RRC Group D Previous Year Paper 49 (Held On: 12 Dec 2018 Shift 2)

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

Take this paper as a timed mock test

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

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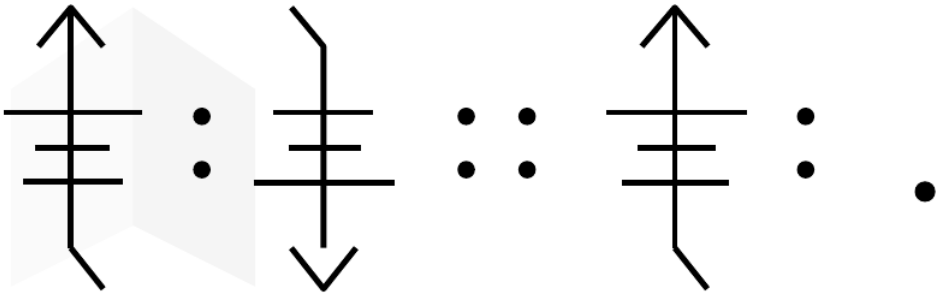
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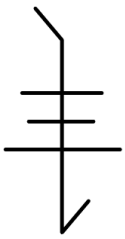
Q1. A person facing west from point O walks 4 km to reach point A, then from there he walks 4 km to the right and reaches point B, then walks 4 km to the right and reaches point C, turns right and walks 3 km to reach point D, turns left 4 km to reach point E, walks 5 km to the right and arrives at point F, The shortest distance (in km) between point D and point B is:

(a) 10
(b) 5
(c) 6
(d) 4

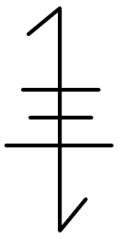
Q2. Find the figure that will replace the question mark in the following symmetry.



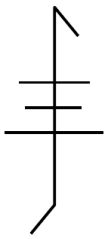
(a)



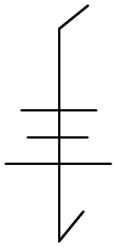
(b)



(c)



(d)



Q3. A sum of Rs 5400 is invested at 20% Per annum compounded annually for 2 years. What will be the the compound interest earned after 2 years.

(a) Rs. 7,776
(b) Rs. 1,876
(c) Rs. 2,376
(d) Rs. 7,276

Q4. A and B are in ideal condition. The ratio of molecular weights of A and B is 1 : 4. The pressure of the gas mixture of A and B with equal weight is P atm. What is the partial pressure (in atm) of mixture B?

(a) P/2
(b) P/5
(c) P/2.5
(d) P/4

Q5. What are the coordinates of the point dividing the line segment internally in the ratio of 3 : 1, end points of the line segments are (–2, 2) and (10,–6) ?

(a) (1,0)
(b) (4,-2)
(c) (7,-4)
(d) (9/2,3)

Q6. There are two pipes, pipe M and pipe N to fill a tank. Pipe M alone can fill 2over3 of the empty tank's capacity in 24 hours. Pipe N alone can fill 5over6 of the empty tank's capacity in 60 hours. Both pipes fill water at their respective rates. How many hours will both pipes fill the empty tank together according to their capacity?

(a) 30 hours
(b) 36 hours
(c) 24 hours
(d) 32 hours

Q7. Which post of the Indian Army has been given to MS Dhoni?

(a) Lieutenant Colonel (Lt. Col.)
(b) Colonel
(c) Captain
(d) Major General

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Q8. Which of carbon isotope is radioactive and is used for radio-carbon dating?

(a) ^{13}C
(b) ^(14)C
(c) ^{13}C and ^(14)C
(d) ^{12}C

Q9. Which of the following pair is not a co-prime pair?

(a) 35, 51
(b) 75, 104
(c) 49, 133
(d) 63, 95

Q10. Which of the following company has signed a Memorandum of Understanding with the Government of Rajasthan to provide digital training to 9,500 students of government colleges?

(a) Accenture
(b) Amazon
(c) IBM
(d) Microsoft

Q11. Consider the following two statements and select the most appropriate option -

A. The linear momentum of a particle's system is zero.

B. The kinetic energy of a particle's system is zero.

(a) A does not mean B, but B means A.
(b) A does not mean B and B does not mean A.
(c) A means B but A means B.
(d) A means B but A does not mean B.

Q12. _____ is the first Indian to win the Asian Marathon Championship.

(a) Wally Sathyabhama
(b) Gopi Thonakal
(c) Sunita Godara
(d) Indresh dheeraj

Q13. Saharanpur city of Uttar Pradesh is famous for which industry?

(a) Glass Bangles
(b) Brass Ware
(c) Silk Dress
(d) Wood Carving Cottage Industries

Q14. Study the given statement (s) and conclusion carefully. Assuming that the information given in the statement is true, even if it appears to be at variance from commonly known facts, select from the statement those rationally adhering conclusions that are beyond a reasonable doubt.

Statement:

Doctors say, "Practicing yoga in the morning is good for health."

Conclusions:

I. Morning yoga practice is the only way to have good health.

II. Yoga practice in the evening is harmful to health

(a) Either I or II follows.
(b) Neither I or II follows.
(c) Only I follows.
(d) Only II follows.

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Q15. If the compound interest is compounded half-yearly, then investing a certain sum at the rate of 10% per annum, the maturity amount after one year is Rs. 13,230. What is the sum?

(a) 12,500
(b) 12,000
(c) 12,750
(d) 12,250

Q16. A lady named, Shree pointing to Jai said, "He is the son of my daughter's mother's father". How is Jai related to Shree?

(a) Brother
(b) Uncle
(c) Cousin
(d) Brother-in-Law

Q17. S number of triangles can be formed whose vertices are the vertices of the octagon but the triangles have the same side with octagon only. Find the value of S.

(a) 32
(b) 64
(c) 24
(d) 16

Q18. Paro Anand was given the Sahitya Akademi's Bal Sahitya Puraskar 2017 for his short story collection titled _____.

(a) Wild Child and Other Stories
(b) School Ahead
(c) I am no butter chicken
(d) No gun at my son's funeral

Q19. Some long circular cylindrical small chocolates were made by a cylindrical chocolate having base radius 6 cm and height 6cm. The radius of base of each small chocolate is 2 cm and height is 2 cm. If the small chocolates are placed in 9 × 3 configuration in a rectangular box and the height of the box is 2 cm, Find the percentage of free space inside the box based on volume? (use π = 3.14)

(a) 20
(b) 21.5
(c) 33.6
(d) 24

Q20. The statement is followed by two arguments. State which argument is stronger with respect to the statement.

Statement:

Is music the universal language of mankind?

Argument:

I. Yes, the distinctive features of rhythm and melody contribute to portraying the human expression of emotions through music.

II. Although, from the base they are human expressions, but music and linguistic systems vary from culture to culture.

(a) Only argument II is strong.
(b) Both arguments I and II are strong.
(c) Neither I nor II are strong.
(d) Only argument I is strong.

Q21. 6.5 × 0.0004 = _____ ?

(a) 0.26
(b) 2.6
(c) 0.0026
(d) 0.026

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Q22. Milena and Mashuka can together complete a work in 36 days. However, Mashuka works alone and left the work after completing 2/5 part of work and then Milena starts work and completes the rest of the work. As a result both completes the work in 78 days. If Mashuka is more efficient than Milena then time(in days) taken by Milena to complete the work alone:

(a) 96
(b) 100
(c) 90
(d) 102

Q23. Find the number of twin prime pairs between 100 and 200 ?

(a) 10
(b) 8
(c) 7
(d) 9

Q24. India's Sykhom Mirabai Chanu has won _____ at the World Weightlifting Championships held in Anaheim, United States.

(a) Bronze Medal
(b) Fourth place
(c) Silver Medal
(d) Gold Medal

Q25. The Right to Education Act, often seen in the news, came into force in which year?

(a) 1999
(b) 2010
(c) 2014
(d) 2017

Q26. _____ protein is compressed and relaxed, causing the muscles to move.

(a) Contractile
(b) Relaxo
(c) Nucleo
(d) Lipo

Q27. The mass of the earth is _____.

(a) 6 × 10^(-24) kg
(b) 6 × 10-23 kg
(c) 6 × 1023 kg
(d) 6 × 1024 kg

Q28. Cells of fungi are made up of _____.

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

Q29. As of September 2018, who was the current Chief Minister of Goa?

(a) Biplav Deb
(b) Naveen Patnaik
(c) Manohar Parrikar
(d) Vilasrao Deshmukh

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Q30. Which of the following number is divisible by 6?

(a) 12384
(b) 12358
(c) 12368
(d) 12376

Q31. The spermatheca joins the tube coming from the bladder to form a common passage called _____.

(a) Urethra
(b) Ureter
(c) Testis
(d) Spermatheca

Q32. For how much loans has India signed an agreement with the World Bank for the Tamil Nadu Irrigation Agriculture Modernization Project?

(a) $381 Million
(b) $318 Million
(c) $813 Million
(d) $831 Million

Q33. In a group, the number of valence electrons is _____.

(a) Increases
(b) Stays the same
(c) Decreases
(d) Cannot be determined

Q34. Multiplication of 72/100 and 175/108 is:

(a) 7/6
(b) 14/3
(c) 7/12
(d) 7/3

Q35. Name the person, an indefatigable wrestler, on whose life the Dangal film was made?

(a) Mahavir Singh Phogat
(b) Dhanraj Singh
(c) Suresh Sharma
(d) Dilip Sarkar

Q36. How many Indian football players have played more than a hundred international matches for India?

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

Q37. A man was asked to multiply a number by 21 but he multiplied the number by 12, by which resultant was 198 less than the actual value. Find the number?

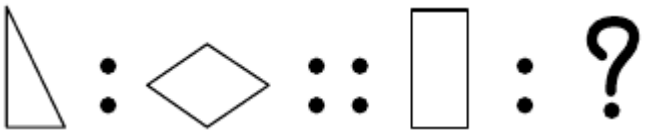
(a) 18
(b) 22
(c) 32
(d) 10

Q38. Which of the following is found in the highest quantity in Digboi mines?

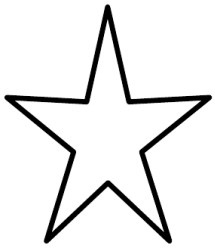
(a) Coal
(b) Copper
(c) Petroleum
(d) Natural Gas

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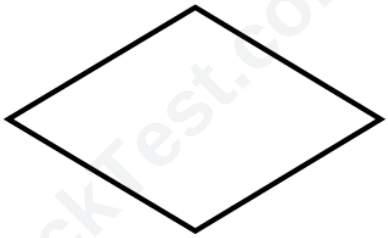
Q39. Identify the option that is related to the third figure in the same way as the second figure is related to the first figure.



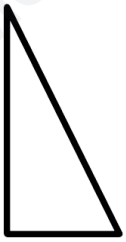
(a)



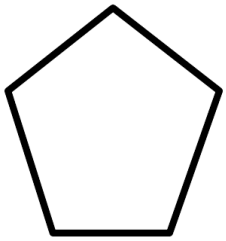
(b)



(c)



(d)



Q40. A cylinder and a cone, whose radius of the base are r1and r2(r1 > r2) respectively, have uniform mass, and equal heights. The force exerted by the cylinder will be _____.

(a) More than cone
(b) Zero
(c) Less than cone
(d) Equal to cone

Q41. If the intensity of the rustle of the leaves is 10^(-11) Wm^(-2), what will be the level of intensity due to that rustle?

(a) 8 dB
(b) 10 dB
(c) 5 dB
(d) 12 dB

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Q42. Select the option which is related to the third term in the same way as the second term is related to the first term.

SANDY : HZMWB :: CRATE : _____ ?

(a) XIZVG
(b) XIZGV
(c) XIGZV
(d) XZIGV

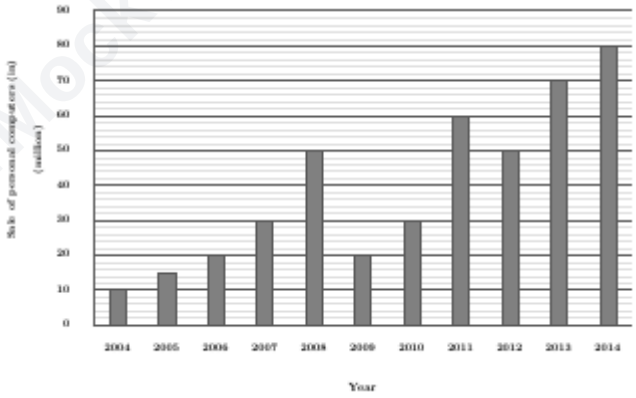
Q43. In which language was the award winning film 'Little Magician' made?

