# RRB ALP CBT-I 2024 Official Paper (Held On: 29 Nov, 2024 Shift 2) (Previous Year Paper)

RRB Group D • 2024 • 75 questions • 60 minutes • Answer key and solutions

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## STAGE I (CBT I)

**Q1.** Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which pair does not belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter cluster.)

**(a)** FK-IN
**(b)** DI-GL
**(c)** LP-NR
**(d)** QV-TY

**Q2.** According to the '2024 State of the Rhino' Report by the International Rhino Foundation (IRF), which species of rhino could be severely affected by climate change?

**(a)** Sumatran Rhino
**(b)** Javan Rhino
**(c)** Black Rhino
**(d)** Greater One-horned Rhino

**Q3.** A reduction of 20% in the price of sugar enables a purchaser to obtain 2.5 kg more for Rs. 160. The original price per kg of sugar is:

**(a)** Rs. 12
**(b)** Rs. 16
**(c)** Rs. 20
**(d)** Rs. 15

**Q4.** Two trains travelling in the same direction at 40 km/h and 22 km/h cross each other completely in 1 minute. If the length of the first train is 125 m, what is the length of the second train?

**(a)** 175 m
**(b)** 185 m
**(c)** 150 m
**(d)** 125 m

**Q5.** What can be formed by a coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder?

**(a)** Circular coil
**(b)** Solenoid
**(c)** Straight conductor
**(d)** Toroid

**Q6.** Which indigenously developed technology was used in the AKASH-NG missile during its flight test in 2024?

**(a)** Electro-optical Seeker
**(b)** Radio Frequency Seeker
**(c)** Laser-guided Seeker

**(d)** Infrared Seeker

**Q7.** In the word MAJESTIC, each consonant is changed to the letter immediately preceding it in the English alphabetical order and each vowel is changed to the letter immediately succeeding it in the English alphabetical order. How many vowels are present in the new group of letters thus formed?

**(a)** Two
**(b)** One
**(c)** Four
**(d)** None

**Q8.** A can do a certain work in the same time in which B and C together can do it. If A and B together could do it in 10 days and C alone in 50 days, then B alone could do it in:

**(a)** 15 days
**(b)** 30 days
**(c)** 20 days
**(d)** 25 days

**Q9.** Seven people, B, C, D, E, F, G, and K, are sitting in a straight line, facing north.

Only two people sit between D and G. Only E sits to the right of K. Only one person sits between G and K. C sits at some place to the right of B but at some place to the left of F.

Who sits third from the right end of the line?

**(a)** F
**(b)** C
**(c)** G
**(d)** B

**Q10.** The corresponding sides of two similar triangles are in the ratio of 2: 3. If the area of the smaller triangle is 36 sq cm, then the area of the bigger triangle is:

**(a)** 16 sq cm
**(b)** 96 sq cm
**(c)** 81 sq cm
**(d)** 36 sq cm

**Q11.** Each vowel in the word JOURNALIST 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. How many letters will appear exactly twice in the group of letters thus formed?

**(a)** Two
**(b)** Three
**(c)** None
**(d)** One

**Q12.** Which of the following options does NOT represent a property of liquids?

**(a)** Liquids have no fixed shape
**(b)** Liquids flow and change shape
**(c)** Liquids do not have fixed volume
**(d)** Liquids take the shape of the container in which they are kept

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**Q13.** A, B, C, D, E and F are sitting around a circular table facing the centre. C sits to the immediate left of E. F is an immediate neighbour of A and C. D is not an immediate neighbour of E. What is the position of D with respect to F?

**(a)** Third to the left
**(b)** Immiediate left
**(c)** Second to the left
**(d)** Third to the right

**Q14.** In 2024, the Ministry of Women and Child Development launched the platform ____ to register and monitor complaints of sexual harassment of women at the workplace.

**(a)** Work Guard
**(b)** She-Box
**(c)** WomenSafe
**(d)** Secure Her

**Q15.** The oxygen molecule is a _____.

**(a)** triatomic molecule
**(b)** diatomic molecule
**(c)** tetratomic molecule
**(d)** monoatomic molecule

**Q16.** If the mean of a distribution is 8.73 and its median is 11, then the mode of the distribution is _____ (using empirical relation).

**(a)** 15.54
**(b)** 19.73
**(c)** 22
**(d)** 17.46

**Q17.** Which two numbers should be interchanged to make the given equation correct?

3 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

(Note: Interchange should be done of the entire number and not individual digits of a given number.)

**(a)** 3 and 4
**(b)** 2 and 4
**(c)** 64 and 78
**(d)** 7 and 5

**Q18.** If 'I' stands for '+', 'J' stands for '×', 'K' stands for '÷', and 'L' stands for '−', what will come in place of the question mark '?' in the following equation?

(35 L 19) J 4 I 26 L (7 J 3) I 11 = ?

**(a)** 105
**(b)** 60
**(c)** 80
**(d)** 120

**Q19.** The force of attraction between two bodies which is directly proportional to the product of masses of the bodies and inversely proportional to the square of the distance of separation is _____.

**(a)** gravitational force
**(b)** electromagnetic force
**(c)** electrostatic force
**(d)** electromotive force

**Q20.** In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is the same as that on the right side of ::?

(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.

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Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

X : 803 :: 469 : Y

**(a)** X = 545, Y = 727
**(b)** X = 512, Y = 792
**(c)** X = 558, Y = 712
**(d)** X = 526, Y = 758

**Q21.** The following substances are stored in the vacuole of plant cells:

**(a)** sugars
**(b)** proteins
**(c)** amino acids
**(d)** All of the above

**Q22.** Which of the following has lowest PH value?

**(a)** Lemon juice
**(b)** Blood
**(c)** Milk of magnesia
**(d)** Gastric juice

**Q23.** If each consonant in the word GRAVITY is changed to the letter immediately preceding it in the English alphabetical order and each vowel is changed to the letter immediately succeeding it in the English alphabetical order. How many consonants are present in the new group of letters thus formed?

**(a)** Six
**(b)** Two
**(c)** Seven
**(d)** Three

**Q24.** Malarial parasite shows which type of asexual reproduction?

**(a)** Binary fission
**(b)** Regeneration
**(c)** Budding
**(d)** Multiple fission

**Q25.** Which of the following is NOT a characteristic feature of epithelial tissue?

**(a)** Have no intercellular spaces
**(b)** Covers most organs and cavities within the body
**(c)** Are tightly packed
**(d)** Seperated from the underlying tissue by a cellular, non fibrous basement membrane

**Q26.** Evaluate the given expression.

19 - 20 ÷ 4

**(a)** -1
**(b)** 24
**(c)** 19
**(d)** 14

**Q27.** An amount is divided between two friends in the ratio 4 : 7. If the second part is Rs. 6 more than the first, then the difference in amount between two friends is:

**(a)** Rs. 2
**(b)** Rs. 6
**(c)** Rs. 4
**(d)** Rs. 3

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**Q28.** By how much is 50% of 60 greater than 30% of 40?

**(a)** 15
**(b)** 18
**(c)** 20
**(d)** 13

**Q29.** Power of a lens of focal length ‘f’ is directly proportional to _____.

**(a)** 1/f
**(b)** $f^2$
**(c)** f
**(d)** $1/f^2$

**Q30.** The resistance of a conductor of length 'L' and cross-section area 'A' is directly proportional to _____

**(a)** A
**(b)** $L^2$
**(c)** L/A
**(d)** A/L

**Q31.** For the what value of K is the equation 0.009/K = 0.1 true?

**(a)** 9
**(b)** 0.09
**(c)** 0.9
**(d)** 0.0009

**Q32.** Select the correct statement.

**(a)** Pollination is transfer of pollen grains from stamen to stigma
**(b)** Pollination is the growth of pollen tube in ovule
**(c)** Pollination is visit of insects to the flower
**(d)** Pollination is germination of pollen grains

**Q33.** Simplify the expression:

$\sqrt{(1 + \cos\theta)/(1 - \cos\theta)}$

**(a)** $\sec\theta + \cot\theta$
**(b)** $\operatorname{cosec}\theta - \cot\theta$
**(c)** $\sec\theta - \cot\theta$
**(d)** $\operatorname{cosec}\theta + \cot\theta$

**Q34.** The 63rd National Open Athletics Championship was conducted in the city of _____.

**(a)** Bhopal
**(b)** Hyderabad
**(c)** Bengaluru
**(d)** Mumbai

**Q35.** On 9 November 2023, N Srikant was appointed as the Additional Secretary in the Union Ministry of _____.

**(a)** Power and New and Renewable Energy
**(b)** Finance
**(c)** Environment and Forests
**(d)** Housing and Urban Affairs

**Q36.** Which of the following missions will lead to India’s first human presence on the International Space Station (ISS)?

**(a)** Axiom-4
**(b)** Taxsci-4
**(c)** VenSpac-4
**(d)** Spacoon-4

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**Q37.** In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is the same as that on the right side of :: ?

(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 is not allowed.)

X : 676 :: 17 : Y

**(a)** X = 21, Y = 396
**(b)** X = 24, Y = 324
**(c)** X = 25, Y = 324
**(d)** X = 28, Y = 361

**Q38.** Which rapper, known for the indie album 'Halaat', has risen from the slums of Dharavi to the forefront of Indian hip hop music?

**(a)** Naezy
**(b)** MC Altaf
**(c)** Divine
**(d)** Emiway Bantai

**Q39.** In a certain code language,

A + B means 'A is the mother of B',

A − B means 'A is the brother of B',

A × B means 'A is the wife of B', and

A ÷ B means 'A is the father of B'.

Based on the above, how is Q related to T if 'P × Q ÷ R − S + T'?

**(a)** Mother's Father
**(b)** Mother's brother
**(c)** Brother
**(d)** Husband

**Q40.** Uniform circular motion is described by which of the following examples?

**(a)** A rain drop falling from the sky
**(b)** A car moving on a straight road
**(c)** A monkey jumping from one tree to another
**(d)** motion of clock hands

**Q41.** A fruit seller had some apples. He sells 40% of those apples and still has 240 apples. How many apples did he originally have?

**(a)** 400
**(b)** 588
**(c)** 372
**(d)** 600

**Q42.** Which of the following options should come in place of the question mark (?) in the given series based on the English alphabetical order?

YRM, PID, GZU, XQL,?

**(a)** OGC
**(b)** PHC
**(c)** OHC
**(d)** OHB

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**Q43.** The work done by a 10 Newton force acting on a body, which results in the displacement of 2 m in the direction of the force, is ____.

**(a)** 10 joules
**(b)** 0 joules
**(c)** 20 joules
**(d)** 0.2 joule

**Q44.** Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which pair does not belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter cluster.)

**(a)** TX-RV
**(b)** SV-MP
**(c)** AD-UX
**(d)** FI-ZC

**Q45.** In the 2024 Union Budget, the government allocated funds for the development of the Vishnupad Temple Corridor. In which of the following states is the Vishnupad Temple located?

**(a)** Uttar Pradesh
**(b)** Tamil Nadu
**(c)** West Bengal
**(d)** Bihar

**Q46.** According to the reactivity series, iron is more reactive than _____.

**(a)** potassiom
**(b)** sodium
**(c)** copper
**(d)** calcium

**Q47.** Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts and decide which conclusion(s) logically follow(s) from the given statements.

Statements:

All water is milk.

No milk is oil.

Conclusions:

(I) Some milk is water.

(II) No oil is water.

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

**Q48.** Two successive discounts of 25% and 10% on a deal are equivalent to a single discount of:

**(a)** 32%
**(b)** 34.5%
**(c)** 32.5%
**(d)** 35%

**Q49.** Select the option that shows the correct age range of puberty in human male and female.

**(a)** 8-11 years
**(b)** 11-17 years
**(c)** 6-10 years
**(d)** 9-12 years

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**Q50.** The volume of a wall that is 5 times as high as it is broad and 8 times as long as it is high is 12.8 cubic meters. Find the breadth of the wall.

**(a)** 0.004 meter
**(b)** 40 cm
**(c)** 400 cm
**(d)** 0.04 meter

**Q51.** Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts and decide which conclusion(s) logically follow(s) from the given statements.

Statements:

Some vegetables are fruits.

Some fruits are sweets.

Conclusions:

(I) Some fruits are vegetables.

