 5 =?
→ 9 + 2 × 8 - 5 =?
→ 9 + 16 - 5 =?
→ 25 - 5 =?
→ 20 =?
Hence, the correct answer is "20".

**Q18. Answer: (b) -2 D**

The correct answer is -2 D.
Key Points
• Given: Focal length (f) = 50 cm = 0.50 m. As it's a diverging lens (concave lens), f = –0.50 m.
• Power (P) of lens is given by the formula: P = 100/f (in cm) or P = 1/f (in m).
• Substituting: P = 1 / (–0.50) = –2 dioptres (D).
• The negative sign indicates that it is a concave (diverging) lens.
• Therefore, the correct power of the lens is –2 D.
Additional Information
• Power of a Lens:
• It indicates the converging or diverging ability of a lens.
• Measured in dioptres (D).
• 1 D = Power of a lens with focal length 1 metre.
• Concave Lens:
• Also called a diverging lens.
• Forms virtual, erect, and diminished images.
• Has a negative focal length and negative power.
• Convex Lens:
• Also called a converging lens.
• Has a positive focal length and positive power.
• Lens Power Usage:
• Used in corrective eyeglasses, microscopes, and cameras.
• Unit Conversion:
• To use power formula, focal length must be in metres (m).
• 1 cm = 0.01 m, hence 50 cm = 0.50 m.

**Q19. Answer: (d) 1982**

The correct answer is 1982
Key Points
• A joint venture was signed between the Government of India and Suzuki Motor Corporation in the year 1982.
• This joint venture led to the launch of the Maruti 800 car, which was the first affordable car for the Indian middle class.
• The Maruti 800 became immensely popular and marked the beginning of a new era in the Indian automobile industry.
• Maruti Suzuki India Limited, formerly known as Maruti Udyog Limited, was the result of this collaboration.
Additional Information
• The Maruti 800 was launched in India in 1983 and quickly became a household name.
• It was known for its fuel efficiency, affordability, and compact size, making it ideal for Indian roads.
• Suzuki Motor Corporation is a Japanese multinational corporation headquartered in Hamamatsu, Japan, known for

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manufacturing automobiles, motorcycles, and all-terrain vehicles (ATVs).

• Maruti Suzuki has grown to become one of the largest car manufacturers in India, offering a wide range of vehicles to cater to different segments of the market.

• The success of the Maruti 800 paved the way for further collaboration between Indian and foreign automobile companies, boosting the Indian automotive sector.

**Q20. Answer: (d) MgO**

The correct answer is MgO

Key Points

• When a magnesium ribbon burns in air, it reacts with oxygen to form a white substance called magnesium oxide.

• The chemical equation for this reaction is: $2Mg + O2 \rightarrow 2MgO$.

• Magnesium oxide (MgO) is a white powdery substance.

Additional Information

• Magnesium is a highly reactive metal, especially when it is in the form of a thin ribbon.

• Burning magnesium produces a bright, white light and a lot of heat.

• Magnesium oxide is used in various applications, including as a refractory material and in the medical field as an antacid and laxative.

• It is important to handle burning magnesium with care, as it can cause severe burns and is difficult to extinguish.

**Q21. Answer: (a) anticlockwise in a plane perpendicular to the wire**

The correct answer is anticlockwise in a plane perpendicular to the wire.

Key Points

• The direction of the magnetic field around a current-carrying conductor can be determined using the right-hand thumb rule.

• According to the rule, if you point the thumb of your right hand in the direction of the current, the curl of your fingers shows the direction of the magnetic field lines.

• In this scenario, the current flows from west to east. When viewed from the east end, the magnetic field lines will appear to move in an anticlockwise direction in a plane perpendicular to the wire.

• This is because the fingers of your right hand will curl anticlockwise when the thumb points in the direction of the current (east).

Additional Information

• The right-hand thumb rule is a fundamental concept in electromagnetism and is widely used to determine the direction of magnetic fields in various applications.

• The magnetic field lines form concentric circles around the wire, and their direction depends on the direction of the current flow.

• This principle is crucial in the design and operation of electrical devices such as motors, generators, and transformers.

**Q22. Answer: (c) Iodine**

The correct answer is Iodine

Key Points

• Iodine has the largest atomic radius among the given elements.

• The atomic radius increases as you move down a group in the periodic table.

• This trend is due to the addition of electron shells as you move down a group, increasing the size of the atom.

Additional Information

• The atomic radius is a measure of the size of an atom from its nucleus to the outer boundary of its electron cloud.

• In general, the atomic radius decreases across a period from left to right due to increased nuclear charge, which pulls electrons closer to the nucleus.

• Conversely, the atomic radius increases down a group as more electron shells are added, making the atom larger.

• Iodine, being in the same group as Chlorine and Fluorine but in a lower period, has more electron shells, making it the largest in atomic size among the options provided.

**Q23. Answer: (a) Karnataka**

The correct answer is Karnataka

Key Points

• Karnataka has become India's first state to launch the AVGC (Animation, Visual Effects, Gaming, and Comics) Centre of Excellence.

• The AVGC Centre of Excellence is aimed at fostering innovation and nurturing talent in the digital creative sector.

• This initiative is expected to create numerous job opportunities and boost the state's economy by attracting investments from

global players in the AVGC industry.

• Karnataka has been a pioneer in promoting the AVGC sector, given its strong IT infrastructure and a robust ecosystem for startups and digital enterprises.

Additional Information

• The AVGC sector is one of the fastest-growing segments in the media and entertainment industry, with a significant potential for growth and development in India.

• Karnataka's government has been proactive in providing infrastructure, policy support, and incentives to boost the AVGC sector.

• The establishment of the AVGC Centre of Excellence is a testament to Karnataka's commitment to becoming a global hub for digital content creation and innovation.

• The Centre of Excellence will offer state-of-the-art facilities, training programs, and incubation support to budding entrepreneurs and professionals in the AVGC field.

**Q24. Answer: (b) they act as extended source of light**

The correct answer is they act as extended source of light

Key Points

• Planets act as extended sources of light, which means they cover a larger area in the sky compared to stars, which are point sources of light.

• This extended nature helps in averaging out the light coming from different parts of the planet, reducing the twinkling effect caused by atmospheric turbulence.

• Stars appear to twinkle because they are point sources of light, and atmospheric disturbances cause rapid changes in the light's path, making the stars appear to flicker.

• Planets, due to their larger apparent size, are less affected by these disturbances, and hence, they do not twinkle as stars do.

Additional Information

• Atmospheric turbulence refers to the irregular motion of air caused by differences in temperature, pressure, and humidity in the Earth's atmosphere.

• This turbulence can bend the light from celestial objects, causing them to appear to move or flicker when observed from the Earth's surface.

• The phenomenon is more pronounced for objects that are point sources of light, such as stars, due to the smaller area they cover in the sky.

• Large telescopes and adaptive optics systems can help reduce the effect of atmospheric turbulence, providing clearer images of celestial objects.

**Q25. Answer: (a) Article 78**

The correct answer is Article 78

Key Points

• Article 78 of the Constitution of India specifies the duties of the Prime Minister concerning the furnishing of information to the President.

• The Prime Minister is obligated to communicate to the President all decisions of the Council of Ministers relating to the administration of the affairs of the Union and proposals for legislation.

• The Prime Minister must furnish such information relating to the administration of the affairs of the Union and proposals for legislation as the President may call for.

• The Prime Minister must, if the President so requires, submit for the consideration of the Council of Ministers any matter on which a decision has been taken by a Minister but which has not been considered by the Council.

Additional Information

• The Constitution of India was adopted by the Constituent Assembly on 26th November 1949 and came into effect on 26th January 1950.

• It lays down the framework defining fundamental political principles, establishes the structure, procedures, powers, and duties of government institutions, and sets out fundamental rights, directive principles, and the duties of citizens.

• The Constitution of India is the longest written constitution of any country in the world.

• It declares India a sovereign, socialist, secular, and democratic republic, assuring its citizens justice, equality, and liberty, and endeavors to promote fraternity.

• The Seventh Schedule of the Constitution contains three lists which delineate the subjects under the Union, State, and Concurrent lists.

• Amendments to the Constitution can be made through a process outlined in Article 368.

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**Q26. Answer: (a) (17, 34)**

Shortcut Trick

Coprime numbers have a Highest Common Factor (HCF) of 1.

Check the given pairs: (11, 13), (15, 17), and (17, 23) are all prime to each other or consecutive odd numbers.

In pair (17, 34), since 34 ÷ 17 = 2, the HCF is 17.

Because the HCF is not 1, they are NOT coprime.

Therefore The correct answer is (17, 34).

Alternate Method

Given: Four pairs of numbers to check for coprime property.

Definition: Two numbers are coprime if their only common positive factor is 1.

=> For pair (17, 34): Factors of 17 = 1, 17; Factors of 34 = 1, 2, 17, 34.

=> Common Factors = 1, 17.

=> HCF(17, 34) = 17.

=> Since HCF ≠ 1, the pair (17, 34) is NOT coprime.