(a) English
(b) Hindi
(c) Tamil
(d) Malayalam

Q44. A man lifts a weight of 20 kg to a height of 5 m from the ground. The work done by him is _____. [g = 10 ms^(-2)]

(a) 1000 N
(b) 1000 C
(c) 1000 J
(d) 1000 Pa

Q45. The following bar graph shows the sales of personal computers by the company XYZ in the last 11 years.



How many units(in million) of personal computer were sold by the company XYZ in the year 2007?

(a) 35
(b) 20
(c) 30
(d) 25

Q46. Who was the Union Minister for Information and Broadcasting in March 2018?

(a) Sushma Swaraj
(b) Smriti Irani
(c) Suresh Prabhu
(d) Maneka Gandhi

Q47. Find the next word in the series.

W23T7, U21R9, _____.

(a) S19P11
(b) S19P12
(c) S18P12
(d) S18P11

Q48. Read the following statements and decide which of the conclusions logically follow/s?

Statement:

• Lack of natural resources is a major problem of X country.
• Population explosion is the major cause of the lack of natural resources.

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Conclusions:

1. Recycling is the only solution to increase the energy population.
2. Population growth is a burden on natural sources.

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

Q49. There is a loss of 20% on selling an article at Rs. 184. What should be the selling price of the article to get 5% profit?

(a) Rs. 254.45
(b) Rs. 256.65
(c) Rs. 241.50
(d) Rs. 223.60

Q50. Three of the four options below are related to each other in a particular way. Choose an option that is different or odd from others.

(a) Bhutan
(b) London
(c) Nepal
(d) Russia

Q51. Three statements were followed by 4 conclusions labeled 1, 2, 3, and 4. The given two statements have to be considered to be correct, even if they differ from commonly known facts.

Look at commonly known facts and then decide which of the given conclusions logically follow the given statements.

Commonly known facts.

Statements:

All B are S.

All S are D.

Some D are P.

Conclusions:

1. All B are P.
2. Some S are P.
3. Some P being B is a possibility.
4. No S is B.

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

Q52. To find the displacement, we need to create a _____ from the initial position to the final position.

(a) Wavy line
(b) Semicircle
(c) Circle
(d) Straight line

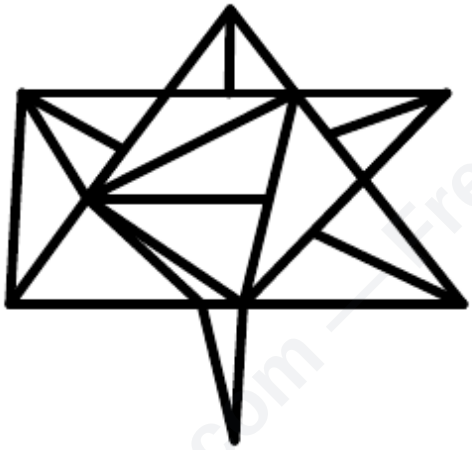
Q53. What will be the next term in the following category?

G7Z26, H8X24, I9V22, _____ ?

(a) J10T20
(b) W23J10
(c) J10W23
(d) W23T20

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Q54. How many triangles are present in the picture given below?



(a) 31
(b) 34
(c) 30
(d) 29

Q55. A and B start walking from the same point O.

A travels 10 m towards the south, turns to his left, and walks 20 m. Then, he turns to his left and walks 10 m. He again turns to his left and walks 10 m.

B travels 10 m towards the west, turns to his right, and walks 10 m. Now he turns to his left and walks 10 m.

What is the direction of B with respect to A?

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

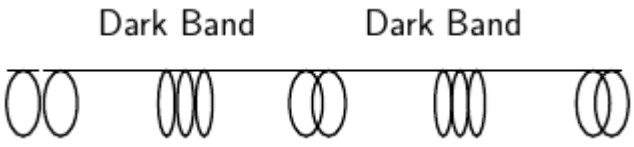
Q56. Rourkela Steel Plant is located in _____.

(a) Gujarat
(b) Karnataka
(c) Odisha
(d) Maharashtra

Q57. In addition to phloem, the following is made up of all the others.

(a) Sieve tubes
(b) Phloem vessel
(c) Celiac
(d) Phloem filaments

Q58. This figure exhibits compression and rarefaction in a slinky (spring-shaped toy). What is a dark band called?



(a) Wavelength
(b) Dimension
(c) Rarefication

(d) Compression

Q59. The first law of motion provides the relation between _____ and time.

(a) Velocity
(b) Phase
(c) Displacement
(d) Acceleration

Q60. What is the unit of ionization energy?

(a) volt
(b) KJ mol^(-1)
(c) joule
(d) Nm

Q61. Suppose a person drives towards the west when the sun sets. He turns to the right, then left, then right and continues driving in this direction overnight. Which side of the man will the rising sun be the next day?

(a) South
(b) Back
(c) Front
(d) Right

Q62. A car is going in the west direction. After 1 km it takes a U-turn and travels 500 m and turns 90° left again to enter a restaurant. Which direction is the car facing now?

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

Q63. Read the following question and decide, which of the statements are sufficient/necessary to answer the question?

Question:

Is the volume of cone more than the volume of sphere?

Statements:

1. Radius of base of cone and radius of sphere are equal.
2. Surface area of cone is more than the surface area of sphere.

(a) Only statement 2 is sufficient, While only statement 1 is not sufficient.
(b) Either 1 or 2 alone is sufficient.
(c) Only statement 1 is sufficient, While only statement 2 is not sufficient.
(d) Both statement 1 and 2 are necessary.

Q64. Which of the following statements is correct about sound waves and light waves?

(a) Sound waves are longitudinal and light waves are transverse.
(b) Both are longitudinal waves
(c) Sound waves are transverse and light waves are longitudinal.
(d) Both are transverse waves

Q65. Select the option which is related to the third term in the same way as the second term is related to the first.

Power : Watt :: Volume : _____ ?

(a) Degree
(b) Volt
(c) Ohm
(d) Liter

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Q66. If $(2 - \sqrt{5})/(2 + \sqrt{5}) = a$ and $(2 + \sqrt{5})/(2 - \sqrt{5}) = b$ then, the value of $a^2 - b^2$ is:

(a) $12\sqrt{5}$
(b) $-144\sqrt{5}$
(c) $62\sqrt{5}$
(d) $5\sqrt{5}$

Q67. The Hathigumpha inscription from Udayagiri in Odisha was written by King _____ of Kalinga.

(a) Kharavel
(b) Mahendra
(c) Ashoka
(d) Bimbisara

Q68. The Arya Samaj was split into two groups in Punjab in the year 1893, primarily due to disagreements over education and dietary practices. Which of the following was a key issue that led to this split?

(a) The introduction of idol worship
(b) The debate over vegetarianism vs. non-vegetarianism
(c) The rejection of the Vedas
(d) The establishment of the first Gurukul

Q69. Ohm's law limits:

1. This does not apply to gaseous conductors.
2. This does not apply to semiconductors such as germanium and silicon.

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

Q70. 4WXZ8QPOJ6GTMVEUH53B

Using the above sequence, find the missing word.

ZJMT : O8HO :: WGV6 : _____

(a) QP5Q
(b) QP58
(c) QO5Q
(d) QP3Q

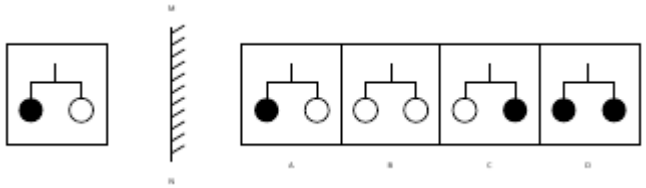
Q71. There is a digit at the 10th place of 6n, in which n is a natural number that is greater than 1, it can be:

(a) 1, 2, 3, 4, 5
(b) 1, 3, 5, 7, 9
(c) 1, 2, 6, 8, 9
(d) 1, 3, 5, 8, 9

Q72. If '<' is treated as '+' and '×' as '÷', what is the value of {(55 < 10) × 10} < 120?

(a) 120
(b) 125
(c) 126
(d) 126.5

Q73. What will be the mirror image of the following figure if the mirror is located on the MN line?



(a) C

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

Q74. Which of the following is not an isomer of pentane?
(a) 2, 2-Dimethyl propane
(b) 1, 3-Dimethyl butane
(c) n-Pentane
(d) 2-Methyl butane

Q75. If the equation $12x^2 – ax + 7 = ax^2 + 9x + 3$ has only one solution (repeated), then what is the positive internal solution of 'a'?
(a) 3
(b) 4
(c) 5
(d) 2

Q76. The hills of the northeast are called _____.
(a) Himadri
(b) Purvanchal
(c) Shivalik
(d) Duns

Q77. What is the square root of 24649?
(a) 157
(b) 147
(c) 163
(d) 167

Q78. Consider the following questions and decide which of the statements is/are sufficient to answer the question.
Question:
Why does Shama read fictional stories?
Statement:
1. She loves to read books.
2. She has an imaginative tendency.
(a) Statements 1 and 2 are both required.
(b) Only statement 2 is sufficient, but statement 1 is not sufficient.
(c) Only statement 1 is sufficient, but statement 2 is not sufficient.
(d) Either statement 1 and or 2 are sufficient.

Q79. If $\sin x + \cos x = \sqrt{3} \cos x$, then the value of $\cot x$ is:
(a) $(\sqrt{3} + 1)/2$
(b) $\sqrt{3}$
(c) 1
(d) $(\sqrt{3} -1)/2$

Q80. A tank can be filled by tap A in 5 hours and tap B in 4 hours. Tap C can empty the filled tank in 8 hours. When the tank is empty, all three taps are opened simultaneously, how long will it take to fill the tank completely?
(a) 10/3 hours
(b) 40/13 hours
(c) 8 hours
(d) 10/7 hours

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Q81. Which of the following is the smallest of the fractions?

5/8, 5/6, 4/3, 3/5

(a) 5/6
(b) 5/8
(c) 4/3
(d) 3/5

Q82. What will be the radius of the incircle of a triangle of sides 14 cm, 48 cm and 50 cm long?

(a) 5 cm
(b) 7 cm
(c) 8 cm
(d) 6 cm

Q83. In a triangle PQR, PS is the height and QR is the base. PQ = 52, side QR = 56 and side PR = 60. What is the height of PS?

(a) 40
(b) 56
(c) 52
(d) 48

Q84. Two people are cycling at the speed of 10.8 km/h and 12 km/h, a bus running in the same direction crosses the cyclist in 9 seconds and 13.5 seconds respectively. What is the length of the bus?

(a) 11 m
(b) 8 m
(c) 9 m
(d) 10 m

Q85. The inflated portion of the underside of the Carpel is called _____.

(a) Style
(b) Ovule
(c) Stigma
(d) Ovary

Q86. It took 138 people to build a house in 50 days. What part of the work can 207 men complete in 20 days?

(a) 3/5
(b) 2/3
(c) 2/5
(d) 4/15

Q87. A particle of m mass moving at a v speed collides with a stationary particle of another m mass. What will be the velocity of the first particle after the collision?

(a) -v
(b) -2v
(c) Zero
(d) v

Q88. In the modern periodic table, where are the elements of electronic configuration 2, 8, 1 placed?

(a) Group 11
(b) Group 3
(c) Period 1
(d) Group 1

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Q89. Study the following related pairs and find the missing letters.

DL : BF, HR : DI, DP : ?

(a) BH
(b) BL
(c) BK
(d) BI

Q90. Consider the following statements and choose the correct option:

Statement:

1. In a game of cricket, batsmen do not change sides at the end of the over.
2. A maximum of 4 runs can be scored on a particular delivery.
3. A batsman can score a maximum score of 423 in 20 overs.

(a) Statement 3 is not correct if only statement 2 is correct.
(b) Statement 3 is correct if only statement 1 is correct.
(c) Statement 3 is correct if only statement 2 is correct.
(d) Statement 3 is true if both statements 1 and 2 are correct.