(II) Some sweets are vegetables.

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

**Q52.** Which of the following options should come in place of the question mark (?) in the given series to make it logically complete?

125, 128, 133, 140, 149,?

**(a)** 156
**(b)** 160
**(c)** 158
**(d)** 154

**Q53.** In this question, a statement is followed by two courses of action, numbered I and II. You must assume everything in the statement to be true and on the basis of the information given in the statement, decide which of the courses of action logically follow(s) for pursuing.

Statement:

Long queues are seen outside the electricity bill payment counters on 14^(th) and 15^(th) of each month, as 15^(th) of each month is the last date for payment of electricity bills. Citizens have lodged several complaints with the electricity board regarding this difficulty in payment.

Courses of Action:

(I) The electricity board should set up additional counters for payment collection on 14^(th) and 15^(th) of each month, to make it easier for citizens.

(II) The electricity board should increase the penalty to be paid after the specified last date.

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

**Q54.** In a certain code language, ‘MEND’ is coded as ‘3186’ and ‘MINE’ is coded as ‘1623’. What is the code for ‘I’ in the given code language?

**(a)** 3
**(b)** 6
**(c)** 1
**(d)** 2

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**Q55.** In a certain code language, ‘cafe hotel room’ is coded as ‘aa bb ee’, ‘room kitchen hall’ is coded as ‘ff aa bb’, and ‘hall hotel garden’ is coded as ‘ee ff tt’. What is the code for ‘garden’ in the given code language?

**(a)** bb
**(b)** tt
**(c)** ff
**(d)** ee

**Q56.** If the radius of a sphere is increased by 2 cm, then its surface area increases by 704 $cm^2$. Using $\pi = 22/7$, find the radius of the sphere after the increase.

**(a)** 16 cm
**(b)** 15 cm
**(c)** 14 cm
**(d)** 13 cm

**Q57.** Johny starts from Point A and drives 6 km towards the North. He then takes a right turn, drives 17 km, turns right and drives 13 km. He then takes a right turn and drives 8 km. He takes a final right turn, drives 7 km and stops at Point P. How far (shortest distance) and towards which direction should he drive to reach Point A again? (All turns are 90 degrees turns only unless specified.)

**(a)** 9 km towards the East
**(b)** 9 km towards the West
**(c)** 10 km towards the East
**(d)** 10 km towards the West

**Q58.** Which of the following molecules has triple bond between the two atoms?

**(a)** F2
**(b)** C_(l2)
**(c)** N2
**(d)** O2

**Q59.** Different cell organelles such as mitochondria, ribosome, etc., together constitute the basic unit of life called the:

**(a)** organ system
**(b)** tissue
**(c)** cell
**(d)** organ

**Q60.** The book 'Coaching Beyond: My Days with the Indian Cricket Team' is authored by R Sridhar and the foreword is by _____.

**(a)** Sachin Tendulkar
**(b)** VVS Laxman
**(c)** Rahul Dravid
**(d)** Saurabh Ganguly

**Q61.** In an election between two candidates, 75% of the voters cast their votes. 2% of the votes cast were declared invalid. A candidate got 9261 votes which were 75% of the total valid votes. The total number of voters enrolled in that election was:

**(a)** 16,400
**(b)** 18,000
**(c)** 16,800
**(d)** 10,000

**Q62.** Which of the following options should come in place of the question mark (?) in the given series based on the English alphabetical order?

BJL, EMO, HPR, KSU, ?

**(a)** NVX
**(b)** NUY

**(c)** NVY
**(d)** NUW

**Q63.** Simplify the following expression:

9992 × 10008

**(a)** 91999964
**(b)** 99999936
**(c)** 9999964
**(d)** 9999936

**Q64.** If x : y = 8 : 3, then (x - y) : (x + y) = ?

**(a)** 2 : 5
**(b)** 5 : 11
**(c)** 5 : 2
**(d)** 11 : 5

**Q65.** QLPK is related to IDHC in a certain way based on the English alphabetical order. In the same way, VQUP is related to NIMH. To which of the following options is TOSN related, following the same logic?

**(a)** GLFK
**(b)** GLKF
**(c)** LGFK
**(d)** LGKF

**Q66.** Which of the following is the correct statement about colloidal solutions?

**(a)** The size of particles of the colloid is not too small.
**(b)** A colloidal solution is a homogeneous mixture.
**(c)** Colloids do not scatter a beam of light passing through them and make its path visible.
**(d)** The components of a colloidal solution are the dispersed phase and the dispersion medium.

**Q67.** Study the given table and answer the question that follows.

The table depicts the number of different articles X and Y sold in the year 2019 and 2020.

What is the absolute difference between the number of article X sold in the year 2019 and 2020?

| Years | Number of article X | Number of article Y |
|---|---|---|
| 2019 | 125 | 150 |
| 2020 | 110 | 130 |

**(a)** 15
**(b)** 45
**(c)** 25
**(d)** 35

**Q68.** Which of the following is NOT an example of combination reaction?

**(a)** Burning of natural gas
**(b)** Calcium oxide reacts vigorously with water to produce slaked lime
**(c)** Formation of water from H2(g) and O2(g)
**(d)** Silver chloride turns grey in sunlight

**Q69.** Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

FB-IE-LM

JF-MI-PQ

**(a)** NI-QN-TU
**(b)** KG-NJ-QS
**(c)** HD-KG-NP

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**(d)** LH-OK-RS

**Q70.** Find the mean marks of the following distribution.

| Marks obtained | No. of students |
|---|---|
| 25 | 5 |
| 30 | 6 |
| 35 | 3 |
| 40 | 1 |

**(a)** 32
**(b)** 29
**(c)** 30
**(d)** 31

**Q71.** Ariel ranked 6^(th) from the top and 18^(th) from the bottom in her class. How many students are there in the class?
**(a)** 23
**(b)** 26
**(c)** 25
**(d)** 22

**Q72.** Arnab buys 9 oranges and 8 bananas for Rs. 276. When the cost of an orange is decreased by 10% and that of a banana remains the same, then the cost of 5 oranges and 10 bananas is Rs. 210. What is the original cost of 4 oranges and 3 bananas?
**(a)** Rs. 116
**(b)** Rs. 120
**(c)** Rs. 123
**(d)** Rs. 108

**Q73.** The line joining the centre of curvature and the pole of a given spherical mirror is called _____.
**(a)** principal focus
**(b)** principal axis
**(c)** focal length
**(d)** radius of curvature

**Q74.** In 2024, which of the following Indian banks launched the Green Rupee Term Deposit?
**(a)** Central Bank of India
**(b)** State Bank of India
**(c)** HDFC Bank
**(d)** ICICI Bank

**Q75.** How long will it take for Rs. 1,500 to become Rs. 2,040 at a rate of 8% per annum simple interest?
**(a)** 3 years
**(b)** 4 1/2 years
**(c)** 2 years
**(d)** 4 3/4 years

## ANSWER KEY

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

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| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | a | 42 | c | 43 | c | 44 | a | 45 | d | 46 | c | 47 | a | 48 | c | 49 | b | 50 | b |
| 51 | b | 52 | b | 53 | a | 54 | d | 55 | b | 56 | b | 57 | b | 58 | c | 59 | c | 60 | b |
| 61 | c | 62 | a | 63 | b | 64 | b | 65 | d | 66 | d | 67 | a | 68 | d | 69 | d | 70 | c |
| 71 | a | 72 | a | 73 | b | 74 | b | 75 | b | | | | | | | | | | |

## SOLUTIONS

**Q1. Answer: (c) LP-NR**

The logic followed here is:

Option 1) FK-IN

Option 2) DI-GL

Option 3) LP-NR

Option 4) QV-TY

Thus, out of all the options 'LP-NR' is the odd one out.

Hence, "Option 3" is the correct answer.

**Q2. Answer: (c) Black Rhino**

The correct answer is Black Rhino

Key Points

• The International Rhino Foundation's (IRF) 2024 "State of the Rhino" report highlights the concerning impact of climate change on rhino populations, particularly in Africa. While the report doesn't explicitly single out one species as being most affected, it strongly suggests that both black and white rhino species in Africa are highly vulnerable to the changing climate.

Additional Information

• Here's a breakdown of why:

• Habitat Alteration:

• Climate change is causing significant shifts in temperature and rainfall patterns across Africa. This leads to habitat degradation, with grasslands turning into arid landscapes and water sources drying up.

• Rhinos rely on specific habitats for food and shelter. Changes in vegetation composition and water availability directly impact their survival.

• Increased Stress and Vulnerability:

• Extreme weather events like droughts and heatwaves, intensified by climate change, can cause stress in rhinos, making them more susceptible to diseases and less able to reproduce.

• Reduced water and food availability can lead to malnutrition, weakening their immune systems and making them more vulnerable to poaching.

• Range Restrictions:

• As suitable habitats shrink, rhinos are forced into smaller areas, increasing competition for resources and making them more vulnerable to poaching and human-wildlife conflict.

• Indirect Impacts:

• Climate change can also affect the availability of food sources for rhinos. Changes in plant life cycles and the distribution of insects can disrupt the food chain, indirectly impacting rhino populations.

• Poaching Exacerbated:

• While not a direct result of climate change, the report highlights that poaching remains the biggest threat to rhinos. Climate change-induced habitat loss can make rhinos easier to target for poachers due to their concentration in smaller areas.

• Specific Data from the Report:

• The report notes a slight decline in the black rhino population due to heavy poaching in Namibia and South Africa. While poaching is the direct cause, climate change can exacerbate the situation by making these populations more vulnerable.

• White rhino populations in South Africa are on the rise despite poaching, indicating some resilience. However, the report emphasizes that continued monitoring and conservation efforts are crucial in the face of climate change.

• Overall, the 2024 "State of the Rhino" report paints a concerning picture of the challenges facing rhinos in a changing climate. While poaching remains the primary threat, the report underscores the growing importance of addressing climate change to ensure the long-term survival of these iconic species.

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**Q3. Answer: (b) Rs. 16**

Shortcut Trick

Price Ratio (Original : New) = 100% : 80% = 5 : 4

Quantity Ratio (Inverse of Price) = 4 : 5

Difference in Quantity = 5 − 4 = 1 unit → 2.5 kg

Original Quantity = 4 units × 2.5 = 10 kg

Original Price per kg = Total Amount ÷ Original Quantity = 160 ÷ 10

Therefore The correct answer is Rs. 16.

Alternate Method

Given:

Total Expenditure = Rs. 160

Price Reduction = 20%

Extra Quantity obtained = 2.5 kg

Calculations:

=> Let the Original Price be Rs. x per kg.

=> Original Quantity = 160 ÷ x

=> Reduced Price = x − 20% of x = 0.8x

=> New Quantity = 160 ÷ 0.8x = 200 ÷ x

=> According to the question: New Quantity − Original Quantity = 2.5

=> (200 ÷ x) − (160 ÷ x) = 2.5

=> 40 ÷ x = 2.5

=> x = 40 ÷ 2.5 = 400 ÷ 25

=> x = 16

Therefore The correct answer is Rs. 16.

Additional Information

Inverse Proportion Rule

When the total expenditure remains constant, the price is inversely proportional to the quantity. If price decreases by 1/n, quantity increases by 1/(n−1).

Reduced Price Formula

Reduced Price per unit = (Total Amount × % Reduction) ÷ Extra Quantity. For this question: (160 × 20%) ÷ 2.5 = Rs. 12.8.

Original Price from Reduced Price

Original Price = Reduced Price ÷ (1 − % Reduction). Here: 12.8 ÷ (1 − 0.20) = 12.8 ÷ 0.8 = Rs. 16.

**Q4. Answer: (a) 175 m**

Shortcut Trick

Relative speed (same direction) = 40 − 22 = 18 km/h

Convert to m/s: 18 × (5/18) = 5 m/s

Total distance (L1 + L2) = Speed × Time = 5 × 60 = 300 m

Length of second train = 300 − 125 = 175 m

Therefore The correct answer is 175 m.

