RRC Group D Previous Year Paper 65 (Held On: 24 Oct 2018 Shift 1)

RRB Group D • 2018 • 100 questions • 90 minutes • Answer key and solutions

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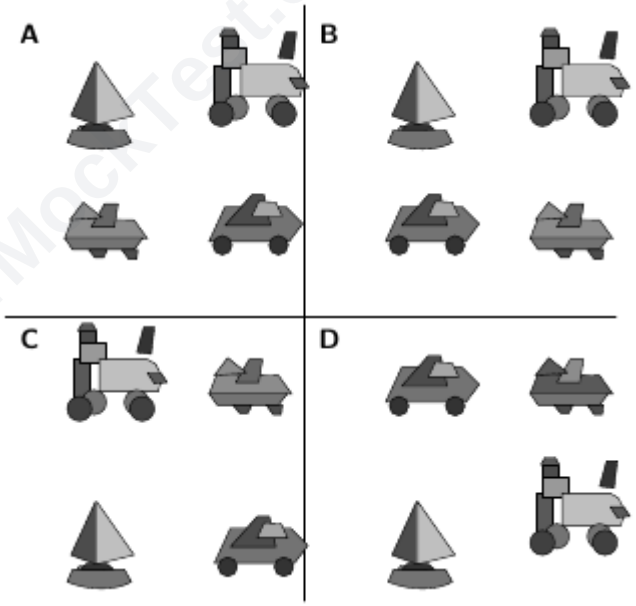
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CBT

Q1.



Consider the above figure. The figure which does not belong to the group is-

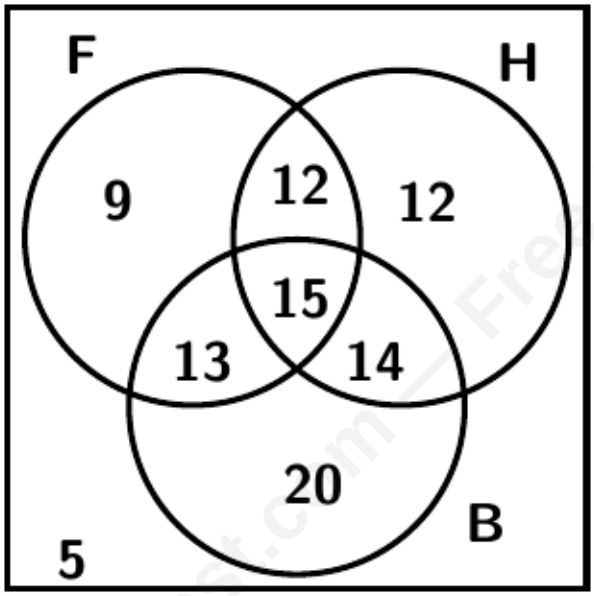
(a) A
(b) C
(c) D
(d) B

Q2. The mean of 10 terms is 49. It was discovered that the three terms 30, 40 and 50 were mistakenly read as 10, 20 and 30 respectively. The correct mean is-

(a) 45
(b) 40
(c) 55
(d) 50

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Q3.



The given diagram shows the number of students who play football (F), hockey (H) and basketball (B) in the class. What is the number of students who play basketball in the class?

(a) 20
(b) 62
(c) 49
(d) 53

Q4. What is dentin (tooth enamel) made of?

(a) Potassium phosphate
(b) Calcium phosphate
(c) Ferrous sulfate
(d) Sodium phosphate

Q5. The cost of installing a paved floor in a circular room at the rate of Rs 10 per sqm is Rs 1540. What will be the cost of fencing on this floor at the rate of Rs 6 per meter?

(a) Rs 260
(b) Rs 264
(c) Rs 250
(d) Rs 265

Q6. The motion of the moon around the earth is due to _____-

(a) Gravitational force
(b) Centrifugal force
(c) Centripetal force
(d) Nuclear force

Q7. Gravitational force exists between _____ objects, but it cannot be felt unless the mass of the objects is very high, such as in planets.

(a) Four
(b) Each and Every
(c) Only two
(d) Only one

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Q8. Sanjay Gandhi National Park is in _____.

(a) Delhi
(b) Maharashtra
(c) Rajasthan
(d) Karnataka

Q9. Study the given statements and conclusions carefully and decide which of the conclusions logically follows from the statement.

Statements: Some girls are doctors.

All doctors are sisters.

Conclusion:

I. Some girls are sisters.

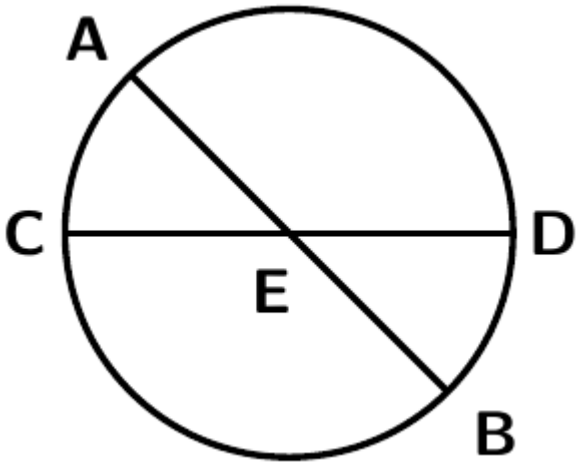
II. All sisters are girls.

(a) Only II follows
(b) Either I or II follows
(c) Only I follows
(d) Both I and II follows

Q10. What is the atomicity of phosphorus?

(a) Binomial
(b) Polyatomic
(c) A nuclear
(d) Quaternary Atom

Q11.



In the above circle, mspaceAE = 4 cm, mspaceBE = 15 cm and mspaceCE = 2.5 cm are given. What will be the value of mspaceDE

(a) 16.5 cm
(b) 20 cm
(c) 24 cm
(d) 30 cm

Q12. When iron is mixed with _____ and _____, we get stainless steel-

(a) Ni; Cr
(b) Ni; Co
(c) Ni; Ca
(d) Ni; Cu

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Q13. Simplify the following expression-

(2/3 × 4/6) + (5/3 × 7/10) - (11/2 × 4/33) = ?

(a) 31/9
(b) 17/18
(c) 16/9
(d) 29/18

Q14. Name the next character in the series-

A, D, B, E, C, F, D, ?

(a) P
(b) L
(c) T
(d) G

Q15. What is the position of India in the Most Valuable Nation Brands list as per the Brand Finance 'Nation Brands 2017' list?

(a) Second
(b) Seventh
(c) Fifth
(d) Eight

Q16. What is the number whose 12% is 9?

(a) 96
(b) 75
(c) 108
(d) 68

Q17. Mr Z is standing facing east. He takes a left turn and walks 5 km to reach point A. Then he takes a left turn and walks 4 km to reach point B. Then he takes a right turn and walks 3 km to reach point C. Finally, he takes a right turn and walks 10 km to reach point D.

Which side is Mr Z facing at point B?

(a) North
(b) South
(c) West
(d) East

Q18. Sreetin is playing a secret word game in which FIRE is written as DGPC, then what will SHOT be written as?

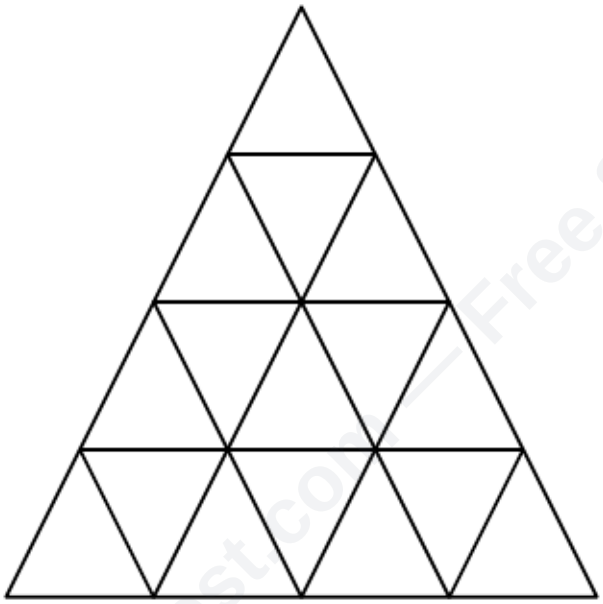
(a) QFMR
(b) QRST
(c) PQRS
(d) SNGR

Q19. In the code language, MELT is written as 2419. What is the code for TIMID?

(a) 98283
(b) 98383
(c) 98284
(d) 98384

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Q20.



What is the minimum number of straight lines required to make the above figure?

(a) 10
(b) 9
(c) 11
(d) 12

Q21. The Union Ministry of Women and Child Development has launched an online campaign with an aim to end gender bias against women. which is called

(a) I am That Woman
(b) Women empowerment
(c) Woman Uprising
(d) Queen is the New King

Q22. 2/3 part of the goods was sold at a profit of 6% and the remaining part at a loss of 3%. If the total profit is Rs 540, then what was the total cost of the article?

(a) Rs 17,000
(b) Rs 18,000
(c) Rs 16,500
(d) Rs 18,500

Q23. In which year the initiative “Swachh Bharat Abhiyan” was introduced by the Government of India?

(a) 2014
(b) 2009
(c) 2011
(d) 2000

Q24. For 2 years Rs 2,000 on 3% p.a. Find the compound interest-

(a) Rs 112.50
(b) Rs 112.80
(c) Rs 211.80
(d) Rs 121.80

Q25. A tank can be filled by two taps A and B in 5 hours and 15 hours respectively. Tap C can empty the tank in 5 hours. If all the three taps are opened simultaneously, approximately how long will it take to fill the tank completely?

(a) 24 hours
(b) 15 hours

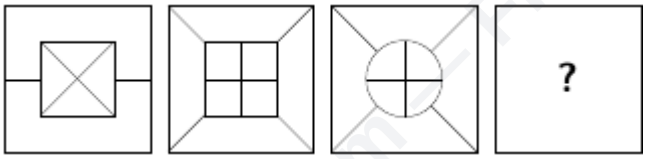
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(c) 20 hours
(d) 12 hours

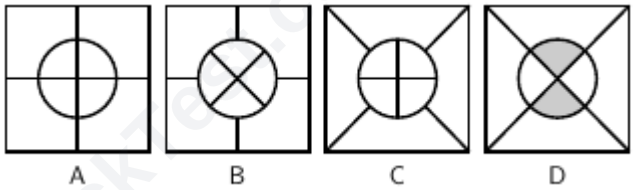
Q26. _____ ruled the region around Madurai and attained supremacy in the thirteenth century-

(a) Rajput
(b) Chola
(c) Chera
(d) Pandya

Q27.



Choose the correct option given below from the alternatives that fit the (?) in the blank space-

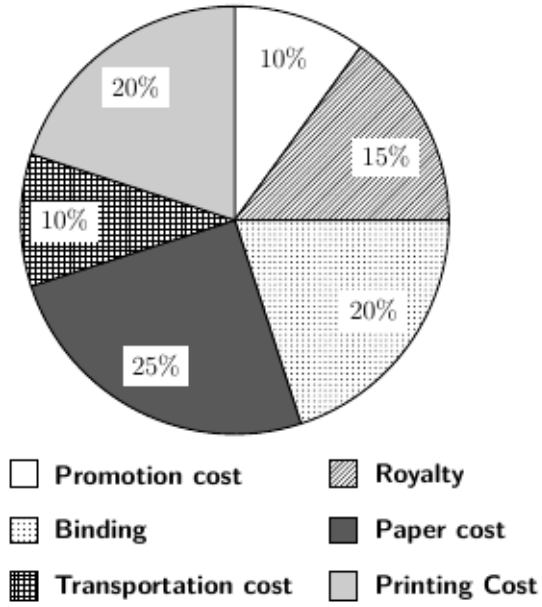


(a) D
(b) C
(c) B
(d) A

Q28. One-fourth of the 6400 employees of company Z are clerks. If the clerk employees were to be reduced by one-fourth, then what percent of the total number of remaining employees would be clerks?

(a) 18.75
(b) 6.6
(c) 20
(d) 6.25

Q29.

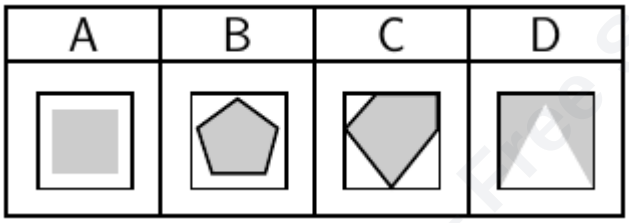


The pie graph shows the expenditure of a publishing body in Karnataka. If the total expenditure is Rs. 50,000 then the expenditure on transportation is-

(a) Rs 5000

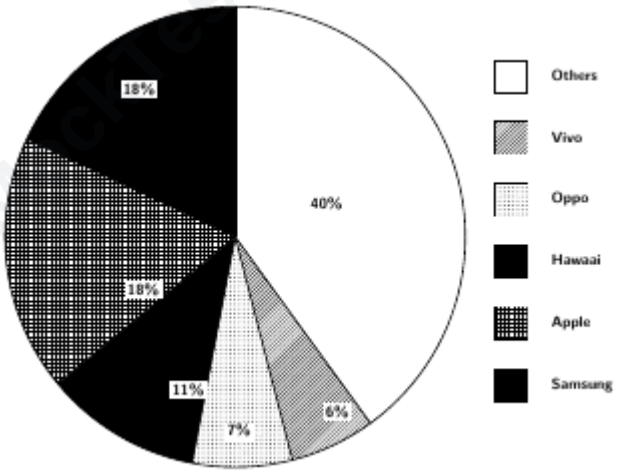
(b) Rs 7000
(c) Rs 10000
(d) Rs 2500

Q30. Select odd-



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

Q31. The following pie chart shows the total sales made by different mobile companies in the year 2017.



What is the share of the segment corresponding to the sales of 'Others'?

(a) 150°
(b) 155°
(c) 145°
(d) 144°

Q32. Oscar-winning composer A.R. Rahman has become the official brand ambassador of which state?

(a) Arunachal Pradesh
(b) Assam
(c) Sikkim
(d) Manipur

Q33. Which of the following have in common?

A. A fast-moving pebble can injure a person or break the glass of the window.
B. Energy of a moving vehicle.
C. Fast-moving wind can damage many homes
D. Wind can move the blades of a windmill.

(a) Kinetic energy
(b) Very high speed
(c) Gravitational pull
(d) Frictional force

Q34. The permanent tissue that provides elasticity is called-

(a) Parenchyma
(b) Aerenchyma
(c) Sclerenchyma
(d) Collenchyma

Q35. What should be added to 2.06 to get 3.1?

(a) 1.24
(b) 0.8
(c) 1.04
(d) 1.4

Q36. Nalini, Tanvi and Rashi share a cake. Nalini ate 1/12th of it, Tanvi ate 1/3th of it and Rashi ate the rest of the cake. What was the cake's share of Rashi?