Q91. Read the following question and decide which of the statements is sufficient/necessary to answer the question.

Question:

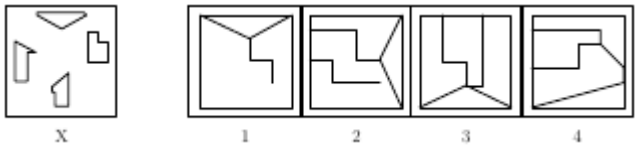
If positive, what is the value of X/4Y?

Statement:

1. Y = 3X
2. X = 5

(a) Both 1 and 2 together are sufficient.
(b) 1 alone is sufficient, while 2 alone is not sufficient.
(c) Both statements alone are sufficient.
(d) 2 alone is sufficient, while 1 alone is not sufficient.

Q92. Which shapes 1, 2, 3, and 4 can be formed from the pieces given in the figure?



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

Q93. Where was the Shanghai Cooperation Organization (SCO) Peace Mission 2018 organized:

(a) China
(b) India
(c) Russia
(d) Hong Kong

Q94. Read the given question and decide which of the following statements is sufficient to answer the question.

Question:

Latika and Geetika are sisters. What will be the total age of both girls 5 years from now?

Statement:

1. Latika is now 10 years old.
2. Geetika is the elder sister of Latika.

(a) Statements 1 and 2 are both sufficient.
(b) Only statement 1 is sufficient.

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(c) Statements 1 and 2 are not sufficient.
(d) Statement 2 alone is sufficient.

Q95. Who was appointed as the Chancellor of Pondicherry Central University in July 2018?
(a) Venkaiah Naidu
(b) MK Stalin
(c) O. PaneerSelvam
(d) Amit Shah

Q96. Suppose the atomic number of a given atom is 17, what will be its electronic configuration?
(a) 3, 4, 8, 2
(b) 8, 2, 7
(c) 2, 7, 8
(d) 2, 8, 7

Q97. Triangle XYZ is similar to triangle RST. Area of triangle XYZ is 2304 cm^2 and area of triangle RST is 1296 cm^2. If the longest side of the triangle XYZ measures 144 cm, then what will be the measure of the longest side of the triangle RST?
(a) 104 cm
(b) 120 cm
(c) 108 cm
(d) 112 cm

Q98. Teesta's salary is always a fixed portion of Torsa's salary. When Tista's income was Rs. 1,625, Torsa's income was Rs. 2,125. If Torsa receives Rs. 2,720, how much will Teesta get?
(a) Rs 2,040
(b) Rs 2,080
(c) Rs 2,120
(d) Rs 2,140

Q99. Litmus solution is a violet dye, which is extracted from _____.
(a) Rixia
(b) Moss
(c) Lichen
(d) Spirogyra

Q100. Match the following.

A. Dalton	1. Hydrogen atom
B. 10-10 m	2. Latin name for potassium
C. Kalium	3. First user of symbol for elements

(a) A - 3, B - 2, C - 1
(b) A - 1, B - 2, C - 3
(c) A - 3, B - 1, C - 2
(d) A - 2, B - 3, C - 1

ANSWER KEY

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

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

SOLUTIONS

Q1. Answer: (b) 5

The possible diagram for the given data is:

According to the Pythagoras Theorem,

The shortest distance between B and D = $\sqrt{(3^2 + 4^2)}$

BD = $\sqrt{(9 + 16)}$

BD = $\sqrt{25}$

BD = 5 km

Hence, the shortest distance between B and D is 5 km.

Q2. Answer: (a) [figure]

The second image present in the question figure is the inverted version of the first image.

(Inverted: Turn the image upside down)

Hence, option 1 is the correct answer.

Q3. Answer: (c) Rs. 2,376

Shortcut Trick

Effective interest rate for 2 years at 20% per annum compounded annually is calculated as: x + y + (xy/100).

Effective Rate = 20 + 20 + (20 × 20)/100 = 44%.

Compound Interest = 44% of Rs. 5400.

CI = (44/100) × 5400 = 44 × 54 = Rs. 2,376.

Therefore The correct answer is Rs. 2,376.

Alternate Method

Given: Principal (P) = Rs. 5400, Rate (R) = 20%, Time (T) = 2 years.

Formula Used: Amount (A) = P(1 + R/100)^T | CI = A − P

=> Amount (A) = 5400 × $(1 + 20/100)^2$

=> A = 5400 × (120/100) × (120/100)

=> A = 5400 × 1.2 × 1.2 = 5400 × 1.44

=> A = Rs. 7,776

=> Compound Interest (CI) = 7776 − 5400 = Rs. 2,376

Therefore The correct answer is Rs. 2,376.

Additional Information

Successive Percentage Change

For two successive changes of a% and b%, the net change is (a + b + ab/100)%. This is used to find effective interest rates.

Difference between CI and SI

The difference between Compound Interest and Simple Interest for 2 years is given by D = $P(R/100)^2$.

Ratio Method for CI

For 2 years, the CI can be calculated using the ratio 2 : 1. For 20% of 5400 = 1080 and 20% of 1080 = 216. Total CI = (2 × 1080) + (1 × 216) = 2160 + 216 = 2376.

Q4. Answer: (b) P/5

The correct answer is P/5.

Concept:

• Daltons Law of Partial Pressure:

• The total pressure of Gas exerted is the sum of partial pressure exerted by all gases.
• P_(total) = P1 + P2 + P3
• For two gases in the container, the relationship between the partial pressure of a gas (Pa) and the total pressure is given as P_a = n_a/(n_a + n_b) P_(Total) ----(1)
• Pa is the partial pressure of first gas, n_a is the number of moles of gas A and n_b is the number of moles of gas B.
Calculation:
• Given the ratio of molecular weight is 1 : 4
• or M_a = 4 M_b ----(2)
• Their weight is the same, so mass is same
• W_a = W_b = W -- (3)
• Now, the number of moles is given by mass / molecular mass
• Number of moles of a
• n_a = W_a/M_a = W/M_a ----(4)
• Number of moles of b
• n_b= W_b/M_b = W/M_b ----(5)
• Now partial pressure of B from the equation 1
• P_b = n_b/(n_a + n_b) P_(Total) ----(6)
• Putting (4) and (5) in 6
• P_b = (W/M_b)/(W/M_a + W/M_b) P_(Total) ----(7)
• Now putting (2) in 7
• P_b = (W/M_b)/(W/4M_b + W/M_b) P_(Total)
• => P_b = 1/(1+4) P_(Total)
• => P_b = (P_(Total))/5
• So, P/5 is the correct option.

Q5. Answer: (c) (7,-4)

Shortcut Trick
Use the weighted average of the coordinates based on the given ratio.
x = (3 × 10 + 1 × (−2)) ÷ (3 + 1) = (30 − 2) ÷ 4 = 7
y = (3 × (−6) + 1 × 2) ÷ (3 + 1) = (−18 + 2) ÷ 4 = −4
Therefore The correct answer is (7, −4).
Alternate Method
Given: End points A = (−2, 2), B = (10, −6) and 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 × 10 + 1 × (−2)) ÷ (3 + 1)
=> x = (30 − 2) ÷ 4 = 28 ÷ 4 = 7
=> y = (3 × (−6) + 1 × 2) ÷ (3 + 1)
=> y = (−18 + 2) ÷ 4 = −16 ÷ 4 = −4
Therefore The correct answer is (7, −4).
Additional Information
External Division Formula
If a point divides a segment externally in ratio m : n, the coordinates are [(mx2 − nx

Q6. Answer: (c) 24 hours

Shortcut Trick
Time for Pipe M to fill full tank = 24 × (3/2) = 36 hours.
Time for Pipe N to fill full tank = 60 × (6/5) = 72 hours.
Using LCM (36, 72) = 72: Efficiencies are 2 and 1 respectively.
Together time = Total Work ÷ Total Efficiency = 72 ÷ (2 + 1) = 24 hours.
Therefore The correct answer is 24 hr.
Alternate Method
Given:

Pipe M fills 2/3 tank in 24 hours.

Pipe N fills 5/6 tank in 60 hours.

Formula Used:

Time for full tank = Time taken ÷ Fraction of tank filled.

Combined Time = (T1 × T2) ÷ (T1 + T2)

Person	Days	Total Work	Efficiency
Pipe M	36	72	2
Pipe N	72	1	

Calculations:

=> Full capacity time for Pipe M = 24 × (3/2) = 36 hours

=> Full capacity time for Pipe N = 60 × (6/5) = 72 hours

=> Let Total Work = LCM of (36, 72) = 72 units

=> Efficiency of Pipe M = 72 ÷ 36 = 2 units/hr

=> Efficiency of Pipe N = 72 ÷ 72 = 1 unit/hr

=> Combined Efficiency = 2 + 1 = 3 units/hr

=> Time required = 72 ÷ 3 = 24 hours

Therefore The correct answer is 24 hr.

Additional Information

Pipes and Cisterns Efficiency

If a pipe can fill a tank in x hours, then the part filled in 1 hour is 1/x. This is inversely proportional to time.

Inlet and Outlet Pipes

Inlet pipes (filling) are taken as positive efficiency, while outlet pipes (emptying/leakage) are taken as negative efficiency.

Total Capacity Formula

Total Capacity = Time taken × Rate of flow (Efficiency). This is analogous to Work = Time × Efficiency.

Q7. Answer: (a) Lieutenant Colonel (Lt. Col.)

The correct answer is Lieutenant Colonel (Lt. Col.).

Key Points

• Dhoni is proceeding to 106 Territorial Army Battalion (Para) and is staying as part of Victor Force in the Kashmir Valley from July 31 to August 15.

• Dhoni was accorded the honorary rank of Lieutenant Colonel in 2011.

• He is also a qualified paratrooper after having completed five parachute training jumps.

• The wicket-keeper-batsman has been conferred the Padma Bhushan, the country's third-highest civilian award, by President Ramnath Kovind at Rashtrapati Bhavan.

• Dhoni made his ODI debut on 23 December 2004 against Bangladesh.

Additional Information

• Dhoni played his first Test a year later against Sri Lanka.

• Dhoni played his last Test Match against Australia in 2014.

• Dhoni played a total of 90 Test Matches, 350 ODIs, 98 T20s.

• Dhoni also took 1 ODI wicket.

• Dhoni's best score in ODIs is 183 not out against Sri Lanka.

Q8. Answer: (b) ^(14)C

The correct answer is ^(14)C.

Key Points

• Carbon-14 dating, also called radiocarbon dating, method of age determination that depends upon the decay to nitrogen of radiocarbon (carbon-14).

• The method was developed in the late 1940s at the University of Chicago by Willard Libby, who received the Nobel Prize in Chemistry for his work in 1960.

• It is based on the fact that radiocarbon (^(14)C) is constantly being created in the atmosphere by the interaction of cosmic rays with atmospheric nitrogen.

• The resulting ^(14)C combines with atmospheric oxygen to form radioactive carbon dioxide, which is incorporated into plants by

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photosynthesis; animals then acquire 14

C by eating the plants.

Additional Information

• In 2020, the Nobel prize for chemistry was won by Emmanuelle Charpentier and Jennifer A. Doudna for the development of a method for genome editing.

• Carbon - 14 is an isotopic chronometer.

• There are three principal techniques used to measure the carbon 14 content of any given sample— gas proportional counting, liquid scintillation counting, and accelerator mass spectrometry.

Q9. Answer: (c) 49, 133

Shortcut Trick

Co-prime numbers are pairs of numbers that have no common factor other than 1.

Check divisibility for each pair: 49 and 133 are both divisible by 7.

49 = 7 × 7 and 133 = 7 × 19.

Since they share a common factor 7, they are not co-prime.

Therefore The correct answer is 49, 133.

Alternate Method

Given: Four pairs of numbers to check for co-prime status.

Definition: A pair (a, b) is co-prime if HCF(a, b) = 1.

=> For (35, 51): Factors of 35 = 1, 5, 7, 35; Factors of 51 = 1, 3, 17, 51. HCF = 1.

=> For (75, 104): Factors of 75 = 1, 3, 5, 15, 25, 75; Factors of 104 = 1, 2, 4, 8, 13, 26, 52, 104. HCF = 1.

=> For (49, 133): Factors of 49 = 1, 7, 49; Factors of 133 = 1, 7, 19, 133. HCF = 7.