Alternate Method

Given:

Speed of first train (S1) = 40 km/h

Speed of second train (S2) = 22 km/h

Time taken (t) = 1 min = 60 s

Length of first train (L1) = 125 m

Formula Used:

Relative Speed (same direction) = S1 − S2

Total Distance = Length of Train 1 + Length of Train 2

Distance = Speed × Time

Calculations:

=> Relative Speed = (40 − 22) km/h = 18 km/h

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=> Convert Speed to m/s = 18 × (5/18) = 5 m/s

=> Total Distance (L1 + L2) = Relative Speed × Time

=> 125 + L2 = 5 × 60

=> 125 + L2 = 300

=> L2 = 300 − 125

=> L2 = 175 m

Therefore The correct answer is 175 m.

Additional Information

Relative Speed in Same Direction

When two objects move in the same direction, their relative speed is the difference of their individual speeds (S1 − S2).

Relative Speed in Opposite Direction

When two objects move towards each other, their relative speed is the sum of their individual speeds (S1 + S2).

Speed Unit Conversion

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

Train Crossing Concepts

When a train crosses another train, the total distance covered is the sum of the lengths of both trains.

**Q5. Answer: (b) Solenoid**

The correct answer is Solenoid.

Key Points

• A solenoid is formed by a coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder.

• When an electric current passes through the solenoid, it generates a uniform magnetic field inside the coil.

• Solenoids are commonly used as electromagnets, which can be turned on or off with the flow of electric current.

• The strength of the magnetic field inside a solenoid is directly proportional to the number of turns in the coil and the current flowing through it.

• Solenoids are used in various applications such as electromagnetic switches, inductors, and actuators.

Additional Information

• Electromagnets

• Electromagnets are created by passing an electric current through a coil of wire, generating a magnetic field.

• The magnetic field can be controlled by adjusting the current flowing through the coil.

• Inductors

• Inductors are components in electrical circuits that store energy in a magnetic field when electric current flows through them.

• They are typically made of a coil of wire and are used in various applications such as filters and transformers.

• Actuators

• Actuators are devices that convert electrical energy into mechanical motion.

• They are used in a variety of applications, including robotics, industrial machinery, and automotive systems.

**Q6. Answer: (b) Radio Frequency Seeker**

The correct is answer is Radio Frequency Seeker.

Key Points

• Akash Missile (Akash-NG):

• It is a surface-to-air Missile. Hence, Option 3 is correct.

• It is a new variant of the Akash missile that can strike targets at a distance of around 60 km and fly at a speed of up to Mach 2.5.

• Once deployed, the Akash-NG weapon system will prove to be a force multiplier for the air defence capability of the Indian Air Force.

• Developed by Defence Research & Development Laboratory (DRDL), Hyderabad in collaboration with other DRDO laboratories.

• It is being produced by Bharat Electronics Limited (BEL) and Bharat Dynamics Limited (BDL).

Additional Information

• Akash Missile:

• Akash is India’s first indigenously produced medium-range Surface to Air missile that can engage multiple targets from multiple directions.

• The missile is unique in the way that it can be launched from mobile platforms like battle tanks or wheeled trucks. It has a nearly 90% kill probability.

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• The missile is supported by the indigenously developed radar called 'Rajendra'.

• The missile is reportedly cheaper and more accurate than US Patriot missiles due to its solid-fuel technology and high-tech radars.

• It can engage targets at a speed 2.5 times more than the speed of sound and can detect and destroy targets flying at low, medium, and high altitudes.

• The Akash missile system has been designed and developed as part of India's 30-year-old Integrated Guided-Missile Development Programme (IGMDP).

• Defense Research & Development Organisation

• It is the Research & Development wing of the Ministry of Defence, Govt of India, with a vision to empower India with cutting-edge defence technologies.

• It was established in 1958 after combining the Technical Development Establishment (TDEs) of the Indian Army and the Directorate of Technical Development & Production (DTDP) with the Defence Science Organisation (DSO).

**Q7. Answer: (b) One**

Given word: 'MAJESTIC'

After applying the given transformation rules:

| **Original Letters** | **M** | **A** | **J** | **E** | **S** | **T** | **I** | **C** |
|---|---|---|---|---|---|---|---|---|
| Transformed Letters | L | B | I | F | R | S | J | B |

After transformation,

'L B I F R S J B'

Only one vowel is present.

Hence, the correct answer is "Option 2".

**Q8. Answer: (d) 25 days**

Shortcut Trick

Total Work = LCM(10, 50) = 50 units.

Efficiency of (A + B) = 5 units/day and Efficiency of C = 1 unit/day.

Total Efficiency (A + B + C) = 5 + 1 = 6 units/day.

Given A = B + C, so Efficiency of A = 6 ÷ 2 = 3 units/day.

Efficiency of B = Efficiency of (A + B) − Efficiency of A = 5 − 3 = 2 units/day.

Time for B = 50 ÷ 2 = 25 days.

Therefore The correct answer is 25 days.

Alternate Method

Given:

Time taken by (A + B) = 10 days

Time taken by C alone = 50 days

Condition: Efficiency of A = Efficiency of (B + C)

| **Person** | **Days** | **Total Work** | **Efficiency** |
|---|---|---|---|
| (A + B) | 10 | 50 units | 5 |
| C | 50 | 1 | |

Calculations:

=> Total efficiency of (A + B + C) = 5 + 1 = 6 units/day

=> Since Efficiency of A = Efficiency of (B + C)

=> A + (B + C) = 6 => A + A = 6

=> 2 × Efficiency of A = 6

=> Efficiency of A = 3 units/day

=> Efficiency of B = Efficiency of (A + B) − Efficiency of A

=> Efficiency of B = 5 − 3 = 2 units/day

=> Time taken by B alone = Total Work ÷ Efficiency of B

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=> Time = 50 ÷ 2 = 25 days

Therefore The correct answer is 25 days.

Additional Information

Work and Efficiency Relationship

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

Combined Efficiency

When multiple people work together, their total efficiency is the sum of their individual efficiencies.

Time Calculation

Total time taken to complete the work = Total Units of Work ÷ Combined Efficiency.

**Q9. Answer: (a) F**

Given: Seven people, B, C, D, E, F, G, and K, are sitting in a straight line, facing north.

1) Only E sits to the right of K.

2) Only one person sits between G and K.

3) Only two people sit between D and G.

4) C sits at some place to the right of B but at some place to the left of F.

Thus, according to the final arrangement, F sits third from the right end of the line.

Hence, "Option 1" is the correct answer.

**Q10. Answer: (c) 81 sq cm**

Shortcut Trick

For similar triangles, the ratio of their areas is the square of the ratio of their corresponding sides.

Ratio of sides = 2 : 3

Ratio of areas = $2^2 : 3^2 = 4 : 9$

Given: Area of smaller triangle (4 units) = 36 sq cm

=> 1 unit = 36 ÷ 4 = 9 sq cm

=> Area of bigger triangle (9 units) = 9 × 9 = 81 sq cm

Therefore The correct answer is 81 sq cm.

Alternate Method

Given:

Ratio of sides (s1 : s2) = 2 : 3

Area of smaller triangle (A1) = 36 sq cm

Formula Used:

Area1 / Area2 = $(\text{side1} / \text{side2})^2$

Calculations:

=> Area(Smaller) / Area(Bigger) = $(2 / 3)^2$

=> 36 / Area(Bigger) = 4 / 9

=> Area(Bigger) × 4 = 36 × 9

=> Area(Bigger) = (36 × 9) ÷ 4

=> Area(Bigger) = 9 × 9

=> Area(Bigger) = 81 sq cm

Therefore The correct answer is 81 sq cm.

Additional Information

Area Ratio Theorem

For any two similar triangles, the ratio of their areas is equal to the square of the ratio of their corresponding altitudes, medians, or perimeters.

Perimeter Ratio

The ratio of the perimeters of two similar triangles is equal to the ratio of their corresponding sides: P1/P2 = s1/s2.

Conditions for Similarity

Triangles are similar if they satisfy AA (Angle-Angle), SAS (Side-Angle-Side), or SSS (Side-Side-Side) criteria.

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**Q11. Answer: (c) None**

Given word: 'JOURNALIST'

Each vowel changed to the letter following letter and each consonant is changed to the preceding letter.

After transforming the letters:

| Original Letter | J | O | U | R | N | A | L | I | S | T |
|---|---|---|---|---|---|---|---|---|---|---|
| Transformed Letter | I | P | V | Q | M | B | K | J | R | S |

No letters appear exactly twice.

Hence, the correct answer is "Option 3".

**Q12. Answer: (c) Liquids do not have fixed volume**

The correct answer is Liquids do not have fixed volume.

Key Points

• Liquids have no fixed shape and take the shape of the container in which they are kept.

• Liquids are able to flow and change shape easily.

• Unlike gases, liquids have a definite volume that does not change under normal conditions.

• The molecules in a liquid are closely packed but not in fixed positions, allowing them to move around each other.

• Liquids exhibit properties like surface tension and viscosity, which are related to the cohesive forces between their molecules.

Additional Information

• Gases

• Gases have neither a fixed shape nor a fixed volume.

• They expand to fill the shape and volume of their container.

• The molecules in gases are much farther apart compared to liquids and move freely at high speeds.

• Solids

• Solids have both a fixed shape and a fixed volume.

• The molecules in solids are closely packed in a regular arrangement and can only vibrate in place.

• They do not flow and maintain their shape under normal conditions.

• Plasma

• Plasma is a state of matter similar to gas but consists of charged particles (ions and electrons).

• It is found in stars, including the sun, and is created at very high temperatures.

• Plasma conducts electricity and is affected by magnetic fields.

**Q13. Answer: (c) Second to the left**

Given: A, B, C, D, E and F are sitting around a circular table facing the centre.

1) C sits to the immediate left of E.

2) F is an immediate neighbour of A and C.

3) D is not an immediate neighbour of E.

After positioning D only one position is left which will be occupied by the only person left i.e. B.

Thus, according to the final arrangement, D sits second to the left F.

Hence, "Option 1" is the correct answer.

**Q14. Answer: (b) She-Box**

The correct answer is She-Box.

Key Points

• SHe-Box Portal: In August 2024, the Union Minister of Women and Child Development, Smt. Annpurna Devi, launched the SHe-Box (Sexual Harassment electronic-Box) Portal. This portal is designed to enable women to register and monitor complaints related to sexual harassment at the workplace. It aims to provide a simple,, and efficient mechanism for addressing such complaints.

• Features of the Portal: The SHe-Box Portal allows users to file complaints online, track their status, and seek redressal. It covers both private and government workplaces, ensuring that women have access to support across various sectors.

Important Points

• Sexual Harassment Complaints: The SHe-Box Portal is a significant initiative aimed at addressing the issue of sexual

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harassment in workplaces, empowering women by providing them with a direct and confidential way to report incidents.

• Access for All Women: The portal is open to all women, whether employed in the public or private sector, ensuring comprehensive coverage and accessibility.

Additional Information

• Workplace Harassment Laws: The portal operates under the legal framework of the Prevention of Sexual Harassment (POSH) Act, ensuring that complaints are handled as per the prescribed procedures.

• Monitoring and Accountability: By providing a tracking mechanism, the portal ensures that complaints are addressed in a timely manner, and complainants can monitor the progress of their cases, enhancing transparency and accountability.

**Q15. Answer: (b) diatomic molecule**

The correct answer is diatomic molecule.

Key Points

• Oxygen molecules (O2) consist of two oxygen atoms bonded together, making it a diatomic molecule.

• Diatomic molecules are molecules composed of only two atoms, of the same or different chemical elements.

• Oxygen is essential for respiration in most living organisms and is a critical component of the Earth's atmosphere.

• In its diatomic form, oxygen is a colorless, odorless, and tasteless gas at room temperature.

• Diatomic molecules, like O2, often form due to the need for atoms to achieve a stable electron configuration by sharing electrons.

Additional Information

• Triatomic Molecules

• These are molecules composed of three atoms, which can be the same or different elements.

• An example of a triatomic molecule is ozone (O3).

• Monoatomic Molecules

• These are molecules consisting of a single atom.

• Noble gases like helium (He) and neon (Ne) are examples of monoatomic molecules.

• Tetratomic Molecules

• These are molecules that consist of four atoms.

• An example is phosphorus (P4).

**Q16. Answer: (a) 15.54**

Shortcut Trick

According to Karl Pearson's empirical relationship for a moderately skewed distribution:

Mode = 3 × Median − 2 × Mean

=> Mode = 3 × 11 − 2 × 8.73

=> Mode = 33 − 17.46 = 15.54

Therefore The correct answer is 15.54.