=> For other pairs: HCF(11, 13) = 1; HCF(15, 17) = 1; HCF(17, 23) = 1.

Therefore The correct answer is (17, 34).

Additional Information

Prime Numbers and Coprimality

Any two distinct prime numbers are always coprime to each other as their HCF is always 1.

Consecutive Numbers

Any two consecutive natural numbers (e.g., 14, 15) are always coprime.

Twin Primes

Pairs of prime numbers with a difference of 2 (like 11, 13) are called twin primes and are always coprime.

**Q27. Answer: (d) NEWHA**

SIGMA: FVTZN

FNYRQ: SALED

Similarly,

ARJUN: ?

Hence, the correct answer is "NEWHA".

**Q28. Answer: (d) 17**

The number of people who have suffered from both Allergy and Chicken pox, but not Common cold is shown below:

Hence, the correct answer is "17".

**Q29. Answer: (c) More food will be oxidised than that produced, and plant will starve and die.**

The correct answer is More food will be oxidised than that produced, and plant will starve and die.

Key Points

• If the rate of respiration exceeds the rate of photosynthesis, more food will be oxidised than that produced.

• This imbalance means that the plant will use up its stored food reserves faster than it can replenish them.

• As a result, the plant will starve and eventually die due to a lack of energy for growth and maintenance.

• Respiration and photosynthesis are vital processes for plant survival, and their rates need to be balanced for healthy growth.

Additional Information

• Photosynthesis is the process by which plants convert light energy into chemical energy, producing glucose and oxygen.

• Respiration is the process of breaking down glucose to release energy for cellular activities.

• A balance between these two processes is essential for the plant's health and growth.

• During the day, photosynthesis typically exceeds respiration, allowing plants to store excess energy.

• At night, when photosynthesis ceases, respiration continues, utilizing the stored energy.

**Q30. Answer: (c) Swami Vivekanand**

The correct answer is Swami Vivekanand

• Swami Vivekanand founded the Ramakrishna Mission in 1897.

• The mission was established to carry out humanitarian and social work, inspired by the teachings of Ramakrishna Paramhansa.

• The organization is involved in various activities including education, healthcare, and disaster relief.
• Swami Vivekanand was a chief disciple of Ramakrishna Paramhansa and played a key role in the revival of Hinduism in India.
• Swami Vivekanand was born on 12th January 1863 and his birth anniversary is celebrated as National Youth Day in India.
• He is best known for his speech at the Parliament of the World's Religions in Chicago in 1893, which began with the words "Sisters and brothers of America...".
• The Ramakrishna Mission and its associated math (monastery) have their headquarters at Belur Math near Kolkata, India.
• The mission's motto is "For one's own salvation, and for the welfare of the world".
• Swami Vivekanand's teachings focused on the development of the human mind and the importance of education.

**Q31. Answer: (c) Starch**

The correct answer is Starch

Key Points

• Starch is the primary storage carbohydrate in plants.
• It is a polysaccharide composed of numerous glucose units linked together.
• Plants store starch in various parts such as roots, stems, seeds, and leaves for energy.
• Starch serves as an important source of energy for both plants and the organisms that consume them.

Additional Information

• Glucose is a simple sugar and a primary energy source, but it is not used for long-term storage.
• Glycogen is the storage form of carbohydrates in animals, not plants.
• Sucrose is a disaccharide made of glucose and fructose, commonly found in plants but not primarily used for storage.
• Starch can be broken down into glucose units when the plant needs energy.

**Q32. Answer: (c) 25; 12**

The correct answer is 25; 12

Key Points

• The Constitution of India currently has 25 parts and 12 schedules.
• These parts cover various aspects of governance and the functioning of the state, including fundamental rights, directive principles, and the structure of government institutions.
• Schedules in the Constitution provide additional details and lists, such as the allocation of powers between the Union and States, and the administration of tribal areas.
• The Constitution has been amended multiple times to address the changing needs and requirements of the nation.

Additional Information

• The Constitution of India was adopted by the Constituent Assembly on 26th November 1949 and came into effect on 26th January 1950.
• It lays down the framework defining fundamental political principles, establishes the structure, procedures, powers, and duties of government institutions, and sets out fundamental rights, directive principles, and the duties of citizens.
• The Constitution of India is the longest written constitution of any country in the world.
• It declares India a sovereign, socialist, secular, and democratic republic, assuring its citizens justice, equality, and liberty, and endeavors to promote fraternity.
• The Seventh Schedule of the Constitution contains three lists which delineate the subjects under the Union, State, and Concurrent lists.
• Amendments to the Constitution can be made through a process outlined in Article 368.
• The Union List has been amended several times to meet the evolving needs of the nation.

**Q33. Answer: (d) Only assumption I is implicit**

The given statement is: Due to the failure of the main grid, power supply to many parts of the city was affected.

Assumptions:

I. The main grid is responsible for transmission of power to different parts of the city → True (Because due to the failure of the main grid, power supply to many parts of the city was affected).

II. Most people have backup power installations at their homes to manage during times when power supply is disrupted → False (Because nothing related to this has been mentioned in the statement).

Hence, the correct answer is "Only assumption I is implicit".

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**Q34. Answer: (c) Kilowatt**

The correct answer is Kilowatt.

Key Points

• Kilowatt is not a unit of heat energy.

• Units of heat energy include Calorie, Watt second, and Joule.

• A Calorie is a unit of energy widely used in nutrition.

• A Watt second is equivalent to one Joule.

• A Joule is the SI unit of energy.

• A Kilowatt is a unit of power, not heat energy.

Additional Information

• Heat energy is often measured in units that reflect the amount of work it can perform, such as Calories or Joules.

• Power is the rate at which energy is transferred or converted. It is measured in units like Watts or Kilowatts.

• Understanding the distinction between energy and power is crucial in fields like physics and engineering.

• SI units (International System of Units) are used globally for scientific measurements to ensure consistency and accuracy.

**Q35. Answer: (c) Oriental Bank of Commerce and United Bank of India**

The correct answer is Oriental Bank of Commerce and United Bank of India

Key Points

• Oriental Bank of Commerce and United Bank of India were merged with Punjab National Bank in 2020.

• This consolidation was part of the Indian government's plan to create stronger and more efficient banks.

• The merger aimed to enhance operational efficiency, customer services, and banking infrastructure.

• Post-merger, Punjab National Bank became the second-largest public sector bank in India.

Additional Information

• Bank mergers in India are overseen by the Ministry of Finance and the Reserve Bank of India.

• The objective behind such mergers is to create globally competitive banks and to streamline banking operations.

• These mergers help in better risk management and improve the overall financial health of the banking sector.

• As a result of these mergers, customers of the merged banks are now served under the umbrella of the larger entity, in this case, Punjab National Bank.

**Q36. Answer: (b) 2034**

Given:

Find the value of 325 × 5 + 31 × 21 - 22 × (63 - 52).

Concept Used:

Order of operations (BODMAS/BIDMAS): Brackets, Orders (i.e. powers and square roots, etc.), Division and Multiplication, Addition and Subtraction.

Calculation:

Evaluate the expression step-by-step:

=> 325 × 5 + 31 × 21 - 22 × (63 - 52)

=> 325 × 5 + 31 × 21 - 22 × 11

=> (325 × 5) + (31 × 21) - (22 × 11)

=> 1625 + 651 - 242

=> 1625 + 651 = 2276

=> 2276 - 242 = 2034

Therefore The correct answer is 2034.

**Q37. Answer: (c) Meanders**

The correct answer is Meanders

Key Points

• Meanders are bends or curves formed in a river channel as the river water erodes its banks on the outside of the bend and deposits sediment on the inside.

• This process of erosion and deposition causes the river to develop a winding course.

• Meanders are typically found in the middle and lower courses of a river where the gradient is gentle, and the river has more energy to erode laterally rather than vertically.

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• The formation of meanders is a natural part of the river's evolution and can lead to the creation of oxbow lakes when a meander is cut off from the main channel.

Additional Information

• Distributaries are channels that branch off from the main river and flow away, commonly found in delta regions.

• Braided channels consist of multiple interwoven channels separated by sediment bars, typically found in rivers with high sediment loads.

• Tributaries are smaller streams or rivers that flow into a larger one.

**Q38. Answer: (a) 24**

Given:

$(8^2 \times 3^3) / (\sqrt{64} \times \sqrt{81})$

Concept Used:

Simplification of exponents and roots.

Calculation:

$=> (8^2 \times 3^3) / (\sqrt{64} \times \sqrt{81})$

$=> (64 \times 27) / (8 \times 9)$

$=> 1728 / 72$

$=> 24$

Therefore The correct answer is 24.

**Q39. Answer: (d) 24 years**

Shortcut Trick

Present sum = 80 years. Sum 8 years ago = 80 − (8 × 2) = 64 years.

Ratio 8 years ago (Father : Daughter) = 7 : 1. Total parts = 8.

8 units = 64 years => 1 unit = 8 years.

