RRC Group D Previous Year Paper 52 (Held On: 28 Sept 2018 Shift 3)

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

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CBT

Q1. A constant force acts on an object of mass 5 kg for a period of 2 seconds. It increases the velocity of the object from 4 ms^(-1) to 7 ms^(-1). Find the amount of force applied.

(a) 5.5 N
(b) 8.5 N
(c) 7.5 N
(d) 4.8 N

Q2. In which year the first amendment was made to the Indian Constitution?

(a) 1951
(b) 1960
(c) 1947
(d) 1950

Q3. The properties of an element in the periodic table depend on _____.

(a) atomic size
(b) number of protons
(c) atomic mass
(d) electronic configuration

Q4. In 1781, Warren Hastings, the first Governor General of Bengal, established a madrasa in _____ for the study and teaching of Muslim law.

(a) Mumbai
(b) Delhi
(c) Bihar
(d) Calcutta

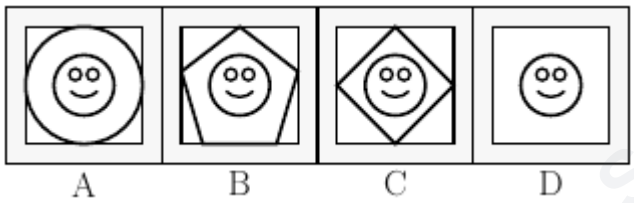
Q5. -(-6) [3 - {8 - (-3)}] ÷ [4{12 + (-3) × 6}] = ?

(a) -4
(b) 1
(c) -2
(d) 2

Q6. A booster pump can be used to fill a tank. Tank capacity is 2400 m³. The emptying speed is 10 m³more than its filling capacity and the pump needs 8 minutes lesser to empty the tank than it needs to fill it. What is the filling capacity of the pump?

(a) 50 m³/min
(b) 40 m³/min
(c) 20 m³/min
(d) 25 m³/min

Q7. Identify the odd.



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

Q8. Nitara walks 1 km towards West and takes a left turn. After that moves 1 km and then turns left and walks 1 km again and turns left and after that walks 450 m. How far is Nitara from her starting point?

(a) 500 m
(b) 700 m
(c) 550 m
(d) 200 m

Q9. Which metal oxide is an amphoteric oxide?

(a) Iron
(b) Aluminum
(c) Sodium
(d) Potassium

Q10. The coordinates of a point, which internally divides the line segment joining the points (-1, 9) and (11, 1) in the ratio 3 :1, are as follows:

(a) (5, 5)
(b) (13/2,4)
(c) (2, 7)
(d) (8, 3)

Q11. _____ is the number of electrons involved in bond formation in N2.

(a) 4
(b) 2
(c) 6
(d) 3

Q12. Based on the following table, on an average how many departures are there between 6 in the morning to 12 in the day?

Flight time	Departure
06:00 am to 07:00 am	4
07:00 am to 08:00 am	2
08:00 am to 09:00 am	2
09:00 am to 10:00 am	1
10:00 am to 11:00 am	1
11:00 am to 12:00 am	2

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

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Q13. Elements of the same group in the modern periodic table have the same _____.

(a) Atomic mass
(b) Atomic radius
(c) Atomic number
(d) Valence electron

Q14. If OATH is coded as 151208, then what will be the code for ALTER?

(a) 11221518
(b) 11320518
(c) 11220518
(d) 12220518

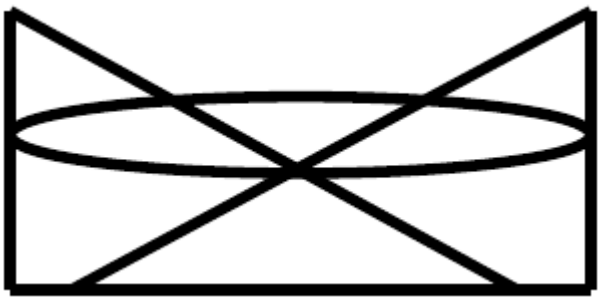
Q15. To encourage workers in the unorganized sector to voluntarily save for their old age, an initiative known as _____ was launched in 2010.

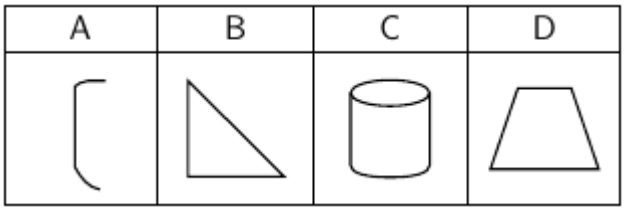
(a) Voluntary Retirement Scheme (VRS)
(b) Self-reliance scheme
(c) Old age committee
(d) New construction plan

Q16. Which of the following pair is not a prime number?

(a) 161, 163
(b) 101, 103
(c) 191, 193
(d) 41, 43

Q17. Which of the figures given in the alternative figure is combined to form the question figure?





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

Q18. The oxidation reaction that produces heat and light is _____.

(a) Endotherm
(b) Combustion
(c) Exothermic
(d) Neutral

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Q19. From the top of the platform, the angle of elevation of the top of the tower at a distance of 50√3 m is 30°. If the height of the tower is 60 m, what will be the height of the platform?

(a) 20√3 m
(b) 10 m
(c) 40 m
(d) 45√3 m

Q20. A simple magnifying glass contains:

(a) convex lens of high focus length
(b) concave lens of short focus length
(c) concave lens of high focus length
(d) convex lens of short focus length

Q21. The dry deciduous forest, Gir is in _____.

(a) Goa
(b) Gujarat
(c) Maharashtra
(d) Chhattisgarh

Q22. Sandra and Mayuri working together can complete a piece of work in 45 days. However, Mayuri works alone and leaves after completing one third of the work and then Sandra completes the work herself. As a result, both are able to complete the work in 104 days. If Mayuri acted faster than her. Then in how many days will Sandra alone complete the work?

(a) 72
(b) 60
(c) 240
(d) 120

Q23. Write the sum of the place value of 5 in 6/8 and place value of 4 in 6/25.

(a) 8/100
(b) 99/100
(c) 9/100
(d) 88/100

Q24. 'Ilayaraja' is known for his contribution in which of the following fields?

(a) Politics
(b) Literature
(c) Games
(d) Music

Q25. 30% of sales of a food retail chain is from dairy products and the rest is from fresh produce. If the chain has sales of about Rs.50000 in a month then what is the sale amount from dairy products?

(a) Rs. 15000
(b) Rs. 25000
(c) Rs. 22000
(d) Rs. 30000

Q26. A molecule of any substance contains 6.023×10^{23} particles. If 3.05×10^{23} particles are present in CO_2, then the number of molecules of CO_2 is:

(a) 0.5
(b) 1
(c) 0.25
(d) 2

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Q27. Leela walks 3 km towards South. At a crossroads, she turns left and walks 500 m to a cafe facing the road. In which direction is she with respect to his initial position?

(a) Southeast
(b) Northwest
(c) Northeast
(d) Southwest

Q28. Who won the 2016 World Chess Championship title?

(a) Garry Kasparov
(b) Magnus Carlsen
(c) Vishwanath Anand
(d) Sergey Karjakin

Q29. A shopkeeper sold 6 radios at 20% loss. Find the profit at which he should sell a TV, so that he can be at overall zero loss. The cost price of TV is 3 times that of each radio.

(a) 40%
(b) 50%
(c) 30%
(d) 60%

Q30. A statement is followed by two arguments. You have to decide which of the arguments is/are strong with respect to the statement.

Statement: There should be a power cut to save electricity.

Argument:

1. Yes, it helps in saving electricity and people have to pay less.
2. No, there should be no power cut. Institutions which require 24×7 electricity will be affected.

(a) Only argument 1 is strong.
(b) Both 1 and 2 are strong.
(c) Neither 1 nor 2 is strong.
(d) Only argument 2 is strong.

Q31. Soma's yearly income is Rs 15,00,000; each month, she pays an EMI of Rs 30,000. What percentage of her monthly salary goes towards EMI?

(a) 24
(b) 26
(c) 28
(d) 25

Q32. What is the full form of BCCI?

(a) Board of Control for Cricket in India
(b) Board for Cricket Control in India
(c) Board of Contract for Cricket in India
(d) Board of Conference for Cricket in India

Q33. The book "Interpreter of Maladies" is written by:

(a) Nayantara Sehgal
(b) Jhumpa Lahiri
(c) Arundhati Roy
(d) Shobhaa De

Q34. $425^2 - 424^2 = ?$

(a) 859
(b) 869
(c) 839
(d) 849

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Q35. The value of √45×√20/√12×√3 is:

(a) 9
(b) 6
(c) 15
(d) 5

Q36. Baby is born as a result of rhythmic contraction of muscles in _____.

(a) Cervix
(b) Oviduct
(c) Uterus
(d) Vagina

Q37. In a class of 150 students everyone plays at least one game Kabaddi or Kho-Kho. 78 students play Kabaddi and 18 students play both the games. What percentage of students play Kho-Kho?

(a) 60%
(b) 52%
(c) 40%
(d) 48%

Q38. Which of the following is the emblem of the Communist Party of India?

(a) Hammer, Sickle and Star
(b) Hand
(c) Corn and Sickle
(d) Elephant

Q39. Which of the following Ministry of Government of India prepares fiscal policy?

(a) Human Resource Development
(b) Finance
(c) Defence
(d) Home Affairs

Q40. What will be the smaller of the two angles made by the hour hand and minute hand in the clock at 2:41 pm?

(a) 165°
(b) 165.5°
(c) 166.5°
(d) 166°

Q41. Who has been crowned Miss Transqueen India 2017 for the first time from India?

(a) Nitasha Vinayana
(b) Ragasiya
(c) Loi Loi
(d) Laeticia Raveena

Q42. The resistance of a conductor is directly proportional to:

(a) Area of cross section
(b) Electric current
(c) Coulomb
(d) Length

Q43. Who among the following was NOT awarded the Crystal Prize by World Economic in Davos in January 2018?

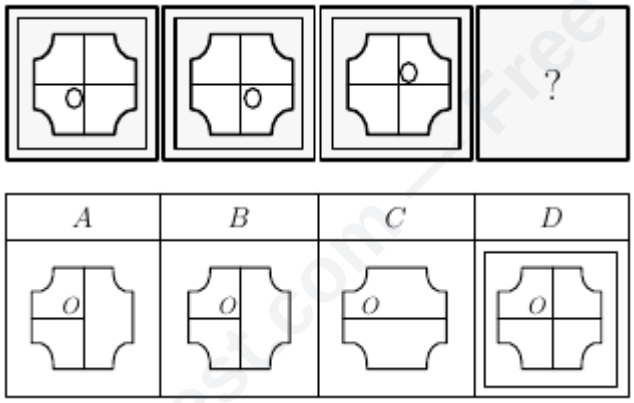
(a) Kiran Rao
(b) Shahrukh Khan
(c) Cate Blanchett
(d) Elton John

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Q44. Human genetics can be traced back to:

(a) African origin
(b) American origin
(c) South Asian origin
(d) East Asian origin

Q45. Which option will replace the question mark (?) in the following series?

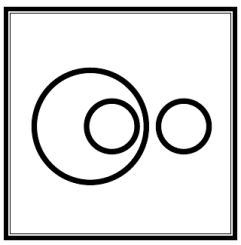


(a) A
(b) B
(c) D
(d) C

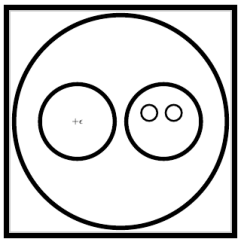
Q46. Which of the following correctly represents the relationship between the classes given below?

A. Italian
B.Spanish
C.Language

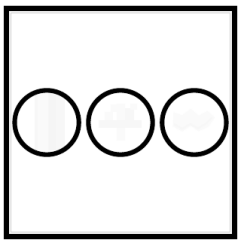
(a)



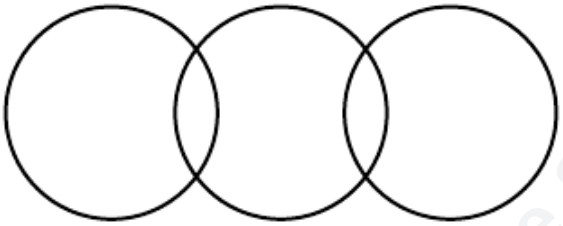
(b)



(c)



(d)



Q47. Which union ministry launched the 'Green Good Deeds' campaign in 2018?

(a) Ministry of Chemicals and Fertilizers
(b) Ministry of Environment, Forest and Climate Change
(c) Ministry of Agriculture and Farmers Welfare
(d) Ministry of AYUSH

Q48. If 21st January 2017 was Saturday, then what day was 31st August 2011?

(a) Wednesday
(b) Saturday
(c) Thursday
(d) Tuesday

Q49. If cosec A = 2, sec B = √2 then the value of A + B is:

(a) 30°
(b) 45°
(c) 75°
(d) 15°

Q50. Which committee has been appointed by the Government of India and RBI recently to investigate the assets stuck in the banking industry?

(a) Bibek Debroy Committee
(b) Sunit Mehta Committee
(c) Ashok Mehta Committee
(d) Swaminathan Committee

Q51. Pulse is a wave of _____.

(a) Some time
(b) Continuous period
(c) High span
(d) Beating and Vibration

Q52. An object travels 15 m in 3 s and then another 16 m in 2 s. What is the average speed of the object?

(a) 6.20 m
(b) 6.17 ms^(-1)
(c) 6.20 s^(-1)
(d) 6.20 ms^(-1)

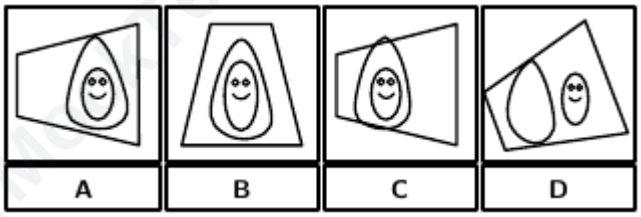
Q53. _____ is a neighboring country to the east of India.

(a) Nepal
(b) Sri Lanka
(c) China
(d) Bangladesh

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Q54. Which of the alternatives is the most closely related to the given figure?





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

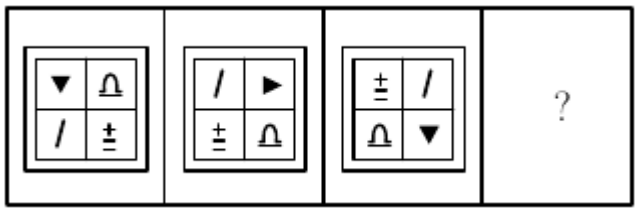
Q55. In December 2017, who was named as the new chairman of Broadcast Audience Research Council (BARC) India?