(a) 13/15 th
(b) 5/6 th
(c) 3/5 th
(d) 7/12 th

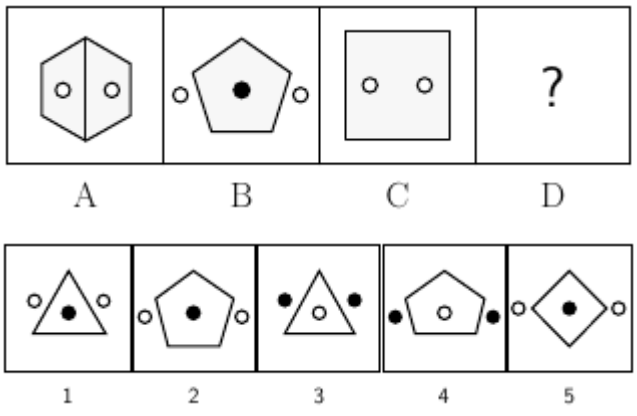
Q37. Which of the following energy increases with speed?

(a) Chemical energy
(b) Potential energy
(c) Kinetic energy
(d) Electrical energy

Q38. A concave mirror is placed in front of the Sun in such a way that the rays of the Sun converge at a point 5 cm away on the principal axis of the mirror. Now if a 3 cm long candle is placed on the principal axis of the mirror at a distance of 10 cm, then how far will the image of the candle be formed?

(a) 5 cm
(b) 15 cm
(c) 10 cm
(d) 20 cm

Q39. Select the option which is related to figure C in the same way as figure B is related to figure A-



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

Q40. Silica is soluble in-

(a) HNO3
(b) H2SO4
(c) HCl

(d) HF

Q41. In December 2017, the central government launched a new scheme to protect _____ from floods and erosion in Assam.

(a) Haflong
(b) Dispur
(c) Manjuli Island
(d) Jatinga

Q42. A filament of an electric bulb carries a current of 0.75 A in 9 minutes. Find the amount of electric charge flowing through the current.

(a) 225 C
(b) 270 C
(c) 240 C
(d) 405 C

Q43. Essar Steel Limited, Hazira is located in _____.

(a) West Bengal
(b) Gujarat
(c) Odisha
(d) Jharkhand

Q44. Consider the statement and the following arguments and decide which of the arguments is strong with respect to the statement.

Statement:

Should employee medical insurance also cover dental care?

Argument:

I. Yes, dental treatment is costly and if insured, it will be of great help to the employees.

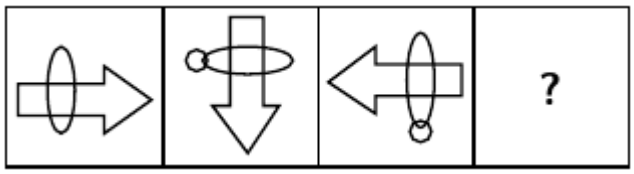
II. No, all dental treatments also include cosmetic changes, so it cannot be covered under medical insurance.

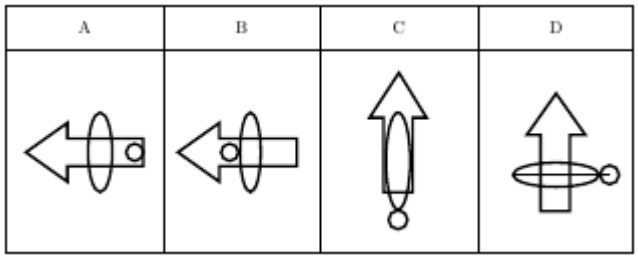
(a) Arguments I and II both are strong
(b) Neither I nor II is strong
(c) Only argument I is strong
(d) Only Argument II is strong

Q45. Who first gave the idea of Constituent Assembly for India?

(a) C.G. Roy
(b) M.N. Roy
(c) Dr. Baba Saheb Ambedkar
(d) Jawaharlal Nehru

Q46. Select the option which is suitable in the place of ? in the given series.





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

Q47. The value of (-√(144/576)) × - (16/√64) is -
(a) 4
(b) 9
(c) 1
(d) 0

Q48. Who among the following was awarded the Best Director Award for the film Dangal for the 64th National Awards 2017?
(a) Nitesh Tiwari
(b) Kabir Khan
(c) Raj Kumar Hirani
(d) Karan Johar

Q49. A boy is walking at a speed of P km/h to cover a distance of 1 km. However, due to slippery ground, his speed decreases by Q km/h (P > Q). If he takes R hours to cover the distance, then find the relation between R and Q.
(a) 1/R = P - Q
(b) R + P - Q
(c) R = P + Q
(d) 1/R = 1/P + 1/Q

Q50. The National Sports Award for continuous outstanding performance for four years is _____.
(a) Khel Ratna Award
(b) Dhyan Chand Award
(c) Arjuna Award
(d) Dronacharya Award

Q51. The word which denotes physical characteristics-
(a) controlled by the environment
(b) genotype
(c) monotype
(d) Phenotype

Q52. A shopkeeper has different varieties of coffee brands. 55% of the store's sales come from selling the 'Espresso' variety of beans. The remaining 45% comes from selling other brands of beans and powders. In each month, the average sales of the store is Rs. 60,000. What is the annual sales from 'Espresso' beans?
(a) Rs. 3,96,000
(b) Rs. 3,90,000
(c) Rs. 3,60,000
(d) Rs. 2,30,000

Q53. 77 people are present at a party, the ratio of males to women is 4 : 7. How many total women are there at the party?
(a) 36
(b) 54
(c) 73
(d) 49

Q54. As of August 2018, which political party is currently ruling the state of Andhra Pradesh?
(a) Congress
(b) TRS
(c) Bharatiya Janata Party

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(d) TDP

Q55. Who is the founder of International Premier Tennis League?

(a) Linder Paes
(b) Sania Mirza
(c) Yuki Bhabri
(d) Mahesh Bhupathi

Q56. The motion of a bus on a crowded road is an example of _____ motion.

(a) unequal
(b) uniform
(c) circular
(d) linear

Q57. _____ when the direction of force applied and the direction of motion of the object are perpendicular to each other.

(a) power used
(b) no work done occurs
(c) power not used
(d) work done

Q58. Solve the equation- √(30+√(30+√(30+√(30+√...))))?

(a) 5
(b) √30
(c) 6
(d) 5.8

Q59. The average speed of the car on a particular stretch of road is 90 km/hr. On a particular day, the average speed was 1/5 less than on normal days, as a result, it took 16 minutes longer. What is the length (in km) of this particular stretch of road?

(a) 96
(b) 108
(c) 120
(d) 84

Q60. Study the statement below followed by two conclusions.

Statement:

Some monkeys are orangutans.

No orangutan is human.

Conclusion:

1. Some monkeys are human.

2. No monkey is human.

Decide which of the conclusion logically follows from the statement?

(a) Conclusions 1 and 2 both follow
(b) Only conclusion 1 follows
(c) Only conclusion 2 follows
(d) Either conclusion 1 or 2 follows

Q61. Given below are three statements followed by two conclusions numbered I and II. You have to take the statements to be true even if they seem to be at variance from commonly known facts. Decide which of the conclusion logically follows from the statement.

Statement:

1. Some apples are horses.

2. All apples are trains.

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3. All trains are violets.

Conclusion:

I. Some apples are not violets.

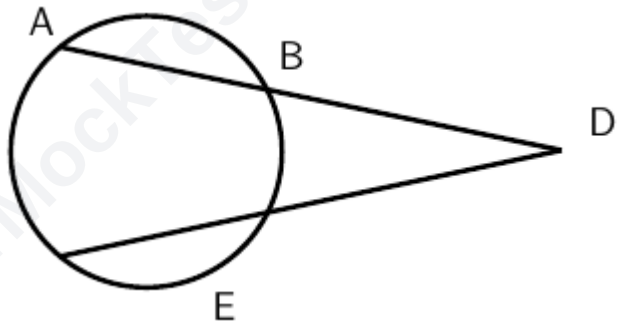
II. All horses being train is a possibility.

(a) Neither conclusion I nor II follows
(b) Conclusion II follows
(c) Both conclusions I and II follows
(d) Conclusion I follows

Q62. X is the brother of Y, V is the mother of Y, M is the sister of V's husband, N is the brother of V, then how is the son of N related to Y?

(a) Sister
(b) Aunt
(c) Cousin
(d) Nephew

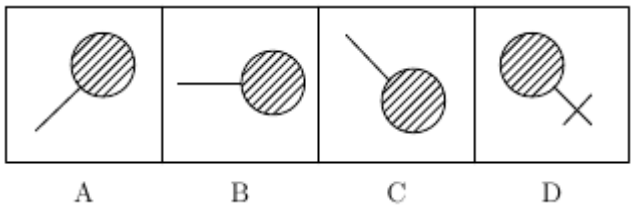
Q63.



In the given circle, line rmAB is produced to meet tangent rmDE at point D. If rmAB = 7 cm and rmDE = 12 cm, then what will be the length of rmBD ?

(a) 7 cm
(b) 9 cm
(c) 2√21 cm
(d) 8 cm

Q64. Identify the odd one out-



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

Q65. Where is the headquarter of Asian Development Bank located?

(a) Japan
(b) China
(c) Philippines
(d) Bharat

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Q66. _____ was prosecuted for leading the rebels of the Revolt of 1857 and exiled to Rangoon, where he died in 1862.

(a) Shah Alam
(b) Bahadur Shah Zafar
(c) Shah Alam-I
(d) Akabar Shah-II

Q67. Elements in the same group have the same _____.

(a) chemical properties
(b) atomic mass
(c) atomic radius
(d) atomic numbers

Q68. If P means ÷, Q means ×, R means + and S means -, then what is the value of 14Q16P4R7S10?

(a) 52
(b) 48
(c) 53
(d) 50

Q69. _____ is known as bisexual flower.

(a) Papaya
(b) Watermelon
(c) Cucumber
(d) Mustard

Q70. 3R # 2 A S K 5 % T 7 & N Y + X B / L Q @ 1

If the first half of the above series is reversed, then the 15th term to the right of the 18th term from the right will be-

(a) T
(b) Q
(c) @
(d) %

Q71. Which of the following book was written by Mahatma Gandhi?

(a) Wings of Fire
(b) The Tensandons
(c) Hind Swaraj
(d) Al-Hilal

Q72. Amit can do 1/2 part of a work in 7 days while Alam can do 1/2 part of the same work in 9 days. In how many days can both together finish the work?

(a) 5.2 Days
(b) 8 Days
(c) 12 Days
(d) 63/8 Days

Q73. The color of iron rust is _____.

(a) Red grey
(b) Red blue
(c) Red brown
(d) Red yellow

Q74. In which of the following concave mirror is not used?

(a) search light
(b) solar furnace
(c) rear mirror

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(d) car headlight

Q75. In the following, there is a certain relationship between two given words, one on one side of : : and the other on the other side of word : :. While one more word has to be found from the given alternatives which has the same relation with this word as in the pair of words given below, select the best option-

Knife : Butcher :: Scissors : _____

(a) Hair dresser
(b) Wood cutter
(c) Mechanic
(d) Cobbler

Q76. In which kingdom would you place all organisms, which are multicellular eucentric with a cell wall?

(a) protista
(b) plantea
(c) monera
(d) animalia

Q77. Read the given question and decide which of the following statement(s) is/are sufficient to answer the question.

Question:

X, Y, T, U, and V, when arranged in ascending order of their weights, who will stand second from the beginning?

Statements:

1. X weighs less than T. U weighs twice as much as T.

2. The weight of Y and V is less than that of X.

(a) Statements 1 and 2 both are sufficient
(b) Statement 1 alone is sufficient
(c) Statement 2 alone is sufficient
(d) Statements 1 and 2 both are insufficient

Q78. Select the alternative which has the same relation to the third word as the second word is to the first word-

Captain : Soldier : : Employer :

(a) Boss
(b) Director
(c) Employee
(d) Officer

Q79. Which railway station has entered the Limca Book of Records 2018 for all railway employees to be female?

(a) Vapi Railway Station
(b) Panvel Railway Station
(c) Matunga Railway Station
(d) Dadar Railway Station

Q80. Which of the following is/are true/false?

Statement:

A. The following is an example of a reversible reaction.

$N_2 (g) + 3H_2 (g) <=>$ Because $2NH_3 (g)$

B. The following is an example of thermal decomposition.

$CaCO_3 (s) \rightarrow$ (heat) $Cao(s) + CO_2(g)$

(a) Only A is true
(b) Both A and B are ture
(c) Only B is true
(d) Both A and B are false

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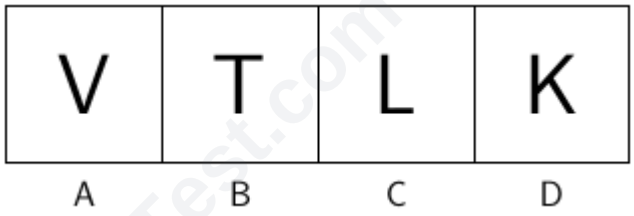
Q81. Ramu's income is 25% more than that of Rohan. Rohan's income is what percent of Ramu's income?

(a) 80%
(b) 50%
(c) 75%
(d) 60%

Q82. _____ shows that the atomic number of an element is a more fundamental property than its atomic mass.

(a) Henry Cavendis
(b) Henry Mosley
(c) John Newland
(d) Demitri Mendeleev

Q83. Select the odd one from the following-



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

Q84. Newton's third law of motion applies to which of the following situations?

(a) When a person jumps from the boat to the bank of the river, the boat goes backwards
(b) Passengers standing in a bus fall in the rear direction when the stationary bus suddenly starts moving
(c) When a person falls on a cement floor, he gets hurt
(d) While catching a fast moving cricket ball, a fielder moves his hands backwards.

Q85. Amita's father was 38 years old when she was born, while her mother was 36 years old when her brother was born who was four years younger than her. What is the difference between the ages of his parents?

(a) 4 years
(b) 6 years
(c) 8 years
(d) 2 years

Q86. The ratio of the ages of Rohan and Sohan is 4 : 3. After 9 years, Rohan's age will become 33 years. Find the present age of Sohan.

(a) 15 years
(b) 19.5 years
(c) 21 years
(d) 18 years

Q87. The process of dialysis is related to-

(a) Liver
(b) Lungs
(c) Abdomen
(d) Kidneys

Q88. What will be the smallest number which when divided by 6, 7, 8, 9 and 12 leaves remainder 2 each time?

(a) 508
(b) 608
(c) 502

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(d) 506

Q89. If the centroid and two vertices of the triangle are (4, 8), (9, 7) and (1, 4) respectively, then find the area of the triangle.

(a) 34.5 unit²
(b) 111 unit2
(c) 33 unit²
(d) 166.5 unit2

Q90. You have to take the given statement to be true even if it seems to be at variance from commonly known facts and then decide which of the given conclusions logically follow from the given statement.