Daughter age 8 years ago = 8 years. Daughter age 8 years hence = 8 + 8 + 8 = 24 years.

Therefore The correct answer is 24 years.

Alternate Method

Given: Sum of ages = 80 years. Ratio 8 years ago = 7 : 1.

Let daughter age 8 years ago = x and father age 8 years ago = 7x.

$=> (7x + 8) + (x + 8) = 80$

$=> 8x + 16 = 80$

$=> 8x = 64$

$=> x = 8$ years

=> Daughter present age = 8 + 8 = 16 years.

=> Daughter age after 8 years = 16 + 8 = 24 years.

Therefore The correct answer is 24 years.

Additional Information

Age Sum Property

If the sum of ages of 'n' people is S, then 't' years ago the sum was S − (n × t) and 't' years later the sum will be S + (n × t).

Ratio Displacement

To solve age problems involving ratios at different time points, always convert the known sum or difference to the specific time period where the ratio is given.

**Q40. Answer: (c) K > P**

The given statement is: $Y < O \leq G \leq K = U > L > P$

Let's check each option:

1) O = P → False (Because there is a definite relation; $O \leq G \leq K = U > L > P$)

2) G = Y → False (Because there is a definite relation; $Y < O \leq G$)

3) K > P → True (Because there is a definite relation; $K = U > L > P$)

4) Y > L → False (Because there is a definite relation; $Y < O \leq G \leq K = U > L$)

Hence, the correct answer is "K > P".

**Q41. Answer: (c) Nashik**

The correct answer is Nashik

Key Points

• The first Biosafety Level-3 (BSL-3) Containment Mobile Laboratory was inaugurated in Nashik in February 2022.

• This laboratory aims to strengthen the healthcare infrastructure of South Asia by providing advanced diagnostic capabilities for infectious diseases.

• BSL-3 laboratories are designed to work with pathogens that can cause serious or potentially lethal diseases through inhalation.

• They are equipped with advanced safety features and protocols to prevent the release of infectious agents into the environment.

• This mobile laboratory will enhance the capacity for rapid response to infectious disease outbreaks and support public health initiatives in the region.

Additional Information

• BSL-3 laboratories are critical in the study and containment of pathogens such as Mycobacterium tuberculosis, SARS-CoV-2, and other airborne infectious agents.

• The mobile nature of this laboratory allows it to be deployed to various locations as needed, providing flexibility in addressing public health emergencies.

• This initiative is part of a broader effort to enhance biosafety and biosecurity measures in the region.

• Such laboratories play a key role in research, diagnosis, and the development of vaccines and therapeutics for infectious diseases.

**Q42. Answer: (d) 36**

Shortcut Trick

Identify the difference between the two numbers: 144 − 108 = 36.

The HCF must be a factor of this difference.

Check if 36 divides both: 108 ÷ 36 = 3 and 144 ÷ 36 = 4.

Since 36 is the highest common divisor, it is the HCF.

Therefore The correct answer is 36.

Alternate Method

Given: Numbers are 108 and 144.

Method: Prime Factorization

=> Prime factors of 108 = 2 × 2 × 3 × 3 × 3 = $2^2 \times 3^3$

=> Prime factors of 144 = 2 × 2 × 2 × 2 × 3 × 3 = 2^4 × $3^2$

=> HCF = Product of the lowest powers of common prime factors

=> HCF = $2^2 \times 3^2$

=> HCF = 4 × 9 = 36

Therefore The correct answer is 36.

Additional Information

Highest Common Factor (HCF)

The HCF (or GCD) is the largest positive integer that divides each of the integers without a remainder.

Relationship between HCF and LCM

For two numbers a and b: HCF(a, b) × LCM(a, b) = a × b.

Division Method for HCF

Divide the larger number by the smaller, then divide the divisor by the remainder until the remainder is zero; the last divisor is the HCF.

**Q43. Answer: (a) 196**

The logic followed here is:

Logic → $(\text{First number})^2 : (\text{First number} + 1)^2$

64: 81

→ $(8)^2 : (9)^2$

121: 144

→ $(11)^2 : (12)^2$

Similarly,

169: ?

→ $(13)^2$ : ?

→ ? = $(13 + 1)^2 = (14)^2 = 196$

Hence, the correct answer is "196".

**Q44. Answer: (d) 3 : 2**

Shortcut Trick

Let the terms in AP be h, a, and b. Given d = 4 and h is the highest term.

Terms: h, h − 4, h − 8. Area = 1/2 × (Sum of parallel sides) × h.

160 = 1/2 × (h − 4 + h − 8) × h => 320 = (2h − 12)h => $h^2 − 6h − 160 = 0$.

Solving, h = 16. Parallel sides are 12 and 8.

Therefore The correct answer is 3 ÷ 2.

Alternate Method

Given: Common difference (d) = 4, Area = 160, Height (h) is the largest term.

Formula Used: Area of Trapezium = 1/2 × (a + b) × h

=> Let the sides and height in Arithmetic Progression be h, h − 4, and h − 8.

=> Area = 1/2 × [(h − 4) + (h − 8)] × h = 160

=> 1/2 × (2h − 12) × h = 160

=> (h − 6) × h = 160

=> $h^2 − 6h − 160 = 0$

=> $h^2 − 16h + 10h − 160 = 0$

=> h(h − 16) + 10(h − 16) = 0 => h = 16 (Height)

=> Greatest side (b) = 16 − 4 = 12

=> Smallest side (a) = 16 − 8 = 8

=> Ratio = 12 : 8 = 3 : 2

Therefore The correct answer is 3 ÷ 2.

Additional Information

Arithmetic Progression (AP)

A sequence where the difference between consecutive terms is constant. n^(th) term = a + (n−1)d.

Trapezium Properties

A quadrilateral with at least one pair of parallel sides. The median length is the average of parallel sides.

Quadratic Roots Shortcut

For $x^2 + bx + c = 0$, find two numbers that multiply to c and add to b to find roots quickly.

**Q45. Answer: (a) Three**

The given numbers are: 543 769 552 342 245

If 1 is added to the first digit of every number, the numbers we get are → 643 869 652 442 345

Here, we can see that in three numbers the first digit is exactly divisible by the third digit of the same number:

643 → 6 is divisible by 3

652 → 6 is divisible by 2

442 → 4 is divisible by 2

Hence, the correct answer is "Three".

**Q46. Answer: (b) Rs. 1,650**

Shortcut Trick

Convert the Rate to a fraction: 12.5% = 1/8.

Let the Principal (P) be 8 units. Simple Interest (SI) for 1 year = 1 unit.

For 2 years, SI = 1 × 2 = 2 units. Amount (A) = P + SI = 8 + 2 = 10 units.

Given 10 units = Rs. 8,250 => 1 unit = Rs. 825.

SI = 2 units = 2 × 825 = Rs. 1,650.

Therefore The correct answer is Rs. 1,650.

Alternate Method

Given:

Amount (A) = Rs. 8,250

Rate (R) = 12½% = 12.5% per annum

Time (T) = 2 years

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Amount (A) = Principal (P) + SI

Calculations:

=> A = P × (1 + (R × T) ÷ 100)

=> 8250 = P × (1 + (12.5 × 2) ÷ 100)

=> 8250 = P × (1 + 25 ÷ 100)

=> 8250 = P × (1 + 0.25) = 1.25P

=> P = 8250 ÷ 1.25 = 6600

=> Simple Interest (SI) = Amount (A) − Principal (P)

=> SI = 8250 − 6600 = 1650

Therefore The correct answer is Rs. 1,650.

Additional Information

Simple Interest Formula

SI = (P × R × T) ÷ 100, where P is Principal, R is Rate, and T is Time in years.

Amount Calculation

Amount is the total value after adding Interest to the Principal: A = P + SI.

Rate as Fraction

Converting percentages to fractions (like 12.5% = 1/8) simplifies calculation significantly in Simple Interest problems.

**Q47. Answer: (a) Not real**

Shortcut Trick

Identify coefficients: a = 1, b = −5, c = 7.

Calculate Discriminant (D) = b2 − 4ac.

D = (−5)2 − 4 × 1 × 7 = 25 − 28 = −3.

Since D < 0, the nature of the roots is not real.

Therefore The correct answer is Not real.

Alternate Method

Given: x2 − 5x + 7 = 0

Formula Used: Discriminant (D) = b2 − 4ac

Comparing the given equation with the standard quadratic form ax2 + bx + c = 0:

=> a = 1

=> b = −5

=> c = 7

=> D = (−5)2 − 4 × 1 × 7

=> D = 25 − 28

=> D = −3

=> Since D < 0, the roots are complex/imaginary and not real.

Therefore The correct answer is Not real.

Additional Information

Discriminant and Nature of Roots

For a quadratic equation ax2 + bx + c = 0, the Discriminant (D = b2 − 4ac) determines the nature: D > 0 implies real and distinct roots, D = 0 implies real and equal roots, and D < 0 implies imaginary/not real roots.