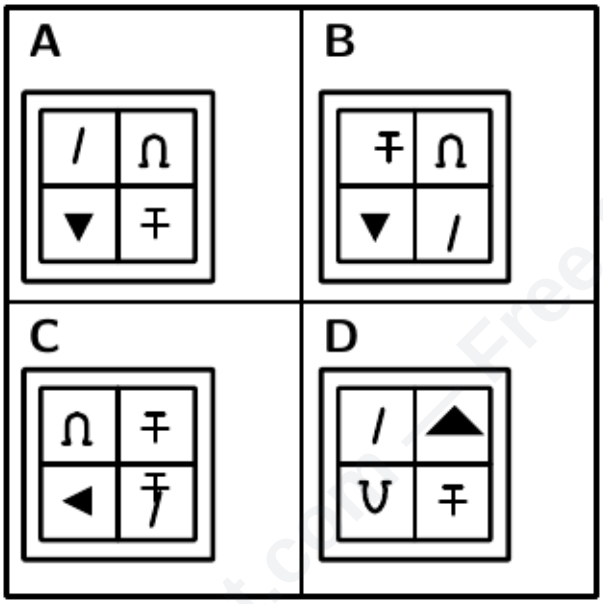
(a) Nakul Chopra
(b) Parvo Dasgupta
(c) Sudhanshu Vats
(d) Sameer Gupta

Q56. The number of solutions of equation x^(2/3)+x^(1/3)-2=0 is:

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

Q57. Which option will come in place of '?' in the following option?





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

Q58. A rower takes 8 hours to cover a distance of 60 km upstream while it takes 5 hours to cover the same distance downstream. What will be the speed of the rower in still water?

(a) 9.25 km/h
(b) 9.80 km/h
(c) 9.75 km/h
(d) 9.5 km/h

Q59. In _____, Sir William Jones founded the Asiatic Society of Bengal.

(a) 1786
(b) 1785
(c) 1784
(d) 1783

Q60. _____ metal is extracted by electrolysis only.

(a) Al
(b) Zn
(c) Fe
(d) Cu

Q61. The angle of elevation of a point A on the ground from the top of a tower is 30°. On going 20 m towards the foot of the tower, the angle of elevation changes to 60°. What is the distance of the tower from point A?

(a) 5√11 m
(b) 30 m
(c) 5 m
(d) 16 m

Q62. What will be the interest on Rs. 4600 in 5 years at the rate of 4.5% per annum simple interest?

(a) Rs. 1020
(b) Rs. 1025
(c) Rs. 1035
(d) Rs. 1045

Q63. Sunaina works in a private company and her annual income is 3 lakhs. He has a new and an old car. 5% of his income is spent on the upkeep of the new car and 2% more on the old one than the expenditure on the new one. What is his total annual expenditure on the maintenance of both the vehicles?

(a) Rs. 20000
(b) Rs. 36000
(c) Rs 12500
(d) Rs. 25000

Q64. Heat is related to Cold, in the same way Knight is related to _____?

(a) Coward
(b) Cowherd
(c) Shepherd
(d) Leopard

Q65. Below you are given a statement and two conclusions. Read them carefully and select the conclusions that logically follow from the statement.

Statement: A small child said, “Out of all the sweets, laddoos are my favourite.”

Conclusion:

1. He does not like any other sweets
2. The only sweet available to them is laddoos.

(a) Both conclusions follow.
(b) Only conclusion 1 follows.
(c) Only conclusion 2 follows.
(d) Neither 1 nor 2 follows.

Q66. What will be the next number in the following series?

51, 46, 41, _____,

(a) 29
(b) 36
(c) 26
(d) 27

Q67. Which of the following does not belong to this group?

1. Holes
2. Jhalar
3. Vacancy
4. Crack

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

Q68. Which award is given to the best performing university in the inter-university tournament?

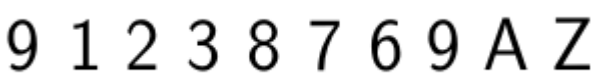
(a) National Sports Promotion Award
(b) Dronacharya Award
(c) Arjuna Award
(d) Maulana Abdul Kalam Azad Trophy

Q69. Which of the following number is the square root of 17956?

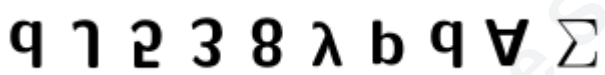
(a) 124
(b) 122
(c) 128
(d) 134

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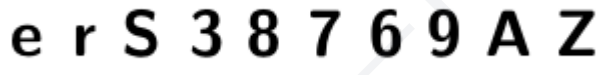
Q70. What will be the water image of the above figure?



(a)



(b)



(c)



(d)



Q71. Find out the next word in this series.

N4O5, P6Q7, R8S9, _____

(a) T0U2
(b) T0U3
(c) T9U1
(d) T0U1

Q72. Three years from now, Panna's age will be four years less than three times Eugene's age. The sum of their present ages is 54 years. What is the present age of Panna?

(a) 36 years
(b) 43 years
(c) 39 years
(d) 41 years

Q73. A statement is followed by two arguments. State which of the arguments is true regarding the statement.

Statements:

People should not use "use and throw pens".

Argument:

1. Yes, it leads to more wastage. At least in schools they should promote children to fountain pens or ones they can refill.

2. No, there are so many pens available, why should it be used less.

(a) Only argument 1 is correct.
(b) Neither 1 nor 2 is correct.
(c) Both 1 and 2 are correct.
(d) Only argument 2 is correct.

Q74. The fungal cell wall is made up of hard complex sugars called _____.

(a) Chitin
(b) Lignin
(c) Pectin
(d) Cellulose

Q75. The kinetic energy of an object of mass 10 kg moving with a velocity of 6 ms^(-1) is:

(a) 18 J
(b) 180 J
(c) 1.80 J
(d) 360 J

Q76. The normal average speed of a car on a road covering a certain distance is 50 km/h. On a particular day, the average speed was 1/10 less than the normal average speed, as a result of which it took 18 minutes longer to complete the journey. What is this distance of the road, in kilometres?

(a) 135
(b) 120
(c) 125
(d) 140

Q77. When a stone is released with zero velocity from the top of the tower it reaches the ground in 4 seconds, what is the height of the tower?

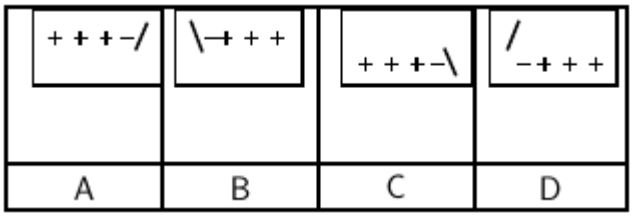
take g = 10 m/s²

(a) 40 m
(b) 80 m
(c) 400 m
(d) 20 m

Q78. 250 ÷ [-5 + (-5) of {63 ÷ (-28 ÷ -4)}] = ?

(a) 10
(b) -5
(c) 8
(d) -4

Q79. What is the lateral mirror image of + + + -/?



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

Q80. Writing 1/3000 as a recurring decimal, it will be

(a) 0.000333
(b) 0.333
(c) 0.00333
(d) 0.0333

Q81. In the following number series, What will be the next number?

3, 2, 8, 7, 13, 12, _____

(a) 26
(b) 27
(c) 18
(d) 17

Q82. At the three vertices of the triangle, three smaller triangles are drawn into the larger triangle such that each side of the smaller triangle is one-third as long as the congruent side of the larger triangle. The ratio of the area of the three smaller triangles taken together with that of the rest of the larger triangle will be:

(a) 3 : 13
(b) 1 : 2
(c) 3 : 16
(d) 1 : 4

Q83. The common element for all acids is:

(a) Bromine
(b) Chlorine
(c) Iodine
(d) Hydrogen

Q84. An object travels 15 m in 2 s and then 16 m in 2 s. What is the average speed of the object?

(a) 7 ms^(-1)
(b) 7.75 m
(c) 7.75 ms^(-1)
(d) 7.25 s^(-1)

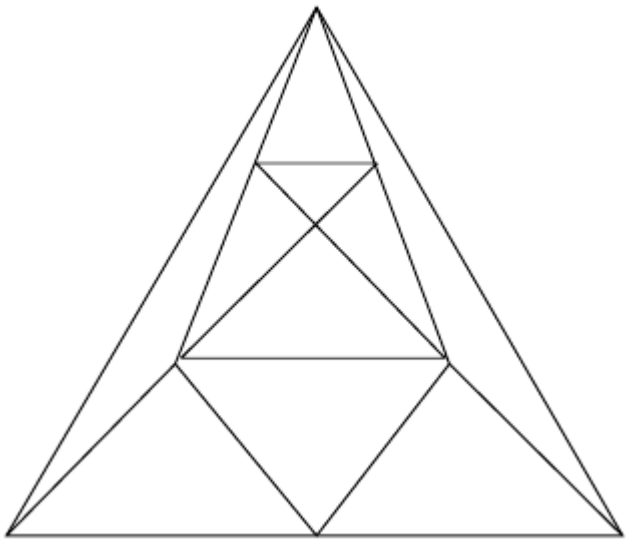
Q85. An object weighs 60 N when measured on the surface of the earth. Its weight on the surface of the Moon will be _____.

(a) 10 N
(b) 100 N
(c) 360 N
(d) 1 N

Q86. An electric bulb is connected to a 220 V generator. The current generated through it is 0.50 A. What is the Power of bulb?

(a) 110 Pa
(b) 110 N
(c) 110 W
(d) 110 J

Q87. How many triangles are there in the given figure?



(a) 14
(b) 21
(c) 10
(d) 16

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Q88. Starting from point A, X walks 15 km towards north to reach point B, from there he turns left and walks 10 km to reach point C. Then he turns right, and walks 10 km to reach point D. And finally he turns right and walks 30 km to reach point E.

The shortest distance (in km) between the starting point and the end point is:

(a) 6√41
(b) 5√42
(c) 2√42
(d) 5√41

Q89. Select the correct option to complete the pattern:

91827364, 81726354, 71625344, _____

(a) 5234166
(b) 61524334
(c) 61524336
(d) 5234165

Q90. Select the word which is related to the third term in the same way as the second term is related to the first term.

Sand : Rough :: Cotton :

(a) Nylon
(b) Soft
(c) Fabric
(d) Lycra

Q91. Select the word which is related to the third term in the same way as the second term is related to the first term.

Petrol : Car :: Electricity :

(a) Dark
(b) Room
(c) Object
(d) Bulb

Q92. Read the statement given below and some arguments given on its basis.

Statement:

The government should also promote indigenous medical systems along with allopathic medicines in general hospitals.

Argument:

1. Yes, this will ensure that people get access to the best of both the medical systems.

2. No, the allopathic system has treatment for all diseases, so there is no need to promote indigenous system.

Which of the above arguments is strong with respect to the statement?

(a) Only argument 2 is strong.
(b) Only argument 1 is strong.
(c) Both 1 and 2 are strong.
(d) Neither 1 nor 2 is strong.

Q93. Kurdish people are an ethnic community belonging to which of the following countries?

(a) Iraq
(b) Yemen
(c) Pakistan
(d) Bangladesh

Q94. The boiling point of water is:

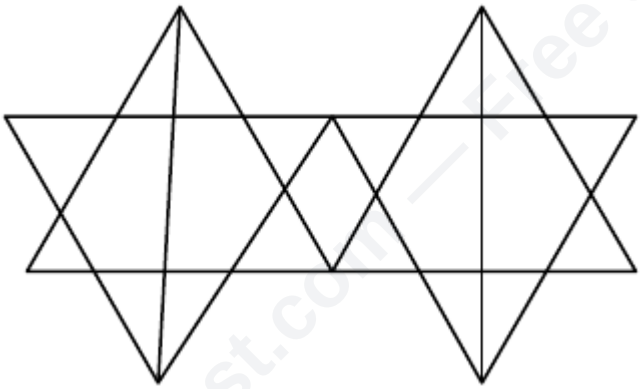
(a) 100°C
(b) 50°C
(c) 0°C
(d) 10°C

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Q95. _____ type of tissue make glands.

(a) Nerve
(b) Epithelial
(c) Muscle
(d) Connective

Q96. How many triangles are there in the following figure?



(a) 30
(b) 36
(c) 21
(d) 29

Q97. The World Food Prize 2018 has been won by two individuals. One of them is Dr. David Nabarro. What is the other's name?

(a) Robert mwanga
(b) Laurence Haddad
(c) Maria andrade
(d) Dr. Akinwumi Adesina

Q98. The outermost orbit has the same number of electrons in _____.

(a) O, F
(b) As, Bi
(c) H, Be
(d) Ar, K

Q99. Rod and cone are found in:

(a) Heart
(b) Lungs
(c) Eyes
(d) Nose

Q100. A solid metal sphere of diameter 42 cm is melted and recast into a wire whose diameter is 7 mm. Find the length of the wire.

(a) 1008 m
(b) 1080 cm
(c) 2016 m
(d) 2016 cm

ANSWER KEY

1	c	2	a	3	d	4	d	5	d	6	a	7	c	8	c	9	b	10	d
11	c	12	b	13	d	14	c	15	b	16	a	17	d	18	b	19	b	20	d
21	b	22	d	23	c	24	d	25	a	26	a	27	a	28	b	29	a	30	d

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31	a	32	a	33	b	34	d	35	d	36	c	37	a	38	c	39	b	40	b
41	a	42	d	43	a	44	a	45	c	46	b	47	b	48	a	49	c	50	b
51	a	52	d	53	d	54	a	55	a	56	d	57	a	58	c	59	c	60	a
61	b	62	c	63	b	64	a	65	d	66	b	67	b	68	d	69	d	70	a
71	d	72	d	73	a	74	a	75	b	76	a	77	b	78	b	79	a	80	a
81	c	82	b	83	d	84	c	85	a	86	c	87	b	88	d	89	b	90	b
91	d	92	b	93	a	94	a	95	b	96	b	97	b	98	b	99	c	100	a

SOLUTIONS

Q1. Answer: (c) 7.5 N

The correct answer is 7.5 N.

Key Points

• Given,

• mass = 5kg

• time = 2s

• Initial velocity = 4 ms-1

• final velocity = 7 ms-1

• Let the acceleration be 'a'.

• Therefore,

• a = (v-u)/t

• a = (7-4)/2

• a = 1.5 ms-2

• We know that force is the product of mass and acceleration.

• Therefore, force = 5 x 1.5 = 7.5 N

Q2. Answer: (a) 1951

The correct answer is 1951.

Key Points

• The first amendment was made to the Indian Constitution in 1951.

• The Constitution (First Amendment) Act, 1951, enacted in 1951, made several changes to the Fundamental Rights provisions of the Indian constitution.

• It provided means to restrict freedom of speech and expression, validation of zamindari abolition laws, and clarified that the right to equality does not bar the enactment of laws that provide "special consideration" for weaker sections of society.

• The formal title of the amendment is the Constitution (First Amendment) Act, 1951.

• It was moved by the then Prime Minister of India, Jawaharlal Nehru, on 10 May 1951 and enacted by Parliament on 18 June 1951.

Additional Information

• 93rd Amendment:

• The 93rd Constitutional Amendment allows the government to make special provisions for "advancement of any socially and educationally backward classes of citizens", including their admission in aided or unaided private educational institutions.