Statement:

Due to heavy snowfall in Canada, the normal life of Canadians has come to a standstill.

Conclusion:

1. The Government of Canada must take measures to help people and prevent loss of life and property.

2. The government should ask all citizens to stay at home till the weather changes.

(a) Only conclusion 2 follows
(b) Only conclusion 1 follows
(c) Neither conclusion 1 nor conclusion 2 follows
(d) Either conclusion 1 or conclusion 2 follows

Q91. Which ministry regulates cow slaughter in India?

(a) Defense
(b) Agriculture
(c) Home
(d) Environment

Q92. Consider the given statements and decide which of the assumptions is/are implicit in the statement.

Statement:

Shyam says to Ram, I would like to find out the effect of mobile radiation on the children.

Assumptions:

I. One can trace the effect of mobile radiation on children.

II. Shyam is very good at detecting mobile radiation effects.

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

Q93. The color preferences of a group of girls were mapped and the results were as follows: 20 preferred pink, 16 preferred red and 14 preferred green. 5 preferred all the three colours. 9 of them chose Pink and Green. 7 of them chose Pink and Red. 8 of them chose Red and Green. How many girls chose only one colour?

(a) 17
(b) 44
(c) 40
(d) 36

Q94. The correct increasing order of acidity of Mn oxide is-

(a) MnO < MnO2 < Mn2O7
(b) MnO2 > MnO > Mn2O7
(c) Mn2O7 > MnO2 > MnO
(d) MnO2 > Mn2O7 > MnO

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Q95. 99-year old freedom fighter and Padma awardee, who runs 18 schools in West Bengal and provides free education and food-

(a) Sitavva Jodadi
(b) Sulagitti
(c) Sudhanshu Vishwas
(d) Damodar Bapat

Q96. What is the main component of CNG?

(a) Methane
(b) Butane
(c) Ethane
(d) Propane

Q97. In a college of 420 students, each student studies 5 subjects and each subject is studied by 60 students. What is the number of subjects?

(a) Exactly 35 :
(b) Exactly 25 :
(c) Minimum 50
(d) Maximum 30

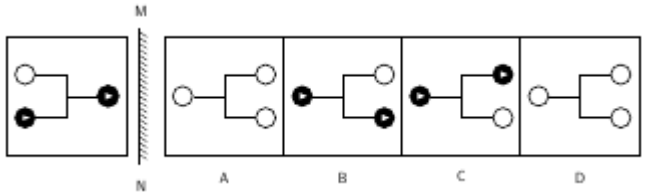
Q98. In which country is the Eden Gardens Cricket Ground located?

(a) Pakistan
(b) Shri Lanka
(c) Bangladesh
(d) Bharat

Q99. The greatest common factor of 290 and 660 is 10. What is their least common factor?

(a) 38280
(b) 9570
(c) 19140
(d) 191400

Q100. Select the correct image formed in the mirror of the following figure-



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

ANSWER KEY

1	c	2	c	3	b	4	b	5	b	6	a	7	b	8	b	9	c	10	d
11	c	12	a	13	b	14	d	15	d	16	b	17	c	18	a	19	a	20	c
21	a	22	b	23	a	24	d	25	b	26	d	27	c	28	c	29	a	30	d
31	d	32	c	33	a	34	d	35	c	36	d	37	c	38	c	39	d	40	d
41	c	42	d	43	b	44	c	45	b	46	d	47	c	48	a	49	a	50	a
51	d	52	a	53	d	54	d	55	d	56	a	57	b	58	c	59	a	60	d
61	b	62	c	63	b	64	d	65	c	66	b	67	a	68	c	69	d	70	b

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71	c	72	d	73	c	74	c	75	a	76	b	77	d	78	c	79	c	80	b
81	a	82	b	83	d	84	a	85	b	86	d	87	d	88	d	89	a	90	a
91	d	92	c	93	a	94	a	95	c	96	a	97	a	98	d	99	c	100	c

SOLUTIONS

Q1. Answer: (c) D

The logic followed here is:-

• In Figures A, B, and C the colour of the aeroplane is red

• In option D there are two colours, red and blue, in the aeroplane. Thus, figure D is the odd one.

Hence, "option 3" is the correct answer.

Q2. Answer: (c) 55

Shortcut Trick

Net increase in Sum = (Correct values) − (Incorrect values) = (30 + 40 + 50) − (10 + 20 + 30) = 120 − 60 = 60.

Net increase in Mean = Total increase ÷ Number of terms = 60 ÷ 10 = 6.

Correct Mean = Old Mean + Net increase = 49 + 6 = 55.

Therefore The correct answer is 55.

Alternate Method

Given: Total terms (n) = 10, Incorrect Mean = 49, Incorrect terms = 10, 20, 30, Correct terms = 30, 40, 50.

Formula: Mean = Sum of observations ÷ Number of observations

=> Incorrect Sum = 10 × 49 = 490.

=> Sum of incorrectly read terms = 10 + 20 + 30 = 60.

=> Sum of correct terms = 30 + 40 + 50 = 120.

=> Correct Sum = 490 − 60 + 120 = 550.

=> Correct Mean = 550 ÷ 10 = 55.

Therefore The correct answer is 55.

Additional Information

Arithmetic Mean Property

The mean is sensitive to every value in the data set. If any value is changed, the mean will change proportionally by (Change ÷ n).

Correction Formula

Correct Mean = [(Incorrect Mean × n) − (Sum of wrong items) + (Sum of correct items)] ÷ n.

Linear Transformation

If a constant k is added to or subtracted from all observations, the new mean will be (Original Mean ± k).

Q3. Answer: (b) 62

The Venn diagram is given below:-

• No. of students who play only basketball = 20

• No. of students who play basketball and football = 13

• No. of students who play basketball and hockey = 14.

• No. of students who play basketball, football, and hockey = 12

• Thus, total students who play basketball in the class = 20 + 13 + 14 + 15 = 62

Hence, "option 2" is the correct answer.

Q4. Answer: (b) Calcium phosphate

The correct answer is Calcium phosphate.

• Dentin (tooth enamel) is made of Calcium and Phosphate.

Key Points

• Dentin is a composite substance of organic and inorganic material found in the tooth's interior.

• Dentin is pale yellow and becomes darker with age.

• It constitutes the bulk of the tooth, providing its structure and protecting the more sensitive pulp inside of it.

• It is one of the major components of human teeth. When dentin is damaged or exposed, a variety of problems can occur, such

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as tooth sensitivity.

Additional Information

• Dentin is one of four major components of a tooth.

• The other layers of a tooth include:

• Enamel: Calcified tissue that acts as a protective barrier for the crown of the tooth. It is the hardest substance in the human body, composed of hydroxyapatite crystals (calcium and phosphate ions).

• Dental pulp: This soft tissue forms the tooth's inner core, containing the blood vessels and nerves.

• Cementum: Forms a tough, protective covering of the root of the tooth, anchoring it in the jaw bone.

Q5. Answer: (b) Rs 264

Shortcut Trick

Area of circular floor = Total Cost ÷ Rate = 1540 ÷ 10 = 154 m^2.

For a circle, if Area = 154, then Radius (r) = 7 and Circumference (2πr) = 44.

Fencing Cost = Circumference × Rate = 44 × 6 = Rs. 264.

Therefore The correct answer is Rs. 264.

Alternate Method

Given: Total installation cost = Rs. 1540, Rate = Rs. 10/m^2, Fencing rate = Rs. 6/m.

Formula Used: Area = πr^2; Circumference = 2πr; Total Cost = Area/Length × Rate.

=> Area of floor = 1540 ÷ 10 = 154 m^2

=> (22/7) × r^2 = 154

=> r^2 = (154 × 7) ÷ 22 = 7 × 7 = 49

=> Radius (r) = 7 m

=> Circumference = 2 × (22/7) × 7 = 44 m

=> Cost of fencing = 44 × 6 = Rs. 264

Therefore The correct answer is Rs. 264.

Additional Information

Standard Circle Dimensions

If radius r = 7, then Circumference = 44 and Area = 154. This ratio helps solve circular problems faster.

Area and Circumference Formulas

Area of circle = πr^2; Perimeter (Circumference) of circle = 2πr or πd, where d is the diameter.

Cost Calculation

Cost of flooring/plastering depends on Area, whereas cost of fencing/bordering depends on Perimeter.

Q6. Answer: (a) Gravitational force

The correct answer is Gravitational force.

• The motion of the moon around the earth is due to gravitational force.

Key Points

• The gravitational attraction provides the centripetal force needed to keep planets in orbit around the Sun and all types of satellites in orbit around the Earth.

• The Earth's gravity keeps the Moon orbiting us. It keeps changing the direction of the Moon's velocity.

• The moon has two movements, the first is that it will revolve around itself in its own axis and the second, it will move around the Earth.

• The moon takes 30 days to move around the Earth and it can be observed in the sky for 15 days and another 15 days it will be another side of the Earth that we cannot see.

Additional Information

• Centrifugal force:

• Centrifugal force is a pseudo force in a circular motion which acts along the radius and is directed away from the center of the circle. The force does not exist when measurements are made in an inertial frame of reference.

• Centripetal force:

• A centripetal force is a force that makes a body follow a curved path. Its direction is always orthogonal to the motion of the body and towards the fixed point of the instantaneous centre of curvature of the path.

• Nuclear force:

• The nuclear force is a force that acts between the protons and neutrons of atoms. Neutrons and protons, both nucleons, are

affected by the nuclear force almost identically.

Q7. Answer: (b) Each and Every

The correct answer is Each and Every.

• Gravitational force exists between each and every object, but it cannot be felt unless the mass of the objects is very high, such as in planets.

Key Points

• Gravity, also called gravitation, in mechanics, is the universal force of attraction acting between all matter.

• On Earth, all bodies have a weight, or downward force of gravity, proportional to their mass, which Earth's mass exerts on them.

• Gravity is measured by the acceleration that it gives to freely falling objects.

Additional Information

• Universal Gravitation Equation.

• This equation describes the force between any two objects in the universe:

• F is the force of gravity (measured in Newtons, N).

• G is the gravitational constant of the universe and is always the same number.

• M is the mass of one object (measured in kilograms, kg).

• m is the mass of the other object (measured in kilograms, kg).

• r is the distance those objects are apart (measured in meters, m).

Formula:

Newton's law of Universal Gravitation

$F=G (m1 m2)/(r^2)$

where, F = force, G = Gravitational constant, m1 = mass of object 1, m2 = mass of object 2, r = distance between centers of masses

Q8. Answer: (b) Maharashtra

The correct answer is Maharashtra.

• Sanjay Gandhi National Park is in Maharashtra.

Key Points

• Sanjay Gandhi National Park is a protected area in Mumbai, Maharashtra State in India. It was established in 1969 with headquarters at Borivali.

• Previously the park was named Krishnagiri National Park in the pre-independence era. At that time the area of the park was only 20.26 sq. km.

• In 1969, the park was expanded to its present size by acquiring various reserve forest properties adjoining the park.

• After this, an independent unit of the Forest Department called Borivali National Park Sub-division administered the area.

• Krishnagiri National Park was created in 1974 and later renamed Borivali National Park.

• In 1981, it was re-dedicated as Sanjay Gandhi National Park in memory of Sanjay Gandhi, the son of ex-Prime Minister of India Indira Gandhi.

Additional Information

State	National Parks
Haryana	• Sultanpur National Park (Gurugram)
Rajasthan	• Ranthambore National Park. - Sariska National Park. - Gajner Wildlife Sanctuary.
Maharashtra	• Chandoli National Park. - Gugumal National Park. - Navegaon National Park.
Karnataka	• Bannerghatta National Park. - Bandipur National Park. - Nagarhole National Park.

Q9. Answer: (c) Only I follows

The logical Venn diagram is given below:-

Conclusion:

I. Some girls are sisters. → True (this can be seen in the Venn diagram; girls that are doctors are sisters)

II. All sisters are girls. → False (it is possible but not definite.)

Hence, "option 3" is the correct answer.

Q10. Answer: (d) Quaternary Atom

The correct answer is Quaternary Atom.

• Quaternary Atom is the atomicity of phosphorus.

Key Points

• Atomicity is the number of atoms of an element present in one molecule of that element.

• The number of atoms present in a molecule of phosphorus is 4. So the atomicity of phosphorus is 4.

Additional Information

• Atomicity is defined as the total number of atoms present in a molecule.

• Atomicity, molecules can be classified as below:

• Monatomic: Composed of one atom e.g. He, Ne, Ar, Kr (all noble gases are monatomic).

• Diatomic: Composed of two atoms e.g. H_2, N_2, O_2, F_2, Cl_2 (all halogens are usually diatomic).

• Triatomic: Composed of three atoms e.g. O_3.

• Polyatomic: Composed of three or more atoms e.g. P_4, S_8.

Q11. Answer: (c) 24 cm

Shortcut Trick

For two intersecting chords in a circle, the product of their segments is equal.

Logic: Product of segments of chord AB = Product of segments of chord CD

4 × 15 = 60

Required segment DE = 60 ÷ 2.5

DE = 24 cm

Therefore The correct answer is 24 cm.

Alternate Method

Given: AE = 4 cm, BE = 15 cm, CE = 2.5 cm.

Formula Used: AE × BE = CE × DE (Intersecting Chords Theorem)

E

A

B

C

D

O

4 cm

15 cm

2.5 cm

DE = ?

Q12. Answer: (a) Ni; Cr

The correct answer is Ni; Cr.

• When iron is mixed with Ni and Cr, we get stainless steel.

• Stainless steel is steel containing at least 10.5% chromium, less than 1.2% carbon, and other alloying elements.

Key Points

• Stainless steel is an alloy of Iron, Nickel, and chromium. This alloy makes the metal strong, durable, and corrosion-resistant.

• Stainless steel is an alloy of iron, chromium, and nickel.

• Because of the interactions between the atmosphere and its alloying components, stainless steel is known to remain stainless and avoid rusting.

• Chromium plays an important role in the production of stainless steel. It gives hardness to the stainless steel and makes it tough. It improves corrosion resistance, particularly at high temperatures.

Additional Information

Q13. Answer: (b) 17/18

Given:

(2/3 × 4/6) + (5/3 × 7/10) - (11/2 × 4/33)

Concept used:

Calculation:

(2/3 × 4/6) + (5/3 × 7/10) - (11/2 × 4/33)

=> 4/9 + 7/6 - 2/3

=> 17/18

Therefore The required value of (2/3 × 4/6) + (5/3 × 7/10) - (11/2 × 4/33) is 17/18.

Q14. Answer: (d) G

The logic followed here is:-

Hence, "option 4" is the correct answer.

Q15. Answer: (d) Eight

The correct answer is Eight.