=> For (63, 95): Factors of 63 = 1, 3, 7, 9, 21, 63; Factors of 95 = 1, 5, 19, 95. HCF = 1.

Therefore The correct answer is 49, 133.

Additional Information

Co-prime Numbers

Two numbers are co-prime if their Highest Common Factor (HCF) is 1. They do not need to be prime numbers themselves.

Consecutive Numbers

Any two consecutive natural numbers are always co-prime to each other (e.g., 15 and 16).

Prime Numbers Property

Any two distinct prime numbers are always co-prime (e.g., 7 and 11).

Q10. Answer: (d) Microsoft

The correct answer is Microsoft.

• The Rajasthan Government has signed a Memorandum of Understanding (MoU) with Microsoft to provide free digital training to 9,500 college students of 50 government colleges in a year.

• State’s Higher Education Minister Kiran Maheshwari said that the initiative was taken for the enhancement of digital learning and capacity building of college students in Rajasthan.

Additional Information

• Chief Minister of Rajasthan - Ashok Gehlot.

• Governor of Rajasthan - Kalraj Mishra.

• National Parks in Rajasthan - Ranthambore, Sariska, Desert, etc.

• Headquarter of Microsoft - Redmond, Washington, United States.

• CEO of Microsoft - Satya Nadela.

Q11. Answer: (a) A does not mean B, but B means A.

The correct answer is A does not mean B, but B means A.

• Linear momentum is a vector quantity while kinetic energy is a scalar quantity. Hence, when the linear momentum is zero, it does not mean kinetic energy need to be zero. But when kinetic energy is zero, the linear momentum has to be zero.

• In the case of rotational motion, Linear momentum could be zero but it still can have non-zero kinetic energy because of other motion.

Important Points

• Kinetic energy = 1/2*mass*velocity²

• Momentum = mass*velocity.

• Vector quantities are those which have direction as well as magnitude.
• Scalar quantities are those which have only magnitude.
• Momentum has also direction along with magnitude.
• Kinetic energy has no direction it has only magnitude.

Q12. Answer: (b) Gopi Thonakal

The correct answer is Gopi Thonakal.

Key Points

• Gopi Thonakal is the first Indian to win the Asian Marathon Championship.
• Gopi Thonakal was born on 24 May 1988 is an Indian athlete who has qualified to represent India at the 2016 Summer Olympics.
• At age 21, he joined as a general recruit, starting as a Havildar at the Army Artillery Center in Hyderabad.
• He also won the South Asian Games in 2016 in the 10,000m event.
• Sunita Godara is a former Indian marathon runner from Nausana.
• Sunita Godara became the national marathon champion first time in 1985 by winning Delhi Marathon.

Additional Information

• Gopi Thonakal was born in the Waynad district of Kerala.
• Chief Minister of Kerala - Pinarayi Vijayan
• Governor of Kerala - Arif Mohammad Khan
• Capital of Kerala - Thiruvananthapuram
• National Parks in Kerala - Eravikulam National Park, Silent Valley National Park, Amarambalam, etc.

Q13. Answer: (d) Wood Carving Cottage Industries

The correct answer is Wood Carving Cottage Industries.

• Saharanpur is one of the flourishing cities of Uttar Pradesh. It has emerged as an important tourist destination, mainly owing to its rich historical and cultural heritage.
• Saharanpur city's name was given after the Saint Shah Haroon Chishti.
• A very famous temple of "Shakumbri Devi" is situated in Saharanpur.
• Saharanpur is the northernmost city of Uttar Pradesh.
• It touches the boundary of Himachal Pradesh.
• The north and the northeast of the district is surrounded by Shivalik hills and separates it from the Dehradun district.

Additional Information

• Chief Minister of Uttar Pradesh - Yogi Adityanath
• Governor of Uttar Pradesh - Anandiben Patel
• Saharanpur has the 200-year-old Shiva Temple in Barsi.
• Uttar Pradesh has a total of 75 districts in which Lakhimpur is the largest district of Uttar Pradesh.

Q14. Answer: (b) Neither I or II follows.

According to the first conclusion, morning yoga practice is the only way to have good health is not true. It is definitely good for health but it is just one of the ways to achieve good health.

According to the second conclusion, yoga practice in the evening is harmful to health. It is also not true. It is just that, practicing yoga in the morning is slightly more beneficial than in the evening.

Hence, neither conclusion I nor II follows.

Q15. Answer: (b) 12,000

Shortcut Trick

For half-yearly compounding, effective Rate = 10% ÷ 2 = 5% per 6 months.

Time periods (n) = 1 year × 2 = 2 periods.

5% as a fraction = 1/20. So, Principal : Amount ratio for one period = 20 : 21.

For 2 periods, Ratio = $20^2 : 21^2 = 400 : 441$.

Given 441 units = Rs. 13,230 => 1 unit = Rs. 30.

Principal (400 units) = 400 × 30 = Rs. 12,000.

Therefore The correct answer is Rs. 12,000.

Alternate Method

Given:

Maturity Amount (A) = Rs. 13,230

Annual Rate (R) = 10%

Time (T) = 1 year

Compounding Frequency = Half-yearly

Formula used:

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

Where r = R/2 and n = 2 × T

Calculations:

=> r = 10% ÷ 2 = 5%

=> n = 1 × 2 = 2 periods

=> $13,230 = P(1 + 5/100)^2$

=> $13,230 = P(1 + 1/20)^2$

=> $13,230 = P(21/20)^2$

=> 13,230 = P × (441 / 400)

=> P = (13,230 × 400) ÷ 441

=> P = 30 × 400

=> P = 12,000

Therefore The correct answer is Rs. 12,000.

Additional Information

Compounding Frequency

If interest is compounded quarterly, the rate is divided by 4 and the time is multiplied by 4 (r = R/4, n = 4T).

Effective Rate of Interest

The equivalent annual rate for half-yearly compounding at rate r is given by R_(eff) = r + r + (r × r)/100.

CI vs SI for 2 Periods

Difference = $P(r/100)^2$, where r is the rate per period.

Q16. Answer: (a) Brother

According to the given information,

Shree's daughter's mother is Shree herself. Also, the son of Shree's father is Shree's brother.

Hence, Jai is the brother of Shree.

Q17. Answer: (a) 32

Shortcut Trick

Number of triangles with exactly one side common with an n-sided polygon = n × (n − 4).

Number of triangles with exactly two sides common with an n-sided polygon = n.

For an octagon (n = 8), triangles having 'same side' means either 1 side or 2 sides common.

Triangles with same side = [8 × (8 − 4)] + 8 = 32 + 8 = 40. Wait, if only exactly one side common: 8 × 4 = 32.

Therefore The correct answer is 32.

Alternate Method

Given: A polygon is an octagon, so number of vertices n = 8.

The question asks for triangles that have the same side with the octagon. This usually refers to triangles having exactly one side common with the polygon.

=> Total ways to select 1 side from 8 sides = ^8C1 = 8 ways.

=> For each selected side (let's say V1V2), the third vertex cannot be V1, V2, V3, or V8 (to ensure exactly one side is common and avoid two sides being common).

=> Remaining available vertices for the third point = 8 − 4 = 4 vertices.

=> Total such triangles S = 8 × 4

=> S = 32.

Therefore The correct answer is 32.

Additional Information

Total Triangles in a Polygon

Total number of triangles that can be formed using vertices of an n-sided polygon is $^nC3$.

No Sides Common

Number of triangles with no sides common with the polygon = $^nC3 - n(n - 4) - n$.

Two Sides Common

Number of triangles having two sides common with an n-sided polygon is always equal to n.

Q18. Answer: (a) Wild Child and Other Stories

The correct answer is Wild Child and Other Stories.

• Paro Anand was given the Sahitya Akademi's Bal Sahitya Puraskar 2017 for her short story collection titled Wild Child and Other Stories.

• Paro Anand is an Indian author of books for children, young adults, and adults including novels, short stories, and plays.

• Wild Child and Other Stories is now published as Like Smoke: 20 Teens 20 Stories.

• She headed the National Centre for Children's Literature at the National Book Trust India, the apex body for children's literature in India.

• Paro Anand's book No Guns at My Son's Funeral made it to the IBBY Honors List of 2006.

Additional Information

• The Sahitya Akademi was Founded on 12 March 1954, it is supported by, though independent of, the Indian government.

• The most recent Sahitya Akademi was announced in 2019 in seven books of poetry, six short stories, four novels, three non-fiction books, and three essays.

Q19. Answer: (b) 21.5

Shortcut Trick

Number of chocolates = $(R^2 \times H) \div (r^2 \times h) = (6^2 \times 6) \div (2^2 \times 2) = (36 \times 6) \div 8 = 27$ chocolates.

Box configuration 9×3 holds 27 chocolates perfectly in a rectangular layout.

Free space % in a circle-in-square grid = 100 − (Area of Circle ÷ Area of Square × 100) = $100 - (\pi r^2 \div (2r)^2 \times 100)$.

Free space % = $100 - (\pi \div 4 \times 100) = 100 - (3.14 \div 4 \times 100) = 100 - 78.5\% = 21.5\%$.

Therefore The correct answer is 21.5%.

Alternate Method

Given: Base radius of large cylinder (R) = 6 cm, Height (H) = 6 cm. Small cylinder radius (r) = 2 cm, Height (h) = 2 cm. Box config = 9×3.

Step 1: Calculate the number of small chocolates.

=> Volume of large cylinder = $\pi \times R^2 \times H = \pi \times 6^2 \times 6 = 216\pi$ cm³.

=> Volume of small cylinder = $\pi \times r^2 \times h = \pi \times 2^2 \times 2 = 8\pi$ cm³.

=> Total chocolates = $216\pi \div 8\pi = 27$.

Step 2: Dimensions of the rectangular box.

=> Since configuration is 9×3, Length (L) = 9 × diameter = 9 × 4 = 36 cm.

=> Width (W) = 3 × diameter = 3 × 4 = 12 cm.

=> Height of box is given as 2 cm.

=> Volume of Box = L × W × Height = 36 × 12 × 2 = 864 cm³.

Step 3: Volume of 27 chocolates and free space.

=> Total volume of chocolates = 27 × 8 × 3.14 = 216 × 3.14 = 678.24 cm³.

=> Free space volume = 864 − 678.24 = 185.76 cm³.

=> Percentage free space = (185.76 ÷ 864) × 100 = 21.5%.

Therefore The correct answer is 21.5%.

Additional Information

Volume of Cylinder

The volume is calculated as $\pi r^2 h$, where r is the radius and h is the height.

Packing Efficiency

For a circular cross-section inside a square grid, the packing efficiency is always $(\pi/4) \times 100 \approx 78.5\%$.

Rectangular Prism Volume

The volume of the box is found by multiplying its length, width, and height (V = l × w × h).

Q20. Answer: (d) Only argument I is strong.

According to the first argument, the rhythm and melody contribute to portraying the human expression of emotions through music. Now, even though the instruments, music, and linguistics vary from culture to culture, the overall human expression remains the same everywhere. Hence, music plays a great role in being the universal language.

According to statement II, music and linguistics are one of the components of music which may vary from culture to culture. This may not be true for the overall music.

Hence, only argument I is strong.

Q21. Answer: (c) 0.0026

Given:

6.5 × 0.0004

Calculation:

6.5 × 0.0004 = (65 × 4)/100000

=> 260/100000

=> 26/10000

=> 0.0026

Therefore The value of 6.5 × 0.0004 is 0.0026

Q22. Answer: (c) 90

Shortcut TrickLet total work = 180 units (LCM of 36 and options like 90).Combined efficiency (Milena + Mashuka) = 180 ÷ 36 = 5 units/day.Using option (3): Milena alone takes 90 days => Milena's efficiency = 180 ÷ 90 = 2 units/day.Then Mashuka's efficiency = 5 − 2 = 3 units/day (Satisfies Mashuka > Milena).Check condition: (2/5 × 180)/3 + (3/5 × 180)/2 = 72/3 + 108/2 = 24 + 54 = 78 days. (Matches!)Therefore The correct answer is 90 days.Alternate MethodGiven: Combined time = 36 days. Work done separately (2/5 by Mashuka, 3/5 by Milena) = 78 days. Mashuka efficiency > Milena efficiency.Formula: 1/A + 1/B = 1/T; Time = Work ÷ Efficiency.PersonDaysTotal Work (W)EfficiencyMilena (A)xW/xMashuka (B)yW/y=> 1/x + 1/y = 1/36 --- (Eq. 1)=> (2/5)y + (3/5)x = 78 => 2y + 3x = 390 --- (Eq. 2)=> From Eq. 1: 36(x + y) = xy=> Substitute y = (390 − 3x)/2 into the equation:=> 36(x + (390 − 3x)/2) = x(390 − 3x)/2=> 36(2x + 390 − 3x) = 390x − 3x2=> 36(390 − x) = 390x − 3x2 => 12(390 − x) = 130x − x2=> 4680 − 12x = 130x − x2 => x2 − 142x + 4680 = 0=> (x − 90)(x − 52) = 0=> If x = 90, y = (390 − 270)/2 = 60. (Since Mashuka is faster, y < x is correct).Therefore The correct answer is 90 days.Additional InformationEfficiency and Time RelationEfficiency is inversely proportional to the time taken to complete a work. If Efficiency ratio is a:b, then Time ratio is b:a.Combined Work FormulaIf two people complete work in A and B days, they together complete it in (A × B) ÷ (A + B) days.Quadratic Shortcut in Time & WorkWhen the sum of times and product of times are known, the individual times are the roots of the equation: t2 − (Sum)t + (Product) = 0.