• 97th Amendment:

• The 97th Constitution Amendment Act, 2011 relates to the cooperative societies working in India.

• It aims to overcome all the problems faced by these societies and bring about an efficient way to manage them.

• It aims at encouraging the economic activities of cooperatives which in turn will help rural India progress.

• 24th Amendment:

• The 24th amendment was enacted as a reaction to the Golak Nath case, 1967.

• The Golak Nath ruling led to increased parliamentary authority to amend the Constitution.

• Through the Amendment, Parliament restored to itself undisputed authority to amend the Constitution, including its repeal.

• The 24th Amendment was the first of a series of several constitutional amendments designed to weaken the judiciary and enhance the authority of Parliament and the Prime Minister's office.

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• The most notable among these was the 25th, 38th, and 39th Amendments, culminating in the 42nd Amendment in 1976, which brought about the most sweeping changes to the Constitution in history..

Q3. Answer: (d) electronic configuration

The correct answer is electronic configuration.

Key Points

• The properties of an element in the periodic table depend on electronic configuration.

• The chemical properties of each element are determined by the element's electronic configuration, and particularly by its outermost valence electrons.

• An element's location in the periodic table is largely dependent on its electrons; the number of valence shell electrons determines its group, and the type of orbital in which the valence electrons lie determines the element's block.

• In addition, the total number of electron shells an atom determines which period it belongs to.

• Because of its structure, the periodic table has become an extremely useful tool for assessing and predicting elemental and chemical trends.

Additional Information

• The periodic table, also known as the periodic table of (the) elements, is a tabular display of the chemical elements.

• It is a graphic formulation of the periodic law, which states that the properties of the chemical elements exhibit a periodic dependence on their atomic numbers.

• The table is divided into four roughly rectangular areas called blocks.

• The rows of the table are called periods, and the columns are called groups.

• Elements from the same column group of the periodic table show similar chemical characteristics.

• Trends run through the periodic table, with nonmetallic character (keeping their own electrons) increasing from left to right across a period, and from down to up across a group, and metallic character (surrendering electrons to other atoms) increasing in the opposite direction.

• The underlying reason for these trends is the electron configurations of atoms.

Q4. Answer: (d) Calcutta

The correct answer is Calcutta.

Key Points

• In 1781, Warren Hastings, the first Governor-General of Bengal, established a madrasa in Calcutta for the study and teaching of Muslim law.

• Calcutta Madrasa, The (later Calcutta Aliya Madrasa) was the earliest of the state-managed educational institutions under British rule in India.

• Founded by Governor-General Warren Hastings in October 1780 with its entire expense borne by him for a year and a half, of course fully reimbursed later, the Bengal Government took it over in April 1782.

• Originally situated at Baithakkhana near Sealdah in Calcutta.

• It was shifted to its present site at Wellesley Square in 1827.

Additional Information

• The Zamindari System :

• The zamindari system was introduced by Lord Cornwallis in 1793 through Permanent Settlement that fixed the land rights of the members in perpetuity without any provision for fixed rent or occupancy right for actual cultivators.

• Under the Zamindari system, the land revenue was collected from the farmers by the intermediaries known as Zamindars.

• The Ryotwari System :

• In the British territories in southern India, there was a move away from the idea of Permanent Settlement.

• A system that came to be known as the Ryotwari System, was devised by Captain Alexander Read and Sir Thomas Munro at the end of the 18th century and introduced by the latter when he was governor of Madras Presidency (1819–26).

• Under the Ryotwari system, the land revenue was paid by the farmers directly to the state.

• The Mahalwari System :

• The system was popularised by Lord William Bentinck in Agra and Awadh and was later extended to Madhya Pradesh and Punjab.

• Under the Mahalwari system, the land revenue was collected from the farmers by the village headmen on behalf of the whole village (and not the zamindar).

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Q5. Answer: (d) 2

Concept used:

Follow BODMAS rule to solve this question, as per the order given below,

Given:

-(-6) [3 - {8 - (-3)}] ÷ [4{12 + (-3) × 6}] = ?

Calculation:

-(-6) [3 - {8 - (-3)}] ÷ [4{12 + (-3) × 6}] = ?

=> 6 [3 - {8 + 3}] ÷ [4{12 - 3 × 6}] = ?

=> 6 [3 - 11] ÷ [4{12 - 18}] = ?

=> 6 [- 8] ÷ [4 × {- 6}] = ?

=> - 48 ÷ [- 24] = ?

=> - 48/- 24 = ?

=> 48/24 = ?

=> 2 = ?

Therefore The value of ? is 2.

Mistake Points(-) × (-) = +

(+) × (-) = -

(+) × (+) = +

(-) × (+) = -

Q6. Answer: (a) 50 m³/min

Shortcut Trick

Let filling capacity be x m³/min and emptying speed be (x + 10) m³/min.

Using the time difference formula: (Total Capacity ÷ x) − (Total Capacity ÷ (x + 10)) = Time Difference.

Check options: If x = 50, then (2400 ÷ 50) − (2400 ÷ 60) = 48 − 40 = 8 minutes.

Since the difference matches the given 8 minutes, the filling capacity is 50 m³/min.

Therefore The correct answer is 50 m³/min.

Alternate Method

Given:

Tank Capacity = 2400 m³

Let filling capacity = x m³/min

Then emptying speed = (x + 10) m³/min

Time difference = 8 minutes

Formula Used:

Time = Work ÷ Efficiency

Process	Capacity (m³/min)	Total Work (m³)	Time (min)
Filling	x	2400	2400 ÷ x
Emptying	x + 10	2400 ÷ (x + 10)	

Calculations:

=> [2400 ÷ x] − [2400 ÷ (x + 10)] = 8

=> 2400 × [(x + 10 − x) ÷ (x × (x + 10))] = 8

=> 2400 × [10 ÷ (x² + 10x)] = 8

=> 300 × 10 = x² + 10x

=> x² + 10x − 3000 = 0

=> x² + 60x − 50x − 3000 = 0

=> x(x + 60) − 50(x + 60) = 0

=> (x − 50)(x + 60) = 0

=> x = 50 (Since capacity cannot be negative)

Therefore The correct answer is 50 m³/min.

Additional Information

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Pipes and Cisterns Efficiency

Filling capacity is treated as positive efficiency, while emptying capacity is treated as negative efficiency in net work calculations.

Quadratic Shortcut

For $x^2 + bx + c = 0$, if c is negative, the roots have opposite signs. The larger factor of c (when sum is b) takes the opposite sign of b.

Time-Work Relation

Time is inversely proportional to efficiency for a constant amount of work (tank capacity).

Q7. Answer: (c) D

The logic followed here is:

• There are three images in each figure a square, a smiley and a geometrical figure circle, pentagon and rhombus.

• In figure D there are only two images. a smiley and a square.

Hence, 'figure D' is the odd one.

Q8. Answer: (c) 550 m

The diagrammatic representation of the given data is as follows:

• The distance between the starting point and her final position is: 1km - 450 m = 1000 m - 450 m = 550 m.

Hence, '550 m is the correct answer.

Q9. Answer: (b) Aluminum

The correct answer is Aluminum.

Key Points

• The metal oxide of aluminum is an amphoteric oxide.

• Metal oxides that react with both acids as well as bases to produce salts and water are known as amphoteric oxides.

• Many metals (such as zinc, tin, lead, aluminum, and beryllium) form amphoteric oxides or hydroxides.

• Amphoterism depends on the oxidation states of the oxide.

• Al2O3 is an example of an amphoteric oxide.

• Amphoteric oxides also include lead (II) oxide, and zinc (II) oxide, among many others.

Additional Information

• A Bronsted-Lowry acid is any species that is capable of donating a proton—H+.

• A Bronsted-Lowry base is any species that is capable of accepting a proton, which requires a lone pair of electrons to bond to the H+.

• Water is amphoteric, which means it can act as both a Brønsted-Lowry acid and a Brønsted-Lowry base.

• Strong acids and bases ionize completely in an aqueous solution, while weak acids and bases ionize only partially.

• The conjugate base of a Brønsted-Lowry acid is the species formed after an acid donates a proton.

• The conjugate acid of a Brønsted-Lowry base is the species formed after a base accepts a proton.

• The two species in a conjugate acid-base pair have the same molecular formula except the acid has an extra H+.

Q10. Answer: (d) (8, 3)

Shortcut Trick

Use the weighted average of the coordinates based on the ratio 3 : 1.

x-coordinate = $[3 \times 11 + 1 \times (-1)] \div (3 + 1) = 32 \div 4 = 8$

y-coordinate = $[3 \times 1 + 1 \times 9] \div (3 + 1) = 12 \div 4 = 3$

Therefore The correct answer is (8, 3).

Alternate Method

Given: Points A(−1, 9) and B(11, 1), Ratio m : n = 3 : 1.

Formula Used: Section Formula for internal division: P(x, y) = [(mx2 + nx1)/(m + n), (my2 + ny1)/(m + n)]

=> $x = [3 \times 11 + 1 \times (-1)] \div (3 + 1)$

=> $x = (33 - 1) \div 4 = 32 \div 4 = 8$

=> $y = [3 \times 1 + 1 \times 9] \div (3 + 1)$

=> $y = (3 + 9) \div 4 = 12 \div 4 = 3$

Therefore The correct answer is (8, 3).

Additional Information

External Division Formula

If a point divides a segment externally in ratio m:n, the coordinates are [(mx2 − nx1)/(m − n), (my2 − ny1)/(m − n)].

Q11. Answer: (c) 6

The correct answer is 6.

Key Points

• There are 6 electrons involved in bond formation in N_(2.)

• Nitrogen molecule is formed by sharing of three electrons by each nitrogen, so the total number of electrons shared are six.

• Both the nitrogen atoms will each share three electrons and thus, form three covalent bonds and make a nitrogen molecule (N2).

• By sharing 6 electrons where the shells touch each nitrogen atom can count 8 electrons in its outer shell.

Additional Information

• Molecular nitrogen (N2) is a very common chemical compound in which two nitrogen atoms are tightly bound together by a strong covalent bond.

• Molecular nitrogen is a colorless, odorless, tasteless, and inert gas at standard temperature and pressure.

Q12. Answer: (b) 2

Shortcut Trick

Total departures from 06:00 am to 12:00 pm = 4 + 2 + 2 + 1 + 1 + 2 = 12

Total number of hourly intervals = 6

Required Average = Total Departures ÷ Number of intervals = 12 ÷ 6 = 2

Therefore The correct answer is 2.

Alternate Method

Given:

Hourly departures: 4, 2, 2, 1, 1, 2

Total duration: 6 hours (from 6:00 am to 12:00 pm)

Formula Used:

Average = (Sum of all observations) ÷ (Total number of observations)

Calculations:

=> Sum of departures = 4 + 2 + 2 + 1 + 1 + 2

=> Sum of departures = 12

=> Total number of time slots = 6

=> Average departures = 12 ÷ 6

=> Average departures = 2

Therefore The correct answer is 2.

Additional Information

Arithmetic Mean (Average)

The average is the central value of a set of data, calculated by dividing the total sum by the count of elements. Formula: Average = Σx ÷ n.

Data Interpretation (Tabulation)

In table-based DI, always identify the specific range or category requested before summing the values to avoid calculation errors.

Weighted Average

When different groups have different weights or frequencies, the average is calculated as Σ(f × x) ÷ Σf.

Q13. Answer: (d) Valence electron

The correct answer is Valence electrons.

Key Points.

• Elements of the same group in the modern periodic table have the same valence electrons.

• The atomic mass of an element is the average mass of the atoms of an element measured in the atomic mass unit (AMU, also known as daltons, D).

• The atomic mass is a weighted average of all of the isotopes of that element, in which the mass of each isotope is multiplied by the abundance of that particular isotope.

• The atomic radius of a chemical element is a measure of the size of its atoms, usually the mean or typical distance from the center of the nucleus to the boundary of the surrounding shells of electrons.

Additional Information

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• Elements in the same group have similar properties because they have the same number of valence electrons in their outermost shell.

• Elements in the same period have different properties because the number of valence electrons in their outermost shells differs.

• In chemistry, the valence or valency of an element is the measure of its combining capacity with other atoms when it forms chemical compounds or molecules.

Q14. Answer: (c) 11220518

• The logic followed here is: Code of a letter = its positional value

OATH is coded as follows:

Therefore, 'OATH' is coded as 151208.

Similarly,

ALTER is coded as

Therefore, ALTER is coded as 11220518.

Hence. '11220518' is the correct answer.

Q15. Answer: (b) Self-reliance scheme

The correct answer is Self-reliance scheme.

Key Points

• To encourage workers in the unorganized sector to voluntarily save for their old age, an initiative known as Self-reliance or swabhalamban scheme was launched in 2010.

• The government of India established Pension Fund Regulatory and Development Authority (PFRDA)- External website that opens in a new window on 10th October 2003 to develop and regulate the pension sector in the country.

Additional Information

• The National Pension System (NPS) was launched on 1st January 2004 with the objective of providing retirement income to all citizens.

• NPS aims to institute pension reforms and to inculcate the habit of saving for retirement amongst the citizens.

• Initially, NPS was introduced for the new government recruits (except armed forces).

• With effect from 1st May 2009, NPS has been provided for all citizens of the country including the unorganized sector workers on a voluntary basis.

• Under Swavalamban Scheme- External website that opens in a new window, the government will contribute a sum of Rs.1,000 to each eligible NPS subscriber who contributes a minimum of Rs.1,000 and a maximum of Rs.12,000 per annum.

• This scheme is presently applicable up to F.Y.2016-17.

• Under Swavalamban Pension Yojana, the minimum investment amount was Rs. 1000 per annum, whereas, the maximum amount per annum was Rs. 12,000.

• Further, the Indian Government contributed a sum of Rs. 1000 per annum in all active Swavalamban Scheme accounts for 5 years.

Q16. Answer: (a) 161, 163

The logic followed here is:

• 161, 163 → 161 is divisible by 7. (7 × 23 = 161)

• 101, 103 → 101, and 103 are prime numbers.

• 191, 193 → 191, and 193 are prime numbers.

• 41, 43 → 41, and 43 are prime numbers.

Hence, '161, 163' is the correct answer.

Q17. Answer: (d) Only B and C

The logic followed here is :

Hence, answer figures B and C are combined to form the question figure.

Q18. Answer: (b) Combustion

The correct answer is Combustion.

Key Points

• The oxidation reaction that produces heat and light is combustion.

• Combustion reactions occur when oxygen reacts with another substance and gives off heat and light.

• Burning coal, methane gas, and sparklers are all common examples of combustion reactions.

• Essentially, any reaction that involves burning something is a combustion reaction.

Additional Information

• An endothermic reaction occurs when energy is absorbed from the surroundings in the form of heat.

• Melting ice cubes, Melting solid salts, Evaporating liquid water, Converting frost to water vapor (melting, boiling, and evaporation, in general, are endothermic processes.

• Conversely, an exothermic reaction is one in which energy is released from the system into the surroundings.

• Brushing your teeth, washing your hair, and lighting your stove are all examples of exothermic reactions.