• Eight positions of India in the Most Valuable Nation Brands list as per the Brand Finance 'Nation Brands 2017' list.

Key Points

• The NBI looks at each nation's reputation along six dimensions of national competence:

• The Anholt Ipsos Nation Brands Index is a global nation brand survey. The NBI examines the images of around 50 nations each year, by conducting online interviews with 20,000 adults aged 18 and over, in 20 core panel countries.

• The NBI looks at each nation’s reputation along six dimensions of national competence: Exports, Governance, Culture, People, Tourism, Immigration, and Investment. Together these provide an overall indication of a nation’s reputation.

• The Scottish Government subscribed to the NBI in 2008 (collecting baseline data reported in the NPF) and 2009 and has subscribed on a biannual basis since 2010.

Additional Information

• Most valuable nation brands worldwide in 2021:

Q16. Answer: (b) 75

Given:

There is a number whose 12% is 9

Concept used:

Application of percentage

Calculation:

Let the number P.

According to the question,

P × 12% = 9

=> P = 75

Therefore 12% of 75 is 9.

Q17. Answer: (c) West

The diagram is given below:-

• Mr Z facing west at point B.

Hence, "option 3" is the correct answer.

Q18. Answer: (a) QFMR

The logic followed here is:-

Similarly,

Hence, "option 1" is the correct answer.

Q19. Answer: (a) 98283

The logic followed here is:-

• Code of a letter = digit in the units place of its positional value - 1

• Similarly,

Hence, "option 1" is the correct answer.

Q20. Answer: (c) 11

The figure is given below:-

• The minimum number of lines to make the question figure is 11.

Hence, "option 3" is the correct answer.

Q21. Answer: (a) I am That Woman

The correct answer is I am That Woman.

• The Union Ministry of Women and Child Development has launched an online campaign with an aim to end gender bias against women is I am that women.

Key Points

• The Union Ministry of Women and Child Development (WCD) has launched an online campaign #IamThatWoman to end gender bias in women against women.

• Through the campaign, the Ministry seeks to highlight the various aspects of women standing by and for women.

• The purpose of the campaign is to shed light on the enormous contributions made by women for women.

Additional Information

• Twitter and Facebook users have been encouraged to tag and share stories of women helping women with a photograph and post online with the hashtag #IamThatWoman.

Q22. Answer: (b) Rs 18,000

Shortcut Trick

Net profit % = (Part1 × Profit1%) − (Part2 × Loss2%)

Net profit % = (2/3 × 6%) − (1/3 × 3%) = 4% − 1% = 3%

According to the question, 3% of Total Cost = Rs 540

1% = 540 ÷ 3 = Rs 180

100% (Total Cost) = 180 × 100 = Rs 18,000

Therefore The correct answer is Rs 18,000.

Alternate Method

Given: 2/3 part sold at 6% profit, 1/3 part sold at 3% loss, Total profit = Rs 540.

Formulas: Profit = SP − CP | Profit% = (Profit ÷ CP) × 100 | Total Profit = Profit1 − Loss2

=> Let the Total Cost Price be 300x.

=> CP of 2/3 part = 2/3 × 300x = 200x. Profit on this = 6% of 200x = 12x.

=> CP of remaining 1/3 part = 100x. Loss on this = 3% of 100x = 3x.

=> Net Profit = 12x − 3x = 9x.

=> Given 9x = 540 => x = 60.

=> Total Cost = 300 × 60 = Rs 18,000.

Therefore The correct answer is Rs 18,000.

Additional Information

Weighted Average Profit

When different parts of an inventory are sold at different profit/loss rates, the overall profit/loss% is the weighted average of the individual rates.

Cost Price Calculation

Total Cost Price = (Total Profit Amount × 100) ÷ (Overall Profit Percentage).

Q23. Answer: (a) 2014

The correct answer is 2014.

• In 2014 the initiative “Swachh Bharat Abhiyan” was introduced by the Government of India.

Key Points

• Swachh Bharat Abhiyan is a national level campaign by the Government of India covering 4041 statutory towns to clean the streets, roads and infrastructure of the country.

• The campaign is India's biggest ever cleanliness drive and 3 million government employees and schools and colleges students of India participated in this event.

• On 2nd October 2014, Swachh Bharat Mission was launched throughout length and breadth of the country as a national

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movement.

• The campaign aims to achieve the vision of a Clean India by 2nd October 2019.

• The mission aims to cover 1.04 crore households, provide 2.5 lakh community toilets, 2.6 lakh public toilets, and a solid waste management facility in each town.

Additional Information

• Objectives of Swachh Bharat Abhiyan:

• Villages to be kept clean with Solid and Liquid Waste Management.

• Construction of individual, cluster and community toilets.

• To eliminate or reduce open defecation. Open defecation is one of the main causes of deaths of thousands of children each year.

• Solid and liquid waste management through gram panchayats.

• To provide toilets, separately for Boys and Girls in all schools by 15.8.2015.

Q24. Answer: (d) Rs 121.80

Shortcut Trick

For 2 years, use the effective rate of interest formula: Effective Rate = x + y + (x × y)/100.

Effective Rate = 3 + 3 + (3 × 3)/100 = 6 + 0.09 = 6.09%.

Compound Interest (CI) = Principal × Effective Rate / 100.

CI = 2000 × 6.09 / 100 = 20 × 6.09 = Rs. 121.80.

Therefore The correct answer is Rs. 121.80.

Alternate Method

Given:

Principal (P) = Rs. 2,000

Rate (R) = 3% p.a.

Time (n) = 2 years

Formula Used:

Amount (A) = $P(1 + R/100)^n$

Compound Interest (CI) = Amount (A) − Principal (P)

Calculations:

=> Amount (A) = $2000 \times (1 + 3/100)^2$

=> A = $2000 \times (103/100) \times (103/100)$

=> A = $2000 \times 1.03 \times 1.03$

=> A = 2000×1.0609

=> A = Rs. 2,121.80

=> CI = A − P

=> CI = 2121.80 − 2000

=> CI = Rs. 121.80

Therefore The correct answer is Rs. 121.80.

Additional Information

CI − SI Difference for 2 Years

The difference between compound interest and simple interest for 2 years is given by $P(R/100)^2$.

Effective Interest Rate

For successive growth over n years, the total percentage change is the compound interest rate equivalent.

Quarterly and Half-Yearly Compounding

For half-yearly, R becomes R/2 and n becomes 2n. For quarterly, R becomes R/4 and n becomes 4n.

Q25. Answer: (b) 15 hours

Shortcut Trick

Net efficiency = Efficiency of A + Efficiency of B − Efficiency of C.

Using LCM of 5, 15, and 5 = 15 units as Total Work.

Efficiencies: A = 3, B = 1, C = 3.

Combined efficiency = 3 + 1 − 3 = 1 unit/hr.

Time required = 15 ÷ 1 = 15 hours.

Therefore The correct answer is 15 hr.

Alternate Method

Given: Filling time Tap A = 5 hr, Tap B = 15 hr; Emptying time Tap C = 5 hr.

Person	Days	Total Work	Efficiency
Tap A (Filling)	5	15	3
Tap B (Filling)	15	1	
Tap C (Emptying)	5	−3	

=> Total Work (LCM of 5, 15, 5) = 15 units.

=> Total Efficiency = Efficiency(A) + Efficiency(B) + Efficiency(C)

=> Total Efficiency = 3 + 1 + (−3) = 1 unit/hr.

=> Time taken = Total Work ÷ Total Efficiency

=> Time taken = 15 ÷ 1 = 15 hr.

Therefore The correct answer is 15 hr.

Additional Information

Pipes and Cisterns Efficiency

Filling pipes have positive efficiency, while leakage/outlet pipes have negative efficiency.

Net Work Formula

If two pipes fill in x and y hours and one empties in z hours, the part filled in 1 hour is (1/x + 1/y − 1/z).

Time and Work Relation

Time is inversely proportional to Efficiency; Total Work = Efficiency × Time.

Q26. Answer: (d) Pandya

The correct answer is Pandya.

• Pandya ruled the region around Madurai and attained supremacy in the thirteenth century.

Key Points

• The Pandyas established their dynastic rule in southern Tamil Nadu by the end of the sixth century CE after Kalabhras.

• The foundation for the Pandya supremacy in south India was laid by Maravarman Sundara I.

• Pandya ruled initially from Korkai, a seaport on the southernmost tip of the Indian peninsula, and in later times moved to Madurai.

• Jatavarman Sundara Pandyan expanded their empire into the Telugu country and invaded Sri Lanka to conquer the northern half of the island.

• The Pandyan Kingdom finally became extinct after the establishment of the Madurai Sultanate in the 14th century CE.

Additional Information

Dynasty	Description
Rajput	• This Rajput dynasty was founded by Simharaj, who is famously known as the founder of the city of Ajmer. - Prithviraj Chauhan was considered the greatest of all Chauhan rulers. - The Rajputs became prominent in the early medieval period in about the seventh century and dominated in regions now known as Rajasthan, Delhi, Haryana, Western Gangetic plains, and Bundelkhand.
Chola	• The Chola dynasty was a Tamil dynasty that ruled primarily in southern India until the 13th century. - The dynasty originated in the fertile valley of the Kaveri River. - Karikala Chola was the most famous among the early Chola kings, while Rajaraja Chola, Rajendra Chola, and Kulothunga Chola I were famous emperors of the medieval Cholas.
Chera	• The founder of the Chera dynasty was Uthiyan Cheral Athan. - The Chera dynasty was one of the principal lineages to have ruled over southern India in early history. - The Cheras controlled the central and northern parts of Kerala and the Kongu region of Tamil Nadu.

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Q27. Answer: (c) B

The logic followed here is:-

• Figure 1 to Figure 2: lines inside the internal square are interchanged with the lines inside the external square

Similarly,

• Figure 3 to Figure 4: lines inside the internal circle should be interchanged with the lines inside the external square

• Therefore, figure B will be the next figure.

• Hence, "option 3" is the correct answer.

Q28. Answer: (c) 20

Shortcut Trick

Initial clerks = 1/4 of total; Non-clerks = 3/4 of total.

Remaining clerks = 3/4 of initial clerks = 3/4 × 1/4 = 3/16 of original total.

Remaining total = 3/4 (non-clerks) + 3/16 (clerks) = 15/16 of original total.

Required % = (3/16 ÷ 15/16) × 100 = (3/15) × 100 = 20%.

Therefore The correct answer is 20%.

Alternate Method

Given:

Total employees = 6400

Initial Clerk employees = 1/4 × 6400 = 1600

Non-clerk employees = 6400 − 1600 = 4800

Calculations:

=> Reduction in clerks = 1/4 × 1600 = 400

=> Remaining clerks = 1600 − 400 = 1200

=> Total remaining employees = 1200 (clerks) + 4800 (non-clerks) = 6000

=> Required Percentage = (Remaining clerks ÷ Total remaining employees) × 100

=> Required Percentage = (1200 ÷ 6000) × 100

=> Required Percentage = 1/5 × 100 = 20%

Therefore The correct answer is 20%.

Additional Information

Percentage Change

Percentage change = (Change / Original Value) × 100. It is used to express the relative change in a quantity.

Successive Percentage

When a value is changed by a% and then by b%, the net change is [a + b + (ab/100)]%.

Fraction to Percentage Conversion

1/2 = 50%, 1/3 = 33.33%, 1/4 = 25%, 1/5 = 20%, 1/6 = 16.66%.

Q29. Answer: (a) Rs 5000

The total expenditure is Rs. 50,000.

The expenditure on transportation = (50000 × 10%) = Rs. 5000

Therefore The expenditure on transportation is Rs. 5000.

Q30. Answer: (d) D

The logic followed here is:-

• In figure A, the inner square is shaded and the outer square is not.

• In figure B, the inner pentagon is shaded and the outer square is not.

• In figure A, the inner pentagon is shaded and the outer square is not.

• In figure D, the outer square is shaded and the inner triangle is not.

So figure D is different from others.

Hence, "option 4" is the correct answer.

Q31. Answer: (d) 144°

Total pie chart that 360° circle represents 100% of the data.

So, the share of the segment corresponding to the sales of 'Others' = 360/100 × 40 = 144°

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Therefore The share of the segment corresponding to the sales of 'Others' is 144°.

Q32. Answer: (c) Sikkim

The correct answer is Sikkim.

• Oscar-winning composer A.R. Rahman has become the official brand ambassador of Sikkim state.

Key Points

• AR Rahman was born on 6 January 1967, is an Indian film composer, record producer, singer, and songwriter who works predominantly in Tamil and Hindi films.

• In 2010, the Indian government awarded him the Padma Bhushan.

• In 1992, he was approached by director Mani Ratnam to compose the score and soundtrack for his Tamil film, Roja.

• Rahman's film career began in 1992 when he started Panchathan Record Inn, a recording and mixing studio in his backyard.

Additional Information

State	Chief Minister	Brand ambassador
Arunachal Pradesh	Pema Khandu	Sanjay Dutt
Assam	Himanta Biswa Sarma	Priyanka Chopra
Manipur	N. Biren Singh	Mirabai Chanu

Q33. Answer: (a) Kinetic energy

The correct answer is Kinetic Energy.

Key Points

• Kinetic energy is a form of energy that an object or a particle has by reason of its motion.

• If work, which transfers energy, is done on an object by applying a net force, the object speeds up and thereby gains kinetic energy.

• There are many forms of kinetic energy, vibrational (the energy due to vibrational motion), rotational (the energy due to rotational motion), and translational (the energy due to motion from one location to another).

• Kinetic energy is a scalar quantity, it does not have a direction. Unlike velocity, acceleration, force, and momentum, the kinetic energy of an object is completely described by magnitude alone.

Additional Information

• Kinetic Energy Concept:

Q34. Answer: (d) Collenchyma

The correct answer is Collenchyma.

• The permanent tissue that provides elasticity is called Collenchyma.

Key Points

• Collenchyma cells are long elongated cells with an irregular thick wall. They have thick walls which provide support and elasticity to the plant's part.

• They provide structural support and flexibility to the growing stems. It acts as a supporting tissue in the stems of young plants. It provides mechanical support, elasticity, and tensile strength to the plant body.

• Elasticity is provided by collenchyma because of the presence of hydrated pectin in their cell walls.

• Collenchyma consists of narrow cells.

Additional Information

• Collenchyma mainly provides mechanical strength to the growing plant parts.

• Collenchyma generally occurs in the hypodermis of the dicot stem. It is absent in the roots and also occurs in petioles and pedicels.

Q35. Answer: (c) 1.04

Given:

2.06 and 3.1

Calculation:

So, (3.10 - 2.06) = 1.04 should be added.

Therefore 1.04 should be added to 2.06 to get 3.1.

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Q36. Answer: (d) 7/12 th

Shortcut Trick

Total cake = LCM of denominators (12 and 3) = 12 units.

Nalini ate = 1/12 × 12 = 1 unit.