Alternate Method

Given:

Mean = 8.73

Median = 11

Mean

8.73

Median

11

Mode

15.54

Diff = 2.27

Diff = 4.54 = 2 × 2.27

Empirical Relation: Mode = 3 × Median − 2 × Mean

Formula Used:

The statistical relationship establishing the connection between Mean, Median, and Mode states:

Mode = 3 × Median − 2 × Mean

Calculations:

=> Mode = (3 × 11) − (2 × 8.73)

=> Mode = 33 − 17.46

=> Mode = 15.54

Therefore The correct answer is 15.54.

Additional Information

Empirical Relationship

For a moderately skewed distribution, the difference between Mean and Mode is three times the difference between Mean and Median. This can be written as: (Mean − Mode) = 3 × (Mean − Median).

Symmetrical Distribution

In a perfectly normal or symmetrical distribution, the values of Mean, Median, and Mode coincide perfectly, making Mean = Median = Mode.

Positively Skewed Distribution

When a distribution is positively skewed, the tail on the right side is longer. The relationship follows the order: Mean > Median > Mode.

Negatively Skewed Distribution

When a distribution is negatively skewed, the tail on the left side is longer. The relationship follows the order: Mean < Median < Mode.

**Q17. Answer: (c) 64 and 78**

Given: 3 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

According to the question:

Let's check options one by one:

Option 1) 3 and 4

3 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

=> 4 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 3 = 82

=> 4 × (16 - 5) + 32 - 22 - 24 = 82

=> 4 × 11 - 14 = 82

=> 44 - 14 = 30 ≠ 82

Option 2) 2 and 4

3 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

=> 3 × (9 + 7 - 5) + (64 ÷ 4) - 22 + 78 - 8 × 2 = 82

=> 3 × (11) + (6) - 22 + 78 - 16 = 82

=> 33 + 6 - 22 + 78 - 16 = 82

=> 33 + 6 - 22 + 78 - 16 = 79 ≠ 82

Option 3) 64 and 78

3 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

=> 3 × (9 + 7 - 5) + (78 ÷ 2) - 22 + 64 - 8 × 4 = 82

=> 3 × (11) + (39) - 22 + 64 - 32 = 82

=> 33 + (39) - 22 + 64 - 32 = 82

=> 72 - 22 + 32 = 82

Option 4) 7 and 5

3 × (9 + 7 - 5) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

=> 3 × (9 + 5 - 7) + (64 ÷ 2) - 22 + 78 - 8 × 4 = 82

=> 3 × (7) + (32) - 22 + 78 - 32 = 82

=> 21 + 32 - 22 + 78 - 32 = 82

=> 53 - 22 + 78 - 32 = 77 ≠ 823×(9+7−5)+(64÷2)−22+78−8×4=82 Hence, the correct answer is "Option 3".[Math Processing Error]3×(9+7−5)+(64÷2)−22+78−8×4=823×(9+7−5)+(64÷2)−22+78−8×4=82 3×(9+7−5)+(64÷2)−22+78−8×3×(9+7−5)+(64÷2)−22+78−8×4=823×(9+7−5)+(64÷2)−22+78−8×4=823×(9+7−5)+(64÷2)−22+78−8×4=82 3×(9+7−5)+(64÷2)−22+78−8×4=82 3×(9+7−5)+(64÷2)−22+78−8×4=823×(9+7−5)+(64÷2)−22+78−8×4=823×(9+7−5)+(64÷2)−22+78−8×4=82

**Q18. Answer: (c) 80**

Decoding signs:

| Letter | I | J | K | L |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Stands For | • | × | ÷ | – |

Given: (35 L 19) J 4 I 26 L (7 J 3) I 11 = ?

(35 L 19) J 4 I 26 L (7 J 3) I 11 = ? => (35 - 19) × 4 + 26 - (7 × 3) + 11 = ?

=> (35 - 19) × 4 + 26 - (7 × 3) + 11 = ?

=> 16 × 4 + 26 - 21 + 11 = ?

=> 64 + 26 + 11 - 21 = ?

=> 101 - 21 = ?

=> 80 = ?

Hence, "Option 3" is the correct answer.

**Q19. Answer: (a) gravitational force**

The correct answer is gravitational force.

Key Points

• Gravitational force is the force of attraction between two bodies due to their masses.

• It is directly proportional to the product of the masses of the two bodies.

• The force is inversely proportional to the square of the distance between the centers of the two bodies.

• This relationship is described by Newton's Law of Universal Gravitation.

• Gravitational force acts over large distances and is one of the four fundamental forces of nature.

Additional Information

• Electromagnetic Force

• This is the force between charged particles.

• It includes both electric forces (between static charges) and magnetic forces (between moving charges).

• Electrostatic Force

• This is the force between stationary charged particles.

• It follows Coulomb's law, which states that the force is directly proportional to the product of the charges and inversely proportional to the square of the distance between them.

• Electromotive Force (EMF)

• This is not an actual force but a potential difference that drives current in a circuit.

• It is measured in volts and is generated by sources like batteries and generators.

**Q20. Answer: (a) X = 545, Y = 727**

The logic followed here is:

Given: X : 803 :: 469 : Y

So, checking each option one by one:

Option 1) X = 545, Y = 727 → 545 : 803 :: 469 : 727

545 - 803 = 469 - 727

-258 = -258 (LHS = RHS)

Option 2) X = 512, Y = 792 → 512 : 803 :: 469 : 792

512 - 803 = 469 - 792

-291 ≠ -323 (LHS ≠ RHS)

Option 3) X = 558, Y = 712 → 558 : 803 :: 469 : 712

558 - 803 = 469 - 712

-245 ≠ -243 (LHS ≠ RHS)

Option 4) X = 526, Y = 758 → 526 : 803 :: 469 : 758

526 - 803 = 469 - 758

-277 ≠ -289 (LHS ≠ RHS)

Hence, "Option 1" is the correct answer.

**Q21. Answer: (d) All of the above**

The correct answer is All of the above.

Key Points

• Vacuoles are storage sacs for solid or liquid contents.

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• The central vacuole of some plant cells may occupy 50-90% of the cell volume.
• In plant cells vacuoles are full of cell sap and provide turgidity and rigidity to the cell.
• Many substances of importance in the life of the plant cell are stored in vacuoles.
• These include amino acids, sugars, various organic acids and some proteins.

Additional Information

• Lysosomes
• These are membrane-bound organelles that contain enzymes responsible for breaking down waste materials and cellular debris.
• They are often referred to as the "digestive system" of the cell because they help in the degradation of macromolecules.
• Chloroplast
• These are organelles found in plant cells and eukaryotic algae that conduct photosynthesis.
• Chloroplasts capture light energy and convert it into chemical energy in the form of glucose through the process of photosynthesis.
• Endoplasmic Reticulum (ER)
• It is a network of membranes within the cytoplasm of eukaryotic cells, involved in protein and lipid synthesis.
• The ER is divided into two types: rough ER (with ribosomes) and smooth ER (without ribosomes).
• Rough ER is involved in protein synthesis and folding, while smooth ER is associated with lipid synthesis and detoxification processes.

**Q22. Answer: (d) Gastric juice**

The correct answer is Gastric juice.

Key Points

• Gastric juice has a very low pH value, typically around 1.5 to 3.5, making it highly acidic.
• This acidity is due to the presence of hydrochloric acid (HCl) in the stomach, which aids in digestion.
• The acidic environment of the stomach helps to kill harmful bacteria and pathogens ingested with food.
• Lemon juice also has a low pH, but it is not as low as gastric juice; its pH is usually around 2 to 3.
• Other substances like blood and milk of magnesia have higher pH values, making them less acidic or even basic in the case of milk of magnesia.

Additional Information

• Lemon Juice
• Lemon juice is acidic, with a pH of around 2 to 3.
• It contains citric acid, which gives it its sour taste.
• Blood
• Blood is slightly basic, with a pH of around 7.35 to 7.45.
• This pH is tightly regulated to maintain homeostasis in the body.
• Milk of Magnesia
• Milk of magnesia is basic, with a pH of around 10.5.
• It is used as an antacid to neutralize stomach acid.

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

Given word: 'GRAVITY'

After changing each consonant to the letter immediately preceding it and each vowel to the letter immediately succeeding it:

| **Original Letters** | **G** | **R** | **A** | **V** | **I** | **T** | **Y** |
|---|---|---|---|---|---|---|---|
| New Letters | F | Q | B | U | J | S | X |

Now, let's count the number of consonants in the new group of letters.

F Q B U J S X

Therefore, the number of consonants in the new group of letters is 6.

Hence, the correct answer is "Option 1".

**Q24. Answer: (d) Multiple fission**

The correct answer is Multiple fission.

Key Points

• Malarial parasite, Plasmodium, reproduces asexually through a process known as multiple fission.
• During multiple fission, the nucleus of the parasite divides multiple times before the cell splits into several daughter cells.
• This process allows for rapid multiplication of the parasite within the host's body.
• Multiple fission typically occurs in the liver cells and red blood cells of the infected host.
• It is a crucial part of the parasite's life cycle, contributing to the spread and severity of malaria.

Additional Information

• Binary Fission
• A type of asexual reproduction commonly found in prokaryotes like bacteria.
• Involves the division of a single organism into two equal parts, each with a copy of the DNA.
• Regeneration
• A process where organisms regrow lost or damaged parts.
• Commonly seen in species like starfish and planarians.
• Budding
• A type of asexual reproduction seen in organisms like yeast and Hydra.
• Involves the formation of a new organism from a small projection growing on the parent organism.

**Q25. Answer: (d) Seperated from the underlying tissue by a cellular, non fibrous basement membrane**

The correct answer is option 4.

Key Points

• Epithelial tissues have no intercellular spaces, making them tightly packed and forming continuous sheets.
• They cover most organs and cavities within the body, providing a protective barrier.
• Epithelial tissues are separated from the underlying tissue by a basement membrane, which is non-cellular and fibrous.
• The basement membrane is composed of proteins like collagen and glycoproteins, providing support and anchoring the epithelium.
• Epithelial tissues play roles in protection, secretion, absorption, and sensation in various organs.

Additional Information

• Connective Tissue
• Connective tissues support, bind, and protect other tissues and organs.
• They have various types, including loose connective tissue, dense connective tissue, cartilage, bone, and blood.
• Muscle Tissue
• Muscle tissues are responsible for movement in the body.
• They are categorized into three types: skeletal, cardiac, and smooth muscle tissues.
• Nervous Tissue
• Nervous tissues are specialized for the conduction of electrical impulses.
• They consist of neurons and glial cells, with functions in sensing stimuli and transmitting signals.

**Q26. Answer: (d) 14**

Given:

19 - 20 ÷ 4

Formula used:

Order of Operations (PEMDAS/BODMAS): Parentheses, Exponents, Multiplication and Division (from left to right), Addition and Subtraction (from left to right)

Calculation:

19 - 20 ÷ 4

=> 19 - 5

=> 14

Therefore The correct answer is option (4).

**Q27. Answer: (b) Rs. 6**

Shortcut Trick

Ratio of shares = 4 : 7

Difference in ratio units = 7 − 4 = 3 units

Given: The second part is Rs. 6 more than the first part.

This means the 3 units difference is equivalent to Rs. 6.

The question asks for the difference in amount between the two friends, which is exactly 3 units.

Therefore The correct answer is Rs. 6.

Alternate Method

Given:

Ratio of amounts = 4 : 7

Difference between parts = Rs. 6

Calculation:

Let the amount of the first friend be 4x and the second friend be 7x.

=> According to the problem: 7x − 4x = 6

=> 3x = 6

=> x = 6 ÷ 3 = 2

=> First friend share = 4 × 2 = Rs. 8

=> Second friend share = 7 × 2 = Rs. 14

=> Difference in amount = 14 − 8 = Rs. 6

Therefore The correct answer is Rs. 6.

Additional Information

Concept of Ratio

A ratio compares two quantities by division. If a total amount T is divided in the ratio a : b, the parts are [a/(a+b)] × T and [b/(a+b)] × T.

Difference between Parts

When the ratio is a : b (where b > a), the difference in units is (b − a). If this difference corresponds to a value V, then 1 unit = V ÷ (b − a).