• Combustion, a chemical reaction between substances, usually including oxygen and usually accompanied by the generation of heat and light in the form of flame.

Q19. Answer: (b) 10 m

Shortcut Trick

For an angle of 30°, the ratio of Perpendicular to Base is 1 : √3.

Base = 50√3 m (given distance), so Perpendicular part of tower = 50 m.

Height of Platform = Total Tower Height − Perpendicular part = 60 − 50 = 10 m.

Therefore The correct answer is 10 m.

Alternate Method

Given: Height of Tower (H) = 60 m, Distance between Platform and Tower (D) = 50√3 m, Angle of elevation (θ) = 30°.

Formula Used: tanθ = Perpendicular / Base

=> Let the height of the Platform be 'h' m.

=> Height of the tower above the platform level = (60 − h) m.

=> tan 30° = (60 − h) / 50√3

=> 1/√3 = (60 − h) / 50√3

=> 50 = 60 − h

=> h = 60 − 50 = 10 m.

Therefore The correct answer is 10 m.

Additional Information

Angle of Elevation

The angle formed by the line of sight with the horizontal when looking up at an object.

Trigonometric Ratios

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

Height and Distance Relation

Height = Distance × tan(θ) when measuring from the ground level.

Q20. Answer: (d) convex lens of short focus length

The correct answer is convex lens of short focus length.

Key Points

• A simple magnifying glass contains a convex lens of short focal length.

• A simple magnifier is a converging lens and produces a magnified virtual image of an object located within the lens’s focal length.

• The simple magnifier is a convex lens used to produce an enlarged image of an object on the retina.

Additional Information

• A convex lens is thicker at the centre and thinner at the edges.

• A concave lens is thicker at the edges and thinner at the centre.

• Due to the converging rays, it is called a converging lens.

• Due to the diverging rays, it is called a diverging lens.

• A Concave lens is a lens that diverges the straight light beam coming from the source to create a reduced, upright, or digital picture.

• It can generate real and virtual objects, depending on the light source.

• Convex lenses are known as positive lenses, plus lenses, lenses that converge, and condensers.

• The convex lenses are in the middle fat and on the

Q21. Answer: (b) Gujarat

The correct answer is Gujarat.

Key Points

• The dry deciduous forest, Gir is in Gujarat.

• Gir Forest National Park is a wildlife sanctuary in Gujarat, western India.

• It was established to protect Asiatic lions, who frequent the fenced-off Devalia Safari Park, along with leopards and antelopes.

• Gir Jungle Trail, outside the fenced area, traverses deciduous forest and is home to wildlife including vultures and pythons.

• The Kamleshwar Dam has marsh crocodiles and birds, such as Indian skimmers and pelicans.

Additional Information

• Simlipal National Park :

• Similipal National Park is a national park and a tiger reserve in the Mayurbhanj district in the Indian state of Odisha.

• It has some beautiful waterfalls like Joranda and Barehipani.

• Guindy National Park :

• Guindy National Park is a beautiful place, located in the Chennai district of the state of Tamil Nadu.

• The park is home to spotted deer, blackbucks, white bucks, river otter, hyena, bonnet monkey, civet cat, jackals, pangolin, hedgehog and common mongoose, etc.

• Guindy National Park was established in the year of 1976.

• Ranthambore National Park :

• Ranthambore National Park is located about 13.5 kilometers from the city of Sawai Madhopur in Rajasthan.

• It is a former royal hunting ground and home to tigers, leopards, and marsh crocodiles.

Q22. Answer: (d) 120

Shortcut Trick

Combined efficiency of Sandra (S) and Mayuri (M): 1/45 of work per day.

Condition: (1/3)/M + (2/3)/S = 104 => 1/M + 2/S = 312.

From 1/M + 1/S = 1/45 → 1/M = 1/45 − 1/S. Substitute in above: (1/45 − 1/S) + 2/S = 312 → 1/S = 312 − 1/45 is incorrect for direct work days; we use quadratic/options.

Testing option 120 days for Sandra: If S = 120, then 1/M = 1/45 − 1/120 = (8 − 3)/360 = 5/360 = 1/72. (M = 72 days).

Verify time: (1/3 × 72) + (2/3 × 120) = 24 + 80 = 104 days. Since M (72) < S (120), Mayuri is faster.

Therefore The correct answer is 120 days.

Alternate Method

Given: (S + M) together = 45 days. 1/3 work by M and 2/3 work by S = 104 days. Mayuri is faster (M < S).

Formula Used: Total Work = Time × Efficiency; Time = Work / Efficiency.

Let total work be 1 unit. Let S be days for Sandra and M be days for Mayuri.

=> 1/M + 1/S = 1/45 ... (Equation 1)

=> M/3 + 2S/3 = 104 => M + 2S = 312 => M = 312 − 2S ... (Equation 2)

Substitute M in Eq 1:

=> 1/(312 − 2S) + 1/S = 1/45

=> (S + 312 − 2S) / (S(312 − 2S)) = 1/45

=> 45(312 − S) = 312S − 2S2

=> 14040 − 45S = 312S − 2S2

=> 2S2 − 357S + 14040 = 0

Solving the quadratic equation for S:

=> S = [357 ± √(3572 − 4 × 2 × 14040)] / (2 × 2)

=> S = [357 ± √(127449 − 112320)] / 4 = [357 ± √15129] / 4

=> S = (357 ± 123) / 4

=> S1 = 480/4 = 120; S2 = 234/4 = 58.5

If S = 120, then M = 312 − 2(120) = 72 (Mayuri is faster, satisfies condition).

If S = 58.5, then M = 312 − 117 = 195 (Sandra is faster, violates condition).

Therefore The correct answer is 120 days.

Additional Information

Combined Work Formula

If two people A and B complete work in 'a' and 'b' days respectively, then working together they take (a × b) / (a + b) days.

Efficiency and Time Relationship

Efficiency is inversely proportional to time taken. If Mayuri is faster, her time 'M' must be less than Sandra's time 'S'.

Partial Work

Time taken for partial work = (Fraction of work) × (Total time to complete full work alone).

Q23. Answer: (c) 9/100

Shortcut Trick

Convert fractions to decimals first: 6/8 = 0.75 and 6/25 = 0.24.

Place value of 5 in 0.75 is 0.05 (5/100).

Place value of 4 in 0.24 is 0.04 (4/100).

Sum = 5/100 + 4/100 = 9/100.

Therefore The correct answer is 9/100.

Alternate Method

Given: First fraction = 6/8, Second fraction = 6/25.

Formula Used: Place value in decimals: Tenths = 1/10, Hundredths = 1/100.

=> 6/8 = 0.75

=> In 0.75, 7 is at tenths place and 5 is at hundredths place.

=> Place value of 5 = 5/100

=> 6/25 = (6×4)/(25×4) = 24/100 = 0.24

=> In 0.24, 2 is at tenths place and 4 is at hundredths place.

=> Place value of 4 = 4/100

=> Sum = 5/100 + 4/100 = 9/100

Therefore The correct answer is 9/100.

Additional Information

Decimal Place Value

For a decimal number 0.abc, the place value of a is a/10, b is b/100, and c is c/1000.

Fraction to Decimal Conversion

To convert a fraction to a decimal, divide the numerator by the denominator or make the denominator a power of 10.

Q24. Answer: (d) Music

The correct answer is Music.

Key Points

• 'Ilayaraja' is known for his contribution in music.

• R. Gnanathesikan (born 2 June 1943), known as Ilaiyaraaja, is an Indian film composer, conductor-arranger, singer and lyricist who works in the Indian film industry, predominantly in Tamil.

• Widely regarded as one of the greatest Indian music composers, he is often credited for introducing Western musical sensibilities in the South Indian film musical mainstream.

• He has composed more than 7,000 songs, provided film scores for more than 1,000 movies and performed in more than 20,000 concerts.

• Ilaiyaraaja is nicknamed "Isaignani" (musical genius) and is often referred to as "Maestro".

Additional Information

• Ilaiyaraaja is a recipient of five National Film Awards—three for Best Music Direction and two for Best Background Score.

• In 2012, he received the Sangeet Natak Akademi Award, the highest Indian recognition given to practising artists, for his creative and experimental works in the music field.

• In 2010, he was awarded the Padma Bhusan, the third-highest civilian honour in India and the Padma Vibhushan in 2018, the second-highest civilian award by the government of India.

Q25. Answer: (a) Rs. 15000

Shortcut Trick

Dairy sales = 30% of Total sales

Dairy sales = 0.3 × 50000

Dairy sales = 15000

Therefore The correct answer is Rs. 15000.

Alternate Method

Given:

Total Sales = Rs. 50000

Dairy Products Share = 30%

Formula: Value = (Percentage ÷ 100) × Total Value

Calculations:

=> Dairy Sale Amount = (30 ÷ 100) × 50000

=> Dairy Sale Amount = 0.30 × 50000

=> Dairy Sale Amount = 3 × 5000

=> Dairy Sale Amount = 15000

Therefore The correct answer is Rs. 15000.

Additional Information

Percentage to Fraction Conversion

To simplify calculations, remember that 30% is equivalent to the fraction 3/10.

Complementary Percentage

If 30% is dairy, the Fresh Produce sales account for 100% − 30% = 70% of the total sales.

Base Value Concept

In percentage problems, the Total Sales (Rs. 50000) acts as the base (100%) upon which all other values are calculated.

Q26. Answer: (a) 0.5

The correct answer is 0.5

Key Points

• The number of molecules of CO_2 is 0.5 (half of total)

• We know One mole of a substance contains 6.023×10^{23} particles.

• In CO_2,

• Molecular mass = 12 + (16 × 2) = 44g = 1 mole

Given:

• 3.05×10^{23} particles present in CO_2

• Number of moles in 3.05×10^{23} particles of CO_2,

• $=(3.05\times10^{23})/(6.023\times10^{23})$

• 0.50639

• approximately it is taken as 0.5

• Hence the molecules present in the CO_2 are 0.5mole

Additional Information

• 1 Mole: A mole is defined as $6.02214076 \times 10^{23}$of some chemical unit, be it atoms, molecules, ions, or others.

Q27. Answer: (a) Southeast

On diagrammatically representing the given data:

Hence, Leela is now in Southeast direction with respect to her initial position.

Q28. Answer: (b) Magnus Carlsen

The correct answer is Magnus Carlsen.

Key Points

• The 2016 World Chess Championship title was won by Magnus Carlsen.

• The World Chess Championship 2016 was a chess match between the reigning world champion Magnus Carlsen and the challenger Sergey Karjakin to determine the World Chess Champion.

• Carlsen had been world champion since 2013, while Karjakin qualified as a challenger by winning the 2016 Candidates Tournament.

Additional Information

• Sven Magnus oen Carlsen is a Norwegian chess grandmaster who is the reigning five-time World Chess Champion, three-time World Rapid Chess Champion, and five-time World Blitz Chess Champion.

• The World Chess Championship is played to determine the world champion in chess.

• The current world champion is Magnus Carlsen of Norway, who has held the title since 2013.

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• The best-of-12 match, organized by FIDE and its commercial partner Agon, was played in New York City between 10 and 30 November 2016.

Q29. Answer: (a) 40%

Shortcut Trick

Let the Cost Price of one radio be 100 units.

Total Loss on 6 radios = 6 × 20% of 100 = 120 units.

Cost Price of TV = 3 × 100 = 300 units.

To achieve overall zero loss, Profit on TV must equal Loss on radios.

Profit% on TV = (Total Loss ÷ CP of TV) × 100 = (120 ÷ 300) × 100 = 40%.

Therefore The correct answer is 40%.

Alternate Method

Given: Number of radios = 6, Loss% per radio = 20%, CP of TV = 3 × CP of Radio.

Formulas: Total Loss = n × (CP × Loss%), Profit = SP − CP, Profit% = (Profit ÷ CP) × 100.

=> Let CP of one radio = x. Then Total CP of 6 radios = 6x.

=> Total Loss on radios = 20% of 6x = 0.20 × 6x = 1.2x.

=> Cost Price of TV = 3x.

=> To have zero profit/loss, Profit on TV must be 1.2x.

=> Required Profit% = (1.2x ÷ 3x) × 100 = 0.4 × 100 = 40%.

Therefore The correct answer is 40%.

Additional Information

Overall Profit and Loss

When multiple articles are sold, the Net Profit or Loss is the algebraic sum of the individual profits and losses in absolute value.

Zero Loss Condition

A state of Zero Loss/Zero Profit (Break-even) occurs when the total Selling Price of all items equals the total Cost Price of all items.

Q30. Answer: (d) Only argument 2 is strong.

1. Yes, it helps in saving electricity and people have to pay less.→ This argument is not a strong argument. People can save electricity by having control on electricity usage at their personal level. It is also possible to develop other sources of power to reduce usage. A power cut is not a sensible or reasonable action.

2. No, there should be no power cut. Institutions that require 24×7 electricity will be affected. → This argument is a strong argument. There are institutions such as hospitals that require 24 × 7 electricity, in case of power cut they will be affected and may put lives in danger.

Hence, only argument 2 is strong.

Q31. Answer: (a) 24

Shortcut Trick

Monthly Income = Yearly Income ÷ 12 = 15,00,000 ÷ 12 = 1,25,000

EMI Percentage = (Monthly EMI ÷ Monthly Income) × 100

=> (30,000 ÷ 1,25,000) × 100 = 300 ÷ 12.5 = 24%

Therefore The correct answer is 24%.

Alternate Method

Given:

Yearly Income of Soma = Rs. 15,00,000

Monthly EMI = Rs. 30,000

Formula Used:

Monthly Salary = Yearly Income ÷ 12

Percentage = (Part Value ÷ Total Value) × 100

Calculations:

=> Monthly Income = 15,00,000 ÷ 12

=> Monthly Income = Rs. 1,25,000

=> EMI Percentage = (30,000 ÷ 1,25,000) × 100

=> EMI Percentage = (30 ÷ 125) × 100

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=> EMI Percentage = (6 ÷ 25) × 100

=> EMI Percentage = 6 × 4 = 24%

Therefore The correct answer is 24%.

Additional Information

Percentage Conversion

To find what percentage x is of y, use the formula: (x ÷ y) × 100.

Annual to Monthly conversion

When data is given yearly, always divide by 12 to find the monthly equivalent before comparing with monthly expenses.

Fraction to Percentage

Common fractions like 1/4 = 25%, 1/5 = 20%, and 6/25 = 24% help in faster calculation during exams.

Q32. Answer: (a) Board of Control for Cricket in India

The correct answer is Board of Control for Cricket in India.

Key Points

• The full form of BCCI is the Board of Control for Cricket in India.

• The Board of Control for Cricket in India (BCCI) is the governing body for cricket in India and is under the jurisdiction of the Ministry of Youth Affairs and Sports, the Government of India.

• It is an autonomous organization and does not come under the National sports federation of India.

• The board was formed in December 1928 as a society, registered under the Tamil Nadu Societies Registration Act.

• BCCI is an autonomous body and does not review any grants or fundings from the Sports Ministry of India.

Additional Information

• BCCI has two International Cricket teams that represent India in international cricket, are India men's national cricket team and the India women's national cricket team.