Tanvi ate = 1/3 × 12 = 4 units.

Rashi ate = 12 − (1 + 4) = 7 units.

Share of Rashi = 7/12th.

Therefore The correct answer is 7/12 th.

Alternate Method

Given:

Share of Nalini = 1/12

Share of Tanvi = 1/3

Formula Used:

Remaining share = 1 − (Sum of individual shares)

Calculations:

=> Total share consumed by Nalini and Tanvi = 1/12 + 1/3

=> Total share = (1 + 4)/12 = 5/12

=> Share of Rashi = 1 − 5/12

=> Share of Rashi = (12 − 5)/12

=> Share of Rashi = 7/12

Therefore The correct answer is 7/12 th.

Additional Information

Addition of Fractions

To add fractions with different denominators, find the Least Common Multiple (LCM) to make denominators common.

Total Representation

In fraction-based problems, the whole entity is always represented as 1 or 100%.

Ratio Conversion

If required, the ratio of shares of Nalini, Tanvi, and Rashi is 1 : 4 : 7.

Q37. Answer: (c) Kinetic energy

The correct answer is Kinetic Energy.

• Kinetic energy increases with speed.

Key Points

• Kinetic energy is seen when the object is in motion. Energy is exerted on the object in order to make it move.

• The kinetic energy of the object is dependent on the mass of the object and the speed at which it moves.

Kinetic Energy Concept:

Additional Information

• Chemical energy:

• Chemical energy is energy stored in the bonds of chemical compounds, like atoms and molecules. This energy is released when a chemical reaction takes place.

• Potential energy:

• Potential energy, stored energy that depends upon the relative position of various parts of a system. Spring has more potential energy when it is compressed or stretched.

• Electrical energy:

• Electrical energy is energy derived as a result of the movement of electrically charged particles. This energy is supplied by the combination of electric current and electric potential that is delivered by an electrical circuit.

Q38. Answer: (c) 10 cm

The correct answer is 10 cm.

Concept:

• Concave mirror: The mirror in which the rays converge after falling on it is known as the concave mirror.

• Concave mirrors are also known as converging mirror.

• The focal length of a concave mirror is negative according to the sign convention.

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• Mirror Formula: The following formula is known as the mirror formula:

1/f=1/u+1/v

where,

f = focal length

v = the distance of the image from the mirror,

u = the distance of the object from the mirror.

Calculation:

Here the rays of the sun are focussed at 5 cm away from the mirror, so the focus of the mirror is 5 cm.

f = -5 cm

u = -10 cm

v = ?

We know that,

1/f=1/u+1/v

=> 1/(-5)=1/(-10)+1/v

=> v = -10 cm i.e in front of the mirror

Alternate Method When the object is at double the focus point i.e at C, then the image is also formed at C in concave mirror.

Hence the image is at 10 cm

Additional Information

Position of object	Position of image	Nature of image	Ray diagram
(i) At infinity	At focus	Real, Inverted and diminished	
(ii) Beyond C	Between F and C	Real, Inverted and diminished	
(iii) At C	At C	Real, Inverted and same size	
(iv) Between F and C	Beyond C	Real, Inverted and enlarged	
(v) At F	At Infinity	Real Inverted and highly enlarged	
(vi) Between F and P	Behind the mirror	Virtual, enlarged and erect image	

Q39. Answer: (d) 1

The logic followed here is:-

• Figure A to figure B: Hexagon changes to pentagon (one side decreased); no. of circles increases by 1 and only the middle circle is shaded

Similarly,

• Figure C to figure D: Square should change to triangle (one side decreases); no. of circles should increase by 1 and only the middle circle will be shaded. This condition is satisfied by figure 1.

Hence, "option 4" is the correct answer.

Q40. Answer: (d) HF

The correct answer is HF.

Key Points

• Silica is soluble in HF.

• Silica is the name given to a group of minerals composed of silicon and oxygen, the two most abundant elements in the earth's crust.

• Silica is found commonly in the crystalline state and rarely in an amorphous state.

• It is composed of one atom of silicon and two atoms of oxygen resulting in the chemical formula SiO_2.

• Silica exists in nine different crystalline forms or polymorphs with the three main forms being quartz, which is by far the most common, tridymite and cristobalite.

Additional Information

• Hydrofluoric acid has the ability to dissolve (most) oxides, glass, and silicates.

• $SiO_2+6HF \rightarrow H_2SiF_6+2H_2O$.

• The dissolution process of silica and silicates from rocks into water is mainly due to the hydrolysis of silica-oxygen-silica bonds,

resulting in the liberation of silicic acid (Si(OH)4) and silicates into the aqueous phase.

Important Points

Element	Details
HNO3	• Nitric acid (HNO3). A colourless liquid that is used in the manufacture of inorganic and organic nitrates and nitro compounds for fertilizers, dye intermediates, explosives, and many different organic chemicals.
H2SO4	• Sulphuric acid is highly acidic. Therefore, it is used in the cleaning of metals, removal of impurities from oil, manufacturing of chemicals nitric acid, hydrochloric acid, synthesis of dye, drugs, detergents, explosives, etc.
HCl	• Hydrogen chloride (HCl), a compound of the elements hydrogen and chlorine, is a gas at room temperature and pressure. A solution of the gas in water is called hydrochloric acid.

Q41. Answer: (c) Manjuli Island

The correct answer is Manjuli Island.

• In December 2017, the central government launched a new scheme to protect Manjuli Island from floods and erosion in Assam.

Key Points

• The scheme was sanctioned by Government in March 2017 and funding for it will be from the Ministry of Development of the North Eastern Region (DoNER).

• The major components of the scheme include are:

• Bank revetment with geo bags filled with earth/sand for a reach length of 27 km in 14 locations.

• RCC porcupine works in 41 locations.

• Construction of a sluice.

• Construction of a Pilot channel of the length of 3.50 km.

Additional Information

• Manjuli Island:

• Majuli Island is the largest river island in the world and the first island district in the country.

• It is formed by the Brahmaputra River in the south and Kherkutia Xuti, another branch of Brahmaputra, joined by Subansiri River in the north.

• Geomorphologically, the entire Majuli island is part of the alluvial flood plains of the Brahmaputra river.

• The problem of erosion was exacerbated after the 1950 disastrous earthquake and has become a severe environmental issue as it remains mostly uncontained.

Q42. Answer: (d) 405 C

The correct answer is 405C.

Key Points

• A filament of an electric bulb carries a current of 0.75 A in 9 minutes. Find the amount of electric charge flowing through the current;

• Current (I): 0.75 A.

• Time (t): 9 minutes.

• Time in minutes can be converted into seconds as follows.

• Time (t) = 9 × 60

• t = 540 sec

• Q = I X t

• Q = 0.75 X 540

• Q = 405C

Q43. Answer: (b) Gujarat

The correct answer is Gujarat.

• Essar Steel Limited, Hazira is located in Gujarat.

Key Points

• Essar Steel was a steel manufacturing company of the Essar Group of Companies.

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• Its main subsidiary was Essar Steel India Limited, a fully integrated flat carbon steel manufacturer based in Mumbai, which owned and operated a steel mill in Hazira, Surat district of Gujarat state.

• In addition, it had also a beneficiation plant at Bailadilla, Chhattisgarh, and pellet plants at Visakhapatnam, Andhra Pradesh, and Paradeep, Odisha.

• Essar Steel India Limited was acquired by ArcelorMittal Nippon Steel India Limited. Aditya Mittal is the Chairman of ArcelorMittal Nippon Steel and Dilip Oommen is the CEO.

Additional Information

• Hazira:

• Hazira is a suburb and a transshipment port in Surat City in the Gujarat state of India. It is the westmost end of Surat.

• Hazira is one of the major ports of India and the most important element of the Surat Metropolitan Region.

Important Points

State	Chief Minister
West Bengal	• Mamata Banerjee
Gujarat	• Bhupendrabhai Patel
Odisha	• Naveen Patnaik.
Jharkhand	• Hemant Soren.

Q44. Answer: (c) Only argument I is strong

• Argument I agrees with the statement and justifies it by explaining that dental treatment is costly so it will be good for the employees if covered by insurance. So, Argument I is strong.

• Argument II disagrees with the statement. It would be unreasonable if necessary cosmetic changes that are expensive are not considered. Minor cosmetic changes are inevitable sometimes in treatments like burns and injuries too. So, argument II is not strong.

Hence the correct answer is option 3.

Q45. Answer: (b) M.N. Roy

The correct answer is M.N. Roy.

• M.N.Roy first gave the idea of Constituent Assembly for India.

Key Points

• An official demand for a Constituent Assembly to frame the Constitution of India was made for the first time by Indian National Congress in 1935.

• Finally, in 1940, this demand was accepted by the British Government in the August Offer.

Additional Information

• The idea of a Constituent Assembly for India for the first time was put forward by M.N. Roy was a pioneer of the communist movement in India in 1934.

• On behalf of the Indian National Congress, Jawaharlal Nehru declared that the Constitution of free India must be framed by a Constituent Assembly elected on the basis of the adult franchise without outside interference.

• At the point when this interest was acknowledged by the August Offer Sir Stafford Cripps, an individual from the bureau, came to India in 1942 with a draft proposal of the British Government on the outlining of an autonomous Constitution to be received after World War II.

• As the Muslim League wanted India to be divided into two autonomous states with two separate Constituent Assemblies, thus they rejected the Cripps Proposals.

• Under this scheme formulated by the Cabinet Mission Plan, in November 1946, the Constituent Assembly was constituted. The Constituent Assembly was to be a partly nominated and partly elected body.

Important Points

• The elections to the Constituent Assembly were held in July-August 1946.

• 208 seats were won by the Indian National Congress, 73 seats by the Muslim League, and 15 by the small groups and independents.

• However, the princely states were allotted 93 seats but these were not filled as they decided to stay away from the Constituent Assembly.

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Q46. Answer: (d) D

The logic followed here is:-

• - arrow moves 90° clockwise direction in each step.

• moves 90° anticlockwise direction in each step

• Hence, "option 4" is the correct answer.

Q47. Answer: (c) 1

Given:

(-√(144/576)) × - (16/√64)

Calculation:

(-√(144/576)) × - (16/√64)

=> (-12/24) × (-16/8)

=> 1

Therefore The required value of (-√(144/576)) × - 16/√64 is 1.

Q48. Answer: (a) Nitesh Tiwari

The correct answer is Nitesh Tiwari.

• Nitesh Tiwari was awarded the Best Director Award for the film Dangal for the 64th National Awards 2017.

• 16-year-old Zaira Wasim, who played Aamir Khan's on-screen daughter in Dangal, won her first National Award. Zaira won the award for her portrayal of young Geeta Phogat.

Key Points

• Nitesh Tiwari is a writer and director, known for Dangal (2016), Chhichhore (2019) and Bareilly Ki Barfi (2017).

• He made his directorial debut by co-directing Chillar Party (2011) which won the National Film Award for Best Children's Film for that year.

• In 2016, Tiwari scripted and directed Dangal which was screened at the Beijing International Film Festival in April 2017 and second BRICS festival in June 2017.

• Nitesh Tiwari Awards are:

• National Film Award for Best Feature Film in Hindi (2021).

• Filmfare Award for Best Director (2017).

• National Film Award for Best Screenplay (2012).

• Screen Award for Best Dialogue (2017).

Q49. Answer: (a) 1/R = P - Q

Shortcut Trick

Net Speed = Original Speed − Decrease in Speed = P − Q km/h.

Using Speed = Distance ÷ Time.

P − Q = 1 ÷ R.

Therefore The correct answer is 1/R = P − Q.

Alternate Method

Given:

Original Speed = P km/h

Reduction in Speed = Q km/h

Distance = 1 km

Time = R hours

Formula Used:

Speed = Distance / Time

Calculations:

=> Effective Speed = P − Q

=> (P − Q) = 1 / R

=> 1/R = P − Q

Therefore The correct answer is 1/R = P − Q.

Additional Information

Speed-Distance-Time Relation

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Distance = Speed × Time. If distance is constant, speed is inversely proportional to time (S prop. to 1/T).

Relative Speed

When two objects move in the same direction, relative speed is the difference of their speeds. Here, the reduction acts as a negative factor on the movement.

Average Speed

Average Speed = Total Distance ÷ Total Time. For different speeds over equal distances, Avg Speed = 2v1v2 ÷ (v1 + v2).

Q50. Answer: (a) Khel Ratna Award

The correct answer is Khel Ratna Award.

• The National Sports Award for continuous outstanding performance for four years is Khel Ratna Award.

Key Points

• Khel Ratna Award:

• Khel Ratna Award is the highest sporting honor of India. It is awarded annually by the Ministry of Youth Affairs and Sports.

• As of 2020, the award comprises a medallion, a certificate, and a cash prize of Rs 25 lakh.

• Khel Ratna Award was established in 1991–1992.

• The award since August 6, 2021, is named after Major Dhyan Chand, an Indian field hockey player, widely regarded as one of the greatest field hockey players of all time.

• The Khel Ratna Award was first received by Viswanathan Anand in the chess game 1992.

Additional Information

• Arjuna Award:

• The Arjuna Award for Outstanding Performance in Sports and Games is the second-highest sporting honor of India.

• It was established in 1961.

• Dronacharya Award:

• The Dronacharya Award for Outstanding Coaches in Sports and Games in the sports coaching honor of the Republic of India.

• It was established in 1985.

Q51. Answer: (d) Phenotype

The correct answer is Phenotype.

• The word denotes physical characteristics Phenotype.

Key Points

• The term phenotype refers to the observable physical properties of an organism, these include the organism's appearance, development, and behavior.

• An organism's phenotype is determined by its genotype, which is the set of genes the organism carries, as well as by environmental influences upon these genes.

• Due to the influence of environmental factors, organisms with identical genotypes, such as identical twins, ultimately express nonidentical phenotypes because each organism encounters unique environmental influences as it develops.

• Examples of phenotypes include height, wing length, and hair color.

Additional Information

• Genotype:

• A genotype is an individual's collection of genes.

• The genotype is expressed when the information encoded in the genes' DNA is used to make protein and RNA molecules.

• Monotype:

• A monotypic species is one that does not include subspecies or smaller, infraspecific taxa.

• a monotypic genus is a genus in the special case where a genus and a single species are simultaneously described.

Q52. Answer: (a) Rs. 3,96,000

Shortcut Trick

Total Annual Sales = Monthly Sales × 12 = 60,000 × 12 = 7,20,000.

Espresso Sales = 55% of Total Annual Sales.

Espresso Sales = 0.55 × 7,20,000.

Espresso Sales = 3,96,000.

Therefore The correct answer is Rs. 3,96,000.

Alternate Method

Given: Average monthly sales = Rs. 60,000, Espresso sales percentage = 55%.

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Formulas: Annual Sales = Monthly Sales × 12 | Required Value = (Percentage ÷ 100) × Total Value.