Total Amount Formula

Total amount = (Sum of ratio parts) × (Value of 1 unit). In this case, Total = (4 + 7) × 2 = Rs. 22.

**Q28. Answer: (b) 18**

Shortcut Trick

Calculate 50% of 60 by taking half of the value: 60 ÷ 2 = 30.

Calculate 30% of 40 by multiplying the non-zero digits: 3 × 4 = 12.

Determine the required difference by subtracting the smaller result from the larger: 30 − 12 = 18.

Therefore The correct answer is 18.

Alternate Method

Given:

First number = 50% of 60

Second number = 30% of 40

Formula Used:

Percentage Value = (Percentage/100) × Total Value

Calculations:

=> First value = (50/100) × 60

=> First value = 0.5 × 60 = 30

=> Second value = (30/100) × 40

=> Second value = 0.3 × 40 = 12

=> Difference = First value − Second value

=> Difference = 30 − 12 = 18

Therefore The correct answer is 18.

Additional Information

Basic Percentage Rule

To calculate x% of y, the formula used is (x × y) ÷ 100. Multiplication is commutative, so x% of y is the same as y% of x.

Percentage to Fraction Conversion

Common fractions simplify calculations: 50% = 1/2, 25% = 1/4, 20% = 1/5, and 10% = 1/10.

Percentage Change

The percentage difference between two values a and b is calculated as |a − b| ÷ b × 100, where b is the base value.

**Q29. Answer: (a) 1/f**

The correct answer is 1/f.

Key Points

• The power of a lens (P) is defined as the reciprocal of its focal length (f) in meters.
• It is mathematically expressed as P=1/f
• The unit of power of a lens is diopter (D), where 1 D = 1 m^(-1).
• A lens with a short focal length has a higher power, and a lens with a long focal length has a lower power.
• The power of a converging lens (convex) is positive, while the power of a diverging lens (concave) is negative.

Additional Information

• Focal Length
• The focal length of a lens is the distance from the lens to the point where parallel rays of light converge or appear to diverge.
• The focal length determines the magnifying power of the lens.
• Diopter
• Diopter is a unit of measurement of the optical power of a lens.
• It is commonly used in the field of optometry and ophthalmology.
• Lens Types
• Convex lenses are converging lenses that bring light rays to a focus.
• Concave lenses are diverging lenses that spread light rays outward.

**Q30. Answer: (c) L/A**

The correct answer is L/A.

Key Points

• The resistance of a conductor is directly proportional to its length (L).
• It is inversely proportional to the cross-sectional area (A) of the conductor.
• Mathematically, resistance (R) is expressed as R = ρ(L/A), where ρ is the resistivity of the material.
• As the length of the conductor increases, the resistance increases.
• As the cross-sectional area increases, the resistance decreases.

Additional Information

• Ohm's Law
• Ohm's Law states that the current through a conductor between two points is directly proportional to the voltage across the two points.
• The formula is expressed as V = IR, where V is the voltage, I is the current, and R is the resistance.
• Resistivity
• Resistivity is a material-specific property that quantifies how strongly a given material opposes the flow of electric current.
• It is denoted by the symbol ρ (rho) and is measured in ohm-meters (Ω·m).
• Conductivity
• Conductivity is the reciprocal of resistivity and measures a material's ability to conduct electric current.
• It is denoted by the symbol σ (sigma) and is measured in siemens per meter (S/m).

**Q31. Answer: (b) 0.09**

Given:

(0.009)/(K) = 0.1

Formula used:

0.009/K = 0.1

Calculations:

0.009/K = 0.1

=> K = 0.009/0.1

=> K = 0.09

Therefore The correct answer is option (2).

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**Q32. Answer: (a) Pollination is transfer of pollen grains from stamen to stigma**

The correct answer is Pollination is transfer of pollen grains from stamen to stigma.

Key Points

• Pollination is a crucial process in the sexual reproduction of flowering plants.

• It involves the transfer of pollen grains from the male reproductive organ (stamen) to the female reproductive organ (stigma).

• Successful pollination leads to the fertilization of the ovules within the flower.

• Pollination can occur through various agents such as wind, water, insects, birds, and other animals.

• Cross-pollination increases genetic diversity within plant populations, which is beneficial for adaptation and survival.

Additional Information

• Fertilization

• Fertilization is the fusion of male and female gametes to form a zygote.

• This process occurs after successful pollination and leads to the development of seeds and fruit.

• Pollen Tube

• The pollen tube is a structure that grows from a pollen grain after it lands on a compatible stigma.

• It facilitates the transport of sperm cells from the pollen grain to the ovule for fertilization.

• Self-Pollination vs. Cross-Pollination

• Self-pollination occurs within the same flower or between flowers on the same plant.

• Cross-pollination occurs between flowers on different plants, promoting genetic diversity.

**Q33. Answer: (d) cosecθ + cotθ**

Shortcut Trick

To simplify $\sqrt{((1 + \cos\theta) / (1 - \cos\theta))}$, multiply numerator and denominator by the conjugate of the denominator $(1 + \cos\theta)$.

The expression becomes $(1 + \cos\theta) / \sqrt{(1 - \cos^2\theta)}$.

Applying the identity $\sin^2\theta + \cos^2\theta = 1$, we get $(1 + \cos\theta) / \sin\theta$.

Separating the terms gives $1/\sin\theta + \cos\theta/\sin\theta$, which is $\text{cosec}\theta + \cot\theta$.

Therefore The correct answer is $\text{cosec}\theta + \cot\theta$.

Alternate Method

Given: $\sqrt{((1 + \cos\theta) / (1 - \cos\theta))}$

Formula Used: $\sin^2\theta + \cos^2\theta = 1$; $\text{cosec}\theta = 1/\sin\theta$; $\cot\theta = \cos\theta/\sin\theta$.

=> Expression = $\sqrt{[((1 + \cos\theta) \times (1 + \cos\theta)) / ((1 - \cos\theta) \times (1 + \cos\theta))]}$

=> Expression = $\sqrt{[(1 + \cos\theta)^2 / (1 - \cos^2\theta)]}$

=> Expression = $(1 + \cos\theta) / \sqrt{(\sin^2\theta)}$

=> Expression = $(1 + \cos\theta) / \sin\theta$

=> Expression = $(1 / \sin\theta) + (\cos\theta / \sin\theta)$

=> Expression = $\text{cosec}\theta + \cot\theta$

Therefore The correct answer is $\text{cosec}\theta + \cot\theta$.

Additional Information

Pythagorean Identities

The three fundamental identities are $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Rationalization in Trigonometry

When a term like $(1 \pm \sin\theta)$ or $(1 \pm \cos\theta)$ is under a square root, multiplying by its conjugate is the standard method to eliminate the radical.

Reciprocal and Quotient Relations

$\text{cosec}\theta = 1/\sin\theta$, $\sec\theta = 1/\cos\theta$, $\tan\theta = \sin\theta/\cos\theta$, and $\cot\theta = \cos\theta/\sin\theta$.

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

The correct answer is Bengaluru.

Key Points

• The 63rd National Open Athletics Championships took place in Bengaluru, India, from August 30th to September 2nd, 2024. Here's a comprehensive overview of the event:

• Key Highlights:

• Venue: Sree Kanteerava Outdoor Stadium, Bengaluru

• Dates: August 30th - September 2nd, 2024

• Notable Absences: Olympic javelin champion Neeraj Chopra did not participate.
• New Records: Gulveer Singh set a new meet record in the men's 5000m race with a time of 13:54.70.
• Dominant Performances: Seema won gold in both the women's 5000m and 10,000m races.
• Race Walk Records: Amit and Payal set new meet records in the men's and women's 35km race walk events, respectively.
• Best Athletes: Nithin and Ancy Sojan were awarded the titles of best athletes of the championships.
• Major Results:
• Men's Javelin Throw: Vikrant Malik secured the gold medal with a throw of 80.02m in Neeraj Chopra's absence.
• Women's Javelin Throw: Annu Rani emerged victorious with a throw of 58.97m.
• Men's 100m: Lalu Prasad Bhoi clinched the gold medal with a time of 10.46 seconds.
• Women's 100m: Nithya Gandhe and Sneha tied for first place, both clocking 11.57 seconds.
• Men's 400m: Tushar Manna won the race with a time of 45.97 seconds.
• Women's 400m: Aishwarya Mishra secured the gold medal with a time of 53.77 seconds.
• Men's 5000m: Gulveer Singh set a new meet record with a time of 13:54.70.
• Women's 5000m: Seema won the gold medal with a time of 15:47.95.
• Men's 10,000m: Abhishek claimed the gold medal with a time of 29:48.18.
• Women's 10,000m: Seema secured her second gold medal of the championships with a time of 33:56.86.
• Men's Triple Jump: Mohammed SN jumped the farthest with a distance of 16.28m.
• Women's Triple Jump: Sheena V won the gold medal with a jump of 13.27m.
• Men's High Jump: Jomon Joy cleared a height of 2.14m to win the gold medal.
• Women's High Jump: Rekha jumped the highest with a height of 1.82m.

**Q35. Answer: (a) Power and New and Renewable Energy**

The correct answer is Power and New and Renewable Energy.

Key Points

• The Union Ministry of Power and New and Renewable Energy is a crucial arm of the Indian government responsible for the development and management of the power sector, including both conventional and renewable energy sources. Here's a detailed look at this important ministry:
• Formation and Mandate:
• Origins: The Ministr y of New and Renewable Energy (MNRE) was initially established in 1982 as the Department of Non-conventional Energy Sources (DNES). It was later upgraded to a full-fledged ministry in 2006, recognizing the growing importance of renewable energy.
• Dual Responsibility: In 2021, the Ministry of Power and the MNRE were merged, bringing both conventional power generation and renewable energy development under one umbrella. This integration aimed to streamline policy and promote a holistic approach to energy security and sustainability.
• Key Functions: The ministry's mandate encompasses a wide range of responsibilities, including:
• Policy formulation and implementation for the power sector
• Development and promotion of renewable energy technologies
• Regulation of the electricity sector
• Energy conservation and efficiency
• Research and development in the power and renewable energy sectors
• International cooperation in the energy sector

Additional Inf ormation

• Leadership and Structure:
• Current Minister: Shri Pralhad Joshi is the current Union Cabinet Minister holding charge of both the Ministry of Power and the Ministry of New and Renewable Energy. He assumed office in June 2024.
• Minister of State: Shri Shripad Yesso Naik serves as the Minister of State in both ministries.
• Secretary: Ms. Nidhi Khare, IAS, is the Secretary of both the Ministry of Power and the Ministry of New and Renewable Energy.
• Organizational Structure: The ministry comprises various wings and divisions that handle specific areas, such as:
• Renewable Energy
• Power
• Planning and Research
• Administration and Finance

**Q36. Answer: (a) Axiom-4**

The correct answer is Axiom-4.

Key Points

• Group Captain Shubhanshu Shukla will pilot the Axiom-4 (Ax-4) mission to the International Space Station (ISS) in 2025, marking India’s first human presence aboard the ISS and its second government-sponsored human spaceflight since Rakesh Sharma's 1984 mission.

Additional Information

• Collaboration: This mission is a collaboration between India and the United States, following an agreement between ISRO and Axiom Space, announced during Prime Minister Modi's state visit to the U.S.

• Crew Composition: Shukla, an experienced test pilot from the Indian Air Force (IAF), will be joined by fellow IAF astronaut and backup pilot Group Captain Prashanth Nair, with the mission commanded by renowned astronaut Peggy Whitson.

• Role and Training: As pilot, Shukla will assist with spacecraft operations, navigation, and docking, while also preparing for emergencies and conducting critical system checks. He will support scientific research by managing microgravity experiments aboard the ISS.

• Future Endeavors: The Ax-4 mission is pivotal for advancing India’s space capabilities, particularly in preparation for the Gaganyaan project, India’s upcoming crewed mission. Shukla is expected to conduct five experiments during his time on the ISS.