• The board organizes matches and does the scheduling for both teams.

• BCCI is the richest cricket board in the world and is part of the 'big three' of international cricket along with Cricket Australia and England and Wales Cricket Board.

• Its headquarters is located at Wankhede Stadium in Mumbai, Maharashtra.

• Grant Govan was its first president and Anthony De Mello was the first secretary.

Q33. Answer: (b) Jhumpa Lahiri

The correct answer is Jhumpa Lahiri.

Key Points

• The book "Interpreter of Maladies" is written by Jhumpa Lahiri.

• Interpreter of Maladies is a book collection of nine short stories by American author of Indian origin Jhumpa Lahiri published in 1999.

• It won the Pulitzer Prize for Fiction and the Hemingway Foundation/PEN Award in the year 2000 and has sold over 15 million copies worldwide.

• It was also chosen as The New Yorker's Best Debut of the Year and is on Oprah Winfrey's Top Ten Book List.

• The stories are about the lives of Indians and Indian Americans who are caught between their roots and the "New World".

Additional Information

• Nilanjana Sudeshna "Jhumpa" Lahiri (born July 11, 1967) is an American author known for her short stories, novels, and essays in English, and, more recently, in Italian.

• Her debut collection of short stories Interpreter of Maladies (1999) won the Pulitzer Prize for Fiction and the PEN/Hemingway Award, and her first novel, The Namesake (2003), was adapted into the popular film of the same name.

• Nayantara Sehgal

• Sahgal first wrote Prison and Chocolate Cake (1954), an autobiographical memoir about her youth amid the Nehru family.

• In her fourth novel, The Day in Shadow (1971), for example, the heroine is an educated divorcée struggling in India’s male-dominated society.

• Books by Arundhati Roy

• The Algebra of Infinite Justice

• The God of Small Things

• The Ministry of Utmost Happiness

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Q34. Answer: (d) 849

Shortcut Trick

The difference between the squares of two consecutive numbers is always equal to the sum of the two numbers.

Logic: $(n + 1)^2 - n^2 = (n + 1 + n)(n + 1 - n) = 2n + 1 = (n + 1) + n$

=> $425^2 - 424^2 = 425 + 424$

=> 849

Therefore The correct answer is 849.

Alternate Method

Given:

Expression = $425^2 - 424^2$

Formula Used:

Using the algebraic identity: $a^2 - b^2 = (a - b)(a + b)$

Calculations:

=> Here, a = 425 and b = 424

=> $425^2 - 424^2 = (425 - 424) \times (425 + 424)$

=> $1 \times (425 + 424)$

=> 1×849

=> 849

Therefore The correct answer is 849.

Additional Information

Square of numbers ending in 5

To square a number ending in 5 (n5), multiply the tens digit (n) by the next consecutive integer (n+1) and append 25 at the end. Example: $25^2 = (2 \times 3)25 = 625$.

Basic Algebraic Identities

$(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$ are fundamental for simplifying complex square expressions.

Sum of First n Odd Numbers

The sum of the first n odd natural numbers is always equal to n^2. This property is often used to calculate squares by summation.

Q35. Answer: (d) 5

Given:

$(\sqrt{45} \times \sqrt{20})/(\sqrt{12} \times \sqrt{3})$

Concept used:

$\sqrt{a} \times \sqrt{a} = a$

Calculation:

$(\sqrt{45} \times \sqrt{20})/(\sqrt{12} \times \sqrt{3})$

=> $(\sqrt{3} \times 3 \times 5 \times \sqrt{2} \times 2 \times 5)/(\sqrt{2} \times 2 \times 3 \times \sqrt{3})$

=> $(3 \times \sqrt{5} \times 2\sqrt{5})/(2\sqrt{3} \times \sqrt{3})$

=> $(6 \times 5)/(2 \times 3)$

=> 30/6

=> 5

Therefore The required result is 5.

Q36. Answer: (c) Uterus

The correct answer is Uterus.

Key Points

• A baby is born as a result of the rhythmic contraction of muscles in the uterus.

• Rhythmic contractions of the uterus lead to the dilation of the cervix.

• When the cervix (upper end of the birth canal) is sufficiently dilated baby travels from the uterus through the birth canal eventually emerging from the vagina.

• The process lasts 12-24 hours (first-time mothers) Subsequent births are quicker.

Additional Information

• The uterus is a hollow organ that provides protective and nutritive support to the ovum from the moment it is fertilized until it grows into a well-developed fetus ready for parturition.

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• The cervix functions as the entrance for sperm to enter the uterus.
• During menstruation, the cervix opens slightly to allow menstrual blood to flow out of the uterus.
• The vagina connects the uterus to the outside world.
• The vulva and labia form the entrance, and the cervix of the uterus protrudes into the vagina, forming the interior end.

Q37. Answer: (a) 60%

Shortcut Trick
Total students = 150
Students playing Kho-Kho = Total − (Only Kabaddi)
Only Kabaddi = 78 − 18 = 60
Kho-Kho players = 150 − 60 = 90
Percentage = (90 ÷ 150) × 100 = 60%
Therefore The correct answer is 60%.
Alternate Method
Given:
Total students n(A U B) = 150
Students playing Kabaddi n(A) = 78
Students playing both n(A ∩ B) = 18
Formula Used:
n(A U B) = n(A) + n(B) − n(A ∩ B)
Calculations:
=> 150 = 78 + n(B) − 18
=> 150 = 60 + n(B)
=> n(B) = 150 − 60 = 90
=> Percentage of Kho-Kho players = (90 ÷ 150) × 100
=> Percentage = 0.6 × 100 = 60%
Therefore The correct answer is 60%.
Additional Information
Set Theory Principle
For two sets, the size of the union is the sum of sizes of individual sets minus the size of their intersection.
Only One Game
To find students playing only one game: n(A only) = n(A) − n(A ∩ B).
Percentage Calculation
Percentage = (Value ÷ Total Base) × 100.

Q38. Answer: (c) Corn and Sickle

The correct answer is Corn and Sickle.
Key Points
• The emblem of the Communist Party of India is corn and sickle.
• The Communist Party of India (CPI) is the oldest communist party in India. The CPI was founded in modern-day Kanpur on 26 December 1925.
• Although the CPI considers its formation date as 1925, but Communist Party of India (Marxist), which got split from CPI in 1964, is of the view that CPI was founded on 17 October 1920. There is a technical dispute between both parties on this issue.
Additional Information
The Communist Party of India (Marxist) emerged from a division within the Communist Party of India, which was formed on 26 December 1925.
• The CPI had experienced a period of upsurge during the years following the Second World War.
• The CPI led armed rebellions in Telangana, Tripura, and Kerala. However, it soon abandoned the strategy of armed revolution in favour of working within the parliamentary framework.
• In 1950, B. T. Ranadive, the CPI general secretary and a prominent representative of the radical sector inside the party, was demoted on grounds of left-adventurism.
• The All-India Party Congress is the supreme authority of the Communist Party of India (Marxist).
• However, in between two party congresses, the Central Committee is the highest decision-making body.

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• The Central Committee shall elect from among its members a Political Bureau including the General Secretary.

Q39. Answer: (b) Finance

The correct answer is Finance.

Key Points

• Finance Ministry of Government of India prepares fiscal policy.

• Fiscal policy, in simple terms, is an estimate of taxation and government spending that impacts the economy.

• There are two types of fiscal policy:

• Expansionary fiscal policy: This policy is designed to boost the economy.

• It is mostly used in times of high unemployment and recession.

• It leads to the government lowering taxes and spending more or one of the two.

• The aim is to stimulate the economy and ensure consumers' purchasing power does not weaken.

• Contractionary fiscal policy: As the term suggests, this policy is designed to slow economic growth in case of high inflation.

• The contractionary fiscal policy raises taxes and cuts spending.

Additional Information

• There are two key tools of the fiscal policy:

• Taxation:

• Funds in the form of direct and indirect taxes, capital gains from investment, etc, help the government function.

• Taxes affect the consumer's income and changes in consumption lead to changes in the real gross domestic product (GDP).

• Government spending:

• It includes welfare programs, government salaries, subsidies, infrastructure, etc. Government spending has the power to raise or lower real GDP, hence it is included as a fiscal policy tool.

• Some of the key objectives of fiscal policy are economic stability, price stability, full employment, optimum allocation of resources, accelerating the rate of economic development, encouraging investment, and capital formation and growth.

Q40. Answer: (b) 165.5°

Shortcut Trick The angle between the hour hand and the minute hand when the clock shows 2.41 pm can be calculated using the following formula:

• Angle = (11/2 M - 30 H)

• where M = Minutes and H = Hours

• Here, M = 41 and H = 14

• Therefore, Angle = (11/2 × 41 - 30 ×2) = 225.5 - 60 = 165.5°.

Detailed Explanation:

• Angle traced by hour hand in 12 hours = 360 °

• Angle traced by hour hand in 1 hour = 360°/12 =30°

• Angle traced by hour hand in 2 hour = 2 × 30° = 60°

• At 2:41, hour hand will be in middle of 2 & 3, so angle traced by hour hand at 2:41

= 60° + (30°× 41/60) = 60° + 20.5° = 80.5° -(i)

• Angle traced by minute hand in 60 minutes = 360 °

• Angle traced by minute hand in 1 minute = (360°/60)= 6°

• Angle traced by minute hand in 41 minutes = 41 × 6° = 246° -(ii)

• Now, the angle between the two hands of a clock when time is 2:41 = 246° - 80.5° (from i & ii) = 165.5°

Hence, '165.5°' is the correct answer.

Q41. Answer: (a) Nitasha Vinayana

The correct answer is Nitasha Vinayana.

Key Points

• Nitasha Vinayana has been crowned Miss Transqueen India 2017 for the first time from India.

• Nitasha, a trans woman who hails from Kolkata, was named the first Miss Transqueen India in Gurgaon.

• It was a beauty pageant, unlike others.

Additional Information

Zozibini Tunzi is the Miss Universe crown winner for the year 2019.

• - South Africa's Zozibini Tunzi has been crowned Miss Universe for the year 2019, beating more than 90 contestants.

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• The 26-year-old Tunzi was declared the winner at a televised event, hosted by American comic-turned-TV personality Steve Harvey, held at Tyler Perry Studios.

• Indian contestant Vartika Singh crashed out of the world's biggest beauty pageant after securing a place in the top 20.

• Miss Universe 2018 Catriona Gray, from the Philippines, presented Tunzi with the crown.

• Miss Puerto Rico Madison Anderson was named the first runner-up, followed by Mexican contestant Ashley Alvidrez as the second runner-up.

Q42. Answer: (d) Length

The correct answer is Length.

Key Points

• The resistance of a conductor is directly proportional to length.

• The resistance of a wire is directly proportional to its length and inversely proportional to its cross-sectional area.

• Resistance also depends on the material of the conductor.

Additional Information

• The dissipation of electric energy in the form of heat, even though small, affects the amount of electromotive force, or electromotive force,e, required to produce a given current through the circuit.

• In fact, the electromotive force V (measured in volts) across a circuit divided by the current I (amperes) through that circuit defines quantitatively the amount of electricity.

• resistance R.

• Precisely, R = V/I.

• Thus, if a 12-volt battery steadily drives a two-ampere current through a length of wire, the wire has a resistance of six volts per ampere or six ohms.

• The ohm is the common unit of electrical resistance, equivalent to one volt per ampere and represented by the capital Greek letter omega, Ω.

Q43. Answer: (a) Kiran Rao

The correct answer is Kiran Rao.

Key Points

• Kiran Rao was not awarded the crystal award at the World Economic Forum in Davos in January 2018.

• Kiran Rao (born 7 November 1973) is an Indian film producer, screenwriter, and director who works in Hindi cinema.

• In 2016, Rao co-founded Paani Foundation, a non-profit organization working towards the mission of fighting drought in Maharashtra.

Additional Information

• The Globes de Crystal Awards is a set of awards bestowed by members of the French Press Association recognizing excellence in home art and culture. The annual formal ceremony and dinner at which the awards are presented happen each February.

• Bollywood actor Sharukh Khan has won the 2018 crystal award for his leadership in championing children's and women's rights in India.

• Bollywood actor Deepika Padukone has been awarded this award in 2020 for her leadership in raising mental health awareness and her foundation live love laugh.

• Sir Elton John is an English singer, songwriter, and composer and was also awarded this award.

• Cate Blanchett is an Australian actor, producer and she has been also awarded with this award.

Q44. Answer: (a) African origin

The correct answer is African origin.

Key Points

• Human genetics can be traced back to African origin.

• Paleontological and genetic evidence indicates that modern humans originated in Africa within the past 300 thousand years and spread across the globe within the last 100 thousand years.

• Therefore, modern humans have continuously inhabited the African continent longer than any other region.

• Africans have high levels of genetic, cultural, and linguistic diversity as well as extensive population structure.

• More than 2000 ethnolinguistic groups have been identified in Africa, consisting of around one-third of the world’s languages.

Additional Information

• Genetics, the study of heredity in general and of genes in particular.

• Genetics forms one of the central pillars of biology and overlaps with many other areas, such as agriculture, medicine, and biotechnology.

• Since the dawn of civilization, humankind has recognized the influence of heredity and applied its principles to the improvement of cultivated crops and domestic animals.

Q45. Answer: (c) D

The logic followed here is:

Here, in each question figure, there is an image divided in four parts and a circle is moving around this four-part in an anticlockwise direction. So in the answer figure circle will be in the fourth quadrant.

Step 1:

Step 2:

Step 3:

Final series:

Hence, answer 'figure D' is the correct answer.

Q46. Answer: (b) [figure]

The logic followed here is:

Italian and Spanish are both languages. But no Italian is Spanish.

Hence, the above figure is the correct answer.

Q47. Answer: (b) Ministry of Environment, Forest and Climate Change

The correct answer is Ministry of Environment, Forest and Climate Change.

Key Points

• Ministry of Environment, Forest, and Climate Change has launched the 'Green Good Deeds' campaign in 2018.

• Green Good Deed initiative was launched by Dr. Harsh Vardhan former Minister of Environment, Forest, and Climate Change in January 2018.

• As stated in a press release, Dr. Harsh Vardhan had said, “In India, we are trying to develop a societal movement of Green Good Deeds, which are small positive actions to be performed by individuals or organizations to strengthen the cause of environmental protection.”

Additional Information

• Dr. Harsh Vardhan, the Union Minister for Environment, Forest, and Climate Change, has launched a people-oriented campaign "Green Good Deeds\" to sensitize the people and students.

• In particular, about climate change and global warming. Referring to the crucial role played by “Polio Sainiks” for the Pulse Polio campaign.

• Dr. Vardhan has underlined the need for “Green Sainiks” to broad-base the Green Good Deeds movement and to take it down to the grassroots level successfully.

• The Environment ministry has also appealed to the teaching community to join the campaign to make people aware of the cause of the campaign.

• The Ministry of Environment, Forest, and Climate Change (MoEFCC) is an Indian government ministry.

• This ministry is headed by Secretary Rank senior-most IAS officer.