=> Monthly sales from Espresso = 55% of 60,000

=> Monthly Espresso sales = (55 ÷ 100) × 60,000 = 55 × 600 = Rs. 33,000

=> Annual sales from Espresso = Monthly Espresso sales × 12 months

=> Annual Espresso sales = 33,000 × 12 = Rs. 3,96,000

Therefore The correct answer is Rs. 3,96,000.

Additional Information

Percentage Calculation

To find x% of a value y, use the formula: (x × y) ÷ 100.

Annual Conversion

Always ensure the time period matches the question requirement (1 year = 12 months).

Q53. Answer: (d) 49

Shortcut Trick

Total ratio parts = 4 (Males) + 7 (Women) = 11 units.

Given, 11 units = 77 People.

1 unit = 77 ÷ 11 = 7.

Total Women = 7 units × 7 = 49.

Therefore The correct answer is 49 women.

Alternate Method

Given:

Total number of People = 77

Ratio of Males to Women = 4 : 7

Formula Used:

Value of a specific part = (Ratio of part ÷ Sum of ratios) × Total value

Calculations:

=> Sum of ratio parts = 4 + 7 = 11

=> Number of Women = (7 / 11) × 77

=> Number of Women = 7 × 7

=> Number of Women = 49

Therefore The correct answer is 49 women.

Additional Information

Ratio and Proportion

A ratio indicates how many times one number contains another. If a quantity is divided in the ratio a:b, the parts are a/(a+b) and b/(a+b) of the total.

Compound Ratio

The compound ratio of two ratios a:b and c:d is (a×c):(b×d).

Q54. Answer: (d) TDP

The correct answer is TDP.

• As of August 2018, TDP political party is currently ruling the state of Andhra Pradesh.

• As of January 2022 YSR congress party, a political party is currently ruling the state of Andhra Pradesh.

Key Points

• The Telugu Desam Party is a regional Indian political party active in the southern states of Andhra Pradesh and Telangana.

• The party was founded by N. T. Rama Rao on 29 March 1982.

• Since 1995 the party has been headed by N. Chandrababu Naidu, former Chief Minister of Andhra Pradesh.

• The party's headquarters is located at NTR Bhavan in Hyderabad.

• TDP was the first regional party to become the main opposition party at the 8th Lok Sabha from 1984 to 1989.

• On 16 March 2018, the TDP walked out of the National Democratic Alliance (NDA).

Additional Information

Political Party Name	Details

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Congress	• Congress was founded in 1885, it was the first modern nationalist movement to emerge in the British Empire in Asia and Africa. - From the late 19th century, and especially after 1920, under the leadership of Mahatma Gandhi, Congress became the principal leader of the Indian independence movement.
TRS	• In the 2014 Telangana Assembly Election, the party won a majority of seats and formed the first government of the state with K. Chandrashekar Rao as its chief minister. - Telangana Rashtra Samithi is an Indian regional political party that is predominantly active in the state of Telangana. - It was founded on 27 April 2001 by K. Chandrashekar Rao, with a single-point agenda of creating a separate Telangana state with Hyderabad as its capital.
Bharatiya Janata Party	• The Bharatiya Janata Party is one of the political parties in India. - The BJP was founded by Atal Bihari Vajpayee and L K Advani. - The official ideology of the BJP is integral humanism, first formulated by Deendayal Upadhyaya in 1965. - The BJP's origins lie in the Bharatiya Jana Sangh, popularly known as the Jana Sangh, founded by Syama Prasad Mukherjee in 1951 in response to the politics of the dominant Congress party.

Q55. Answer: (d) Mahesh Bhupathi

The correct answer is Mahesh Bhupathi.

• Mahesh Bhupathi is the founder of the International Premier Tennis League.

Key Points

• International Premier Tennis League:

• The International Premier Tennis League was an annual team tennis league that took place in various cities in Asia.

• It was founded in 2013, the elite level exhibition tennis tournament took place for the first time in November 2014.

Additional Information

Person Name	Details
Linder Paes	• Leander Adrian Paes OLY is an Indian former professional tennis player. - He holds the record for the most doubles wins in the Davis Cup. - Paes has won eight men's doubles and ten mixed doubles Grand Slam titles. - Paes was honored with the Arjuna award 1990, Padma Shri 2001, and Padma Bhushan.
Sania Mirza	• Sania Mirza is an Indian professional tennis player. A former doubles world No. 1, she has won six Grand Slam titles in her career. - Mirza was honored with Arjuna award 2006, Padma Shri 2006, Khel Ratna award 2015 and Padma Bhushan 2016.
Yuki Bhabri	• Yuki Bhambri is an Indian professional tennis player. He is a former junior no. 1 and winner of the 2009 Australian Open Junior Championship. - He is the first Indian to win the junior Australian Open title and the fourth Indian in history to capture a junior singles title at a Grand Slam championship.
Mahesh Bhupathi	• Mahesh Shrinivas Bhupathi is an Indian former doubles world No. 1 tennis player. - In 1997, he became the first Indian to win a major tournament. With his win at the 2006 Australian Open mixed doubles. - He joined the elite group of eight tennis players who have achieved a career in the Grand Slam in mixed doubles. - Bhupati has been honoured with the Arjuna award 1995 and Padma Shri 2001.

Q56. Answer: (a) unequal

The correct answer is Unequal.

• An example of the unequal speed of a bus on a congested road.

Key Points

• In a crowded road, moving through different traffic conditions, a bus travels at different speeds at different points of time. So, this is an example of unequal motion.

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• Unequal motion:

• This type of motion is defined as the motion of an object in which the object travels with varied speed and it does not cover some distance in equal time intervals, irrespective of the time interval duration.

Additional Information

• Uniform motion:

• This type of motion is defined as the motion of an object in which the object travels in a straight line and its velocity remains constant along that line as it covers equal distances in equal intervals of time, irrespective of the duration of the time.

• Circular Motion:

• In physics, circular motion is a movement of an object along the circumference of a circle or rotation along a circular path.

• Linear motion:

• Linear motion, also called rectilinear motion, is one-dimensional motion along a straight line, and can therefore be described mathematically using only one spatial dimension.

Q57. Answer: (b) no work done occurs

The correct answer is no work done occurs.

• No work done occurs when the direction of force is applied and the direction of motion of the object is perpendicular to each other.

Key Points

• Force: It is defined as the push/pull which is required to change the state of the object.

• Work: It is the amount of force required to move an object.

• Work = Force x Displacement.

• If the direction of applied force and direction, in which an object moves, are perpendicular to each other, then the work is done = 0 i.e no work is done.

• Work is done only when a certain force is applied to an object and the object moves a certain distance in the direction of the applied force. Hence work done is zero when the direction is perpendicular.

Q58. Answer: (c) 6

Given:

√(30+√(30+√(30+√(30+√...))))

Concept used:

Middle term factor

Calculation:

Let √(30+√(30+√(30+√(30+√...)))) be P.

So,

P = √(30+√(30+√(30+√(30+√...))))

=> P^2 = 30 + √(30+√(30+√(30+√(30+√...))))

=> P^2 = 30 + P

=> P^2 - P - 30 = 0

=> (P - 6) (P + 5) = 0

So, P = 6 (Because Sum of positive numbers can't be negative)

Therefore The value of √(30+√(30+√(30+√(30+√...)))) is 6.

Q59. Answer: (a) 96

Shortcut Trick

Ratio of Normal Speed to Reduced Speed = 1 : (1 − 1/5) = 5 : 4.

Since Distance is constant, Time Ratio is the inverse of Speed Ratio = 4 : 5.

Difference in time units = 5 − 4 = 1 unit → 16 min.

Normal Time = 4 units = 4 × 16 = 64 min = 64/60 hours.

Distance = 90 km/hr × 64/60 hr = 96 km.

Therefore The correct answer is 96 km.

Alternate Method

Given:

Normal average speed (S1) = 90 km/hr

Speed reduction = 1/5 of normal

Time increase = 16 min = 16/60 hr = 4/15 hr

Formula Used:

Distance = Speed × Time

Calculations:

=> Reduced speed (S2) = 90 − (1/5 × 90) = 90 − 18 = 72 km/hr

=> Let the length of the stretch be D km.

=> Time taken at normal speed = D/90 hours

=> Time taken at reduced speed = D/72 hours

=> According to the question: D/72 − D/90 = 16/60

=> (5D − 4D) / 360 = 4/15

=> D / 360 = 4 / 15

=> D = (4 × 360) / 15

=> D = 4 × 24 = 96 km

Therefore The correct answer is 96 km.

Additional Information

Speed-Time Relationship

When distance is constant, speed is inversely proportional to time (S prop. to 1/T). If speed becomes x/y of original, time becomes y/x of original.

Average Speed Formula

For two equal distances traveled at speeds x and y, the Average Speed is given by (2 × x × y) / (x + y).

Unit Conversion

To convert km/hr to m/s, multiply by 5/18. To convert minutes to hours, divide the value by 60.

Q60. Answer: (d) Either conclusion 1 or 2 follows

The logical Venn diagram is given below:-

Conclusion:

1. Some monkeys are human. → False (it is possible but not definite)

2. No monkey is human..→ False (it is possible but not definite)

• Statements 1 and 2 form a complementary pair.

• Therefore, "either statement 1 or 2 follows.."

Hence, "option 4" is the correct answer.

Q61. Answer: (b) Conclusion II follows

The least possible Venn diagram is as follows:

Conclusion:

I. Some apples are not violets. → False (as can be seen in the Venn diagram, this is not possible because all apples are violets)

II. All horses being train is a possibility. → True (the possibility exists as shown in the below Venn diagram).

• Possibility diagram for conclusion II:

Hence, "Conclusion II follows" is the correct answer.

Note: In the original paper, the second conclusion was "Some violets being train is a possibility." and it was stated as true. This is incorrect. So, we have changed it.

Q62. Answer: (c) Cousin

The family tree is given below:-

The son of N is the cousin of Y.

Hence, "option 3" is the correct answer.

Q63. Answer: (b) 9 cm

Shortcut Trick

Apply the Tangent-Secant Theorem: (Tangent)² = (Outer Part of Secant) × (Whole Secant).

Let BD = x cm. Then AD = (x + 7) cm.

=> $DE^2 = BD \times AD$

=> $12^2 = x \times (x + 7)$

=> 144 = 9 × (9 + 7) = 9 × 16 (By observation or solving quadratic)

=> x = 9 cm

Therefore The correct answer is 9 cm.

Alternate Method

Given:

Length of chord AB = 7 cm

Length of tangent DE = 12 cm

Formula Used:

According to the Tangent-Secant Theorem, if a tangent segment and a secant segment are drawn to a circle from an exterior point, then the square of the measure of the tangent segment is equal to the product of the measures of the secant segment and its external secant segment.

$DE^2 = BD \times AD$

D

B

A

E

O

7 cm

Q64. Answer: (d) D

The logic followed here is:-

• We have

in figure A, B, and, C

• In figure D, there is an additional line segment.

Thus, Figure D is different from others.

Hence, "option 4" is the correct answer.

Q65. Answer: (c) Philippines

The correct answer is Philippines.

• The Philippines is the headquarter of the Asian Development Bank.

Key Points

• Asian Development Bank is an international development finance institution whose mission is to help its developing member countries reduce poverty and improve the quality of life of their people.

• Asian development bank established in 1966, ADB is owned and financed by its 67 members, of which 48 are from the region and 19 are from other parts of the globe.

• Under Strategy 2020, a long-term strategic framework adopted in 2008, ADB will follow three complementary strategic agendas: inclusive growth, environmentally sustainable growth, and regional integration.

• As of now January 2022 the president of the Asian development bank is Masatsugu Asakawa.

Key Points

Country	Capital	Currency
Japan	Tokyo	Japanese yen
China	Beijing	Renminbi
Philippines	Manila	Philippine peso
India	New Delhi	Indian rupee

Q66. Answer: (b) Bahadur Shah Zafar

The correct answer is Bahadur Shah Zafar.

• Bahadur Shah Zafar was prosecuted for leading the rebels of the Revolt of 1857 and exiled to Rangoon, where he died in 1862.

Key Points

• The Indian Rebellion of 1857 was a major uprising in India in 1857–58 against the rule of the British East India Company, which functioned as a sovereign power on behalf of the British Crown.

• The main centers of revolt, commonly known as the sepoy mutiny in these regions namely Kanpur, Lucknow, Bareilly, Jhansi,

Gwalior, and Arrah in Bihar.

• The impact that the revolt of 1857 created was to develop unity & patriotism among the nation.

Additional Information

• Leaders of Revolt of 1857:

Leaders	Place
Kanpur	• Tantia Tope
Lucknow	• Begum Hazrat Mahal, Birjis Qadir, Ahmadullah
Barrackpore	• Mangal Pandey
Jhansi	• Rani Laxmibai
Bihar	• Kunwar Singh, Amar Singh
Delhi	• Bahadur Shah II, General Bakht Khan

Important Points

• Bahadur Shah Zafar:

• He was born in 1775 in old Delhi.

• Bahadur Shah Zafar ascended the Mughal throne in 1837 at the age of 62.

• Zafar had been on the throne for twenty years when the First War of Independence took place in 1857.

• On 4th December 1858, Zafar along with his family was transported from Diamond Harbor to Rangoon on the Ship Magoera.

Q67. Answer: (a) chemical properties

The correct answer is Chemical properties.

• Elements in the same group have the same chemical properties.

Key Points

• The elements in the periodic table are arranged according to the Modern periodic law.

• It states that the physical and chemical properties of the elements are periodic functions of their atomic numbers.

• The physical and chemical properties depend on the number of valence electrons in an atom.

Additional Information

• A vertical column in the periodic table of elements is called a group.

• There are a total of 18 groups present in the periodic table. In the basic theme of organization of elements in the periodic table, elements having a similar outer electronic configuration in their atoms are arranged in the same group.

• So, we should know that an element's group number also denotes the number of electrons present in its outermost shell or valence shell.

• These valence electrons are responsible for the vast majority of physical properties, chemical properties, and reactivities of the elements.

• If the valence shell electronic configuration remains the same within a group, physical and chemical properties tend to remain somewhat consistent.

Q68. Answer: (c) 53

Given: 14Q16P4R7S10

Symbol	P	Q	R	S
Meaning	÷	×	•	•

• After replacing the symbols with their meanings, we get: 14 × 16 ÷ 4 + 7 - 10

14 × 16 ÷ 4 + 7 - 10

= 14 × 4 + 7 - 10

= 56 + 7 - 10

= 63 - 10

= 53

Hence, "53" is the correct answer.

Q69. Answer: (d) Mustard

The correct answer is Mustard.

• Mustard is known as a bisexual flower.

Key Points

• Bisexual Flower:

• The flowers which contain both male and female reproductive organs are known as full or bisexual flowers.

• The bisexual flower will self-pollinate themselves.