**Q37. Answer: (c) X = 25, Y = 324**

The logic followed here is:

Given: X : 676 :: 17 : Y

So, checking each option one by one:

Option 1) X = 21, Y = 396 → 21 : 676 :: 17 : 396

(21 + 1)2 = 676

(22)2 = 676

484 ≠ 676 (LHS ≠ RHS)

(17 + 1)2 = 396

(18)2 = 396

324 ≠ 396 (LHS ≠ RHS)

Option 2) X = 24, Y = 324 → 24 : 676 :: 17 : 324

(24 + 1)2 = 676

(25)2 = 676

625 ≠ 676 (LHS ≠ RHS)

(17 + 1)2 = 324

(18)2 = 324

324 = 324 (LHS = RHS)

Option 3) X = 25, Y = 324 → 25 : 676 :: 17 : 324

$(25 + 1)^2 = 676$

(26)2 = 676

676 = 676 (LHS = RHS)

(17 + 1)2 = 324

(18)2 = 324

324 = 324 (LHS = RHS)

Option 4) X = 28, Y = 361 → 28 : 676 :: 17 : 361

(28 + 1)2 = 676

(29)2 = 676

841 ≠ 676 (LHS ≠ RHS)

(17 + 1)2 = 361

(18)2 = 361

324 ≠ 361 (LHS ≠ RHS)

Hence, "Option 3" is the correct answer.

**Q38. Answer: (b) MC Altaf**

The correct answer is MC Altaf.

Key Points

• MC Altaf

• Real Name: Altaf Shaikh

• Origin: Dharavi, Mumbai, India

• Style: Raw, Bronx-inspired hip-hop with a focus on social commentary and street narratives.

• Key Works: "Soch," "Robin Hood," "Halaat" (debut album), "Chooke Dekh" (feat. DIVINE, Sammohit)

• Notable Achievements:

• Featured in the Bollywood film "Gully Boy" (2019)

• Mentored actor Ranveer Singh in "Bambaiya" dialect for "Gully Boy"

• Signed to DIVINE's Gully Gang Entertainment

• Known for his authentic portrayal of life in Dharavi

• Collaborated with prominent artists like DIVINE, Shah Rule, and Raftaar.

• Social Impact: MC Altaf's music often sheds light on the challenges faced by those living in underprivileged communities, giving voice to their struggles and aspirations.

• Evolution: While starting with a raw, boom-bap sound, Altaf has experimented with different styles, including trap and more melodic approaches, while maintaining his lyrical focus.

• Influence: He is considered an influential figure in the Mumbai hip-hop scene, inspiring aspiring rappers with his storytelling and authentic delivery.

• Recent Work: His debut album "Halaat" (2024) is a culmination of his experiences and a testament to his growth as an artist.

Additional Information

• Naezy

• Real Name: Naved Shaikh

• Origin: Mumbai, India

• Style: Conscious hip-hop with socially relevant lyrics, often addressing issues of poverty, inequality, and political issues.

• Key Works: "Mere Gully Mein," "Aafat," "Mumbai 70," "Khamakha"

• Notable Achievements:

• One of the pioneers of the "gully rap" movement in India

• Featured in the documentary "Gully Life: The Story of Divine and Naezy"

• Known for his raw and honest storytelling

• His music has been featured in several films and TV shows.

• Social Impact: Naezy's music has played a significant role in bringing social issues to the forefront of the Indian hip-hop scene.

• Influence: He has inspired a generation of rappers to use their voices to address social and political concerns.

• Collaborations: Naezy has collaborated with a wide range of artists, including DIVINE, as well as international musicians.

• Evolution: While maintaining his focus on conscious lyrics, Naezy has also experimented with different musical styles, incorporating elements of trap, dancehall, and other genres.

• Recent Work: He continues to release music that challenges the status quo and encourages listeners to think critically about the world around them.1

• Divine

• Real Name: Vivian Fernandes

• Origin: Mumbai, India

• Style: Versatile hip-hop with a blend of street rap, trap, and conscious lyrics.

• Key Works: "Mere Gully Mein" (with Naezy), "Jungli Sher," "Kaam 25," "Farak"

• Notable Achievements:

• Considered one of the most influential figures in the Indian hip-hop scene

• His life story inspired the Bollywood film "Gully Boy"

• Founder of Gully Gang Entertainment, a platform for emerging hip-hop artists

• Collaborated with international artists like Nas

• Known for his powerful stage presence and energetic performances.

• Social Impact: Divine's music has helped to bring Indian hip-hop to a global audience and has inspired countless young people to pursue their dreams.

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• Influence: He is a role model for many aspiring rappers and has helped to shape the sound of contemporary Indian hip-hop.

• Business Acumen: In addition to his music, Divine is also a successful entrepreneur, building the Gully Gang brand into a major force in the Indian music industry.

• Evolution: Divine has constantly evolved his sound, experimenting with different styles and incorporating elements of various genres into his music.

• Recent Work: He continues to release music that pushes boundaries and challenges listeners, while also supporting and mentoring new talent through Gully Gang.

• Emiway Bantai

• Real Name: Bilal Shaikh

• Origin: Mumbai, India

• Style: Aggressive, battle-oriented rap with a focus on lyrical dexterity and wordplay.

• Key Works: "Machayenge," "Aila Re Ailla," "Samajh Mein Aaya Kya," "Khatam"

• Notable Achievements:

• Known for his high-energy performances and freestyle skills

• Gained popularity through his YouTube channel, where he posts music videos and vlogs

• Engaged in a highly publicized "beef" with fellow rapper Raftaar

• Has a large and dedicated fan base.

• Lyrical Prowess: Emiway is known for his intricate rhyme schemes, rapid-fire delivery, and clever wordplay.

• Independent Artist: He has maintained his independence from major record labels, building his career through his own efforts and connecting directly with his fans.

• Controversies: Emiway has been involved in several controversies, including his public dispute with Raftaar, which generated a lot of attention in the Indian hip-hop community.

• Evolution: While initially known for his battle rap style, Emiway has also explored other themes and styles in his music, including more introspective and melodic tracks.

• Recent Work: He continues to release music and perform for his fans, maintaining his position as one of the most popular independent rappers in India.

**Q39. Answer: (a) Mother's Father**

Decoding symbols:

| **K is** | | | | |
|---|---|---|---|---|
| Symbol | • | – | × | ÷ |
| Meaning | Mother | Brother | Wife | Father |
| to L | | | | |

Given: P × Q ÷ R − S + T

P × Q => F is the wife of Q.

Q ÷ R => Q is the father of R.

R − S => R is the brother of S.

S + T => S is the mother of T.

Thus, Q is T's mother's father or maternal grandfather.

Hence, "Option 1" is the correct answer.

**Q40. Answer: (d) motion of clock hands**

The correct answer is motion of clock hands.

Key Points

• Uniform circular motion refers to motion in a circular path with constant speed.

• The motion of the hands of a clock is an example of uniform circular motion because they move in a circular path at a constant speed.

• The second, minute, and hour hands of a clock each complete a full circle in 60 seconds, 60 minutes, and 12 hours respectively.

• Uniform circular motion is characterized by a constant angular velocity.

• Even though the speed is constant, the direction of motion is continuously changing, meaning there is a centripetal acceleration directed towards the center of the circular path.

Additional Information

• Non-Uniform Circular Motion
• In this type of motion, the speed varies while the object moves along a circular path.
• Examples include a car turning on a curved road at varying speeds.
• Linear Motion
• In linear motion, an object moves along a straight path.
• Examples include a car moving on a straight road or a raindrop falling vertically.
• Projectile Motion
• Projectile motion involves an object moving in a curved trajectory under the influence of gravity.
• An example is a monkey jumping from one tree to another.

**Q41. Answer: (a) 400**

Shortcut Trick
Since 40% of the apples are sold, the remaining fraction is 100% − 40% = 60%.
We are given that 60% of the total apples corresponds to 240 apples.
10% of the total apples = 240 ÷ 6 = 40 apples.
100% of the total apples = 40 × 10 = 400 apples.
Therefore The correct answer is 400 apples.
Alternate Method
Given:
Percentage of apples sold = 40%
Number of apples remaining = 240
Calculation:
=> Let the total number of originally available apples be x.
=> Percentage of apples left = 100% − 40% = 60%
=> 60% of x = 240
=> (60 ÷ 100) × x = 240
=> x = 240 × (100 ÷ 60)
=> x = 4 × 100
=> x = 400
Therefore The correct answer is 400 apples.
Additional Information
Percentage Change Formula
The percentage change in any quantity is given by: [(New Value − Old Value) ÷ Old Value] × 100.
Successive Percentage Change
If a single value undergoes two successive changes of a% and b%, the effective percentage change is calculated as: [a + b + (a × b ÷ 100)]%.
Base Reference Conversion
If Quantity A is R% more than Quantity B, then Quantity B is strictly less than A by exactly [R ÷ (100 + R) × 100]%.

**Q42. Answer: (c) OHC**

The logic followed here is:
Hence, "Option 3" is the correct answer.

**Q43. Answer: (c) 20 joules**

The Correct answer is 20 joules.
Key Points
• Work is defined as the product of force and displacement, provided the displacement occurs in the direction of the applied force.
• The formula for work is: Work = Force × Displacement × cos(θ), where θ is the angle between force and displacement.
• In this case, the force is 10 Newtons, displacement is 2 meters, and θ is 0 degrees (because the displacement is in the direction of the force).
• Since cos(0°) is equal to 1, the work done is calculated as: Work = 10 × 2 × 1 = 20 joules.
• Joule is the SI unit of work or energy.
• This calculation demonstrates that when a force acts on a body in the same direction as its displacement, the work done is the

product of the magnitude of the force and the distance moved.

• The correct answer is 20 joules, which matches option 3.

Additional Information

• Important Points to Remember

• The concept of work is essential in physics and is closely tied to the laws of motion and energy conservation.

• The angle θ plays a critical role in determining the magnitude of work done.

• Understanding how to apply the formula for work is important for solving problems in mechanics and related fields.

**Q44. Answer: (a) TX-RV**

The logic followed here is:

Option 1) TX-RV

Option 2) SV-MP

Option 3) AD-UX

Option 4) FI-ZC

Thus, out of all the options 'TX-RV ' is the odd one out.

Hence, "Option 1" is the correct answer.

**Q45. Answer: (d) Bihar**

The solution is in Hindi. Read it online.

**Q46. Answer: (c) copper**

The correct answer is copper.

Key Points

• The reactivity series is a list of elements ordered by their reactivity.

• Iron is more reactive than copper in the reactivity series.

• Reactivity of metals is an important concept in chemistry, influencing how metals are used and extracted.

• In displacement reactions, a more reactive metal will displace a less reactive metal from its compound.

• Copper is less reactive than iron, making it useful for applications where resistance to corrosion is important.

Additional Information

• Potassium

• Highly reactive metal, more reactive than iron.

• Often stored in oil to prevent reaction with air.

• Sodium

• More reactive than iron, reacts vigorously with water.

• Commonly used in street lights and as a heat exchanger.

• Calcium

• More reactive than iron, important for biological functions in organisms.

• Used in the production of metals and in cement.

**Q47. Answer: (a) Both conclusions (I) and (II) follow.**

The least possible Venn diagram for the given statements is as shown below :

Conclusions:

(I) Some milk is water → Follow (As all water is milk. As whole water comes in milk, therefore it is true.)

(II) No oil is water → Follow (As all water is milk and no milk is oil. As whole water comes in milk which cannot be oil, therefore it is true.)

Therefore Here, Both conclusions (I) and (II) follow.

Hence, the correct answer is "Option 1".

**Q48. Answer: (c) 32.5%**

Shortcut Trick

For two successive discounts of x% and y%, the single equivalent discount is given by the formula: $(x + y - (x \times y)/100)\%$

Here, x = 25 and y = 10.

Equivalent Discount = $(25 + 10 - (25 \times 10)/100)\%$

Equivalent Discount = $(35 - 250/100)\% = 35 - 2.5 = 32.5\%$

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Therefore The correct answer is 32.5%.

Alternate Method

Given: First discount = 25%, Second discount = 10%.

Formula Used: Selling Price (SP) = Marked Price (MP) × (100 − d1)/100 × (100 − d2)/100

Let the Marked Price (MP) of the article be 100 units.

=> Price after the first discount of 25% = 100 − (25% of 100)

=> Price after first discount = 100 − 25 = 75 units.

=> Price after the second discount of 10% = 75 − (10% of 75)

=> Price after second discount = 75 − 7.5 = 67.5 units.