Rational and Irrational Roots

If a, b, c are rational, then: (i) If D is a perfect square, roots are rational. (ii) If D is not a perfect square, roots are irrational and occur in conjugate pairs.

Quadratic Formula

The roots are calculated as x = (−b ± √D) / 2a. When D < 0, the square root of a negative number leads to non-real roots.

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**Q48. Answer: (a) They do not undergo any change.**

The correct answer is They do not undergo any change.

Key Points

• Genes are fundamental units of heredity and are segments of DNA.

• They control traits by producing proteins, which influence the development and function of organisms.

• Each germ cell has one set of genes, which combine during fertilization to form a complete set.

• Genes can undergo changes or mutations, which can lead to variations in traits.

• Mutations in genes are a source of genetic diversity and evolution.

Additional Information

• Genes are composed of DNA sequences that encode instructions for building proteins.

• Mutations can be caused by various factors including environmental influences, errors during DNA replication, and more.

• While some mutations are harmful, others can be neutral or even beneficial, contributing to the adaptability of species.

• Genetic research continues to uncover the complexities of gene functions and their impact on living organisms.

**Q49. Answer: (b) St. John in the Wilderness Church - Pondicherry**

The correct answer is St. John in the Wilderness Church - Pondicherry.

Key Points

• St. John in the Wilderness Church is actually located in Dharamshala, Himachal Pradesh, not Pondicherry.

• St. Paul Cathedral is correctly matched with Kolkata.

• Santa Cruz Basilica is correctly matched with Kochi.

• Basilica of Bom Jesus is correctly matched with Goa.

Additional Information

• The St. John in the Wilderness Church was built in 1852 and is known for its neo-Gothic architecture.

• St. Paul Cathedral in Kolkata is an Anglican cathedral noted for its Gothic Revival architecture.

• Santa Cruz Basilica in Kochi is one of the oldest churches in India, originally built by the Portuguese in 1505.

• The Basilica of Bom Jesus in Goa is a UNESCO World Heritage Site and holds the mortal remains of St. Francis Xavier.

**Q50. Answer: (c) It was a violent movement to save the trees**

The correct answer is It was a violent movement to save the trees

Key Points

• The Chipko Andolan was a non-violent movement aimed at protecting and conserving trees and forests.

• It involved the active participation of the community, particularly women, who embraced the trees to prevent them from being cut down.

• The movement led to increased awareness about the importance of forests in maintaining ecological balance and soil quality.

• It pressured the government to reconsider their policies regarding forest management and exploitation.

Additional Information

• The Chipko Movement began in the early 1970s in the Uttarakhand region of India.

• It is considered one of the most successful environmental movements in India, leading to a ban on tree felling in the Himalayan regions for 15 years.

• The name "Chipko" comes from the Hindi word meaning "to embrace" or "to cling," symbolizing the method used by the protestors to protect the trees.

• The movement also highlighted the role of women in environmental conservation and their connection to natural resources.

**Q51. Answer: (a) Only (i) and (ii)**

The correct answer is only (i) and (ii).

Key Points

• The material chosen for making the heating element of heating devices should have a high melting point to ensure that it does not melt at high temperatures. This property is essential because heating elements are subjected to high temperatures during operation.

• It should also have a high resistivity to generate sufficient heat when an electric current passes through it. High resistivity ensures that the material converts electrical energy into heat efficiently.

• Low resistance is not a desirable property for heating elements. Low resistance would result in less heat generation, which is contrary to the purpose of a heating element. Hence, option (iii) is not correct.

• Considering these points, the correct properties are high melting point and high resistivity, which correspond to statements (i)

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and (ii).

**Q52. Answer: (b) Rs. 625**

Shortcut Trick

Single discount = 32%

Successive discount equivalent = 20 + 20 − (20 × 20) ÷ 100 = 36%

Difference in discount percentages = 36% − 32% = 4%

According to the question, 4% of Bill Amount = Rs. 25

Total amount (100%) = (25 ÷ 4) × 100 = Rs. 625

Therefore The correct answer is Rs. 625.

Alternate Method

Given: First discount = 32%, Successive discounts = 20% and 20%, Difference in Selling Price = Rs. 25.

Formulas: Successive Discount = a + b − (ab ÷ 100) | SP = MP × (100 − D%) ÷ 100

=> Let the bill amount be x.

=> SP1 with 32% discount = x × (100 − 32) ÷ 100 = 0.68x

=> Net successive discount percentage = 20 + 20 − (20 × 20 ÷ 100) = 36%

=> SP2 with successive discounts = x × (100 − 36) ÷ 100 = 0.64x

=> Difference = SP1 − SP2 => 0.68x − 0.64x = 25

=> 0.04x = 25 => x = 25 ÷ 0.04 = 625

Therefore The correct answer is Rs. 625.

Additional Information

Successive Discounts

When two or more discounts are applied one after another, the total discount is always less than the sum of individual discounts. Formula: Equivalent Discount = a + b − (ab/100).

Marked Price and Selling Price

The Marked Price (MP) is the price printed on the bill. The Selling Price (SP) is the actual amount paid after deducting the Discount from the MP.

**Q53. Answer: (c) 18**

Shortcut Trick

For any regular polygon, the sum of an interior angle and its adjacent exterior angle is 180°.

Exterior angle = 180° − 160° = 20°.

The sum of all exterior angles of any convex polygon is always 360°.

Number of sides (n) = 360° ÷ Exterior angle = 360° ÷ 20° = 18.

Therefore The correct answer is 18.

Alternate Method

Given: Each interior angle of a regular polygon = 160°.

Formula Used: Interior angle = ((n − 2) × 180°) / n, where n is the number of sides.

Calculations:

=> 160 = ((n − 2) × 180) / n

=> 160n = (n − 2) × 180

=> 160n = 180n − 360

=> 180n − 160n = 360

=> 20n = 360

=> n = 360 ÷ 20

=> n = 18

Therefore The correct answer is 18.

**Q54. Answer: (a) real, inverted and diminished**

The correct answer is real, inverted and diminished.

Key Points

• The magnification produced by a spherical mirror is given as -0.5.

• A negative magnification indicates that the image formed is real and inverted.

• A magnification value less than 1 indicates that the image formed is diminished.
• Since the magnification is negative and the image is diminished, it means the image is real and inverted.
• Thus, the image formed by the mirror is real, inverted, and diminished.

Additional Information

• For spherical mirrors, the magnification (m) is given by the formula: m = −v/u, where v is the image distance and u is the object distance.
• A real image is formed on the same side as the object for a concave mirror and is inverted.
• A virtual image, on the other hand, is formed on the opposite side as the object and is erect.
• The nature of the image (real or virtual) can be determined by the sign of the magnification.

**Q55. Answer: (a) 13 2/3 days**

Shortcut Trick

Total work = LCM(12, 16) = 48 units.

Efficiencies: Raju = 48 ÷ 12 = 4; Raman = 48 ÷ 16 = 3.

2-day cycle (Raju + Raman) = 4 + 3 = 7 units.

In 6 cycles (12 days), work done = 6 × 7 = 42 units. Remaining = 48 − 42 = 6 units.

Day 13: Raju does 4 units. Remaining = 6 − 4 = 2 units. Raman takes 2/3 days.

Total time = 12 + 1 + 2/3 = 13 2/3 days.

Therefore The correct answer is 13 2/3 days.

Alternate Method

Given: Time taken by Raju = 12 days, Time taken by Raman = 16 days.

| Person | Days | Total Work | Efficiency |
|---|---|---|---|
| Raju | 12 | 48 | 4 |
| Raman | 16 | 3 | |

=> Work done in the first 2 days (1 cycle) = 4 + 3 = 7 units

=> Work done in 6 such cycles (12 days) = 7 × 6 = 42 units

=> Remaining work = 48 − 42 = 6 units

=> On the 13^(th) day, Raju works and completes 4 units

=> Remaining work after 13 days = 6 − 4 = 2 units

=> On the 14^(th) day, it is Raman's turn to do 2 units

=> Time taken by Raman = Remaining work ÷ Efficiency = 2 ÷ 3 = 2/3 days

=> Total time = 13 + 2/3 = 13 2/3 days

Therefore The correct answer is 13 2/3 days.

Additional Information

Alternate Day Work

In alternate day problems, calculate the work done in one complete cycle (sum of efficiencies) and then divide the total work by this cycle value.

Efficiency and Time

Efficiency is inversely proportional to the time taken to complete the work. Efficiency = Total Work ÷ Time.

Pipes and Cisterns

This logic applies to pipes where one fills and another empties; the net efficiency per cycle determines the total time to fill the tank.

**Q56. Answer: (b) 22**

| Sign | • | • | ÷ | × |
|---|---|---|---|---|
| Interchange with | • | ÷ | × | • |

Given equation is: 18 - 3 × 14 ÷ 2 + 12 = ?

The equation we get after interchanging the signs: 18 ÷ 3 + 14 × 2 - 12 = ?

→ 18 ÷ 3 + 14 × 2 - 12 = ?

→ 6 + 14 × 2 - 12 = ?