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

• The ministry is responsible for planning, promoting, coordinating, and overseeing the implementation of environmental and forestry programmes in the country.

Q48. Answer: (a) Wednesday

• 31^(st) August, 2011 to 31^(st) August 2016 = 5 years.

• No. of odd days in 5 years

= 2 leap years + 3 ordinary years (2012 and 2016 are leap years)

= {(2 × 2) + (3 × 1)} ÷ 7

= (4 + 3) ÷ 7

= 7 ÷ 7

= 0 odd days .....(I)

• No. of odd days in period from 01 September 2016 to 21st January 2017

= 30(Sept) + 31(Oct) + 30(Nov) + 31(Dec) + 21 (Jan)

= 143 ÷ 7

= 3 odd days ..... (II)

• Total odd days

= 0 + 3 = 3 days

= 3 ÷ 7

= 3 odd days.

• So 31 August 2011 + 3 odd days = Saturday (the day on 21 Jan 2017)

• Wednesday + 3 odd days = Saturday

Hence, Wednesday is the correct answer.

Note:

1) A leap year is a year that is divisible by 4.

2) No. of odd days in a leap year is 2 and in an ordinary year is 1

3) No. of odd days in every 100 years is 5 and each multiple of 400 is 0.

Q49. Answer: (c) 75°

Shortcut Trick

Identify standard trigonometric values: cosec A = 2 → A = 30°.

Identify standard trigonometric values: sec B = √2 → B = 45°.

Calculate A + B = 30° + 45° = 75°.

Therefore The correct answer is 75°.

Alternate Method

Given:

cosec A = 2

sec B = √2

Formula Used:

Standard values of Trigonometric Ratios for specific angles.

Calculations:

=> cosec A = 2

=> since cosec 30° = 2, A = 30°

=> sec B = √2

=> since sec 45° = √2, B = 45°

=> A + B = 30° + 45°

=> A + B = 75°

Therefore The correct answer is 75°.

Additional Information

Reciprocal Identities

cosec θ = 1/sin θ and sec θ = 1/cos θ. Therefore, if cosec A = 2, then sin A = 1/2.

Complementary Angles

sin(90°−θ) = cos θ and cosec(90°−θ) = sec θ.

Standard Values

Always remember standard values for 0°, 30°, 45°, 60°, and 90° for all six trigonometric ratios.

Q50. Answer: (b) Sunit Mehta Committee

The correct answer is Sunit Mehta Committee.

Key Points

• Sunit Mehta Committee has been appointed by the Government of India and RBI recently to investigate the assets stuck in the banking industry.

• A committee under Sunil Mehta was set up to give recommendations on the formation of an Asset Reconstruction Company for quicker resolution on stressed assets.

• Committee has submitted a report to Finance Minister.

• It recommended 5 point plan to fight stressed assets called Project ‘Sashakt’.

Additional Information

• Bibek Debroy Committee

• The committee chaired by Sh. Bibek Debroy had inter-alia recommended Concessioning of commercial operation of train service like Rajdhani/Shatabdi to private parties.

• Railways have planned to introduce 150 passenger trains through private operators in PPP mode.

• Ashok Mehta Committee

• The main recommendations of the committee were:

• The 3-tier system of Panchayati Raj should be replaced by the 2-tier system: Zilla Parishad at the district level, and below it, the Mandal Panchayat consisting of a group of villages covering a population of 15000 to 20000.

• Swaminathan Committee

• M.S. Swaminathan-headed National Commission on Farmers in his fifth and final report submitted in October 2006 has recommended shifting agriculture from the State List to the Concurrent List of the Constitution.

Q51. Answer: (a) Some time

The correct answer is Some time.

Key Points

• A pulse wave or pulse train is a kind of non-sinusoidal waveform that includes square waves (duty cycle of 50%) and similarly periodic but asymmetrical waves (duty cycles other than 50%).

• It is a term is used in synthesizer programming, and is a typical waveform available on many synthesizers.

• The exact shape of the wave is determined by the duty cycle or pulse width of the oscillator output. In many synthesizers, the duty cycle can be modulated (pulse-width modulation) for a more dynamic timbre.

• The pulse wave is also known as the rectangular wave, the periodic version of the rectangular function.

Additional Information

• The amplitude of a wave is the height of a wave as measured from the highest point on the wave (peak or crest) to the lowest point on the wave (trough).

• Wavelength refers to the length of a wave from one peak to the next.

• The amplitude or height of a wave is measured from the peak to the trough.

Q52. Answer: (d) 6.20 ms^(-1)

Given:

Total distance = 15 m + 16 m = 31 m

Total time = 3 s + 2 s = 5 s

Concept used:

Average speed = (Total distance/Total time) = d/t

d = distance

t = time

Calculation:

=> Average speed = 31 m/s

=> 6.20 m/s

Therefore The average speed of the object is 6.20 ms^(-1)

Q53. Answer: (d) Bangladesh

The correct answer is Bangladesh.

Key Points

• Bangladesh is a neighboring country to the east of India.

• The neighbouring countries of India are Afghanistan, Bangladesh, Bhutan, China, Maldives, Myanmar, Nepal, Pakistan, and Sri Lanka.

• India is located latitudinally in the Northern Hemisphere and longitudinally in the Eastern Hemisphere.

Additional Information

• India shares a border with 9 countries and is located latitudinally in the Northern Hemisphere and longitudinally in the Eastern Hemisphere.

• Physical Background of India

• India has a land frontier of 15,200 km.

• The total length of the coastline of the mainland, Lakshadweep Islands, and Andaman and the Nicobar Islands is 7,516.6 km.

• India shares its border with seven countries- Afghanistan and Pakistan to the North-West, China, Bhutan, and Nepal to the North, Myanmar to the far East, and Bangladesh to the East. Sri Lanka (from the South-East) and Maldives (from the South-West) are two countries with water borders.

• Bangladesh, to the east of India on the Bay of Bengal, is a South Asian country marked by lush greenery and many waterways.

• Its Padma (Ganges), Meghna, and Jamuna rivers create fertile plains, and travel by boat is common.

• On the southern coast, the Sundarbans, an enormous mangrove forest shared with Eastern India, is home to the royal Bengal tiger.

Q54. Answer: (a) B

The logic followed here is:

There are three elements in the question figure

• A trapezium,

• a cone, and

• a smiley.

Cone is resting on the longer parallel side and smiley is inside the cone.

Hence, The question figure resembles the answer figure B.

Q55. Answer: (a) Nakul Chopra

The correct answer is Nakul Chopra.

Key Points

• In December 2017, Nakul Chopra was named as the new chairman of Broadcast Audience Research Council (BARC) India.

• Television monitoring agency Broadcast Audience Research Council (Barc) has announced the appointment of Nakul Chopra as its chief executive officer (CEO) effective 25 August 2021.

• Former CEO Sunil Lulla has resigned to pursue his ambition as an entrepreneur.

• This announcement comes as Sunil Lulla has decided to resign from the position of CEO to pursue his entrepreneurial ambitions.

Additional Information

• Mr. Chopra had joined the BARC India Board in 2016 and had been elected as the Chairman during 2018-19.

• In January 2020, he was appointed as a member of BARC's Oversight Committee.

• The media and advertising industry veteran had earlier served as the CEO, India and South Asia of Publicis Worldwide for over a decade.

Q56. Answer: (d) 2

Shortcut Trick

Substitute x^(1/3) = t to transform the equation into a quadratic form.

The equation becomes $t^2 + t - 2 = 0$.

Find factors of −2 that sum to +1: +2 and −1. So, t = −2 or t = 1.

Back-substitute: $x = (-2)^3 = -8$ and $x = 1^3 = 1$.

There are exactly two distinct values of x that satisfy the equation.

Therefore The correct answer is 2.

Alternate Method

Given Equation: x^(2/3) + x^(1/3) − 2 = 0

Formula Used: Substitution method to solve reducible quadratic equations.

=> Let x^(1/3) = k

=> Then, x^(2/3) = (x^(1/3))² = k^2

=> Substituting these in the original equation: $k^2 + k - 2 = 0$

=> $k^2 + 2k - k - 2 = 0$

=> $k(k + 2) - 1(k + 2) = 0$

=> $(k - 1)(k + 2) = 0$

=> Either k = 1 or k = −2

=> If k = 1, then x^(1/3) = 1 => $x = 1^3$ => x = 1

=> If k = −2, then x^(1/3) = −2 => $x = (-2)^3$ => x = −8

=> Both values of x are real and valid solutions for the given equation.

Therefore The correct answer is 2.

Additional Information

Reducible to Quadratic Form

Equations involving fractional powers like $ax^{2n} + bx^n + c = 0$ can be solved by substituting $y = x^n$ to create a standard quadratic equation.

Cubic Roots of Negative Numbers

Unlike square roots, the cube root of a negative number is a real number (e.g., $\sqrt[3]{(-8)} = -2$), which ensures all roots found in such substitutions are valid in the real number system.

Nature of Solutions

For an equation f(x) = 0, the number of solutions is the count of distinct values of x that make the equation true. In this case, the quadratic in 'k' yielded two distinct values, leading to two distinct values for 'x'.

Q57. Answer: (a) C

The logic followed here is::

All the elements in the four quadrants change their positions and move in clockwise direction. Also, Solid triangle changes position in downward direction and sideways alternatively.

So, in the next figure solid triangle will be in sideways direction. This condition is satisfied only in answer figure C.

Step 1:

Step 2:

Step 3:

Final series:

Hence, 'c is the correct answer.

Q58. Answer: (c) 9.75 km/h

Shortcut Trick

Upstream Speed (u) = 60 ÷ 8 = 7.5 km/h

Downstream Speed (v) = 60 ÷ 5 = 12 km/h

Speed in Still Water = (u + v) ÷ 2 = (7.5 + 12) ÷ 2 = 19.5 ÷ 2 = 9.75 km/h

Therefore The correct answer is 9.75 km/h.

Alternate Method

Given:

Distance = 60 km

Upstream Time = 8 hours

Downstream Time = 5 hours

Formula Used:

Speed = Distance ÷ Time

Speed in Still Water (x) = (Downstream Speed + Upstream Speed) ÷ 2

Calculations:

=> Downstream Speed (v) = 60 ÷ 5 = 12 km/h

=> Upstream Speed (u) = 60 ÷ 8 = 7.5 km/h

=> Speed of rower in still water = (12 + 7.5) ÷ 2

=> Speed = 19.5 ÷ 2 = 9.75 km/h

Therefore The correct answer is 9.75 km/h.

Additional Information

Speed of Current

The speed of the stream or current can be calculated as: Speed of Current = (Downstream Speed − Upstream Speed) ÷ 2.

Relative Speed in Water

Downstream Speed = Speed in Still Water + Speed of Stream. Upstream Speed = Speed in Still Water − Speed of Stream.

Average Speed for Round Trip

The average speed for a round trip (upstream and downstream) is calculated as (Downstream Speed × Upstream Speed) ÷ Speed in Still Water.

Q59. Answer: (c) 1784

The correct answer is 1784.

Key Points

• In 1784, Sir William Jones founded the Asiatic Society of Bengal.

• Asiatic Society of Bengal, scholarly society founded on Jan. 15, 1784, by Sir William Jones, a British lawyer and Orientalist, to encourage Oriental studies.

• At its founding, Jones delivered the first of a famous series of discourses.

Additional Information

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• The Asiatic Society had the support and encouragement of Warren Hastings, the governor-general (1772–85) of Bengal, though he declined its presidency.

• Indians were first admitted as members in 1829.

• Headquarters are in Kolkata.

• The society owns an art collection that includes paintings by Peter Paul Rubens and Joshua Reynolds.

• The society's library contains some 100,000 general volumes, and its Sanskrit section has more than 27,000 books, manuscripts, prints, coins, and engravings.

Q60. Answer: (a) Al

The correct answer is Al.

Key Points

• Al metal is extracted by electrolysis only.

• Aluminium is extracted by the electrolysis of alumina mixed with molten cryolite.

• This process is known as the Hoope's process.

• In this process, the impure aluminium is collected over the anode and the pure aluminium is obtained on the cathode with a salt of the metal being the electrolyte.

Additional Information

• During the electrolytic refining of aluminium metal, the impure metal/ore is placed at the anode of an electrolytic cell while the cathode is a thin plate of pure aluminium metal.

• The electrolyte consists of the solution of a salt of the aluminium metal, i.e.cryolite and calcium fluoride.

• On passing the electric current, the pure aluminium metal from the anode dissolves and gets deposited at the cathode.

• The soluble impurities go into the solution while the remaining insoluble or the less electropositive impurities settle down below the anode as anode mud or sludge.

• electrolysis is involved in the refining stage of copper production, it is not the primary method for extracting copper from its ores. Smelting is the primary extraction method, and electrolysis is used in the refining process to purify the obtained copper.

• The difference lies only in the electrolyte and the substances placed at the respective anode and cathode.

Q61. Answer: (b) 30 m

Shortcut Trick

When the angle of elevation changes from 30° to 60° on moving a distance d towards the tower, the distance from the initial point to the tower is 1.5 × d.

Given d = 20 m.

Total distance = 1.5 × 20 = 30 m.

Therefore The correct answer is 30 m.

Alternate Method

Given: Distance AB = 20 m, Angle at A = 30°, Angle at B = 60°.

Formula Used: tan(θ) = Perpendicular ÷ Base

=> Let the height of the tower (TC) = h and distance BC = x.

=> In ΔTBC: tan(60°) = h ÷ x => √3 = h ÷ x => h = x√3

=> In ΔTAC: tan(30°) = h ÷ (20 + x)

=> 1 ÷ √3 = (x√3) ÷ (20 + x)

=> 20 + x = 3x

=> 2x = 20 => x = 10 m

=> Total distance AC = AB + BC = 20 + 10 = 30 m.

Therefore The correct answer is 30 m.

Additional Information

Trigonometric Ratios for Standard Angles

For calculations in height and distance, remember: tan(30°) = 1/√3, tan(45°) = 1, and tan(60°) = √3.

Distance Formula for Angle Change

If the angle changes from α to β while moving distance 'd' towards a tower of height 'h', then h = d ÷ (cot α − cot β).

Angle of Elevation vs Depression

The angle of elevation from an observer's eye to an object above is equal to the angle of depression from the object to the observer's eye due to alternate interior angles.

Q62. Answer: (c) Rs. 1035

Shortcut Trick

Effective Simple Interest rate = Rate × Time

Effective Rate = 4.5% × 5 = 22.5%

Interest = 22.5% of Rs. 4600 = (22.5 ÷ 100) × 4600

Interest = 22.5 × 46 = Rs. 1035

Therefore The correct answer is Rs. 1035.

Alternate Method

Given:

Principal (P) = Rs. 4600

Rate (R) = 4.5% per annum

Time (T) = 5 years

Formula Used:

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

Calculations:

=> SI = (4600 × 4.5 × 5) ÷ 100

=> SI = 46 × 4.5 × 5

=> SI = 46 × 22.5

=> SI = Rs. 1035

Therefore The correct answer is Rs. 1035.