• Examples: Tulip, Sunflower, and Lily.

• Unisexual flowers:

• The flowers which contain only the male or female reproductive organs are called unisexual flowers. They are called incomplete flowers. To reproduce they undergo cross-pollination.

• They do not have both stamen and carpels.

• Examples: Papaya, White mulberry, and Watermelon.

Additional Information

Unisexual flowers	Bisexual flower
• They are of two types: monoecious or dioecious flowers.	• They are also called androgynous flowers.
• Due to the absence of either male or female parts, they are called the incomplete flower.	• They have both male and female parts on the same flower, they are called the complete flower.
• The male part (androecium) or the female part (gynoecium) of the flower, but not both, can be present in the same flowers.	• Both the male and female portions of the flower are present in the same flower.

Important Points

• Mustard is a bisexual flower. Here the male reproductive system is stamens and the female reproductive system is the pistil.

Q70. Answer: (b) Q

Given series: 3R # 2 A S K 5 % T 7 & N Y + X B / L Q @ 1

If the first half of the above series is reversed then:-

7 T % 5 K S A 2 # R 3 & N Y + X B / L Q @ 1

• 18th term from the right end = K

• 7 T % 5 K S A 2 # R 3 & N Y + X B / L Q @ 1

• 15th term to the right of K = Q

• 7 T % 5 K S A 2 # R 3 & N Y + X B / L Q @ 1

Hence, "Q" is the correct answer.

Q71. Answer: (c) Hind Swaraj

The correct answer is Hind Swaraj.

• Hind Swaraj's book was written by Mahatma Gandhi.

Key Points

• Gandhi was an Indian lawyer, anti-colonial nationalist, and political ethicist who employed nonviolent resistance to lead the successful campaign for India's independence from British rule.

• His birthday (2nd October) is commemorated worldwide as International Day of Nonviolence.

• Mohandas Karamchand Gandhi was assassinated in the garden of the former Birla House.

• Gandhi Ji set up a small colony, Tolstoy Farm at an 1100 acre site, 21 miles from Johannesburg, South Africa for his colleagues in the Satyagraha struggle.

• Books are written by Mahatma Gandhi:

• The Story of My Experiments with Truth (1927).

• Hind Swaraj (1909).

• India of my dreams (1947).

• Satyagraha in South Africa (1928).

Additional Information

Book Name	Author
Wings of Fire	• A. P. J. Abdul Kalam and Arun Tiwari

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The Tensandons	• E. Hershey Sneath
Al-Hilal	• Maulana Abul Kalam Azad's

Q72. Answer: (d) 63/8 Days

Shortcut Trick

Total time for Amit = 7 × 2 = 14 days.

Total time for Alam = 9 × 2 = 18 days.

Combined time = (Product) ÷ (Sum) = (14 × 18) ÷ (14 + 18).

Combined time = 252 ÷ 32 = 63/8 days.

Therefore The correct answer is 63/8 Days.

Alternate Method

Given: Amit completes 1/2 work in 7 days. Alam completes 1/2 work in 9 days.

Formula Used: Total Days = Total Work ÷ Combined Efficiency

Person	Days	Total Work	Efficiency
Amit	14	126	9
Alam	18	7	

=> Amit full work days = 7 ÷ (1/2) = 14 days.

=> Alam full work days = 9 ÷ (1/2) = 18 days.

=> LCM of 14 and 18 = 126 (Total Work).

=> Total Efficiency = 9 + 7 = 16.

=> Required Days = 126 ÷ 16 = 63/8 days.

Therefore The correct answer is 63/8 Days.

Additional Information

Combined Work Formula

If A does a work in x days and B in y days, together they take (xy)/(x+y) days.

Efficiency and Time

Efficiency is inversely proportional to time. If time ratio is a:b, efficiency ratio is b:a.

Fractional Work

If 1/n part of work is done in T days, full work is completed in n × T days.

Q73. Answer: (c) Red brown

The correct answer is Red Brown.

Key Points

• Rust, commonly referred to as oxidation, occurs when iron or metal alloys that contain iron, such as steel, are exposed to oxygen and water for a long period of time.

• Rust forms when iron undergoes the process of oxidation but not all oxidation forms rust. As stated previously, only iron or alloys that contain iron can rust, but other metals can corrode in a similar way.

Additional Information

• Corrosion:

• Corrosion occurs when an element that easily loses its electrons (like some metals) combines with an element that absorbs extra electrons (oxygen) and then comes into contact with an electrolyte solution (water).

• The job of the water in the corrosion process is to accelerate the flow of electrons from the metal to oxygen.

• This process is called a redox reaction and is actually two chemical processes that happen at the same time: reduction and oxidation.

Important Points

• Reduction:

• A reduction Reaction refers to a reaction in which either the addition of Hydrogen takes place or the removal of oxygen takes place.

Oxidation:

• Oxidation Reaction refers to a reaction in which either the addition of Oxygen takes place or the removal of Hydrogen takes place.

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Q74. Answer: (c) rear mirror

The correct answer is a rear mirror.

• In the rear mirror, a concave mirror is not used.

• A rear-view mirror is a flat mirror in automobiles and other vehicles, designed to allow the driver to see rearward through the vehicle's rear window.

Key Points

• Magnification: In a concave mirror, the magnification is the ratio of the height of the image to the height of the object.

• When the image is real, the magnification will be negative because the real image is inverted.

• When the image is virtual, the magnification will be positive because the virtual image is erect.

• The concave mirror can form a magnified image when the object is kept at a certain distance.

Additional Information

Q75. Answer: (a) Hair dresser

The logic followed here is:-

The knife is used by a butcher.

Similarly,

Scissors are used by a hair dresser.

Hence, "option 1" is the correct answer.

Q76. Answer: (b) plantea

The correct answer is Plantae.

• In Plantae, all organisms, are multicellular eccentric with a cell wall.

Key Points

• Plantae is a taxonomic group that includes land plants and green algae.

• In the older classification of organisms, there are basically five kingdoms according to Robert Whittaker: Animalia, Plantae, Fungi, Protista, and Moner.

• Kingdom Plantae includes multicellular, (mostly) autotrophic eukaryotes that (usually) conduct photosynthesis.

Additional Information

• Protista:

• A protist is any eukaryotic organism that is not an animal, plant, or fungus. While it is likely that protists share a common ancestor, the exclusion of other eukaryotes means that protists do not form a natural group or clade.

• Monera:

• Monera is a biological kingdom that is made up of prokaryotes. As such, it is composed of single-celled organisms that lack a true nucleus. The taxon Monera was first proposed as a phylum by Ernst Haeckel in 1866.

• Animalia:

• Animals are multicellular, eukaryotic organisms in the biological kingdom Animalia.

• With few exceptions animals consume organic material breathe oxygen, are able to move can reproduce sexually and go through an ontogenetic stage in which their body consists of a hollow sphere of cells the blastula during embryonic development.

Q77. Answer: (d) Statements 1 and 2 both are insufficient

Given that:-

X, Y, T, U, and V, when arranged in ascending order of their weights.

1. X weighs less than T. U weighs twice as much as T.

• X < T, U = 2T => X < T < U

• Here, there is no information about Y and V. Therefore, statement 1 alone is not sufficient.

2. The weight of Y and V is less than that of X.

• Y and V < X

• No information is given about T and U. Therefore, statement 2 alone is not sufficient.

From statements 1 and 2 we get the following cases:

• Case 1: Y < V < X < T < U

• Case 2: V < Y < X < T < U

• So, either V or Y would be second from the beginning.

Thus, statements 1 and 2 both are not sufficient to answer the question.

Hence, "option 4" is the correct answer.

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Q78. Answer: (c) Employee

The logic followed here is:-

• A captain is also a soldier.

Similarly,

• An employer is also an employee.

Hence, "employee" is the correct answer.

Alternate Method

• A captain leads or manages a group of soldiers.

Similarly,

• An employer leads or manages a group of employees.

Hence, "employee" is the correct answer.

Q79. Answer: (c) Matunga Railway Station

The correct answer is Matunga Railway Station.

• Matunga Railway Station has entered the Limca Book of Records 2018 for all railway employees to be female.

Key Points

• Mamta Kulkarni, the first women ASM to be recruited on the Mumbai Division of Central Railway in 1992, is in Incharge of Matunga Railway Station.

• A total of 41 women staff is handling the operations of the station round the clock.

• Matunga Railway Station has become the first station in India that has all women staff managing the operations of the stations.

• Ladies staff across all departments viz. operating, commercial, RPF, etc. are posted at Matunga Railway Station to make it the first of its kind station on Railways.

Additional Information

• The Limca Book of Records is an annual reference book published in India documenting world records held by Indians.

• The Limca book of record was launched in 1990.

Q80. Answer: (b) Both A and B are ture

The correct answer is Both A and B are true.

Key Points

• Thermal decomposition:

• Thermal decomposition is a chemical reaction where heat is a reactant.

• Since heat is a reactant, these reactions are endothermic meaning that the reaction requires thermal energy to break the chemical bonds in the molecule.

• Calcium carbonate, CaCO3, will decompose into carbon dioxide, CO2, and calcium oxide, CaO, when heated above 900 degrees Celcius at a pressure of the atmosphere.

Additional Information

• Reversible reaction:

• A reversible reaction is a reaction in which the conversion of reactants to products and the conversion of products to reactants occur simultaneously.

• A and B can react to form C and D or, in the reverse reaction, C and D can react to form A and B. This is distinct from a reversible process in thermodynamics.

• The forward reaction N 2 (g)+3H 2 (g)<−−>2NH 3 (g) (the production of ammonia) is exothermic.

• According to Le Chatelier's Principle, this will be favoured if you lower the temperature, a very low temperature will cause a reaction to occur very slowly and hence, not efficiently.

• Therefore, 400 - 450°C is a compromise temperature producing a high proportion of ammonia in the equilibrium mixture.

Q81. Answer: (a) 80%

Shortcut Trick

Let Rohan's income be 100 units.

Ramu's income = 100 + 25% of 100 = 125 units.

Required percentage = (Rohan / Ramu) × 100

=> (100 / 125) × 100 = 4/5 × 100 = 80%.

Therefore The correct answer is 80%.

Alternate Method

Given:

Ramu's income is 25% more than Rohan's income.

Formula Used:

If A is x% more than B, then B is [x / (100 + x)] × 100% less than A.

Percentage of B with respect to A = (B / A) × 100

Calculations:

=> Let Rohan's income = R_h and Ramu's income = R_m

=> R_m = R_h + 0.25 × R_h = 1.25 × R_h

=> R_h / R_m = 1 / 1.25

=> R_h / R_m = 100 / 125 = 4 / 5

=> Required percentage = (R_h / R_m) × 100

=> Required percentage = (4 / 5) × 100 = 80%

Therefore The correct answer is 80%.

Additional Information

Percentage Increase vs Decrease

If A is x% more than B, then B is [x / (100 + x)] × 100% less than A.

Fraction to Percentage Conversion

Common fractions: 1/4 = 25%, 1/5 = 20%, 4/5 = 80%, 3/4 = 75%.

Base Change Rule

When the base changes from Rohan to Ramu, the denominator in the percentage calculation must be Ramu's value.

Q82. Answer: (b) Henry Mosley

The correct answer is Henry Mosley.

• Henry Mosley shows that the atomic number of an element is a more fundamental property than its atomic mass.

Key Points

• At present, 118 elements are known to us. All these have different properties. Out of these 118, only 94 are naturally occurring.

• In 1913, Henry Moseley showed that the atomic number (symbolized as Z) of an element is a more fundamental property than its atomic mass.

• The number of electrons in turn is equal to the number of protons in the nucleus.

• The atomic number is a more fundamental property of an element than its atomic mass because when the elements are arranged in the increasing order of their atomic number, most of the defects of Mendeleev's classification get rectified.

Additional Information

Person Name	Description
Henry Cavendis	• Henry Cavendish was an English natural philosopher, scientist, and an important experimental and theoretical chemist and physicist. - He is noted for his discovery of hydrogen, which he termed inflammable air.
Henry Mosley	• Henry Moseley was an English physicist, whose contributed to the science of physics. - Moseley's law advanced atomic physics, nuclear physics and quantum physics by providing the first experimental evidence in favour of Niels Bohr's theory.
John Newland	• John Newlands was a British chemist who worked concerning the periodicity of elements. - Newlands was the first person to devise a periodic table of chemical elements arranged in order of their relative atomic masses.
Demitri Mendeleev	• Dmitri Mendeleev was a Russian chemist and inventor. - He is known for formulating the Periodic Law and creating a farsighted version of the periodic table of elements.

Q83. Answer: (d) D

The logic followed here is:-

• Figure A -

made with two lines.

• Figure B -

made with two lines.

• Figure C -

made with two lines.

• Figure D -

made with three lines.

So, figure D is different from others.

Hence, "option 4" is the correct answer.

Q84. Answer: (a) When a person jumps from the boat to the bank of the river, the boat goes backwards

The correct answer is When a person jumps from the boat to the bank of the river, the boat goes backwards.

• Newton's third law of motion applies to when a person jumps from the boat to the bank of the river, the boat goes backwards.

Key Points

• Newton’s 3rd Law:

• Force is a push or pull acting on an object resulting in its interaction with another object.

• Force is a result of an interaction.

• Force can be classified into two categories: contact force such as frictional force and non-contact force such as gravitational force.

• If object A exerts a force on object B, then object B must exert a force of equal magnitude and opposite direction back on object A.

• Newton’s third law of motion states that.

• When one body exerts a force on the other body, the first body experiences a force that is equal in magnitude in the opposite direction of the force which is exerted.

Additional Information

Q85. Answer: (b) 6 years

Shortcut Trick

Amita's birth: Father = 38 years.

Brother's birth: Amita = 4 years, so Father = 38 + 4 = 42 years.

At Brother's birth, Mother = 36 years.

Age difference = 42 − 36 = 6 years.

Therefore The correct answer is 6 years.

Alternate Method

Given Amita's father's age at her birth = 38 years.

Given Amita's brother is 4 years younger than her.

=> When the brother was born, Amita was 4 years old.

=> When the brother was born, Father's age = 38 + 4 = 42 years.

=> Given Mother's age at brother's birth = 36 years.

=> Difference between parents' ages = 42 − 36 = 6 years.

Therefore The correct answer is 6 years.

Additional Information

Constant Age Difference

The difference between the ages of two people remains constant throughout their lives, regardless of the years passed.

Age Calculations

If person A is 'x' years older than B, then at any point in time: Age(A) − Age(B) = x.

Relative Aging

When 'n' years pass, every individual's age increases by exactly 'n' years.

Q86. Answer: (d) 18 years

Shortcut Trick

Rohan's present age = 33 − 9 = 24 years.

Ratio of Rohan : Sohan = 4 : 3.

4 units → 24 years.

1 unit → 6 years.