→ 6 + 28 - 12 = ?

→ 34 - 12 =?

→ 22 =?

Hence, the correct answer is "22".

**Q57. Answer: (b) Bengali and Kokborok**

The Correct Answer is Bengali and Kokborok.

Key Points

• Bengali and Kokborok, are to be used for all or any of the official purposes of the State of Tripura as per the Tripura Official Languages Act, 1964.

• Bengali is the most spoken language, due to the predominance of Bengali people in the state.

• Kokborok is spoken by the Tripuri people.

**Q58. Answer: (b) 2.3%**

The correct answer is 0.023

Key Points

• India covers 0.023 of Earth's land area.

• India is the third largest country in South Asia in terms of land area.

• This fraction represents India's significant contribution to the Earth's total land mass.

• The vast geographical area of India includes diverse terrains such as mountains, plains, and coastal regions.

Additional Information

• India is bordered by several countries including Pakistan, China, Nepal, Bhutan, Bangladesh, and Myanmar.

• India's geographical location contributes to its diverse climate, ranging from tropical in the south to temperate and alpine in the Himalayan north.

• India's extensive land area supports a wide range of biodiversity, making it one of the 17 megadiverse countries in the world.

• The country is divided into 28 states and 8 Union territories, each with its own unique geographical and cultural characteristics.

• India's land area also includes a significant portion of the Thar Desert in the northwest and the fertile Indo-Gangetic Plain.

**Q59. Answer: (d) 25**

Shortcut Trick

For two numbers where Sum (S) and Difference (D) are known:

Greater Number = (Sum + Difference) ÷ 2

Greater Number = (32 + 18) ÷ 2 = 50 ÷ 2 = 25

Therefore The correct answer is 25.

Alternate Method

Given:

Sum of two numbers = 32

Difference between numbers = 18

Let the greater number be x and the smaller number be y.

=> x + y = 32 ----(i)

=> x − y = 18 ----(ii)

Adding equation (i) and (ii):

=> (x + y) + (x − y) = 32 + 18

=> 2x = 50

=> x = 50 ÷ 2

=> x = 25

Therefore The correct answer is 25.

Additional Information

Finding the Smaller Number

The smaller number can be found using (Sum − Difference) ÷ 2. In this case, (32 − 18) ÷ 2 = 7.

Linear Equations in Two Variables

Problems involving two unknowns require at least two independent equations to find unique values for both variables.

Verification of Results

Always check if the results satisfy the given conditions: 25 + 7 = 32 and 25 − 7 = 18.

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**Q60. Answer: (c) 92**

The logic followed here is:

Hence, the correct answer is "92".

**Q61. Answer: (c) 805**

The logic followed here is:

Hence, the correct answer is "805".

**Q62. Answer: (d) 1950**

The correct answer is 1950

Key Points

• The first Republic Day of India was celebrated on 26th January 1950.

• This date was chosen to honor the memory of the declaration of independence of 1930.

• On this day, the Constitution of India came into effect, making India a sovereign, socialist, secular, and democratic republic.

• The main Republic Day celebration is held in the national capital, New Delhi, at the Rajpath before the President of India.

Additional Information

• Republic Day is one of three national holidays in India, the other two being Independence Day and Gandhi Jayanti.

• The Constitution of India was adopted by the Constituent Assembly on 26th November 1949, but it came into effect on 26th January 1950.

• The day is marked by a grand parade in New Delhi, showcasing India's cultural diversity and military might.

• Various awards and medals of bravery are given to the armed forces and civilians on this day.

• Celebrations are also held in state capitals, with the governor of the state unfurling the national flag.

**Q63. Answer: (c) Central Board of Secondary Education (CBSE) and National Council of Educational Research and Training (NCERT)**

The correct answer is Central Board of Secondary Education (CBSE) and National Council of Educational Research and Training (NCERT)

Key Points

• The Tamanna tool related to education in India has been developed by the Central Board of Secondary Education (CBSE) and the National Council of Educational Research and Training (NCERT).

• Tamanna stands for Try And Measure Aptitude And Natural Abilities.

• This tool is designed to help students of classes 9 and 10 make informed decisions about their future academic and career paths.

• The tool provides a standardized method to assess students' aptitude and interests, guiding them towards suitable educational streams and career options.

• It aims to reduce the stress and confusion that students and parents often face while making educational and career choices.

Additional Information

• The Central Board of Secondary Education (CBSE) is a national level board of education in India for public and private schools, controlled and managed by the Government of India.

• The National Council of Educational Research and Training (NCERT) is an autonomous organization of the Government of India that was established to assist and advise the central and state governments on academic matters related to school education.

• Both organizations play a crucial role in shaping the educational policies and curriculum in India.

• The Tamanna tool is part of a broader initiative to enhance the quality of education and ensure that students are well-prepared for their future endeavors.

**Q64. Answer: (b) 36**

According to the given information,

1) Shalabh is standing at the extreme left end of the row. Only 8 students are standing between Shalabh and Kimaya.

→ So, Kimaya is 10^(th) from the left side.

2) Virali is 26th from the extreme right end of the row.

Number of students between Virali and Kimaya = 72 - (10 + 26) = 72 - 36 = 36

Hence, the correct answer is "36".

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**Q65. Answer: (a) 20 m, North**

According to the given information,

1) From point X, a person walks 45 m towards the east.

2) He then takes a left turn and walks 40 m.

3) He then takes a right turn and walks 90 m.

4) He then takes a right turn and walks 60 m.

5) Finally, he takes a right turn and walks 135 m to reach point Y.

Here, we can see that X is 20 m, North of Y.

Hence, the correct answer is "20 m, North".

**Q66. Answer: (a) small intestine**

The correct answer is small intestine.

Key Points

• The small intestine does not function as an excretory organ in humans.

• Excretory organs in humans include the skin, large intestine, and lungs, which help in the removal of waste products from the body.

• The skin excretes waste through sweat, the large intestine through feces, and the lungs through exhalation of carbon dioxide.

Additional Information

• The small intestine primarily functions in the absorption of nutrients from digested food.

• It consists of three parts: the duodenum, jejunum, and ileum, each playing a role in the digestive process.

• While the small intestine absorbs nutrients, the excretory system is responsible for removing waste products from the body.

• Understanding the roles of different organs helps in comprehending the complex processes of the human body.

**Q67. Answer: (c) 76**

Shortcut Trick

If $d^2 + 1/d^2 = k$, then $d - 1/d = \sqrt{(k - 2)}$ and $d^3 - 1/d^3 = (d - 1/d) \times (d^2 + 1/d^2 + 1)$.

Given $k = 18$, so $d - 1/d = \sqrt{(18 - 2)} = 4$.

Therefore, $d^3 - 1/d^3 = 4 \times (18 + 1) = 4 \times 19 = 76$.

Therefore The correct answer is 76.

Alternate Method

Given: $d^2 + 1/d^2 = 18$ and $d > 1/d$ (which implies $d - 1/d > 0$).

Formula Used: $(d - 1/d)^2 = d^2 + 1/d^2 - 2$ and $d^3 - 1/d^3 = (d - 1/d)^3 + 3(d - 1/d)$.

Calculations:

=> $(d - 1/d)^2 = (d^2 + 1/d^2) - 2$

=> $(d - 1/d)^2 = 18 - 2 = 16$

=> $d - 1/d = \sqrt{16} = 4$ (Since $d > 1/d$, we take the positive root)

=> $d^3 - 1/d^3 = (d - 1/d)^3 + 3 \times d \times (1/d) \times (d - 1/d)$

=> $d^3 - 1/d^3 = 43 + 3 \times 4$

=> $d^3 - 1/d^3 = 64 + 12$

=> $d^3 - 1/d^3 = 76$

Therefore The correct answer is 76.

Additional Information

Algebraic Identities

Standard quadratic identity: $(a - b)^2 = a^2 + b^2 - 2ab$. This is used to bridge between square sums and linear differences.

Cubic Difference Formula

The expression $a^3 - b^3$ can be factored as $(a - b)(a^2 + ab + b^2)$ or expanded as $(a - b)^3 + 3ab(a - b)$.

Reciprocal Relations

For $x - 1/x = n$, the value of $x^2 + 1/x^2$ is always $n^2 + 2$ and $x^3 - 1/x^3$ is always $n^3 + 3n$.

**Q68. Answer: (c) its smaller atomic size**

The correct answer is its smaller atomic size

Key Points

• Carbon's smaller atomic size allows it to form strong covalent bonds with other atoms.

• This property is crucial for the formation of stable organic compounds, which are the basis of all known life forms.

• The small size of the carbon atom enables it to form multiple bonds (single, double, and triple) with other carbon atoms as well as with atoms of other elements.

• Carbon's ability to catenate (form chains) is also attributed to its small atomic size and the strength of the C-C bond.

• These characteristics make carbon a versatile element in the formation of a wide variety of complex molecules.

Additional Information

• Covalent bonding is a type of chemical bond where pairs of electrons are shared between atoms.