Q23. Answer: (c) 7

Shortcut Trick

Twin primes are pairs of prime numbers that have a difference of 2.

Between 100 and 200, the pairs are (101, 103), (107, 109), (137, 139), (149, 151), (179, 181), (191, 193), and (197, 199).

Total number of such pairs = 7.

Therefore The correct answer is 7.

Alternate Method

Given: Range = 100 to 200.

Formula: A pair (p, p+2) is a twin prime if both p and p+2 are prime numbers.

=> Prime numbers between 100-200: 101, 103, 107, 109, 113, 127, 131, 137, 139, 149, 151, 157, 163, 167, 173, 179, 181, 191, 193, 197, 199.

=> Check difference of 2:

=> (101, 103), (107, 109), (137, 139), (149, 151), (179, 181), (191, 193), (197, 199).

=> Total count = 7.

Therefore The correct answer is 7.

Additional Information

Twin Primes

Pairs of primes of the form (p, p+2). Every twin prime pair except (3, 5) is of the form (6n−1, 6n+1).

Prime Numbers up to 100

There are 25 prime numbers between 1 and 100. There are 8 twin prime pairs in this range.

Co-prime Numbers

Two numbers are co-prime if their Highest Common Factor (HCF) is 1. They do not need to be prime themselves.

Q24. Answer: (d) Gold Medal

The correct answer is Gold Medal.

• Sykhom Mirabai Chanu has won a gold medal at the World Weightlifting Championships held in Anaheim, United States.

• Saikhom Mirabai Chanu was born on 8 August 1994.

• Chanu has won the World Championships and multiple medals at the Commonwealth Games.

• She was awarded the Padma Shri by the Government of India for her contributions to the sport.

• She was awarded the Rajiv Gandhi Khel Ratna award by the Government of India for the year 2018.

• Chanu had won the silver medal in the women's 48 kg weight class at the 2014 Commonwealth Games, Glasgow.

Additional Information

• Sykhom Mirabai Chanu is from Manipur.

• India finished at 9th position along with 4 other nations in World Weightlifting Championship, Anaheim.

• Anaheim is a city outside Los Angeles, in Southern California.

Q25. Answer: (b) 2010

The correct answer is 2010.

• Article 21-A of the Constitution of India provides for free and compulsory education of all children in the age group of 6 to 14 years as a Fundamental Right.

• Article 21-A and the Right Education Act came into effect on 1 April 2010.

• After this article came into effect India became one of the 135 countries to have made education a fundamental right for every child.

• It is the 86th Amendment Act of the Constitution.

Important Points

• There are total SIX fundamental Rights of every citizen of India.

• The literacy rate of India as per the 2011 census is 74.04 %.

• Fundamental Rights come under Part III of the constitution.

• Part III contains Articles 12-35.

Q26. Answer: (a) Contractile

The correct answer is Contractile.

• Contractile protein is compressed and relaxed, causing the muscles to move.

• Contractile protein consists of two parts: Actin (a thin filament) and Myosin (a thick filament).

• Myosin is the most abundant contractile protein and consists of two heavy and four light chains.

• During compressed or relaxed movement a thin filament slides over a thick filament.

Additional Information

• Lipo protein is a biochemical assembly whose primary function is to transport hydrophobic lipid (also known as fat) molecules in water, as in blood plasma or other extracellular fluids.

• Nucleo proteins are any proteins that are structurally associated with nucleic acids, either DNA or RNA.

• Typical nucleoproteins include ribosomes, nucleosomes, and viral nucleocapsid proteins.

Q27. Answer: (d) 6 × 1024 kg

The correct answer is 6 × 1024 kg.

Key Points

• The exact mass of the earth is 5.9722×10^(24)Kg.

• The average density of the earth is 5515 kg.m^(−3).

• The mass of the moon is 7.342×10^{22} kg.

• Other names of the earth are - Gaia, Gaea, Terra, Tellus.

• Earth has only one natural satellite i.e. Moon.

Important Points

• The total circumference of Earth is 40,000 km.

• The total surface area of the Earth is 510072000 km^2.

• The axial tilt of the Earth is 23.4392811°.

• The total number of Latitudes is 179.

• Equator (The Great circle) passes through South America, Africa, Asia.

• 1° longitudinal distance at the equator is approximately 111.3 km.
• 180° longitude is known as International Date Line.

Q28. Answer: (b) Chitin

The correct answer is Chitin.

Key Points

• The cell wall of fungi is made from a compound known as 'chitin'.
• The cell wall of plant cells is made from 'cellulose'.
• The cell wall is a tough, rigid layer that surrounds some types of cells.
• The cell wall is the very basic component of the cell of a plant, bacteria, fungi, etc.
• The cell wall is located just outside of the cell membrane.
• Protozoans and animal cells do not have a cell wall.

Important Points

• The cell was discovered by Robert Hooke in 1665.
• Cell Nucleus was discovered by Robert Brown.
• Cells group together to form tissues which in turn group together to form organs.
• The longest cells in the human body are the motor neurons.
• Red blood cells carry oxygen around the body.

Q29. Answer: (c) Manohar Parrikar

The correct answer is Manohar Parrikar.

Key Points

• Manohar Gopalkrishna Prabhu Parrikar (13 December 1955 – 17 March 2019) was an Indian politician and leader of the Bharatiya Janata Party who served as Chief Minister of Goa from 14 March 2017 until his death(17 March 2019).
• Previously, he was Chief Minister of Goa from 2000 to 2005 and from 2012 to 2014, and from 2017 to 2019.
• He also served as the Minister of Defence from October 2014 to March 2017.
• In January 2020, he was posthumously awarded Padma Bhushan.
• He was the first IIT alumnus to serve as MLA of an Indian state, the first IITian to become the Chief Minister of a state in India, the first Goan to become a cabinet-rank minister at the Centre.

Additional Information

• Current Chief Minister of Goa - Pramod Sawant
• Governor of Goa - Bhagat Singh Koshyari
• National Parks/ Wildlife Sanctuary of Goa - Salim Ali Bird Sanctuary, Bondla Wildlife Sanctuary, etc.

Q30. Answer: (a) 12384

Shortcut Trick

A number is divisible by 6 if it is divisible by both 2 and 3.

Check Divisibility by 2: The last digit must be even (0, 2, 4, 6, 8). All options satisfy this.

Check Divisibility by 3: The sum of digits must be divisible by 3.

Option (1): 1 + 2 + 3 + 8 + 4 = 18. Since 18 is divisible by 3, the number is divisible by 6.

Therefore The correct answer is 12384.

Alternate Method

Given: Numbers 12384, 12358, 12368, 12376.

Formula Used: Divisibility rule of 6 => Number must be Even AND Sum of digits must be divisible by 3.

=> Testing 12384: Sum = 1+2+3+8+4 = 18. (Divisible by 3 and 2).

=> Testing 12358: Sum = 1+2+3+5+8 = 19. (Not divisible by 3).

=> Testing 12368: Sum = 1+2+3+6+8 = 20. (Not divisible by 3).

=> Testing 12376: Sum = 1+2+3+7+6 = 19. (Not divisible by 3).

Therefore The correct answer is 12384.

Additional Information

Divisibility by 4

A number is divisible by 4 if the last two digits are divisible by 4 (e.g., 84 in 12384).

Divisibility by 9

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A number is divisible by 9 if the sum of its digits is divisible by 9 (e.g., 18 is divisible by 9, so 12384 is also divisible by 9).

Divisibility by 8

A number is divisible by 8 if the last three digits are divisible by 8 (e.g., 384 ÷ 8 = 48).

Q31. Answer: (a) Urethra

The correct answer is Urethra.

Key Points

• The urine stored in the urinary bladder is expelled out through the urethra to the outside of the body.

• In males, it has the additional function of ejaculating semen when the man reaches orgasm.

• When the penis is erect during sex, the flow of urine is blocked from the urethra, allowing only semen to be ejaculated at orgasm.

Additional Information

• The male reproductive system includes testes, genital ducts, accessory glands, and the penis.

• The semen is composed of the fluid and sperm from the vas deferens which is about 10% of the total, fluid from the seminal vesicles which is about 60% of the total, and the fluid from the prostate glands which is about 30% of the total.

• The pH of the semen is about 7.5.

Q32. Answer: (b) $318 Million

The correct answer is $318 Million.

Key Points

• The World Bank will provide a $318 million loan for the modernization of irrigation projects in Tamil Nadu.

• This helped small and marginal farmers improve water management and adopt climate resilient techniques.

• It is expected that around 500,000 farmers were benefitted from this project.

• Tamil Nadu is a water-stressed state that continues to experience water shortages which are expected to exacerbate in the future.

• More than 160,000 hectares of currently partially irrigated lands will come into full irrigation under this project.

Additional Information

• Chief Minister of Tamil Nadu - Edappadi K. Palanisamy

• Governor of Tamil Nadu - Banwarilal Purohit

• National Parks of Tamil Nadu - Nilgiris Biosphere Reserve, Anamalai Tiger Reserve, Sathyamangalam Wildlife Sanctuary, etc.

Q33. Answer: (b) Stays the same

The correct answer is Stays the same.

Key Points

• In a group, the electrons in the outermost orbit are the same.

• There is a total of 18 groups in the Periodic table.

• There is a total of 4 blocks in the Periodic table.

• Group 18 consists of the Noble gases because the outermost orbit has completely filled.

• Each atom consists of electrons and nuclei.

Additional Information

• The Father of the Modern Periodic table is Dimitri Ivanovich Mendeleev.(published in 1869 with 63 elements)

• The element with the lowest melting and boiling point is Helium.

• The element with the highest melting point is Carbon.

• The element with the highest boiling point is Tungston.

• The element with the highest density is Osmium.

• The element with the highest electronegativity is Fluorine.

Q34. Answer: (a) 7/6

Given:

72/100

175/108

Formula Used:

a/b × c/d = ac/bd

Calculation:

72/100 × 175/108

=> 2/100 × 175/3

=> 2/4 × 7/3

=> 1/2 × 7/3

=> 7/6

Therefore The Multiplication of 72/100 and 175/108 is 7/6

Q35. Answer: (a) Mahavir Singh Phogat

The correct answer is Mahavir Singh Phogat.

Key Points

• Mahavir Singh Phogat is an Indian wrestler, senior Olympics coach, and politician.

• He is the father and coach of Geeta Phogat.

• Geeta Phogat won India's first gold medal in women's wrestling in the 55 kg freestyle category at the 2010 Commonwealth Games.

• Geeta Phogat won a bronze medal at the 2012 World Wrestling Championships.

• Mahavir Singh Phogat was born in the Bhiwani district of Haryana.

• Mahavir's role in the movie Dangal is shaping the wrestling careers of his daughters and niece, unheard of in rural Haryana, was respected by Sondhi.

Additional Information

• The biography of Mr. Phogat is - Akhada.

• The book 'Akhada' is penned by sports journalist Sourabh Duggal and was released on 21 December 2016 at the Chandigarh Press Club.

• Mahavir Singh Phogat won Dronacharya Award for Wrestling in 2016.

Q36. Answer: (b) 2

The correct answer is 2.