3 units → 3 × 6 = 18 years.

Therefore The correct answer is 18 years.

Alternate Method

Given:

Ratio of Rohan and Sohan = 4 : 3

Let Rohan's age be 4x and Sohan's age be 3x.

Calculations:

=> Rohan's age after 9 years = 4x + 9

=> 4x + 9 = 33

=> 4x = 33 − 9

=> 4x = 24

=> x = 6

=> Sohan's present age = 3x = 3 × 6 = 18 years.

Therefore The correct answer is 18 years.

Additional Information

Ratio and Proportion in Ages

When the ratio of ages is given as a:b, we assume the ages as ax and bx to form linear equations based on future or past conditions.

Constant Age Difference

The numerical difference between the ages of two persons remains constant throughout their lives, regardless of the years passed.

Ages After/Before 'n' Years

If present age is 'A', then age after 'n' years is A + n, and age 'n' years ago was A − n.

Q87. Answer: (d) Kidneys

The correct answer is Kidney.

• The process of dialysis is related to the Kidney.

Key Points

• The kidneys filter your blood by removing waste and excess fluid from your body. This waste is sent to the bladder to be eliminated when you urinate.

• Dialysis performs the function of the kidneys if they've failed. According to the National Kidney Foundation, end-stage kidney failure occurs when the kidneys are performing at only 10 to 15 per cent of their normal function.

• Dialysis is a treatment that filters and purifies the blood using a machine. This helps keep your fluids and electrolytes in balance when the kidneys can't do their job.

• Dialysis has been used since the 1940s to treat people with kidney problems.

Additional Information

• There are three different types of dialysis:

• Hemodialysis:

• Hemodialysis is the most common type of dialysis. This process uses an artificial kidney (hemodialyzer) to remove waste and extra fluid from the blood. The blood is removed from the body and filtered through the artificial kidney.

• Peritoneal dialysis:

• Peritoneal dialysis involves surgery to implant a peritoneal dialysis (PD) catheter into your abdomen. The catheter helps filter your blood through the peritoneum, a membrane in your abdomen.

• Continuous renal replacement therapy (CRRT):

• This therapy is used primarily in the intensive care unit for people with acute kidney failure. It's also known as hemofiltration.

Important Points

• Dialysis Process:

Q88. Answer: (d) 506

Shortcut Trick

Smallest number = LCM(6, 7, 8, 9, 12) + Remainder

LCM of 6, 7, 8, 9, 12 = 504

Required number = 504 + 2 = 506

Therefore The correct answer is 506.

Alternate Method

Given: Divisors = 6, 7, 8, 9, 12; Remainder = 2

Formula: Number = [LCM of divisors] × k + Remainder

=> Prime factors of 6 = 2 × 3

=> Prime factors of 7 = 7

=> Prime factors of 8 = 2^3

=> Prime factors of 9 = 3^2

=> Prime factors of 12 = 2^2 × 3

=> LCM = 2^3 × 3^2 × 7 = 8 × 9 × 7 = 504

=> Smallest number = 504 + 2 = 506

Therefore The correct answer is 506.

Additional Information

LCM (Least Common Multiple)

The smallest positive integer that is divisible by each of the given numbers without leaving a remainder.

Remainder Property

When a number N leaves a constant remainder 'r' when divided by a, b, and c, then N = LCM(a, b, c) × k + r.

Divisibility Rule of 9

A number is divisible by 9 if the sum of its digits is divisible by 9. In this question, 506 ÷ 9 gives remainder 2 (5+0+6=11; 11−9=2).

Q89. Answer: (a) 34.5 unit²

Shortcut Trick

Area of triangle ABC = 3 × Area of triangle GAB (where G is the centroid).

Area of ΔGAB = 0.5 × |4(7 − 4) + 9(4 − 8) + 1(8 − 7)|

Area of ΔGAB = 0.5 × |12 − 36 + 1| = 0.5 × |−23| = 11.5 unit².

Total Area = 3 × 11.5 = 34.5 unit².

Therefore The correct answer is 34.5 unit².

Alternate Method

Given: Centroid G = (4, 8), Vertex A = (9, 7), Vertex B = (1, 4).

Formula Used: Centroid G = ((x1+x2+x3)/3, (y1+y2+y3)/3) | Area = 0.5 × |x1(y2−y3) + x2(y3−y1) + x3(y1−y2)|

=> x-coordinate of G: 4 = (9 + 1 + x3) ÷ 3

=> 12 = 10 + x3 => x3 = 2

=> y-coordinate of G: 8 = (7 + 4 + y3) ÷ 3

Q90. Answer: (a) Only conclusion 2 follows

The statement tells that the normal life of Canadians is disrupted or paused because of heavy snowfall.

• Conclusion 1 suggests that the government should take measures to save the lives and property of people. According to the statement, "only normal life is affected in Canada". The statement does not suggest any threat to life and property due to the snowfall. Therefore, conclusion 1 does not follow.

• The government asking people to stay at home is reasonable because the statement implies that the weather conditions are bad and not conducive to moving around as they do normally. Therefore, conclusion 2 follows.

Hence the correct answer is "option 1".

Q91. Answer: (d) Environment

The correct answer is Environment.

• The environment ministry regulates cow slaughter in India.

Key Points

• The law has imposed a complete ban on the slaughter of cows, bulls, bullocks, and male and female buffaloes, below the age of 13 and has enhanced penalties and punishments.

• On 26 May 2017, the Ministry of Environment of the Government of India led by the Bharatiya Janata Party imposed a ban on the sale and purchase of cattle for slaughter at animal markets across India, under Prevention of Cruelty to Animals statutes.

• According to a 2016 United States Department of Agriculture review, India has rapidly grown to become the world's largest beef exporter, accounting for 20% of the world's beef trade based on its large water buffalo meat processing industry.

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Additional Information

• Ministry of Environment, Forest and Climate Change (MoEFCC):

• Ministry of Environment, Forest, and Climate Change was founded in 1947.

• The ministry portfolio is currently held by Bhupender Yadav, Union Minister of Environment, Forest, and Climate Change.

Important Points

Q92. Answer: (c) Only assumption I is implicit

From the statement, it is clear that Shyam wants to find the effect of mobile radiation on children.

• Thus, it can be safely assumed that Shyam is saying this to Ram because it is possible to trace the effect of mobile radiation on children. So, assumption I is implicit.

• The statement does not talk about Shyam's ability to detect the radiation, so assumption II is not implicit. Shyam might be able to detect the radiation but need not be good at it.

Hence the correct answer is option 3.

Q93. Answer: (a) 17

Shortcut Trick

Only Pink = 20 − (Pink & Red + Pink & Green − All 3) = 20 − (7 + 9 − 5) = 9

Only Red = 16 − (Red & Pink + Red & Green − All 3) = 16 − (7 + 8 − 5) = 6

Only Green = 14 − (Green & Pink + Green & Red − All 3) = 14 − (9 + 8 − 5) = 2

Total Only 1 color = 9 + 6 + 2 = 17

Therefore The correct answer is 17 girls.

Alternate Method

Given:

Total Pink = 20, Total Red = 16, Total Green = 14

All three (P ∩ R ∩ G) = 5

Pink & Green (P ∩ G) = 9 => Only Pink & Green = 9 − 5 = 4

Pink & Red (P ∩ R) = 7 => Only Pink & Red = 7 − 5 = 2

Red & Green (R ∩ G) = 8 => Only Red & Green = 8 − 5 = 3

=> Only Pink = 20 − (4 + 2 + 5) = 9

=> Only Red = 16 − (2 + 3 + 5) = 6

=> Only Green = 14 − (4 + 3 + 5) = 2

=> Total only one color = 9 + 6 + 2 = 17

Therefore The correct answer is 17 girls.

Additional Information

Venn Diagram Formula (3 Sets)

n(A U B U C) = n(A) + n(B) + n(C) − n(A∩B) − n(B∩C) − n(A∩C) + n(A∩B∩C).

Exactly Two Colors

Exactly 2 = [n(A∩B) + n(B∩C) + n(A∩C)] − 3×n(A∩B∩C).

Exactly One Color

Exactly 1 = [n(A) + n(B) + n(C)] − 2×[n(A∩B) + n(B∩C) + n(A∩C)] + 3×n(A∩B∩C).

Q94. Answer: (a) MnO < MnO2 < Mn2O7

The correct answer is MnO < MnO2 < Mn2O7.

• The correct increasing order of acidity of Mn oxide is MnO < MnO2 < Mn2O7.

Key Points

• MnO has the lowest oxidation state, so it is the most basic.

• Mn2O3 is next, then MnO2, and finally Mn2O7 (which is actually acidic).

• Due to the difference in oxidation state: Mn in Mn2O7 the oxidation state is +7 state but Mn in MnO the oxidation state is +2.

Additional Information

• More than 30 Mn oxide minerals occur in a wide variety of geological settings.

• They are major components of Mn nodules that pave huge areas of the ocean floor and bottoms of many fresh-water lakes.

• Mn oxide minerals are ubiquitous in soils and sediments and participate in a variety of chemical reactions that affect groundwater and bulk soil composition.

• Formula: MnO_2

• Molar mass: 86.9368 g/mol

• Melting point: 535 °C

Q95. Answer: (c) Sudhanshu Vishwas

The correct answer is Sudhanshu Vishwas.

• 99-year old freedom fighter and Padma awardee, who runs 18 schools in West Bengal and provides free education and food are Sudhanshu Vishwas.

Key Points

• Sudhanshu Biswas:

• He has honored by the Padma Shri in 2018, he is a veteran 99-year-old freedom fighter who left his home in his early teens to fight for our independence.

• He has been jailed several times, one of which was for his bold attack for carrying a live bomb at a British administration gathering.

• He established Sri Ramakrishna Sevashram.

• In the last four decades, he has set up 18 residential schools for such children, all boys, in the most remote areas around West Bengal.

Additional Information

• Sitavva Jodadi:

• Sitavva Joddati, who champions women's development and empowerment, especially 'Devadasis' and Dalits; Nouf Marwari, the first yoga instructor of Saudi Arabia who played an instrumental role in legalizing yoga in that country, will be given the Padma Shri.

• Sulagitti:

• Nonagenarian farm laborer Sulagatti Narasamma, who provides midwifery services in the backward region of Karnataka without any medical facility, too was awarded the Padma Shri.

Q96. Answer: (a) Methane

The correct answer is Methane.

Key Points

• CNG is an abbreviation of “Compressed Natural Gas”. The main component of CNG is Methane.

• It is composed mostly of methane but also composed of ethane and propane in smaller quantities.

• CNG is developed by compressing natural gas mainly methane, down to less than one per cent of its total volume.

• CNG is known to be an eco-friendly alternative option to gasoline which is harmful to nature.

Additional Information

Gas	Description
Butane	• Butane is a petroleum-derived gaseous liquid. - This is primarily used for camping, cooking in the backyard, and in cigarette lighters.
Ethane	• It is in the alkanes substance group with the molecular formula C_nH_{2n+2}. - Ethane is the main component of natural gas and is also found in marsh gas.
Propane	• Propane is actually a byproduct of both petroleum refining and natural gas processing. - Propane comes from natural gas and petroleum wells. About 69 per cent of the propane used in the United States is extracted from raw natural gas.

Q97. Answer: (a) Exactly 35 :

Shortcut Trick

Total Subject-Enrollments = Total Students × Subjects per Student

Total Subject-Enrollments = 420 × 5 = 2100

Number of Subjects = Total Subject-Enrollments ÷ Students per Subject

Number of Subjects = 2100 ÷ 60 = 35

Therefore The correct answer is 35 subjects.

Alternate Method

Given:

Total number of students = 420

Number of subjects per student = 5

Number of students per subject = 60

Calculations:

=> Let the total number of subjects be 'n'.

=> Total student-subject instances = Total students × Subjects each studies

=> Total instances = 420 × 5 = 2100

=> Since each subject is studied by 60 students:

=> n × 60 = 2100

=> n = 2100 ÷ 60

=> n = 35

Therefore The correct answer is 35 subjects.

Additional Information

Double Counting Principle

In problems involving sets and memberships, the total sum of elements across all sets is equal to the sum of the number of members in each set.

Subject-Student Relation

(Total Students) × (Subjects per Student) = (Total Subjects) × (Students per Subject).

Unit Balance

Always ensure the product represents a common unit (like 'total seats' or 'total enrollments') to equate both sides of the equation.

Q98. Answer: (d) Bharat

The correct answer is Bharat.

• The Eden Gardens Cricket Ground is located in Bharat.

Key Points

• The Eden Gardens is a cricket ground is located in Kolkata, West Bengal.

• It was established in 1864.

• It is the oldest and second-largest cricket stadium in India after the Narendra Modi Stadium.

• The largest cricket stadium in the world by area Narendra Modi Stadium Located in Ahmedabad, India, the stadium will be the new home of the Gujarat Cricket Association.

• Spread across 63 acres with a capacity of 132,000, Narendra Modi Stadium surpasses the previous largest cricket stadium's Australia's Melbourne Cricket Ground.

• On 22 November 2019, the venue hosted the first-ever day/night test match in India during the second Test between India and Bangladesh.

Additional Information

• The Melbourne Cricket Ground is the largest cricket ground in the world.

• Pakistan:

• Rafi is the biggest cricket stadium in Pakistan with 50000 capacity.

• Shri Lanka:

• R. Premadasa International Cricket Stadium is the biggest cricket stadium in Shri Lanka with the capacity of 35000.

• Bangladesh:

• Sher-e-Bangla National Cricket Stadium is the biggest cricket stadium in Bangladesh with the capacity of 26000.

Q99. Answer: (c) 19140

Shortcut Trick

The product of two numbers is always equal to the product of their greatest common factor (GCF) and least common multiple (LCM).

LCM = (First Number × Second Number) ÷ GCF

=> LCM = (290 × 660) ÷ 10 = 29 × 660 = 19140

Therefore The correct answer is 19140.

Alternate Method

Given:

First Number (A) = 290
Second Number (B) = 660
Greatest Common Factor (GCF) = 10
Formula Used:
A × B = GCF × LCM
Calculations:
=> 290 × 660 = 10 × LCM
=> 191400 = 10 × LCM
=> LCM = 191400 ÷ 10
=> LCM = 19140
Therefore The correct answer is 19140.
Additional Information
Product of Two Numbers Property
For any two positive integers a and b, LCM(a, b) × HCF(a, b) = a × b. This property is applicable only for two numbers.
Co-prime Numbers Relationship
If two numbers are co-prime, their GCF is 1, and their LCM is equal to the product of the two numbers.
GCF and LCM of Fractions
LCM of Fractions = LCM of Numerators ÷ HCF of Denominators. HCF of Fractions = HCF of Numerators ÷ LCM of Denominators.

Q100. Answer: (c) B

The mirror image of the question figure is given below.
Hence, "option 3" is the correct answer.

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