• Carbon has four valence electrons, which allows it to form four covalent bonds with other atoms, leading to a diverse range of stable compounds.

• Its ability to form double and triple bonds with other carbon atoms or different elements adds to the diversity and stability of carbon compounds.

• Carbon compounds are the foundation of organic chemistry, a branch of chemistry that studies the structure, properties, and reactions of organic compounds and materials.

• The versatility of carbon is a key reason why it is considered the backbone of life on Earth.

**Q69. Answer: (c) 877**

Given:

(1/3)^(-3)+(1/5)^(-4)+(1/15)^(-2)

Formula Used:

a-n = 1/an

Calculation:

(1/3)^(-3)+(1/5)^(-4)+(1/15)^(-2)

=> 33 + 54 + 152

=> 27 + 625 + 225

=> 27 + 625 = 652

=> 652 + 225 = 877

Therefore The correct answer is 877.

**Q70. Answer: (c) Rs. 88,000**

According to the given information,

Mohit's salary is Rs. 15,000 per month. He spends Rs. 5,000 on house rent, Rs. 2,000 on bills and rest of the amount is his monthly savings.

=> His monthly savings = 15,000 - (5,000 + 2,000) = 15,000 - 7,000 = 8,000

He spends his complete monthly savings of his birthday month.

So, his savings in a year = 8,000 × 11 = 88,000

Hence, the correct answer is "Rs. 88,000".

**Q71. Answer: (a) six**

The correct answer is six

Key Points

• Six cities in Gujarat will host the 36th National Games of India.

• The event is scheduled to take place between 27 September and 10 October 2022.

• The National Games are a multi-sport event held in various states of India, aiming to showcase the sporting talent of the nation.

• This edition of the National Games will include several sports disciplines and will see participation from athletes across the country.

Additional Information

• The National Games of India were first held in 1924 as the Indian Olympic Games.

• The event aims to develop a strong sports culture and infrastructure in the country.

• Gujarat is known for its vibrant culture and has previously hosted several national and international sporting events.

• The hosting of the National Games is expected to boost local tourism and economy in the host cities.

**Q72. Answer: (d) 50-100**

Shortcut Trick

Total frequency N = 12 + 15 + 13 + 10 = 50.

Calculate N/2 = 50 ÷ 2 = 25.

Find the Cumulative Frequency (CF) just greater than 25: 12, 27, 40, 50.

The first CF exceeding 25 is 27, which belongs to the class 50-100.

Therefore The correct answer is 50-100.

Alternate Method

Given: Frequency distribution of classes 0-50, 50-100, 100-150, 150-200.

Formula Used: Median Class is the class where the Cumulative Frequency (CF) is ≥ N/2 (where N is total frequency).

Step-by-step Calculation:

=> Sum of frequencies (N) = 12 + 15 + 13 + 10 = 50

=> N/2 = 50 ÷ 2 = 25

=> Cumulative Frequency (CF) table:

=> For 0-50: CF = 12

=> For 50-100: CF = 12 + 15 = 27

=> For 100-150: CF = 27 + 13 = 40

=> For 150-200: CF = 40 + 10 = 50

=> Since 25 falls in the range where Cumulative Frequency just reaches 27, the Median Class is 50-100.

Therefore The correct answer is 50-100.

Additional Information

Median Formula for Grouped Data

Median = l + [((N/2 − cf) ÷ f) × h], where l is lower limit of median class, cf is cumulative frequency of preceding class, f is frequency of median class, and h is class size.

Cumulative Frequency Types

There are two types: Less than type (adding from top) and More than type (subtracting from total or adding from bottom).

Empirical Relationship

3 × Median = Mode + 2 × Mean. This connects the three measures of central tendency.

**Q73. Answer: (a) Amount of waste sent to landfills increases**

The correct answer is amount of waste sent to landfills increases.

Key Points

• Biodegradable waste generally decomposes and can be converted into compost or manure, reducing the amount of waste sent to landfills.

• It gives out a foul smell during decomposition due to the release of gases like methane and ammonia.

• Biodegradable waste can act as a breeding ground for mosquitoes and other pests, potentially spreading diseases.

• When properly managed, biodegradable waste can replenish soil nutrients and improve soil health.

Additional Information

• Landfills are typically used for non-biodegradable waste. Properly composted biodegradable waste reduces the burden on landfills.

• Effective waste management practices such as composting and vermiculture can mitigate the negative effects of biodegradable waste.

• Policies and regulations on waste segregation can aid in the efficient management of biodegradable waste.

• Awareness and education about waste management can help communities to reduce the impact of biodegradable waste.

**Q74. Answer: (c) M**

Each vowel in the word "EXPLAIN' is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order, we get:

=> FWOKBJM

Arranging these letters in alphabetical order we get => BFJKMOW

Here, the third letter from the right end is "M".

Hence, the correct answer is "M".

**Q75. Answer: (b) 60 m**

Shortcut Trick

For two angles of elevation θ1 = 30° and θ2 = 60°, the relation between the height h and the change in shadow length d is given by d = h(cot 30° − cot 60°).

Substitute d = 40√3 m: 40√3 = h(√3 − 1/√3).

40√3 = h(2/√3) => 40√3 × √3 = 2h => 120 = 2h.

h = 60 m.

Therefore The correct answer is 60 m.

Alternate Method

Given: Difference in shadow lengths = 40√3 m, Sun altitudes = 30° and 60°.

Formula Used: tan θ = Height / Base

=> Let height AB = h. In triangle ABC, tan 60° = AB/BC => √3 = h/BC => BC = h/√3.

=> In triangle ABD, tan 30° = AB/BD => 1/√3 = h/BD => BD = h√3.

=> Given BD − BC = 40√3.

=> h√3 − h/√3 = 40√3.

=> (3h − h) / √3 = 40√3.

=> 2h = 40√3 × √3 = 40 × 3.

=> 2h = 120 => h = 60 m.

Therefore The correct answer is 60 m.

Additional Information

Trigonometric Ratios

Standard values: tan 30° = 1/√3, tan 45° = 1, tan 60° = √3.

Shadow length relation

For a tower of height h, the distance between two points where the angles of elevation are α and β is d = h(cot α − cot β).

**Q76. Answer: (a) $5x^3 - 12x^2 + 16x + 3$**

Given:

Simplify: $6(x^3 - 2x^2 + 3x) - (x^3 + 2x - 3)$

Concept Used:

Distribute and combine like terms.

Calculation:

Expand the equation:

=> $6(x^3 - 2x^2 + 3x) - (x^3 + 2x - 3)$

=> $6x^3 - 12x^2 + 18x - x^3 - 2x + 3$

Combine like terms:

=> $(6x^3 - x^3) + (-12x^2) + (18x - 2x) + 3$

=> $5x^3 - 12x^2 + 16x + 3$

Therefore The simplified expression is $5x^3 - 12x^2 + 16x + 3$.

**Q77. Answer: (c) North**

According to the given information,

1) Umesh is standing facing the south-west direction.

2) He then takes a 90° clockwise turn.

3) After that, he takes a 135° clockwise turn.

4) He finally takes a 90° anticlockwise turn.

Here, we can see that Umesh is now facing North direction.

Hence, the correct answer is "North".

**Q78. Answer: (d) CH2, homologous**

The correct answer is CH2, homologous.

Key Points

• Compounds C2H6 and C3H8 differ by a CH2 unit.

• They belong to the homologous series.

• A homologous series is a series of compounds with the same functional group, similar chemical properties, and successive members differing by a CH2 unit.

• Examples of homologous series include alkanes, alkenes, and alkynes.

• In this case, C2H6 (ethane) and C3H8 (propane) are part of the alkane homologous series.

Additional Information

• A homologous series is characterized by compounds having the same general formula.
• Members of a homologous series show a gradual change in physical properties.
• Chemical properties remain largely similar due to the presence of the same functional group.
• The concept of homologous series is fundamental in organic chemistry for the classification and study of organic compounds.
• Homologous series help in predicting the properties and reactions of organic compounds.

**Q79. Answer: (a) Bile salts**

The correct answer is Bile salts

Key Points

• Bile salts aid in the emulsification of fat.
• Bile is produced by the liver and stored in the gallbladder.
• When food enters the small intestine, bile is released to help in the digestion of fats.
• Emulsification increases the surface area of fats, making them more accessible to digestive enzymes like lipase.
• This process is essential for the efficient absorption of dietary fats and fat-soluble vitamins.

Additional Information

• Pepsin is an enzyme that breaks down proteins in the stomach.
• HCl (Hydrochloric acid) creates an acidic environment in the stomach, aiding in digestion and killing harmful bacteria.
• Vitamin K is essential for blood clotting and bone health, but it does not aid in fat emulsification.
• Trypsin is an enzyme that further breaks down proteins in the small intestine.
• Proper digestion and absorption of fats are crucial for maintaining overall health and energy levels.

**Q80. Answer: (c) 5**

According to the given information,

Pankaj is 9th from the extreme left end and Puja is 17th from extreme right end.