• There are only TWO Indian players who have played more than 100 international matches -

1. Sunil Chhetri

2. Bhaichung Bhutia

• Sunil Chhetri has played 115 matches while Bhaichung Bhutia has played 107 matches.

• Sunil Chhetri is the Captain of the Indian Football team.

• Gurpreet Singh Sandhu is the present Goal Keeper of the team.

Additional Information

• Sunil Chhetri is at 10th position in the world's most goal in International football matches.

• Ali Daei of Iran has scored the most goals in International Matches.

Q37. Answer: (b) 22

Shortcut Trick

Difference in multipliers = 21 − 12 = 9 units.

Given that this difference results in 198 less than the actual value.

9 units = 198

1 unit = 198 ÷ 9 = 22

Therefore The correct answer is 22.

Alternate Method

Let the original number be x.

Case 1: Intended multiplication => 21 × x = 21x

Case 2: Actual multiplication => 12 × x = 12x

According to the question, the difference is 198:

=> 21x − 12x = 198

=> 9x = 198

=> x = 198 ÷ 9

=> x = 22

Therefore The correct answer is 22.

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Additional Information

Error Percentage

Error % = (Difference between actual and correct value ÷ Correct value) × 100.

Product Rule

If a number is multiplied by 'a' instead of 'b', the error is (a − b) × number.

Unitary Method

It is a technique for solving a problem by first finding the value of a single unit, and then finding the necessary value by multiplying the single unit value.

Q38. Answer: (c) Petroleum

The correct answer is Petroleum.

Key Points

• Digboi is a town and a town area committee in the Tinsukia district in the north-eastern part of the state of Assam, India.

• Crude oil was discovered here in the late 19th century and the first oil well was dug in 1866.

• Digboi is known as the Oil City of Assam where the first oil well in Asia was drilled.

• The first refinery was started here as early as 1901.

• It is situated 510 km northeast of Guwahati.

• Majuli is the largest River Island in the world is in Assam.

Additional Information

• Chief Minister of Assam - Shri Himanta Biswa Sarma (Aug 2021).

• Governor of Assam - Jagdish Mukhi

• Rivers flow through Assam - Bharamputra, Kopili, Dihang, Manas, Bhogdoi, Jhanji, etc.

• National Parks/ Wildlife Sanctuaries in Assam - Kaziranga National Park, Dibru Saikhowa National Park, Dihing Patkai Rainforest reserve & elephant habitat, etc.

Q39. Answer: (d) [figure]

In the first pair, the image on the left has three sides while the image on the right has four sides (one more than the left one).

Similarly, in the second pair, the image on the left has four sides, which implies, the image to the right must have five sides (one more than the left one).

Hence, the correct answer is option 4.

Q40. Answer: (a) More than cone

Shortcut Trick

Force exerted is Weight (W = mg). Since density and height are uniform, Weight prop. to Volume.

Volume of Cylinder = $\pi r_1^2 h$ and Volume of Cone = $(1/3)\pi r_2^2 h$.

Given $r_1 > r_2$, then $r_1^2 > (1/3)r_2^2$ is always true.

Therefore, Volume of Cylinder > Volume of Cone => Weight of Cylinder > Weight of Cone.

Therefore The correct answer is More than cone.

Alternate Method

Given: Radius of cylinder = r_1, Radius of cone = r_2, $r_1 > r_2$, Heights are equal (h), Uniform mass (constant density ρ).

Formula Used: Weight (Force) = Mass × g = Volume × Density × g

=> Volume of Cylinder (Vcyl) = $\pi r_1^2 h$

=> Volume of Cone (Vcone) = $(1/3)\pi r_2^2 h$

=> Force of Cylinder (F1) = $\pi r_1^2 h \times \rho \times g$

=> Force of Cone (F2) = $(1/3)\pi r_2^2 h \times \rho \times g$

=> Since $r_1 > r_2$, it follows that $r_1^2 > r_2^2$ and $r_1^2 > (1/3)r_2^2$

=> F1 > F2

Therefore The correct answer is More than cone.

Additional Information

Volume Relationship

If a cylinder and a cone have the same radius and same height, the volume of the cylinder is exactly 3 times the volume of the cone.

Pressure vs Force

Force depends on total mass, whereas Pressure depends on Force/Area. For a cone, the pressure on the base is higher due to smaller contact area compared to its volume distribution.

Mass of Uniform Solids

Mass = Density × Volume. For uniform mass objects of the same material, the object with the larger volume will exert more gravitational force (weight).

Q41. Answer: (b) 10 dB

Concept:

The rustling of the leaves:

• A rustling is a gentle swishing sound, like the rustling of leaves in the trees on a breezy night.

• The rustling happens when the wind blows. Small speed differences in the airflow on either side of the leaf create vortices that detach from the leaf surface, lowering the pressure on one side and causing it to flutter.

Sound Intensity: It is also known as acoustic intensity.

• It is the power carried by sound waves per unit area in a direction perpendicular to that area.

• The sound intensity level is just a logarithmic expression of sound intensity relative to a reference intensity. Mathematically

L = 10log10I/I0

where L is the Level of the sound intensity, I is the intensity of the sound intensity, and I0 is the reference intensity.

I0 = 10-12 w/m².

Calculations:

Given that, I = 10^{11} Wm^(-2), I0 = 10^(-12) w/m².

So by the sound intensity,

L = 10log10I/I0 = 10log10(10^(-11))/(10^(-12)) = 10 Db

So the level of intensity due to that rustle is 10 Db.

Q42. Answer: (b) XIZGV

Given;

SANDY : HZMWB

S - Opposite of S - H

A - Opposite of A - Z

N - Opposite of N - M

D - Opposite of D - W

Y - Opposite of Y - B

Similarly;

CRATE : _____ ?

C - Opposite of C - X

R - Opposite of R - I

A - Opposite of A - Z

T - Opposite of T - G

E - Opposite of E - V

Hence, XIZGV is the correct answer.

Q43. Answer: (d) Malayalam

The correct answer is Malayalam.

Key Points

• Little Magician was made in Malayalam.

• Later, it was dubbed in Tamil, Telugu, and Hindi, with the Hindi dub being titled 'Chota Jadugar'.

• It won the National Film Award for Best Special Effects.

• It was directed by Jose Punnoose.

• It was produced by Navodaya Appachan.

• The film stars Suraj Balajee, S. P. Balasubrahmanyam, Tirlok Malik and Pooja Kumar.

Additional Information

• The original name of the Movie is Magic Magic.

• Magic Magic, made on a budget of Rs. 30 million.

• It was written by Gokula Krishnan.

• Music is given by Sharreth.

Q44. Answer: (c) 1000 J

Concept:

• Work is done: The product of force and displacement is called work done

• Work was done against gravity: When an object is brought to some height going against gravity, work is said to be done against gravity.

• This work done is converted into potential energy.

• The potential energy is energy stored in a body when work is done against gravity. It is given as

$P = m \times g \times h$

• As for lifting or after lifting at height some work needs to be done, .for e.g A coolie lifting a weight in his weight, it is in the form of potential energy, so work done can also be written as,

$W = P = m \times g \times h$.

m is mass, g is the acceleration due to gravity, h is the height obtained.

Calculations:

Given that, m = 20 Kg, h = 5 m, g = 10 m/s^2

So we have a formula for work done,

$W = mgh = 20 \times 5 \times 10 = 1000$ J.

So The work done by him to lift the weight is 1000 J.

Additional Information

• When a force is applied to an object which causes displacement along the direction of force then the work is said to be done by that force.

• The work done by a force is defined as: The product of the component of the applied force on the block in the direction of the displacement and the magnitude of this displacement is called work done.

i.e., $W = \vec{F}.d\vec{x} = Fdx\cos\theta$

or in terms of magnitude, it can be given as

$W = F \times s$

where F = force applied in Newton and s = Displacement in meters.

Q45. Answer: (c) 30

Given:

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of personal computers (in million)	10	15	20	30	50	20	30	60	50	70	80

Calculation:

In 2007, 30 million units of personal computer were sold by the XYZ company.

Therefore 30 million units of personal computer were sold by the company XYZ in the year 2007.

Q46. Answer: (b) Smriti Irani

The correct answer is Smriti Irani.

Key Points

• Smriti Irani was the Minister for Information and Broadcasting in March 2018.

• Smriti Zubin Irani was born on 23 March 1976.

• Smriti Irani is serving in the cabinet of Narendra Modi as Minister of Textiles and was given additional charge as Minister of Women and Child Development in the 2nd cabinet of Modi since May 2019.

• Smriti Irani is a Member of Parliament in the Lok Sabha, representing Amethi.

• Smriti Irani is currently the youngest Minister in the Council of Ministers at the age of 43.

Additional Information

• Smriti Irani succeeded Menka Gandhi after assuming the responsibility of Women and Child Development.

• Smriti Irani was one of the participants of the beauty pageant Miss India 1998.
• Smriti Irani made her debut with TV series Aatish and Hum Hain Kal Aaj Aur Kal.
• Smriti Irani holds the record of winning five consecutive Indian Television Academy Award for Best Actress.

Q47. Answer: (a) S19P11

The logic followed here is :
Hence, the next term will be S19P11.

Q48. Answer: (d) Only conclusion (2) follows.

The first statement states the problem while the second statement states the cause of the problem.
The first conclusion talks about recycling which is not directly related to the problem. The second conclusion clearly establishes the fact that popution growth is the reason why any country faces this issue.
Hence, only conclusion 2 follows.

Q49. Answer: (c) Rs. 241.50

Shortcut Trick
Given that Loss = 20%, so first Selling Price (SP1) corresponds to 80% of CP.
To get 5% Profit, the new Selling Price (SP2) must be 105% of CP.
Ratio of SP1 : SP2 = 80 : 105 = 16 : 21.
According to the question, 16 units = Rs. 184.
Therefore, 1 unit = 184 ÷ 16 = Rs. 11.5.
Required SP2 = 21 units = 21 × 11.5 = Rs. 241.50.
Therefore The correct answer is Rs. 241.50.
Alternate Method
Given: SP1 = Rs. 184, Loss1 = 20%, Desired Profit = 5%.
Formulas: CP = [SP × 100] ÷ [100 − Loss%], SP = [CP × (100 + Profit%)] ÷ 100.
=> Cost Price (CP) = (184 × 100) ÷ (100 − 20)
=> CP = (184 × 100) ÷ 80 = 184 × 1.25 = Rs. 230
=> Required Selling Price (SP2) = CP × (100 + 5) ÷ 100
=> SP2 = 230 × 105 ÷ 100 = 230 × 1.05
=> SP2 = Rs. 241.50
Therefore The correct answer is Rs. 241.50.
Additional Information
Profit and Loss on CP
Unless otherwise stated, Profit% and Loss% are always calculated on the Cost Price (CP).
Unitary Method Application
If SP at x% loss is given as A, then SP at y% profit = [A ÷ (100 − x)] × (100 + y).

Q50. Answer: (b) London

Nepal, Bhutan, and Russia are the names of countries while London is the capital.
Hence, London is different from the others.

Q51. Answer: (b) 3

The least possible Venn Diagram for the given data is,
1. All B are P → It is possible but not definite, hence false.
2. Some S are P → It is possible but not definite, hence false.
3. Some P being B is a possibility → True (It is possible)
4. No S is B → False (As, there is a direct relation between B and S)
Hence, only the third conclusion follows.

Q52. Answer: (d) Straight line

The correct answer is a Straight Line.
• The Shortest distance between the initial and final position of an object is known as Displacement.
• Displacement = time * velocity.

• Velocity is a vector quantity which implies that displacement is also a vector quantity.
• Displacement can be zero even if an object has travelled some distance.
• Displacement can be equal to the distance in the case of motion in a single direction and in a straight line.

Additional Information

• Those quantities which have direction, as well as magnitude, are known as Vector quantity.
• Those quantities which have only magnitude are known as Scalar quantity.
• If a body back to its original position then the displacement of the body is zero.

Q53. Answer: (a) J10T20

Hence, the next term will be J10T20.

Q54. Answer: (a) 31

The given figure:

The single triangles are, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

The combined triangles are: (1,2), (3,4), (5,6), (7,8), (9,10), (11,12), (14,15), (1,2,13), (3,4,16), (5,6,16), (7,8,17), (9,10,17), (11,12,13)

There is one large triangle: (1,2,13,15,14,16,17,9,10,5,6)

Hence, there are 31 triangle in the given picture.