=> Total Discount Amount = 100 − 67.5 = 32.5 units.

=> Equivalent Single Discount Percentage = (32.5/100) × 100 = 32.5%

Therefore The correct answer is 32.5%.

Additional Information

Order of Successive Discounts

The final equivalent discount remains the same regardless of the order in which successive discounts are applied (e.g., 25% then 10% is same as 10% then 25%).

Successive Percentage Change

This formula can also be used for percentage increases (appreciation). If values increase, the formula becomes (x + y + xy/100)%.

Three Successive Discounts

For three discounts a%, b%, and c%, first find the equivalent of a% and b% as 'x%', then find the equivalent of x% and c%.

**Q49. Answer: (b) 11-17 years**

The correct answer is 11-17 years.

Key Points

• Puberty is the phase of life when a child's body develops into an adult body capable of reproduction.

• In human males, puberty generally starts between the ages of 11 and 17 years.

• In human females, puberty usually begins earlier than in males, typically between ages 8 to 13, but the range can extend to 17 years.

• During puberty, both boys and girls experience various physical changes, including growth spurts, development of secondary sexual characteristics, and hormonal changes.

• The onset and duration of puberty can vary significantly among individuals due to genetic, environmental, and nutritional factors.

Additional Information

• Hormonal Changes

• During puberty, the body increases the production of hormones such as testosterone in males and estrogen and progesterone in females.

• These hormones are responsible for the development of secondary sexual characteristics like facial hair in males and breast development in females.

• Growth Spurts

• Puberty is often accompanied by rapid growth in height and weight, commonly known as growth spurts.

• These growth spurts are more pronounced during the early to mid-stages of puberty.

• Psychological Changes

• Along with physical changes, puberty is also a period of significant psychological and emotional development.

• Adolescents may experience mood swings, increased independence, and the development of a stronger sense of identity.

**Q50. Answer: (b) 40 cm**

Shortcut Trick

Ratio of Breadth : Height : Length = 1 : 5 : (5 × 8) = 1 : 5 : 40.

Product of ratios = 1 × 5 × 40 = 200 units³.

200 units³ = 12.8 m³ => 1 unit³ = 0.064 m³.

1 unit = $\sqrt[3]{0.064}$ = 0.4 m.

Breadth = 0.4 × 100 cm = 40 cm.

Therefore The correct answer is 40 cm.

Alternate Method

Given:

Volume of the wall = 12.8 $m^3$

Height (h) = 5 × Breadth (b)

Length (l) = 8 × Height (h)

Formula Used:

Volume of a Cuboid (Wall) = Length × Breadth × Height

Calculations:

Let the Breadth of the wall be b m.

=> Height (h) = 5b

=> Length (l) = 8 × (5b) = 40b

=> Volume = l × b × h

=> 12.8 = (40b) × (b) × (5b)

=> 12.8 = $200b^3$

=> $b^3$ = 12.8 ÷ 200

=> $b^3$ = 0.064

=> b = $\sqrt[3]{0.064}$ = 0.4 m

Converting into centimeters:

=> Breadth = 0.4 × 100 = 40 cm

Therefore The correct answer is 40 cm.

Additional Information

Volume and Surface Area of Cuboid

For a cuboid of dimensions l, b, and h, the Total Surface Area (TSA) is given by 2(lb + bh + hl) and the Volume is l × b × h.

Diagonal of a Cuboid

The length of the longest rod that can be placed inside a cuboid is its Diagonal, calculated as $\sqrt{(l^2 + b^2 + h^2)}$.

Unit Conversion

To convert meters to centimeters, multiply by 100 (1 m = 100 cm). For volume, 1 $m^3$ = 1,000,000 $cm^3$.

**Q51. Answer: (b) Only conclusion (I) follows**

The least possible Venn diagram for the given statements is as shown below :

Conclusions:

(I) Some fruits are vegetables → Follow (As some vegetables are fruits. As some part of vegetables is common with fruits, therefore it is true.)

(II) Some sweets are vegetables → Does not follow (As some vegetables are fruits and some fruits are sweets. So it is possible but not definite.)

Therefore Here, Only conclusion (I) follows.

Hence, the correct answer is "Option 2".

**Q52. Answer: (b) 160**

The logic followed here is:

Hence, "Option 2" is the correct answer.

**Q53. Answer: (a) Only I follows**

Given:

Statement: Long queues are seen outside the electricity bill payment counters on 14th and 15th of each month, as 15th of each month is the last date for payment of electricity bills. Citizens have lodged several complaints with the electricity board regarding this difficulty in payment.

Course of Action:

I. The electricity board should set up additional counters for payment collection on 14th and 15th of each month, to make it easier for citizens. – the faulty power supply) - Follow(because, Setting up additional counters on 14th and 15th of each month is a practical solution to address the long queues and the inconvenience faced by citizens. This directly resolves the issue mentioned in the statement).

II. The electricity board should increase the penalty to be paid after the specified last date - Doesn't follow(because, Increasing the penalty for late payment does not address the problem of long queues. Instead, it might create further distress for citizens who are already struggling to make payments on time).

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So, Only I follows

Hence, the correct answer is "Option 1".

**Q54. Answer: (d) 2**

The logic followed here is:

'MEND' is coded as '3186'

'MINE' is coded as '1623'

Thus, code for 'I' is '2'.

Hence, "Option 4" is the correct answer.

**Q55. Answer: (b) tt**

According to the given information,

Thus, according to the given codes the code 'tt' is for the word 'garden'.

Hence, the correct answer is "Option 2".

**Q56. Answer: (b) 15 cm**

Shortcut Trick

Sum of radii (R + r) = Increase in Area / (4 × π × increase in radius)

R + r = 704 / (4 × 22/7 × 2) = 704 / (176/7) = 28 cm.

Given the difference in radii (R − r) = 2 cm.

Radius after increase (R) = (Sum + Difference) / 2 = (28 + 2) / 2 = 15 cm.

Therefore The correct answer is 15 cm.

Alternate Method

Given:

Increase in surface area = 704 $cm^2$

Increase in radius = 2 cm

Formula Used:

Surface area of a sphere = $4\pi r^2$

Calculations:

=> Let the initial radius be r cm and the increased radius be R = (r + 2) cm.

=> $4\pi R^2 - 4\pi r^2 = 704$

=> $4 \times (22/7) \times (R^2 - r^2) = 704$

=> $(88/7) \times (R - r)(R + r) = 704$

=> $(88/7) \times 2 \times (R + r) = 704$

=> $(176/7) \times (R + r) = 704$

=> $R + r = (704 \times 7) / 176$

=> R + r = 28

=> (r + 2) + r = 28 => 2r = 26 => r = 13 cm

=> Radius after increase (R) = 13 + 2 = 15 cm.

Therefore The correct answer is 15 cm.

Additional Information

Volume of a Sphere

The total capacity or volume of a sphere is given by $V = (4/3)\pi r^3$.

Surface Area of a Hemisphere

For a hemisphere of radius r, the Curved Surface Area (CSA) is $2\pi r^2$ and the Total Surface Area (TSA) is $3\pi r^2$.

Change in Surface Area Property

When radius increases by 'x' units, the change in area is always proportional to the sum of the radii multiplied by 'x'.

**Q57. Answer: (b) 9 km towards the West**

Given:

Johny starts from Point A and drives 6 km towards the North.

He then takes a right turn, drives 17 km, turns right and drives 13 km.

He then takes a right turn and drives 8 km.

He takes a final right turn, drives 7 km and stops at Point P.

Thus, Johny should drive (17 km - 8 km) 9 km in the west direction to reach Point A again.

Hence, "Option 2" is the correct answer.

**Q58. Answer: (c) N2**

The correct answer is N2.

Key Points

• The molecule N2 (Nitrogen) has a triple bond between the two nitrogen atoms.

• A triple bond consists of one sigma bond and two pi bonds.

• The bond length of a triple bond is shorter compared to single and double bonds, making N2 a very stable molecule.

• Triple bonds are generally stronger and require more energy to break compared to single and double bonds.

• N2 makes up about 78% of the Earth's atmosphere and is essential for all living organisms.

Additional Information

• F2 (Fluorine)

• Contains a single bond between two fluorine atoms.

• It is a diatomic molecule and highly reactive.

• Cl2 (Chlorine)

• Contains a single bond between two chlorine atoms.

• It is used in water purification and as a disinfectant.

• O2 (Oxygen)

• Contains a double bond between two oxygen atoms.

• It is essential for respiration in most living organisms.

**Q59. Answer: (c) cell**

The correct answer is cell.

Key Points

• Mitochondria, ribosomes, and other organelles together constitute the basic unit of life called the cell.

• The cell is the smallest structural and functional unit of an organism.

• Cells can perform all necessary life processes, including metabolism, energy conversion, and replication.

• Eukaryotic cells contain various organelles, such as the nucleus, mitochondria, and ribosomes, which perform specific functions.

• Cells are the building blocks of tissues, which in turn form organs and organ systems in multicellular organisms.

Additional Information

• Lysosomes

• These are membrane-bound organelles that contain enzymes responsible for breaking down waste materials and cellular debris.

• They are often referred to as the "digestive system" of the cell because they help in the degradation of macromolecules.

• Chloroplast

• These are organelles found in plant cells and eukaryotic algae that conduct photosynthesis.

• Chloroplasts capture light energy and convert it into chemical energy in the form of glucose through the process of photosynthesis.

• Endoplasmic Reticulum (ER)

• It is a network of membranes within the cytoplasm of eukaryotic cells, involved in protein and lipid synthesis.

• The ER is divided into two types: rough ER (with ribosomes) and smooth ER (without ribosomes).

• Rough ER is involved in protein synthesis and folding, while smooth ER is associated with lipid synthesis and detoxification processes.

**Q60. Answer: (b) VVS Laxman**

The correct answer is VVS Laxman.

• A book titled ‘COACHING BEYOND: My Days with the Indian Cricket Team’, authored by R. Kaushik & R. Sridhar, was released in January 2023.

Key Points

• The book reflects on R. Sridhar’s seven-year coaching tenure with the Indian cricket team as its fielding coach.

• R. Kaushik is also the co-author of V.V.S Laxman’s autobiography, 281 And Beyond, as well as, Gundappa Vishwanath’s autobiography, Wrist Assured.

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Additional Information

| Books | Authors |
|---|---|
| Jadunama | Arvind Mandloi |
| Human Anatomy | Dr Ashvini Kumar Dwivedi |
| Roller Coaster: An Affair with Banking | Tamal Bandyopadhyay |
| Revolutionaries: The Other Story of How India Won Its Freedom | Sanjeev Sanyal |
| Ambedkar: A Life | Shashi Tharoor |
| Bravehearts of Bharat: Vignettes from Indian History | Vikram Sampath |
| Forging Mettle: Nrupender Rao and the Pennar Story | Pavan C. Lall |
| Beyond The Misty Veil, Temple Tales of Uttarakhand | Aradhana Johri |
| The McMahon line: A century of discord | JJ Singh |
| Crunch Time: Narendra Modi's National Security Crises | Dr Sreeram Chaulia |

**Q61. Answer: (c) 16,800**

Shortcut Trick

Use the successive percentage method for total voters x.

x × (75/100) × (98/100) × (75/100) = 9261

x × (3/4) × (49/50) × (3/4) = 9261

x × (441/800) = 9261 => x = (9261 ÷ 441) × 800

x = 21 × 800 = 16800

Therefore The correct answer is 16,800.

Alternate Method

Given: Votes cast = 75%, Invalid votes = 2%, Candidate votes = 9261 (75% of valid votes).

Step-by-step calculation:

=> Total Valid Votes = 9261 × (100 / 75) = 12348

=> Percentage of Valid Votes out of cast votes = 100% − 2% = 98%

=> Total Votes Cast = 12348 × (100 / 98) = 12600

=> Total Enrolled Voters = 12600 × (100 / 75) = 16800

Therefore The correct answer is 16,800.

Additional Information

Percentage Multiplication Factor

To increase or decrease a value by a%, multiply by (1 ± a/100). For example, a 2% decrease means multiplying by 0.98.

Successive Percentage Formula

When a value is changed multiple times, the final value = Initial value × (1 ± r1/100) × (1 ± r2/100) × ... × (1 ± r_n/100).