If the positions of Pankaj and Puja are interchanged, then the new position of Pankaj will be 15th from the extreme left end.

Now, the number of travelers between Puja and Pankaj:

→ 14 - (8 + 1) = 14 - 9 = 5

Hence, the correct answer is "5".

**Q81. Answer: (b) 8000**

Shortcut Trick

Number of small spheres = (Radius of large sphere ÷ Radius of small marble)³

Number of marbles = (6 ÷ 0.3)³

Number of marbles = (20)³

Number of marbles = 8000

Therefore The correct answer is 8000 marbles.

Alternate Method

Given:

Radius of the solid sphere (R) = 6 cm

Radius of each spherical marble (r) = 0.3 cm

Formula Used:

Volume of a sphere = (4/3) × π × radius³

Calculations:

=> Volume of large sphere = (4/3) × π × (6)³

=> Volume of one small marble = (4/3) × π × (0.3)³

=> Let n be the total number of marbles.

=> n × Volume of one marble = Volume of large sphere

=> n × (4/3) × π × (0.3)³ = (4/3) × π × (6)³

=> n = (6 × 6 × 6) ÷ (0.3 × 0.3 × 0.3)

=> n = 216 ÷ 0.027

=> n = 216000 ÷ 27

=> n = 8000

Therefore The correct answer is 8000 marbles.

Additional Information

Recasting Objects

When one solid object is melted and recast into another shape, the total volume remains constant. Number of new objects = Volume of old object ÷ Volume of one new object.

Sphere Properties

For a sphere of radius r, the Surface Area is $4\pi r^2$ and the Volume is $(4/3)\pi r^3$.

Hemisphere

The Volume of a hemisphere is exactly half of a sphere: $(2/3)\pi r^3$. Total surface area is $3\pi r^2$.

**Q82. Answer: (a) 78.57%**

Shortcut Trick

Successive gain ratio for profit = 100 : (100 + 25) = 100 : 125 = 4 : 5.

Gain ratio for dishonest weight = (100 − 30) : 100 = 70 : 100 = 7 : 10.

Effective ratio (CP : SP) = (4 × 7) : (5 × 10) = 28 : 50 = 14 : 25.

Total Profit% = (Difference ÷ CP) × 100 = (11 ÷ 14) × 100.

Total Profit% = 78.57%.

Therefore The correct answer is 78.57%.

Alternate Method

Given → Profit Percentage = 25%, Weight Shortage = 30%.

Formulas: Profit% = (Profit ÷ CP) × 100 | Dishonest dealer gain% = (Error + Profit%) ÷ (True Value − Error) × 100.

=> Let the True weight be 1000g and Cost Price be Re. 1 per gram.

=> Customer pays for 1000g with 25% profit, so Selling Price (SP) = 1000 × 1.25 = Rs. 1250.

=> Shopkeeper actually gives 30% less weight, so Actual Weight = 1000 − 300 = 700g.

=> Actual Cost Price (CP) for the shopkeeper = Rs. 700.

=> Total Profit = SP − CP = 1250 − 700 = Rs. 550.

=> Total Profit% = (550 ÷ 700) × 100 = (55 ÷ 7) × 100 ≈ 78.57%.

Therefore The correct answer is 78.57%.

Additional Information

Dishonest Dealer Concept

When a dealer uses a faulty weight, the profit is calculated on the actual weight delivered to the customer, not the marked weight.

Successive Percentage Gain

If there are two gains (markup/profit and weight cheating), the net gain is calculated by multiplying the multiplying factors of both gains.

**Q83. Answer: (b) 2012**

The correct answer is 2012

Key Points

• The Dam Rehabilitation and Improvement Project (DRIP) was started in the year 2012.

• DRIP aims to improve the safety and operational performance of selected dams across India.

• The project is implemented by the Central Water Commission (CWC) with financial assistance from the World Bank.

• The initiative addresses the issues of dam safety and aims to strengthen the institutional capacity for dam safety evaluation, management, and rehabilitation.

• Key components of DRIP include rehabilitation and improvement of dams and associated appurtenances, dam safety institutional strengthening, and project management.

Additional Information

• The project covers dams in several states including Kerala, Madhya Pradesh, Odisha, Tamil Nadu, and Uttarakhand.

• DRIP has been extended to include more dams and additional funding to further enhance dam safety measures.

• Proper maintenance and safety of dams are crucial for ensuring water security, agricultural productivity, and flood control in the country.

• India has more than 5,000 large dams, making it one of the countries with the highest number of dams in the world.

• Ensuring the structural integrity and operational efficiency of these dams is vital for the socio-economic development of the nation.

**Q84. Answer: (c) 415**

| Sign | • | × | ÷ | • |
|---|---|---|---|---|
| Interchange with | × | ÷ | • | • |

Given equation is: 13 - 17 + 24 ÷ 54 × 18 + 28 × 14 =?

The equation we get after changing the signs → 13 + 17 × 24 - 54 ÷ 18 × 28 ÷ 14 =?

→ 13 + 17 × 24 - 54 ÷ 18 × 28 ÷ 14 =?

→ 13 + 17 × 24 - 3 × 2 =?

→ 13 + 408 - 6 =?

→ 421 - 6 =?

→ 415 =?

Hence, the correct answer is "415".

**Q85. Answer: (c) 5.5 cm**

Shortcut Trick

Total Surface Area (TSA) = 2πr(r + h)

Given: Diameter = 10 cm → Radius (r) = 5 cm and TSA = 330 cm².

Using π ≈ 22/7: 330 = 2 × (22/7) × 5 × (5 + h)

330 = (220/7) × (5 + h) => 5 + h = (330 × 7) ÷ 220 = 10.5

h = 10.5 − 5 = 5.5 cm.

Therefore The correct answer is 5.5 cm.

Alternate Method

Given:

Diameter (d) of the cylinder = 10 cm

Total Surface Area (TSA) = 330 cm²

Formula Used:

Radius (r) = d ÷ 2

TSA = 2πr² + 2πrh = 2πr(r + h)

Calculations:

=> Radius (r) = 10 ÷ 2 = 5 cm

=> 330 = 2 × (22/7) × 5 × (5 + h)

=> 330 = (44/7) × 5 × (5 + h)

=> 330 = (220/7) × (5 + h)

=> (330 × 7) ÷ 220 = 5 + h

=> (3 × 7) ÷ 2 = 5 + h

=> 21 ÷ 2 = 5 + h

=> 10.5 = 5 + h

=> h = 10.5 − 5 = 5.5 cm

Therefore The correct answer is 5.5 cm.

Additional Information

Curved Surface Area of Cylinder

The area of only the side surface is given by CSA = 2πrh.

Volume of Cylinder

The total space occupied inside the cylinder is Volume = πr²h.

Base Area of Cylinder

Since the base is a circle, the Area of Base = πr².

**Q86. Answer: (b) Branch Y**

Given:

Data on the production of milk products (in thousand tonnes) by three branches, X, Y, and Z, of a dairy product company over the years.

Concept Used:

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The main concept required is to calculate the average production over the given years for each branch and compare them to find the minimum.

Calculation:

Let the production values for Branch X be denoted as X1, X2, X3, and X4.

Similarly, for Branch Y: Y1, Y2, Y3, and Y4.

And for Branch Z: Z1, Z2, Z3, and Z4.

Average production for Branch X, Y, and Z is calculated as follows:

Average production for Branch X:

=> (X1 + X2 + X3 + X4) / 4

Average production for Branch Y:

=> (Y1 + Y2 + Y3 + Y4) / 4

Average production for Branch Z:

=> (Z1 + Z2 + Z3 + Z4) / 4

Assume the values from the graph are:

X1 = 50, X2 = 45, X3 = 55, X4 = 50

Y1 = 35, Y2 = 45, Y3 = 45, Y4 = 55

Z1 = 45, Z2 = 40, Z3 = 40, Z4 = 60

Calculating the average production:

For Branch X:

=> (50 + 45 + 55 + 50) / 4 = 50

For Branch Y:

=> (35 + 45 + 45 + 55) / 4 = 45

For Branch Z:

=> (45 + 40 + 40 + 60) / 4 = 46.25

Therefore The branch with the minimum average production over the given 4 years is Branch Y.

**Q87. Answer: (a) SIDBI**

The correct answer is SIDBI

Key Points

• SIDBI (Small Industries Development Bank of India) is an independent financial institution established in 1990 under an Act of the Indian Parliament.

• The primary objective of SIDBI is to assist in the growth and development of the Micro, Small and Medium Enterprises (MSMEs) sector in India.

• SIDBI provides financial assistance, refinancing, and other support services to MSMEs, fostering their development and contributing to the economic progress of the country.

• It plays a crucial role in promoting entrepreneurship and innovation in the MSME sector, which is considered the backbone of the Indian economy.

Additional Information

• NBFC (Non-Banking Financial Company) refers to financial institutions that provide banking services without meeting the legal definition of a bank. They are not involved in the primary objective of accepting deposits from the public.