Additional Information

Total Amount (A)

The total sum payable at the end of the period is the sum of Principal and Interest: A = P + SI.

Simple Interest Property

In Simple Interest, the interest remains constant for every year as it is always calculated on the original Principal.

Rate of Interest Formula

If SI, P, and T are known, the Rate (R) can be calculated as: R = (SI × 100) ÷ (P × T).

Q63. Answer: (b) Rs. 36000

Shortcut Trick

Total expenditure percentage = New car% + Old car%.

New car expenditure = 5%.

Old car expenditure = 5% + 2% = 7%.

Total percentage = 5% + 7% = 12%.

Total amount = 12% of 3,00,000 = 12 × 3,000 = 36,000.

Therefore The correct answer is Rs. 36000.

Alternate Method

Given → Annual Income = Rs. 3,00,000 | New car upkeep = 5% | Old car upkeep = New car% + 2%.

Formulas: Expenditure = (Percentage ÷ 100) × Total Income.

=> Expenditure on new car = 5% of 3,00,000 = (5 ÷ 100) × 3,00,000 = Rs. 15,000.

=> Percentage expenditure on old car = 5% + 2% = 7%.

=> Expenditure on old car = 7% of 3,00,000 = (7 ÷ 100) × 3,00,000 = Rs. 21,000.

=> Total expenditure = 15,000 + 21,000 = Rs. 36,000.

Therefore The correct answer is Rs. 36000.

Additional Information

Percentage Calculation

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

Additive Percentages

When multiple percentages are calculated on the same base value (Total Income), they can be added directly before calculation.

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Q64. Answer: (a) Coward

The logic followed here is:

• Heat is antonym of Cold.

Similarly,

• Knight is antonym of Coward.

Hence, 'Coward' is the correct answer.

Additional Information

• Knight - a heroic champion of a lady or of a cause or principle

• Coward - one who shows fear in the face of danger or pain.

Q65. Answer: (d) Neither 1 nor 2 follows.

Analyzing the conclusions:

Conclusion:

1. He does not like any other sweets. → Laddoos are his favourite does not mean that he does not like any other sweets. So this conclusion does not follow.

2. The only sweet available to them is laddoos. → This does not follow the statement. Laddoos are his favourite sweets does not mean that it is the only sweet dish available to the small child.

Hence, neither conclusion 1 nor conclusion 2 follows.

Q66. Answer: (b) 36

The logic followed here is:

51 - 5 = 46;

46 - 5 = 41;

41 - 5 = 36;

Hence, '36' will be the next number in the given series.

Q67. Answer: (b) 2

The logic followed here is:

Holes, Vacancy and Crack, all represent a void or emptiness whereas Jhalar means frills (a type of item for decoration) and does not indicate any void or emptiness.

Hence, 'Jhalar' does not belong to the group.

Q68. Answer: (d) Maulana Abdul Kalam Azad Trophy

The correct answer is Maulana Abdul Kalam Azad Trophy.

Key Points

• Maulana Abdul Kalam Azad Trophy is given to the best performing university in the inter-university tournament.

• The honor is bestowed to the Indian University for the best all-round performance in sports atInter-University, National, and International level competitions.

• The award was instituted in 1956 by the Ministry of Education of Government of India and is presented annually by the President of India that carries a replica of Trophy and cash prize which is to be used for enhancing the level of sports.

• Four Universities are nominated every year for the trophy according to the scoring system by the committee and the winner is decided by the Indian Government.

• The second and third winners also receive a cash prize.

Additional Information

• Punjab University has received Maulana Abul Kalam Azad (MAKA) Trophy for the third consecutive year.

• The Ministry of Youth Affairs and Sports announced the National Sports Awards 2021 on November 2.

• President Ram Nath Kovind gave the awards at a special function to be organized at the Darbar Hall of Rashtrapati Bhavan on November 13.

• For the first time, five sportspersons will be receiving the Rajiv Gandhi Khel Ratna on the occasion of the National Sports Day on 29th August 2020.

• 27 sportspersons have also been finalized for the Arjuna Award while five coaches will receive the Dronacharya Award.

• Ms. Rani will become only the third Indian hockey player after Dhanraj Pillay and Sardar Singh to receive the Khel Ratna.

• Shri Mariyappan is the only third Indian para-athlete to be awarded the Khel Ratna award, after former Paralympic medallists Devendra Jhajharia and Deepa Malik.

• Arjuna Award 2020: Atanu Das (Archery), Dutee Chand (Athletics), Satwik Sairaj Rankireddy (Badminton), Chirag

Chandrasekhar Shetty (Badminton), Vishesh Bhriguvanshi (Basketball), Manish Kaushik (Boxing), Lovlina Borgohain (Boxing), Ishant Sharma (Cricket), Deepti Sharma (Cricket), Sawant Ajay Anant (Equestrian).

Q69. Answer: (d) 134

Shortcut Trick

Number: 17956. Last digit is 6, so the square root must end in 4 or 6.

Group digits: 179 | 56. Find the largest square less than 179: 132 = 169.

Base is 13. Possible roots: 134 or 136.

Check 13.52 = 13 × 14 | 25 = 18225. Since 17956 < 18225, root is 134.

Therefore The correct answer is 134.

Alternate Method

Given number: 17956

Formula used: Long Division Method for square roots.

=> Step 1: Pair the digits from right to left: 1, 79, 56.

=> Step 2: 12 = 1. Substract 1 from 1, remainder 0. Bring down 79.

=> Step 3: Double the quotient (1 × 2 = 2). Find 'x' such that 2x × x ≤ 79. If x=3, 23 × 3 = 69.

=> Step 4: 79 − 69 = 10. Bring down 56. New number is 1056.

=> Step 5: Double current quotient (13 × 2 = 26). Find 'y' such that 26y × y = 1056.

=> Step 6: 264 × 4 = 1056. Remainder is 0.

=> Result: Quotient is 134.

Therefore The correct answer is 134.

Additional Information

Unit Digit Property

If a perfect square ends in 6, its square root must end in either 4 or 6 because 42 = 16 and 62 = 36.

Range Estimation

1302 = 16900 and 1402 = 19600. Since 17956 lies between these, the root must be between 130 and 140.

Perfect Square Ending

A perfect square never ends in the digits 2, 3, 7, or 8.

Q70. Answer: (a) [figure]

The water image of the above figure is as follows:;

Hence, '

' is the correct answer.

Q71. Answer: (d) T0U1

The logic followed here is:

• Here, 8 + 2 = 10 and we consider the digit in the unit place which is 0

• Similarly, 9 + 2 = 11 and the digit in its unit place is 1.

Hence, the next term in the series will be 'T0U1'.

Q72. Answer: (d) 41 years

Shortcut Trick

Sum of present ages = 54 years.

Sum of ages 3 years from now = 54 + 3 + 3 = 60 years.

Let Eugene's age 3 years from now be E3 and Panna's be P3.

P3 + E3 = 60 and P3 = 3E3 − 4.

(3E3 − 4) + E3 = 60 => 4E3 = 64 => E3 = 16.

P3 = 60 − 16 = 44 years. Present age P = 44 − 3 = 41 years.

Therefore The correct answer is 41 years.

Alternate Method

Given:

Let the present age of Panna be P and Eugene be E.

Sum of present ages: P + E = 54 => E = 54 − P

Three years from now, Panna's age = P + 3

Three years from now, Eugene's age = E + 3

Condition: P + 3 = 3(E + 3) − 4

=> P + 3 = 3(54 − P + 3) − 4

=> P + 3 = 3(57 − P) − 4

=> P + 3 = 171 − 3P − 4

=> P + 3 = 167 − 3P

=> 4P = 164

=> P = 41 years

Therefore The correct answer is 41 years.

Additional Information

Age Ratio Concepts

If the ratio of ages is given as a:b, and the sum is S, ages are [a/(a+b)] × S and [b/(a+b)] × S.

Time Shift Property

If there are 'n' persons, the sum of their ages increases by (n × t) after 't' years.

Constant Difference

The difference between the ages of two people remains constant regardless of the number of years passed.

Q73. Answer: (a) Only argument 1 is correct.

Analyzing the given arguments

1. Yes, it leads to more wastage. At least in schools they should promote children to fountain pens or ones they can refill. → Yes, it is a strong argument. Use of 'use and throw pens' should be minimized, it is not eco friendly.

2. No, there are so many pens available, why should it be used less. → It is not a strong argument. Availability of variety of pens or bulk quantity does not mean that it should be used. It should not be used if it creates more wastage.

Hence, Only argument 1 is correct.

Q74. Answer: (a) Chitin

The correct answer is Chitin.

Key Points

The fungal cell wall is made up of hard complex sugars called chitin.

• The cell wall is a characteristic structure of fungi and is composed mainly of glucans, chitin, and glycoproteins.

• As the components of the fungal cell wall are not present in humans, this structure is an excellent target for antifungal therapy.

Additional Information

• The fungal cell wall is located outside the plasma membrane and is the cell compartment that mediates all the relationships of the cell with the environment.

• It protects the contents of the cell, gives rigidity, and defines the cellular structure.

• The cell wall is a skeleton with high plasticity that protects the cell from different stresses, among which osmotic changes stand out.

• The cell wall allows interaction with the external environment since some of its proteins are adhesins and receptors.

• The fungal cell wall is an essential structure with a great plasticity that is vital to maintaining cellular integrity and viability.

Q75. Answer: (b) 180 J

The correct answer is 180 J.

Key Points

• The kinetic energy of an object of mass 10 kg moving with a velocity of 6 ms-1 is 180 J.

• Given that

• Mass (m) = 10 kg

• Velocity (v) = 6 m/s

• The Kinetic Energy of a body is KE =1/2 mv^2

• KE =1/2 ×10×6^2

• KE = 180 J

Additional Information

• kinetic energy, 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.

• Kinetic energy is a property of a moving object or particle and depends not only on its motion but also on its mass.

• The kind of motion may be a translation (or motion along a path from one place to another), rotation about an axis, vibration, or any combination of motions.

Q76. Answer: (a) 135

Shortcut Trick

Normal Speed = 50 km/h. New Speed is 1/10 less, so Speed Ratio = 10 : 9.

Since Distance is constant, Time Ratio = Inverse of Speed Ratio = 9 : 10.

Difference in time ratio (10 − 9) = 1 unit → 18 minutes.

Normal Time = 9 units = 9 × 18 = 162 minutes = 162/60 hours.

Distance = Speed × Time = 50 × (162/60) = 5 × 27 = 135 km.

Therefore The correct answer is 135 km.

Alternate Method

Given: Normal Average Speed = 50 km/h, Speed reduction = 1/10, Time delay = 18 minutes.

Formula Used: Distance = (S1 × S2 / |S1 − S2|) × ΔT

=> Reduction in speed = 50 × (1/10) = 5 km/h

=> New Speed (S2) = 50 − 5 = 45 km/h

=> Time difference (ΔT) = 18 minutes = 18/60 hours = 3/10 hours

=> Distance = (50 × 45 / |50 − 45|) × (3/10)

=> Distance = (50 × 45 / 5) × (3/10)

=> Distance = (10 × 45) × (3/10)

=> Distance = 45 × 3 = 135 km

Therefore The correct answer is 135 km.

Additional Information

Inverse Proportion of Speed and Time

When the distance is constant, the speed is inversely proportional to the time taken (S1/S2 = T2/T1).

Average Speed Formula

For two equal distances covered at speeds x and y, Average Speed = 2xy / (x + y).

Relative Speed

If two objects move in the same direction, relative speed is |S1 − S2|; if opposite, it is S1 + S2.

Q77. Answer: (b) 80 m

The correct answer is 80 m.

Key Points

• Given,

• time(t) = 4 sec

• initial velocity(u) = 0

• g = 10 ms^(-2)

• By equation of motion:

• $s = ut + 1/2gt^2$

• $s = 0*4 + 1/2*10*4^2$

• s = 80 m

• Hence, the height of the tower is 80 m.

Q78. Answer: (b) -5

Given:

250 ÷ [- 5 + (- 5) of {63 ÷ (- 28 ÷ - 4)}] = ?

Concept used:

Calculation:

250 ÷ [- 5 + (- 5) of {63 ÷ (- 28 ÷ - 4)}] = ?

=> 250 ÷ [- 5 + (- 5) of {63 ÷ 7}] = ?

=> 250 ÷ [- 5 + (- 5) of 9] = ?

=> 250 ÷ [- 5 + - 5 × 9] = ?

=> 250 ÷ [- 5 + - 45] = ?

=> 250 ÷ - 50 = ?

=> ? = - 5

Therefore Required value is - 5

Q79. Answer: (a) B

The lateral mirror image will be as follows:

Hence, answer figure B is the correct answer.

Q80. Answer: (a) 0.000333

Shortcut Trick

Convert 1/3 to its decimal form: 1/3 = 0.333...

Since the denominator is 3000, which is 3 × 1000, shift the decimal point 3 places to the left.

0.333... ÷ 1000 = 0.000333...

Therefore The correct answer is 0.000333.

Alternate Method

Given: Fraction = 1/3000

=> Fraction = $1 / (3 \times 10^3)$

=> First, calculate 1 ÷ 3 = 0.33333...

=> Now divide by 1000: 0.33333... ÷ 1000

=> Result = 0.0003333...

Therefore The correct answer is 0.000333.

Additional Information

Recurring Decimals

A recurring decimal is a decimal representation of a number whose digits are periodic and the infinitely repeated portion is not zero. Example: 1/3 = 0.333...

Conversion Tip

When the denominator is a multiple of 10, divide the numerator by the base digit and shift the decimal point to the left by the number of zeros present.

Pure vs Mixed Recurring Decimals

A pure recurring decimal has all digits after the decimal point repeating (e.g., 0.333...), while a mixed recurring decimal has some non-repeating digits before the repeating part (e.g., 0.000333...).

Q81. Answer: (c) 18

The logic followed here is:

3 - 1 = 2;

2 + 6 = 8;

8 - 1 = 7;

7 + 6 = 13;

13 - 1 = 12;

12 + 6 = 18;

Hence, '18' is the correct answer.

Q82. Answer: (b) 1 : 2

Shortcut Trick

Area of similar triangles is proportional to the square of the ratio of their sides.

Side ratio (Small : Large) = 1 : 3

Area ratio (Small : Large) = $(1/3)^2$ = 1 : 9

Total area of 3 small triangles = 3 × 1 = 3 units; Large triangle = 9 units; Rest = 9 − 3 = 6 units.

Required Ratio = 3 : 6 = 1 : 2.

Therefore The correct answer is 1 : 2.

Alternate Method

Given: Side of smaller triangle = 1/3 × Side of larger triangle.

Let the side of the larger triangle be s and its area be A.

=> Side of one smaller triangle = s/3.

=> Area of one smaller triangle = $(s/3 / s)^2 \times A = (1/9) \times A$.

=> Total area of three smaller triangles = 3 × (A/9) = A/3.

=> Area of the rest of the larger triangle = A − (A/3) = 2A/3.

=> Required Ratio = (A/3) : (2A/3) = 1 : 2.

Therefore The correct answer is 1 : 2.