Q55. Answer: (c) North-West

The starting point is O.

According to the given information,

Clearly, point B is to the north-west of point A.

Q56. Answer: (c) Odisha

The correct answer is Odisha.

Key Points

• Rourkela Steel Plant (RSP), in Rourkela, Odisha is the first integrated steel plant in the public sector in India.
• It was set up with West Germany collaboration with an installed capacity of 1 million tonnes.
• On 3 February 1959, then president Rajendra Prasad inaugurated RSP's first blast furnace named 'Parvati'.
• It was built in 1955.
• CEO of Rourkela Steel Plant is Dipak Chattaraj.
• There is a total of 13462 employees in the Steel plant.

Additional Information

• SAIL stands for Steel Authority of India.
• The headquarters of SAIL is in New Delhi.
• CEO of SAIL is CEO: Shri Amarendu Prakash.
• Chief Minister of Odisha - Mohan Charan Majhi
• Governor of Odisha - Raghubar Das
• National Parks in Odisha - Similipal National Park, Bhitarkanika National Park, Ushakothi Wild Life Sanctuary, etc.

Q57. Answer: (b) Phloem vessel

The correct answer is Phloem vessel.

Key Points

• Phloem, also called bast, tissues in plants that conduct foods made in the leaves to all other parts of the plant.
• Phloem is composed of various specialized cells called sieve tubes, companion cells, phloem fibers, and phloem parenchyma cells.
• Phloem is the living tissue in vascular plants that transports the soluble organic compounds made during photosynthesis and known as photosynthates, in particular the sugar sucrose.
• This transport process is called translocation.
• The phloem is the innermost layer of the bark.
• The term was introduced by Carl Nägeli in 1858.

Additional Information

Difference between Phloem and Xylem:

Phloem	Xylem
It conducts organic solutes or food materials.	It conducts water and minerals.
Conduction in Phloem can be bidirectional, that is from leaves to storage organs or growing parts or from storage organs to growing parts of plants.	Conduction is mostly unidirectional, i.e., from roots to apical parts of the plant.
Conducting channels are sieve tubes.	Conducting channels or treachery elements are tracheids and vessels.
Phloem does not perform the mechanical functions of the plants.	The xylem provides mechanical strength to the plant.

Q58. Answer: (d) Compression

The correct answer is Compression

• Compression is a region in a longitudinal wave where the particles or the dark band are closest together.

• A rarefaction is a region in a longitudinal wave where the particles or the dark band are furthest apart.

• The region where the medium is compressed is known as compression and the region where the medium is spread out is known as a rarefaction.

• Rarefaction waves expand with time (much like sea waves spread out as they reach a beach)

• in most cases, rarefaction waves keep the same overall profile ('shape') at all times throughout the wave's movement.

Additional Information

• A natural example of rarefaction occurs in the layers of Earth's atmosphere.

• Air at higher layers of the atmosphere is less dense, or rarefied, relative to air at lower layers.

• The modern construction of guitars is an example of using rarefaction in manufacturing.

Q59. Answer: (a) Velocity

The correct answer is Velocity.

Key Points

Newton's First Law of Motion	**• The first law states that an object at rest will stay at rest, and an object in motion will stay in motion unless acted on by a net external force. - This law is also known as the Law of Inertia.**
Newton's Second Law of Motion	• The second law states that the rate of change of momentum of a body over time is directly proportional to the force applied, and occurs in the same direction as the applied force. - This law is also known as the balance of linear momentum.
Newton's Third Law of Motion	• The third law states that all forces between two objects exist in equal magnitude and opposite direction. - The third law is also known as the law of action and reaction.

Additional Information

• All laws of motion given by Newton was published in 1687.

• Newton's first and second laws are valid only in an inertial reference frame.

• Force = mass * Acceleration

Q60. Answer: (b) KJ mol^(-1)

The correct answer is KJ mol-1

• Ionization energy is the minimum amount of energy required to remove the most loosely bound electron of an isolated neutral gaseous atom or molecule.

• It is quantitatively expressed as X(g) + energy → X+(g) + e− where X is any atom or molecule, X+ is the ion with one electron removed, and e− is the removed electron.

• The adiabatic ionization energy of a molecule is the minimum amount of energy required to remove an electron from a neutral molecule.

Additional Information

• Ionization energy generally increases from left to right within a given period (that is, row).

• Ionization energy generally decreases from top to bottom in a given group (that is, column).

• The work function is the minimum amount of energy required to remove an electron from a solid surface.

Q61. Answer: (d) Right

In the beginning, the person is going towards the west. After the first right turn, he would face the north. Then after turning left, he would face west, and then again after turning right he would face north.

Now, as the sun rises in the east and he is facing north, implies, the sun would be to his right.

Hence, the correct answer is right.

Q62. Answer: (b) North

The person is facing the west in the beginning.

Case 1:

After taking a U-turn (Right), the person would face the opposite of the west i.e. east.

Now, the person is facing the east direction and after taking a left he would face the north direction.

Case 2:

After taking a U-turn (Left), the person would face the opposite of the west i.e. east.

Now, the person is facing the east direction and after taking a left he would face the north direction.

Hence, the person is facing the north direction now.

Q63. Answer: (d) Both statement 1 and 2 are necessary.

Shortcut Trick

Volume of Cone = $(1/3)\pi r^2 h$ and Volume of Sphere = $(4/3)\pi R^3$.

From Statement 1: r = R. Volume comparison depends on height (h) of the cone.

From Statement 2: Surface Area of cone ($\pi rl + \pi r^2$) > Surface Area of sphere ($4\pi R^2$).

Combining both: (1) r = R and (2) $\pi r(l + r) > 4\pi r^2 \Rightarrow l + r > 4r \Rightarrow l > 3r$. Since $l^2 = r^2 + h^2$, we find the relation for h.

Both statements together provide the necessary dimensions to compare volumes.

Therefore The correct answer is Both statement 1 and 2 are necessary.

Alternate Method

Given: Volume of cone (V_c) and Volume of sphere (V_s).

Formula Used: $V_c = (1/3)\pi r^2 h$ | $V_s = (4/3)\pi R^3$ | $S_c = \pi rl + \pi r^2$ | $S_s = 4\pi R^2$

=> From Statement 1: r = R. $V_c = (1/3)\pi r^2 h$ and $V_s = (4/3)\pi r^3$. Comparison requires h.

=> From Statement 2: $\pi rl + \pi r^2 > 4\pi R^2$. Without r = R, we cannot relate l to R.

=> Combining 1 & 2: $\pi r(l + r) > 4\pi r^2 \Rightarrow l + r > 4r \Rightarrow l > 3r$.

$\Rightarrow \sqrt{(r^2 + h^2)} > 3r \Rightarrow r^2 + h^2 > 9r^2 \Rightarrow h^2 > 8r^2 \Rightarrow h > 2\sqrt{2}\, r$.

$\Rightarrow V_c = (1/3)\pi r^2 h > (1/3)\pi r^2 (2\sqrt{2}\, r) \approx 0.94\pi r^3$. $V_s = 1.33\pi r^3$. Now comparison is possible.

Therefore The correct answer is Both statement 1 and 2 are necessary.

Additional Information

Volume of Solids

The Volume of a Cone is exactly one-third the volume of a Cylinder with the same base radius and height.

Slant Height Relationship

In a Right Circular Cone, the slant height l, vertical height h, and radius r always satisfy $l^2 = r^2 + h^2$.

Data Sufficiency Logic

A statement is sufficient if it leads to a unique 'Yes' or 'No' answer. If multiple cases are possible, more data is required.

Q64. Answer: (a) Sound waves are longitudinal and light waves are transverse.

CONCEPT:

Sound:

• A sound is a form of energy that produces a sensation of hearing in our ears.

• It is a kind of disturbance that travels through a medium due to repeated vibrations of the particles of the medium about their mean positions.

• The disturbance being handed over from one particle to the next.

Light:

• Light is a form of electromagnetic radiation that can be detected by the human eye.

• When light falls on an object, some part of the light is reflected on our eyes and we are able to see.

EXPLANATION:

• Sound waves are longitudinal waves and light waves are transverse waves.

• As we know sound waves are longitudinal waves and travel through compression and rarefactions in the medium on the other hand light waves are transverse in nature and do not require medium to travel. Therefore options 2^(nd),3^(rd) and 4^(th) are incorrect.

• Sound waves are longitudinal and light waves are transverse. So, option 1^(st) is the corrcet ansswer.

• As we know that, the sound wave and lightwave travels with different velocity and have a different frequency, therefore the wavelength (λ = v/f) is different for both.

• Both sound and light waves follow the law of reflection i.e. the angle of incidence is equal to the angle of reflection.

Additional Information

• Light waves can be polarized, but sound waves cannot.

• The speed of light in a medium is constant. The velocity of sound waves can change.

• All waves have amplitude, wavelength, and frequency.

• A description of a sound as high or low is known as the pitch of the sound.

Sound Waves	Light Waves
Require a medium.	Do not require a medium
Travel with a speed of 332 m/s at 0^o C.	Travel with a speed of 3 *10^8 m/s.
Are of different frequencies, giving notes of different pitches.	Are of different frequencies, resulting in different colors.
Sound waves are longitudinal.	Light waves are transverse.
Do not travel far as their energy is dissipated easily.	Can travel through a much greater distance.

Q65. Answer: (d) Liter

The unit of Power is Watt, similarly, the unit of Volume is Liter.

Hence, the liter is the correct answer.

Q66. Answer: (b) -144√5

Shortcut Trick

Note that $b = 1/a$ and $a^2 - b^2 = (a + b)(a - b)$.

Sum $(a + b) = 2(2^2 + (\sqrt{5})^2) / (2^2 - (\sqrt{5})^2) = 2(4 + 5) / (4 - 5) = -18$.

Difference $(a - b) = (-4 \times 2 \times \sqrt{5}) / (4 - 5) = 8\sqrt{5}$.

Result $= -18 \times 8\sqrt{5} = -144\sqrt{5}$.

Therefore The correct answer is $-144\sqrt{5}$.

Alternate Method

Given: $a = (2 - \sqrt{5})/(2 + \sqrt{5})$ and $b = (2 + \sqrt{5})/(2 - \sqrt{5})$

Formula Used: $a^2 - b^2 = (a + b)(a - b)$

Rationalizing 'a':

$\Rightarrow a = [(2 - \sqrt{5})(2 - \sqrt{5})] / [(2 + \sqrt{5})(2 - \sqrt{5})]$

$\Rightarrow a = (4 + 5 - 4\sqrt{5}) / (4 - 5) = (9 - 4\sqrt{5}) / -1 = 4\sqrt{5} - 9$

Rationalizing 'b':

$\Rightarrow b = [(2 + \sqrt{5})(2 + \sqrt{5})] / [(2 - \sqrt{5})(2 + \sqrt{5})]$

$\Rightarrow b = (4 + 5 + 4\sqrt{5}) / (4 - 5) = (9 + 4\sqrt{5}) / -1 = -9 - 4\sqrt{5}$

Finding a + b and a − b:

$\Rightarrow a + b = (4\sqrt{5} - 9) + (-9 - 4\sqrt{5}) = -18$

$\Rightarrow a - b = (4\sqrt{5} - 9) - (-9 - 4\sqrt{5}) = 4\sqrt{5} - 9 + 9 + 4\sqrt{5} = 8\sqrt{5}$

Final Calculation:

$\Rightarrow a^2 - b^2 = (-18) \times (8\sqrt{5}) = -144\sqrt{5}$

Therefore The correct answer is $-144\sqrt{5}$.

Additional Information

Rationalization of Surds

To rationalize the denominator of the form $(x + \sqrt{y})$, multiply both numerator and denominator by its conjugate $(x - \sqrt{y})$.

Algebraic Identity

The formula $x^2 - y^2 = (x + y)(x - y)$ is useful when variables are reciprocal or conjugate pairs.

Sum and Product of Conjugates

For conjugates $(A+\sqrt{B})$ and $(A-\sqrt{B})$, the product is $A^2 - B$, which is always a rational number.

Q67. Answer: (a) Kharavel

The correct answer is Kharavel.

• The Hathigumpha inscription from Udayagiri in Odisha was written by the King of Kharavel Kalinga.

• Hathigumpha caves are also known as Elephant caves.

• These caves are written in the 2nd century BCE.