Valid vs Invalid Votes

Only valid votes are considered for determining the winning margin or candidate share. Total votes = Valid votes + Invalid votes.

**Q62. Answer: (a) NVX**

The logic followed here is:

Hence, "Option 1" is the correct answer.

**Q63. Answer: (b) 99999936**

Given:

9992 × 10008

Formula used:

Using the formula for product of numbers close to 10000:

$(a + b) \times (a - b) = a^2 - b^2$

Calculation:

9992 × 10008 = (10000 + 8) × (10000 - 8)
=> 9992 × 10008 = $10000^2 - 8^2$
=> 9992 × 10008 = 100000000 - 64
=> 9992 × 10008 = 99999936
Therefore The correct answer is option (2).

**Q64. Answer: (b) 5 : 11**

Shortcut Trick
For homogeneous ratio expressions like (x − y) : (x + y), we can directly substitute the ratio values as the actual values.
Substitute x = 8 and y = 3 into the required expression.
Required Ratio = (8 − 3) : (8 + 3) = 5 : 11.
Therefore The correct answer is 5 : 11.
Alternate Method
Given: x : y = 8 : 3
Formula Used: Ratio property where x/y = a/b implies x = ak and y = bk.
=> Let x = 8k and y = 3k, where k is a constant.
=> We need to find the value of (x − y) : (x + y).
=> Numerator = x − y = 8k − 3k = 5k
=> Denominator = x + y = 8k + 3k = 11k
=> Required Ratio = 5k / 11k = 5 / 11
Therefore The correct answer is 5 : 11.
Additional Information
Componendo and Dividendo
If a/b = c/d, then (a + b) / (a − b) = (c + d) / (c − d). This property is useful for simplifying ratio-based equations.
Duplicate Ratio
The duplicate ratio of a : b is $a^2 : b^2$, and the triplicate ratio is $a^3 : b^3$.
Inverse Ratio
The inverse ratio of x : y is y : x or 1/x : 1/y.

**Q65. Answer: (d) LGKF**

The logic followed here is:
QLPK is related to IDHC
And,
VQUP is related to NIMH
Similarly,
TOSN is related to
Hence, "Option 4" is the correct answer.

**Q66. Answer: (d) The components of a colloidal solution are the dispersed phase and the dispersion medium.**

The correct answer is The components of a colloidal solution are the dispersed phase and the dispersion medium..
Key Points
• The components of a colloidal solution are the dispersed phase and the dispersion medium.
• The size of particles in a colloid is typically between 1 and 1000 nanometers.
• Colloidal solutions are heterogeneous mixtures, not homogeneous.
• Colloids scatter light due to the Tyndall effect, making the path of light visible.
• Examples of colloidal systems include fog, milk, and blood.
Additional Information
• Suspensions
• These are heterogeneous mixtures where the particles are large enough to settle out over time.
• Examples include sand in water and flour in water.
• Solutions
• These are homogeneous mixtures where the solute is completely dissolved in the solvent.
• Examples include salt in water and sugar in water.

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• Emulsions
• These are a type of colloid where both the dispersed phase and the dispersion medium are liquids.
• Examples include mayonnaise and milk.

**Q67. Answer: (a) 15**

Given:
Number of article X sold in 2019 = 125
Number of article X sold in 2020 = 110
Formula used:
Absolute difference = |Number in 2019 - Number in 2020|
Calculation:
=> Absolute difference = |125 - 110|
=> Absolute difference = 15
Therefore The correct answer is 15.

**Q68. Answer: (d) Silver chloride turns grey in sunlight**

The correct answer is Silver chloride turns grey in sunlight.
Key Points
• A combination reaction involves two or more substances combining to form a single new substance.
• Burning of natural gas is a combustion reaction, which is a type of combination reaction.
• Calcium oxide reacts vigorously with water to produce slaked lime, which is a combination reaction.
• Formation of water from $H_2(g)$ and $O_2(g)$ is a combination reaction.
• Silver chloride turning grey in sunlight is a decomposition reaction, not a combination reaction.
Additional Information
• Decomposition Reactions
• These reactions involve a single compound breaking down into two or more simpler substances.
• Example: $2HgO(s) \rightarrow 2Hg(l) + O_2(g)$.
• Combustion Reactions
• These are reactions where a substance combines with oxygen to produce heat and light.
• Example: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$.
• Displacement Reactions
• These reactions involve an element displacing another element in a compound.
• Example: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$.

**Q69. Answer: (d) LH-OK-RS**

The logic followed here is:
Given:
FB-IE-LM
And,
JF-MI-PQ
So, checking each option one by one:
Option 1) NI-QN-TU
Option 2) KG-NJ-QS
Option 3) HD-KG-NP
Option 4) LH-OK-RS
Thus, out of all the options 'LH-OK-RS ' follows the same logic as given.
Hence, "Option 4" is the correct answer.

**Q70. Answer: (c) 30**

Shortcut Trick
To find the mean marks, calculate the weighted average of the given distribution.
Total Sum = (25 × 5) + (30 × 6) + (35 × 3) + (40 × 1)
Total Sum = 125 + 180 + 105 + 40 = 450

Total Students = 5 + 6 + 3 + 1 = 15
Mean = 450 ÷ 15 = 30
Therefore The correct answer is 30.
Alternate Method
Given:
Marks obtained (x) = 25, 30, 35, 40
Number of students (f) = 5, 6, 3, 1
Formula Used:
Arithmetic Mean (χ) = ∑fx ÷ ∑f
Calculations:
=> ∑fx = (25 × 5) + (30 × 6) + (35 × 3) + (40 × 1)
=> ∑fx = 125 + 180 + 105 + 40
=> ∑fx = 450
=> ∑f = 5 + 6 + 3 + 1 = 15
=> Mean = 450 ÷ 15
=> Mean = 30
Therefore The correct answer is 30.
Additional Information
Arithmetic Mean for Grouped Data
It is the sum of the products of frequencies and values divided by the sum of frequencies: $\chi = \sum f_i x_i / \sum f_i$.
Median
The middle value of a data set when arranged in order. For discrete data, find the cumulative frequency to locate the middle observation.
Mode
The value that occurs most frequently in a data set. In this case, the mode is 30 as it has the highest frequency of 6.
Assumed Mean Method
A shortcut for large numbers: Mean = A + (∑fd / ∑f), where A is the assumed mean and d = x − A.

**Q71. Answer: (a) 23**

Given:
Ariel's rank from the top = 6th
Ariel's rank from the bottom = 18th
Total number of students = Ariel's rank from the top + Ariel's rank from the bottom - 1
(6 + 18) - 1 = 24 - 1 = 23
Hence, the total number of students is "23".

**Q72. Answer: (a) Rs. 116**

Shortcut Trick
Let original costs be O for orange and B for banana.
Equation 1: 9O + 8B = Rs. 276
Equation 2 (after 10% decrease on orange): 4.5O + 10B = Rs. 210 → 9O + 20B = Rs. 420 (multiplied by 2)
Difference: (9O + 20B) − (9O + 8B) = 420 − 276 => 12B = 144 => B = Rs. 12
Substitute B in Eq 1: 9O + 96 = 276 => 9O = 180 => O = Rs. 20
Original cost of 4 oranges and 3 bananas = 4 × 20 + 3 × 12 = 80 + 36 = Rs. 116.
Therefore The correct answer is Rs. 116.
Alternate Method
Given:
Total items in first case: 9 oranges and 8 bananas for Rs. 276.
Total items in second case: 5 oranges (10% cheaper) and 10 bananas for Rs. 210.
Calculations:
Let the original price of one orange be O and one banana be B.
=> 9O + 8B = 276 — (i)

New price of orange = O − 10% of O = 0.9O
=> 5(0.9O) + 10B = 210
=> 4.5O + 10B = 210 — (ii)
To eliminate O, multiply equation (ii) by 2:
=> 9O + 20B = 420 — (iii)
Subtracting equation (i) from (iii):
=> (9O + 20B) − (9O + 8B) = 420 − 276
=> 12B = 144
=> B = 144 ÷ 12 = Rs. 12
Substitute the value of B in equation (i):
=> 9O + 8(12) = 276
=> 9O + 96 = 276
=> 9O = 180
=> O = 180 ÷ 9 = Rs. 20
Original cost of 4 oranges and 3 bananas:
=> Cost = 4O + 3B
=> Cost = 4(20) + 3(12) = 80 + 36 = Rs. 116
Therefore The correct answer is Rs. 116.
Additional Information
Linear Equations in Two Variables
Systems like a1x + b1y = c1 can be solved using substitution or elimination methods to find individual unit values.
Percentage Decrease
A decrease of x% on a value V results in a new value of V × (100 − x) ÷ 100.
Unitary Costing
The total cost is the sum of the products of the quantity and the unit price of each item (Total = ∑ Quantity × Price).

**Q73. Answer: (b) principal axis**

The correct answer is principal axis.
Key Points
• The principal axis is a straight line that passes through the center of curvature and the pole of a spherical mirror.
• This axis is crucial for understanding the image formation in spherical mirrors as it serves as a reference line.
• In the context of a concave mirror, the principal axis helps locate the focal point where parallel rays converge.
• For a convex mirror, the principal axis is used to understand the behavior of diverging rays.
• The principal axis is perpendicular to the surface of the spherical mirror at the pole.
Additional Information
• Principal Focus
• The principal focus is the point where parallel rays of light either converge (concave mirror) or appear to diverge from (convex mirror).
• It lies on the principal axis and is a critical point for image formation.
• Focal Length
• The focal length is the distance between the pole and the principal focus of the mirror.
• This length is half the radius of curvature for spherical mirrors.
• Radius of Curvature
• The radius of curvature is the distance between the center of curvature and the pole of the mirror.
• It is twice the focal length of the mirror.

**Q74. Answer: (b) State Bank of India**

The correct answer is State Bank of India.
Key Points
• SBI Green Rupee Term Deposit is offered in three distinct tenures - 1,111 days, 1,777 days, and 2,222 days.
• The deposit has been introduced to mobilize funds to support environment-friendly initiatives and projects.
• This will result in fostering the growth of a green finance ecosystem in India.

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• The program is available to all persons, including non-resident Indians, and provides investors with the opportunity to choose from three separate tenors: 1,111 days, 1,777 days, and 2,222 days.

• This project Directly supports eco-friendly projects, promoting renewable energy, afforestation, and sustainable practices. Provides competitive interest rates, ensuring financial growth

• The interest rates for 1,111 days, 1,777 days, and 2,222 days are 6.65%, 6.65% and 6.40% respectively

Additional Information

• State Bank of India

• Established in - 1955

• HQ - Mumbai

• Chairman - Dinesh Kumar Khara

**Q75. Answer: (b) 4 1/2 years**

Shortcut Trick

Interest per year = 8% of Rs. 1,500 = Rs. 120.

Total Simple Interest needed = Rs. 2,040 − Rs. 1,500 = Rs. 540.

Time = Total Interest ÷ Interest per year.

=> Time = 540 ÷ 120 = 4.5 years.

4.5 years is equal to 4 1/2 years, which matches Option (2).

Therefore The correct answer is 4 1/2 years.

Alternate Method

Given:

Principal (P) = Rs. 1,500

Amount (A) = Rs. 2,040

Rate (R) = 8% per annum

Formula Used:

Simple Interest (SI) = Amount − Principal

Time (T) = (SI × 100) ÷ (P × R)

Calculations:

=> Simple Interest (SI) = 2040 − 1500 = 540

=> T = (540 × 100) ÷ (1500 × 8)

=> T = 54000 ÷ 12000

=> T = 54 ÷ 12

=> T = 4.5 years

=> T = 4 1/2 years

Thus, the time required is 4 1/2 years, which is given in Option (2).

Therefore The correct answer is 4 1/2 years.

Additional Information

Simple Interest Formula

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

Total Amount

The total Amount (A) accumulated after a period is the sum of the Principal and the Interest: A = P + SI.

Time Conversion

Always ensure Time (T) is in years if the Rate is per annum. If time is in months, divide by 12; if in days, divide by 365.

Difference between SI and CI

In Simple Interest, interest is calculated only on the initial principal, whereas in Compound Interest, interest is calculated on the principal plus accumulated interest.

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