Additional Information

Area of Similar Triangles

If two triangles are similar, the ratio of their areas is equal to the square of the ratio of their corresponding sides: $(Area1/Area2) = (s1/s2)^2$.

Equilateral Triangle Area

The area of an equilateral triangle with side 'a' is given by $(\sqrt{3}/4) \times a^2$.

Ratio and Proportion

A ratio compares two quantities; if the whole is 1 and a part is x, the ratio of the part to the remaining is x : (1−x).

Q83. Answer: (d) Hydrogen

The correct answer is Hydrogen.

Key Points

• The common element for all acids is hydrogen.
• Hydrogen is the element that is common to all acids.
• When an acid is dissolved in water, it gives out H^+ ions which are protons.
• An acid is a substance that donates hydrogen ions.
• Because of this, when an acid is dissolved in water, the balance between hydrogen ions and hydroxide ions is shifted.
• Now there are more hydrogen ions than hydroxide ions in the solution.

Additional Information

• A substance will be known as an acid if it gives out positive hydrogen ions, that is, H^+ ions when dissolved in water.
• An acidic compound donates a proton.
• The acid is regarded as stable if and only if its conjugate base is also stable.
• A base is a substance that accepts hydrogen ions.
• When a base is dissolved in water, the balance between hydrogen ions and hydroxide ions shifts the opposite way.
• Because the base "soaks up" hydrogen ions, the result is a solution with more hydroxide ions than hydrogen ions.
• This kind of solution is alkaline.

Q84. Answer: (c) 7.75 ms^(-1)

Shortcut Trick

Average Speed = Total Distance ÷ Total Time

Total Distance = 15 + 16 = 31 m

Total Time = 2 + 2 = 4 s

Average Speed = 31 ÷ 4 = 7.75 ms^(−1)

Therefore The correct answer is 7.75 ms^(−1).

Alternate Method

Given:

Distance 1 (d1) = 15 m, Time 1 (t1) = 2 s

Distance 2 (d2) = 16 m, Time 2 (t2) = 2 s

Formula Used:

Average Speed = (Total Distance) ÷ (Total Time)

Calculations:

=> Total Distance = d1 + d2 = 15 m + 16 m = 31 m

=> Total Time = t1 + t2 = 2 s + 2 s = 4 s

=> Average Speed = 31 ÷ 4

=> Average Speed = 7.75 ms^(−1)

Therefore The correct answer is 7.75 ms^(−1).

Additional Information

Average Speed vs Average Velocity

Average Speed is a scalar quantity (Total Distance/Total Time), while Average Velocity is a vector quantity (Total Displacement/Total Time).

Harmonic Mean for Equal Distances

If an object travels equal distances at speeds v1 and v2, the average speed is 2 × v1 × v2 ÷ (v1 + v2).

Arithmetic Mean for Equal Time

If an object travels for equal time intervals at speeds v1 and v2, the average speed is (v1 + v2) ÷ 2.

Q85. Answer: (a) 10 N

The correct answer is 10 N.

Key Points

• The weight of the object on the surface of the moon will be 10 N.

• Given that

• Weight of the object on the earth surface (W_e) = 60 N

• sing the concept

• Weight of the object on the moon (Wm) = 1/6 * We

• Wm = 1/6 * 60 = 10 N

• An object weighs 60 N when measured on the surface of the earth.

• Its weight on the surface of the Moon will be 10 N.

Additional Information

• The weight of an object on Earth and the Moon is different because Earth's gravity is much great than the Moon's gravity.

• Newton's law says that F=mg, where F is the weight and M is the mass, and G, is the acceleration due to gravity but since the gravity on Moon is much less than Earth.

• The weight of an object will be Different.

• The formula that links mass and the gravitational field strength is:

• gravity force = mass × gravitational field strength (g)

• This is when:

• gravity force is measured in newtons (N)

• mass is measured in kilograms (kg)

• gravitational field strength (g) is measured in newtons per kilogram (N/kg)

Q86. Answer: (c) 110 W

The correct answer is 110 W.

Key Points

• The Power of the bulb is 110 W.

• Here the potential of the generator = 220 V

• Current flowing across the electric bulb I = 0.50 A

• Therefore Power of the bulb P = V × I

• P = 220 × 0.50 = 110 W

Additional Information

• Ohm's law equation (formula): V = I × R and the power-law equation (formula):

• P = I × V,~ P = power

• I or J = international ampere, or intensity and R = resistance. V = voltage, electric potential difference Δ V or E = electromotive force (emf = voltage).

Q87. Answer: (b) 21

The number of triangles in the given figure are:

ABC, AGH, AEF, GHI, GIE, HIF, BED, DFC, DEF, ABE, AFC, AEH, AGF, IEF, GEF, HEF, HGF, GHE, AHB, AGC, BIC.

Hence, there are 21 triangles in the given figure.

Note:

• For this question, a discrepancy was found in the question/answer in the 2018 exam. So, this question was ignored for all candidates.

• Because of the discrepancy, we have altered the question and changed the second option from 18 to 21.

Q88. Answer: (d) 5√41

The diagrammatic representation of the given information is as follows:

The distance between A and E are as follows:

Applying Pythagoras theorem:

AE^2 = (Vertical Distance between AE)² + (Horizontal Distance between AE)2 = $20^2 + 25^2$

$AE^2 = 400 + 625 = 1025 = (25 \times 41)$

$AE = 5\sqrt{41}$ km.

The shortest distance between A and E is $5\sqrt{41}$ km.

Hence, the correct answer is "$5\sqrt{41}$".

Q89. Answer: (b) 61524334

The logic followed here is:

Therefore, the next term will be 61524334.

Hence, '61524334' is the correct answer.

Q90. Answer: (b) Soft

The logic followed here is:

Sand is Rough. Roughness is a quality of Sand.

Similarly,

Cotton is Soft. Softness is a quality of Cotton.

Hence, Soft is the correct answer.

Q91. Answer: (d) Bulb

The logic followed here is:

Petrol is fuel and is required to operate a Car.

Similarly,

Electricity is required to operate Bulb.

Hence, Bulb is the correct answer.

Q92. Answer: (b) Only argument 1 is strong.

Analyzing the Arguments:

1. Yes, this will ensure that people get access to the best of both the medical systems. → This argument is strong. This argument talks about access to the best of both the systems. This will ensure that access, as well as quality medical care, is provided.

2. No, the allopathic system has treatment for all diseases, so there is no need to promote indigenous system. → This is not a strong argument as to whether the allopathic system has treatment for all diseases or not, it need not be the best or only valid medical system for treatment.

Hence, only argument 1 is strong.

Q93. Answer: (a) Iraq

The correct answer is Iraq.

Key Points

• Kurdish people are an ethnic community belonging to Iraq.

• Iraqi Kurds are people born in or residing in Iraq who is of Kurdish origin.

• The Kurds are the largest ethnic minority in Iraq, comprising between 20% and 25% of the country's population according to the CIA World Factbook.

• The Kurdish people are an ethnic group whose origins are in the Middle East.

• They are one of the largest ethnic groups in the world that do not have a state of their own.

• This geo-cultural region means "Land of the Kurds".

Additional Information

• Iraq, officially the Republic of Iraq, is a country in Western Asia, bordered by Turkey to the north, Iran to the east, Jordan to the southwest, Syria to the west, Kuwait to the southeast, and Saudi Arabia to the south.

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• The capital and largest city is Baghdad.

Q94. Answer: (a) 100°C

The correct answer is 100°C.

Key Points

• The boiling point of water is 100°C.

• At sea level, vapour pressure is equal to the atmospheric pressure at 100 ˚C, and so this is the temperature at which water boils.

• Due to this, the temperature required to reach the necessary vapour becomes lower and lower as we get higher above sea level, and the liquid will therefore boil at a lower temperature.

Additional Information

• Water is an inorganic, transparent, tasteless, odorless, and nearly colorless chemical substance, which is the main constituent of Earth's hydrosphere and the fluids of all known living organisms.

• It is vital for all known forms of life, even though it provides no calories or organic nutrients.

• For water, the vapour pressure reaches the standard atmospheric pressure of 1 atmosphere at 100°C.

• So the normal boiling point of water is 100°C (212°F or 373K). The boiling point of pure water increases on the addition of soluble substances such as sugar or common salt.

Q95. Answer: (b) Epithelial

The correct answer is Epithelial.

Key Points

• Epithelial type of tissue makes gland.

• Glands are an organized collection of secretory epithelial cells.

• Most glands are formed during development by the proliferation of epithelial cells so that they project into the underlying connective tissue.

• Some glands retain their continuity with the surface via a duct and are known as Exocrine Glands.

• Other glands lose this direct continuity with the surface when their ducts degenerate during development.

• These glands are known as Endocrine glands.

Additional Information

• Epithelia are a continuous sheet of cells covering the surfaces of the body.

• They stand on a basement membrane which provides a site of attachment for the epithelium and acts as a selective filtration barrier.

• There is very little intercellular material.

• Epithelia do not have their own blood supply (avascular), they rely on diffusion for the exchange of oxygen and metabolites.

• Epithelia contain specialized cell-cell junctions that bind adjacent cells to each other.

• They also contain communicating junctions (gap junctions) that allow communication between adjacent cells.

Q96. Answer: (b) 36

The total number of triangles in the given figure is as follows:

• AUV, AVB, AUB, PZO, PQZ, POQ, FEW, FWG, FEG, LA1M, LA1K, LKM,

• STU, BCX, DEY, GHI, SRQ, MNY, IKJ,

• ARZ, NA1F, FA1J, FJN,

• PCT, PVC, PVT, LHW, LWD, HLD,

• ASP, APX, FYL, FIL

• BNE, NOX, ANZ

Hence, there are 36 triangles in the given figure.

Q97. Answer: (b) Laurence Haddad

The correct answer is Laurence Haddad.

Key Points

• THE 2018 WORLD FOOD PRIZE was formally awarded to Drs. Lawrence Haddad and David Nabarro of the United Kingdom, during a ceremony held at the Iowa State Capitol on October 18, 2018.

• The ceremony took place during the 32nd World Food Prize 2018 Borlaug Dialogue International Symposium, themed “Rise to the Challenge.”

• Drs. Haddad and Nabarro were honored with the World Food Prize for their individual and complementary global leadership in elevating maternal and child undernutrition to a central issue within the food security and development dialogue at national and

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international levels

Additional Information

• Dr. Rattan Lal

• An alumnus of Punjab Agricultural University (PAU) and a renowned agricultural soil scientist from Ohio State University (OSU), Dr. Rattan Lal (76), has been declared the winner of the World Food Prize 2020.

• The World Food Prize is an international award recognizing the achievements of individuals who have advanced human development by improving the quality, quantity, or availability of food in the world.

Q98. Answer: (b) As, Bi

The correct answer is As, Bi.

Key Points

• The outermost orbit has the same number of electrons in As, Bi.

• Arsenic(As) and Bismuth(Bi) are in the same group.

• So, they have the same valence electron configuration.

• As=[Ar]3d^(10)4s²4p3

• Bi=[Xe] 4f^(14)5d^(10)6s²6p³

• As and Bi both contain the same number of electrons in the outermost orbital since they belong to the same group (i.e. group 15).

^(Additional Information)

• The properties of an element in the periodic table depend on electronic configuration.

• The chemical properties of each element are determined by the element's electronic configuration, and particularly by its outermost valence electrons.

• The periodic table, also known as the periodic table of (the) elements, is a tabular display of the chemical elements.

• It is a graphic formulation of the periodic law, which states that the properties of the chemical elements exhibit a periodic dependence on their atomic numbers.

• The table is divided into four roughly rectangular areas called blocks.

• The rows of the table are called periods, and the columns are called groups.

• Elements from the same column group of the periodic table show similar chemical characteristics.

• Trends run through the periodic table, with nonmetallic character (keeping their own electrons) increasing from left to right across a period, and from down to up across a group, and metallic character (surrendering electrons to other atoms) increasing in the opposite direction.

• The underlying reason for these trends is the electron configurations of atoms.

Q99. Answer: (c) Eyes

The correct answer is Eyes.

Key Points

• Rod and cone are found in the eyes.

• Cones and rods are two types of photoreceptors within the retina.

• This means that they are responsible for receiving signals (or images), processing them, and sending them to the brain.

• The cone and the rod serve different purposes to work towards the same goal.

Additional Information

• Sclera: It is the outer covering, a protective tough white layer called the sclera (white part of the eye).

• Cornea: The front transparent part of the sclera is called the cornea.

• Light enters the eye through the cornea.

• Iris: A dark muscular tissue and ring-like structure behind the cornea is known as the iris.

• The colour of the iris actually indicates the colour of the eye.

• The iris also helps regulate or adjust exposure by adjusting the iris.

• Pupil: A small opening in the iris is known as a pupil.

• Its size is controlled with the help of the iris.

• It controls the amount of light that enters the eye.

• Lens: Behind the pupil, there is a transparent structure called a lens.

• By the action of ciliary muscles, it changes its shape to focus light on the retina.

• It becomes thinner to focus on distant objects and becomes thicker to focus on nearby objects.

• Retina: It is a light-sensitive layer that consists of numerous nerve cells.
• It converts images formed by the lens into electrical impulses.
• These electrical impulses are then transmitted to the brain through optic nerves.

Q100. Answer: (a) 1008 m

Shortcut Trick
Volume of Sphere = Volume of Cylindrical Wire
$(4/3) \times \pi \times R^3 = \pi \times r^2 \times h$
$(4/3) \times 21 \times 21 \times 21 = (0.35) \times (0.35) \times L$
L = 100800 cm = 1008 m
Therefore The correct answer is 1008 m.
Alternate Method
Given:
Diameter of sphere = 42 cm => Radius (R) = 21 cm
Diameter of wire = 7 mm = 0.7 cm => Radius (r) = 0.35 cm
Formula Used:
Volume of Sphere = $(4/3) \times \pi \times R^3$
Volume of Cylinder = $\pi \times r^2 \times L$
Calculations:
=> $(4/3) \times \pi \times 21 \times 21 \times 21 = \pi \times (0.35)^2 \times L$
=> $(4/3) \times 21 \times 21 \times 21 = (7/20) \times (7/20) \times L$
=> $4 \times 7 \times 21 \times 21 = (49/400) \times L$
=> $4 \times 7 \times 441 = (49/400) \times L$
=> $12348 = (49/400) \times L$
=> $L = (12348 \times 400) \div 49$
=> $L = 252 \times 400 = 100800$ cm
=> $L = 100800 \div 100 = 1008$ m
Therefore The correct answer is 1008 m.
Additional Information
Recasting Rule
When one solid is melted and recast into another, the total volume remains constant.
Cylinder Properties
For a wire (cylinder) with radius r and length L, Volume = $\pi r^2 L$ and Curved Surface Area = $2\pi rL$.
Sphere Properties
For a sphere with radius R, Volume = $(4/3)\pi R^3$ and Surface Area = $4\pi R^2$.
Unit Conversion
Always convert all dimensions to the same unit before calculation (1 cm = 10 mm, 1 m = 100 cm).

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