• MSS (Market Stabilisation Scheme) is a tool used by the Reserve Bank of India (RBI) to manage liquidity in the economy, typically through the issuance of government securities.

• FSDC (Financial Stability and Development Council) is an apex-level body constituted by the government of India to strengthen and institutionalize the mechanism for maintaining financial stability and enhancing inter-regulatory coordination.

• The Indian Parliament is the supreme legislative body of India, consisting of two houses: the Rajya Sabha (Council of States) and the Lok Sabha (House of the People).

• The MSME sector is a critical component of the Indian economy, contributing significantly to employment, innovation, and exports.

**Q88. Answer: (c) 245/8**

Shortcut Trick

In a proportion a : b :: c : d, the Product of Extremes equals the Product of Means.

40 × x = 35 × 35

x = (35 × 35) ÷ 40

x = 1225 ÷ 40 = 245/8

Therefore The correct answer is 245/8.

Alternate Method

Given: The expression 40 : 35 :: 35 : x.

Formula Used: If four numbers are in proportion, then the ratio of the first two is equal to the ratio of the last two (a/b = c/d).

=> 40/35 = 35/x

=> 40 × x = 35 × 35

=> 40x = 1225

=> x = 1225/40

=> Dividing both numerator and denominator by 5:

=> x = 245/8

Therefore The correct answer is 245/8.

Additional Information

Mean Proportional

If three quantities a, b, c are in continued proportion, then a : b = b : c, which implies $b^2 = ac$ or $b = \sqrt{(ac)}$.

Fourth Proportional

In the proportion a : b :: c : d, the term 'd' is known as the fourth proportional to a, b, and c.

Invertendo Property

If a : b = c : d, then b : a = d : c. This is a fundamental property of ratios used for simplification.

**Q89. Answer: (a) Saturday**

Total Number of days:

=> (30 + 28 + 31 + 30 + 31 + 30 + 31 + 31 + 30 + 31 + 30 + 31) = 364

Now, 364 ÷ 7 = 52 weeks

So, 31 December 2011 is Saturday.

Hence, the correct answer is "Saturday".

**Q90. Answer: (b) E**

According to the given information,

1) B and D sit at the extreme ends of the row.

2) A is not at the exact center position of the row.

3) C is second from one extreme end, while fourth from the other extreme end.

Here, we can see that 'E' sits at the exact center position of the row.

Hence, the correct answer is "E".

**Q91. Answer: (c) Both (i) and (ii)**

The correct answer is Both (i) and (ii).

Key Points

• A spherical mirror is a mirror that has the shape of a piece cut out of a spherical surface. There are two types of spherical mirrors: concave and convex.

• The normal to a surface at a given point is the line perpendicular to the surface at that point.

• In the case of a spherical mirror, the normal at any point on the mirror is the line joining that point with the center of curvature of the mirror.

• Statement (i): The line joining the pole and the center of curvature is perpendicular at all points on the mirror. Hence, this statement is correct.

• Statement (ii): The line joining the center of curvature and the point of incidence is normal to the mirror at the point of incidence. Hence, this statement is correct.

• Statement (iii): The line joining the focus and the point of incidence is not normal to the mirror at the point of incidence.

• Therefore, the Both (i) and (ii) are correct.

**Q92. Answer: (d) Hydrogen gas and sodium hydroxide solution are produced.**

The correct answer is hydrogen gas and sodium hydroxide solution are produced.

Key Points

• When sodium metal reacts with water, hydrogen gas and sodium hydroxide solution are produced.

• This reaction is highly exothermic and can be quite vigorous.

• The chemical equation for this reaction is: $2Na + 2H_2O \rightarrow 2NaOH + H_2\uparrow$.

• Due to the exothermic nature of the reaction, the hydrogen gas evolved can catch fire, causing the sodium to burn with a characteristic yellow flame.

Additional Information

• Sodium is a highly reactive alkali metal and must be handled with care, especially when in contact with water or moisture.

• The sodium hydroxide produced is a strong base and can cause chemical burns.

• This reaction is a common demonstration in chemistry classes to illustrate the reactivity of alkali metals.

**Q93. Answer: (a) Sweet Potato**

The correct answer is Sweet Potato

Key Points

• Sweet Potato is an example of a plant that can produce new plants from its roots.

• This vegetative propagation method allows the plant to reproduce asexually, ensuring genetic consistency in the offspring.

• Other plants that can propagate from their roots include certain types of grasses and trees, but Sweet Potato is a well-known example.

• Propagation from roots is an efficient way for these plants to spread and colonize new areas.

Additional Information

• Sweet Potato (Ipomoea batatas) is a root vegetable that is rich in vitamins, minerals, and fiber.

• It is commonly grown in tropical and subtropical regions around the world.

• The plant can thrive in a variety of soil types and is relatively easy to cultivate, making it an important crop for food security.

• Sweet Potatoes are also known for their high nutritional value, being a good source of beta-carotene, which the body converts into vitamin A.

• Unlike other plants that propagate through seeds, Sweet Potato plants can be grown from root cuttings, which are sections of the root that can develop into a new plant.

**Q94. Answer: (a) IRMARAST**

The logic followed here is:

PORTUGAL: TROPLAGU

URANUS: ARUSUN

Similarly,

AMRITSAR: ?

Hence, the correct answer is "IRMARAST".

**Q95. Answer: (b) J ≤ G**

Given statement: $J \leq H \leq G = R > Z = E > D$

Let's check each option,

1) D > R => False (Because there is a definite relation; R > Z = E > D)

2) J ≤ G => True (Because there is a definite relation; J ≤ H ≤ G)

3) Z < D => False (Because there is a definite relation; Z = E > D)

4) H > R => False (Because there is a definite relation; H ≤ G = R)

Hence, the correct answer is "J ≤ G".

**Q96. Answer: (a) N**

According to the given information,

1) O is second to the left of N.

2) N and L are immediate neighbours.

3) M is to the immediate right of L.

4) P is second to the right of K.

Here, we can see that N is sitting to the immediate right of P.

Hence, the correct answer is "N".

**Q97. Answer: (b) Both statements are correct. Statement II is correct explanation of Statement I.**

The correct answer is both statements are correct. Statement II is correct explanation of Statement I.

Key Points

• Statement I: Metallic character decreases across a period as we move from left to right.

• Statement II: The effective nuclear charge acting on the valence shell electrons increases across a period, the tendency to lose electrons will decrease.

• Both statements are correct. As we move from left to right across a period, elements tend to gain electrons to achieve a stable electron configuration, hence their metallic character decreases. Therefore, Statement I is correct.

• The effective nuclear charge (the net positive charge experienced by valence electrons) increases across a period due to the increase in the number of protons in the nucleus. This makes it harder for the elements to lose electrons, explaining the decrease in metallic character. Therefore, Statement II is correct and it explains Statement I.

• Hence, the correct answer is option 2.

**Q98. Answer: (c) 58 lakhs**

Given:

The population of State B over the years:

2016: 38 lakhs

2017: 52 lakhs

2018: 58 lakhs

2019: 60 lakhs

2020: 68 lakhs

2021: 72 lakhs

Concept Used:

Calculation of average population.

Calculation:

Sum of the populations of State B:

=> 38 + 52 + 58 + 60 + 68 + 72 = 348 lakhs

Number of years:

=> 6 years

Average population:

=> Average population = Total population / Number of years

=> Average population = 348 / 6 = 58 lakhs

Therefore The approximate average population of State B for all the given years is 58 lakhs.

**Q99. Answer: (d) 5/7 A**

The correct answer is 5/7 A.

Key Points

Given:

• Resistor 1 (R1) = 3 ohms

• Resistor 2 (R2) = 4 ohms

• Voltage (V) = 5V

Formula Used:

The total resistance (R_(total)) in series is calculated as:

R_(total) = R1 + R2

Calculation:

Total Resistance:

R_(total) = 3 ohms + 4 ohms = 7 ohms

Using Ohm's Law to find the total current (I):

I = V / R_(total)

I = 5 V / 7 ohms

I = 5/7 A

Answer:

The current across the 3 ohm resistance is 5/7 A

**Q100. Answer: (d) 2022 and 2026**

The correct answer is 2022 and 2026

Key Points

• The Scheme of Assistance to National Sports Federations (NSFs) has been extended to train and field national teams for national and international competitions between 2022 and 2026.

• This extension aims to provide continuous support to NSFs in preparation for various competitions, ensuring that athletes have the necessary resources and training.

• Such schemes are crucial for the development of sports in the country and help in achieving excellence in international sports arenas.

• Regular funding and support to NSFs can significantly contribute to the overall sports infrastructure and athlete performance.

Additional Information

• The Scheme of Assistance to NSFs is part of the government's broader strategy to promote sports and physical fitness among the youth.

• It includes various initiatives such as talent identification, coaching camps, international exposure, and infrastructure development.

• The scheme also focuses on the holistic development of athletes, including their education, health, and well-being.

• Continuous evaluation and monitoring of the scheme ensure that the funds are utilized effectively and the objectives are met.

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