• The Hathigumpha inscription consists of seventeen lines incised in deep-cut Brahmi letters on the overhanging brow of a natural cavern Hathigumpha on the south side of the Udayagiri hill.

• The inscription also refers to the Kharaval's feat of bringing back the Jain image which was taken by the Nanda empire.

Additional Information

• The founder of the Nanda Dynasty was Mahapadma Nanda.

• He conquered Kalinga but ruled for a very short time.

• The Nanda dynasty immediately preceded the dynasty of the Mauryas.

• A total of 117 caves was excavated by Kharavela and others on Kumari hill (Udayagiri).

• Elephant caves are dedicated to Lord Shiva.

Q68. Answer: (b) The debate over vegetarianism vs. non-vegetarianism

The correct answer is The debate over vegetarianism vs. non-vegetarianism.

• The Arya Samaj founded by Dayanand Saraswati Ji was split into two in Punjab in the year 1893.

• Mahatma group were the people who supported eating meat and the leader was Mahatma Hansraj.

• The other group was Cultured Pary who renounced eating meat and the leader of this party was Swami Shraddhanand.

• The split in Arya Samaj was due to two issues,

• (i) Kind of education that is to be promoted, Conservatives wanted Gurukuls and Radicals wanted a college education and

• (ii) Kind of food to be followed, Conservatives wanted every Hindu to be purely vegetarian and Radicals wanted non-vegetarian food.

• Arya Samaj is a monotheistic Indian Hindu reform movement that promotes values and practices based on the belief in the infallible authority of the Vedas.

• The samaj was founded by Maharishi Dayanand Saraswati on 10 April 1875.

• Members of the Arya Samaj believe in one God and reject the worship of idols.

• Arya Samaj was the first Hindu organization to introduce proselytization in Hinduism.

Additional Information

• The original name of Swami Dayanand Saraswati was Mool Shankar.

• He was born in Gujarat in 1824 and died in Ajmer in 1883.

• The headquarter of Arya Samaj was in Lahore, Pakistan.

• Childhood name of Swami Vivekanand was Narendra Nath Dutt.

Q69. Answer: (c) Both 1 and 2

The correct answer is Both 1 and 2.

• Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points.

• Potential difference(V) = Current(I) * Resistance(R).

• Ohm's law states that the R in this relation is constant, independent of the current.

• Materials that do not obey Ohm's law, are called non-ohmic.

• Ohm's law is only valid for Metals. It does not obey semi-conductors, gaseous substance, non conductors, etc.

Additional Information

• Hopkinson's law is also known as Ohm's law for magnetics.

• Ohm's law was published in a book named Die galvanische Kette, mathematisch bearbeitet in 1827.

• Unit of Resistance is Ohm.

• SI unit of current is Ampere.

• SI unit of Potential difference is volt.

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Q70. Answer: (a) QP5Q

Given series: 4WXZ8QPOJ6GTMVEUH53B

In ZJMT : O8HO, O is the fourth successor of Z, 8 is the fourth predecessor of J, H is the fourth successor of M and O is the fourth predecessor of T.

As per the given series

Using the same approach, we get:

Hence QP5Q will come in place of the blank.

Q71. Answer: (a) 1, 2, 3, 4, 5

Given:

There is a digit at the 10th place of 6n.

Where n is a natural number that is greater than 1.

Calculation:

Let be n= 2, ,3, 4, 5,...

=> 6 × 2 = 12 = 1

=> 6 × 3 = 18 = 1

=> 6 × 4 = 24 = 2

=> 6 × 5 = 30 = 3

=> 6 × 6 = 36 = 3

=> 6 × 7 = 42 = 4

=> 6 × 8 = 48 = 4

=> 6 × 9 = 54 = 5

Therefore It can be 1, 2, 3, 4, 5.

Q72. Answer: (d) 126.5

Given:

'<' is treated as '+' and '×' as '÷'.

Concept used:

We have to follow the BODMAS rule

Calculation:

{(55 < 10) × 10} < 120

According to the question:

=> {(55 + 10) ÷ 10} + 120

=> {65 ÷ 10} + 120

=> (6.5 + 120)

=> 126.5

Therefore The value of ? is 126.5.

Q73. Answer: (a) C

The mirror image of the given image is,

Hence, figure C is the answer figure.

Q74. Answer: (b) 1, 3-Dimethyl butane

The correct answer is 1, 3-Bimethyl butane.

• Concept :

Isomers: isomers are compounds that possess the same molecular formula and have different structural formulas but have different properties are known as isomers and the phenomenon is known as isomerism.

Explanation :

• The chemical formula of pentane is C_(^5)H12.

• Now all the possible isomers of pentane are as follows,

Again, from the above structure, we can see that pentane has only three possible isomers which are n-pentane, 2-methyl butane, and 2,2-dimethyl propane.

Thus, in the given option 1, 3- Dmethyl butane is not the isomer of pentane.

Therefore, the correct option is (2)

Additional Information

• It has a role as a non-polar solvent and a refrigerant.

• It is a volatile organic compound and an alkane.

• N-pentane appears as a clear colorless liquid with a petroleum-like odor.

• The boiling point of N- Pentane is 97°F.

Q75. Answer: (a) 3

Shortcut Trick

Rewrite the equation in standard form: $(12 - a)x^2 - (a + 9)x + 4 = 0$.

For a repeated solution, the Discriminant (D) must be zero: $B^2 - 4AC = 0$.

Substitute values: $(a + 9)^2 - 16(12 - a) = 0$.

Simplify: $a^2 + 34a - 111 = 0 \Rightarrow (a - 3)(a + 37) = 0$.

Since the question asks for the positive solution, a = 3.

Therefore The correct answer is 3.

Alternate Method

Given Equation: $12x^2 - ax + 7 = ax^2 + 9x + 3$

Condition: The equation has only one repeated solution.

Formula used: For a quadratic equation $Ax^2 + Bx + C = 0$ to have a repeated root, the discriminant $D = B^2 - 4AC$ must be 0.

$\Rightarrow 12x^2 - ax^2 - ax - 9x + 7 - 3 = 0$

$\Rightarrow (12 - a)x^2 - (a + 9)x + 4 = 0$

Comparing with $Ax^2 + Bx + C = 0$:

$\Rightarrow A = (12 - a), B = -(a + 9), C = 4$

$\Rightarrow D = [-(a + 9)]^2 - 4 \times (12 - a) \times 4 = 0$

$\Rightarrow (a + 9)^2 - 16(12 - a) = 0$

$\Rightarrow a^2 + 18a + 81 - 192 + 16a = 0$

$\Rightarrow a^2 + 34a - 111 = 0$

$\Rightarrow a^2 + 37a - 3a - 111 = 0$

$\Rightarrow a(a + 37) - 3(a + 37) = 0$

$\Rightarrow (a - 3)(a + 37) = 0$

$\Rightarrow a = 3$ or $a = -37$

Since we need the positive solution for a:

$\Rightarrow a = 3$

Therefore The correct answer is 3.

Additional Information

Nature of Roots

The nature of roots of $Ax^2 + Bx + C = 0$ depends on $D = B^2 - 4AC$. If $D > 0$, roots are real and distinct; if $D = 0$, roots are real and equal; if $D < 0$, roots are imaginary.

Sum and Product of Roots

For $Ax^2 + Bx + C = 0$, the sum of roots is $-B/A$ and the product of roots is C/A.

Quadratic Formula

The roots of a quadratic equation are given by $x = [-B \pm \sqrt{(B^2 - 4AC)}] / 2A$.

Q76. Answer: (b) Purvanchal

The correct answer is Purvanchal.

• Hills including Mishmi, Naga, Manipur, Tripura, Mizo, Patkai that run through the north-east region are known as Purvanchal Hills.

• It lies south of the Brahmaputra valley.

• It covers an area of about 94,800 km².

• It covers Nagaland, Manipur, Tripura, and Mizoram Hills, and Chachar Districts along with a fifth of Haflong tahsil of Assam State and District of Tripa and part of Lohit in Arunachal Pradesh.

Additional Information

• Bharamputra River enters first in Namchafarua mountain in Arunachal Pradesh.

• Majuli Island in Assam is the world's largest river island.

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• Tributaries of Bharamputra are - Manas, Tista, Jamuna, Dihand, Dibang, Kemeng, etc.
• Cities alongside the river Bharamputra are - Guwahati, Dibrugarh.

Q77. Answer: (a) 157

Shortcut Trick
Number 24649 ends in 9, so the unit digit of the square root must be 3 or 7.
Ignore the last two digits (49). The remaining number is 246.
The largest perfect square less than 246 is 225 (which is 152).
Possible answers are 153 or 157. Since 1502 = 22500 and 1602 = 25600, 24649 is closer to 25600.
Therefore The correct answer is 157.
Alternate Method
Given: Number = 24649
Method: Long Division Method for Square Root
=> Grouping digits from right to left: 2, 46, 49
=> Step 1: 1 × 1 = 1 | Remainder = 1 | Bring down 46 → 146
=> Step 2: Double the quotient (1 × 2 = 2). 25 × 5 = 125 | Remainder = 21 | Bring down 49 → 2149
=> Step 3: Double the quotient (15 × 2 = 30). 307 × 7 = 2149 | Remainder = 0
=> Square root = 157
Therefore The correct answer is 157.
Additional Information
Unit Digit Property
If a perfect square ends in 9, its square root unit digit is either 3 or 7 because 32 = 9 and 72 = 49.
Range Estimation
To find the range, use multiples of 10. For example, 1502 = 22500 and 1602 = 25600. Since 22500 < 24649 < 25600, the square root must be between 150 and 160.

Q78. Answer: (b) Only statement 2 is sufficient, but statement 1 is not sufficient.

The word 'fictional stories' is specifically mentioned in the question.
Statement 1 is very vague in nature as a person who loves to read books may or may not like the 'fictional' category. It is very much possible that a person who loves to read books might only read novels or biographies etc.
The second statement is more specific as it states that Shama has an imaginative tendency which is very much relevant to 'fictional books' as the story in these books is written using the imagination of the writer.
Hence, only statement 2 is sufficient but statement 1 is not sufficient.

Q79. Answer: (a) (√3 + 1)/2

Shortcut Trick
Divide the given equation sin x + cos x = √3 cos x by sin x throughout.
1 + cot x = √3 cot x
1 = cot x (√3 − 1)
cot x = 1 / (√3 − 1)
On rationalizing: cot x = (√3 + 1) / (3 − 1) = (√3 + 1) / 2
Therefore The correct answer is (√3 + 1) / 2.
Alternate Method
Given: sin x + cos x = √3 cos x
Formula Used: cot x = cos x / sin x
=> sin x = √3 cos x − cos x
=> sin x = cos x (√3 − 1)
=> 1 = (cos x / sin x) × (√3 − 1)
=> 1 = cot x × (√3 − 1)
=> cot x = 1 / (√3 − 1)
=> Multiplying numerator and denominator by (√3 + 1):
=> cot x = (√3 + 1) / [(√3 − 1)(√3 + 1)]
=> cot x = (√3 + 1) / (3 − 1)

=> cot x = (√3 + 1) / 2

Therefore The correct answer is (√3 + 1) / 2.

Additional Information

Trigonometric Ratios

Standard relations include tan x = sin x / cos x and cot x = 1 / tan x = cos x / sin x.

Rationalization

To rationalize a denominator of the form (a − √b), multiply both numerator and denominator by its conjugate (a + √b).

Pythagorean Identity

The fundamental identity is $\sin^2 x + \cos^2 x = 1$, which can be rearranged to find specific ratio values.

Q80. Answer: (b) 40/13 hours

Shortcut Trick

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

Total work (LCM of 5, 4, 8) = 40 units.

Combined Efficiency = 8 + 10 − 5 = 13 units/hr.

Time taken = Total Work ÷ Net Efficiency = 40/13 hr.

Therefore The correct answer is 40/13 hr.

Alternate Method

Given: Filling time of Tap A = 5 hr, Tap B = 4 hr. Emptying time of Tap C = 8 hr.

Formula Used: Total Work = LCM of individual times; Efficiency = Total Work ÷ Time.

Person	Days	Total Work	Efficiency
Tap A	5 hr	40 units	8
Tap B	4 hr	10	
Tap C	8 hr	−5	

=> Total efficiency when all three taps are opened = 8 + 10 + (−5)

=> Net efficiency = 18 − 5 = 13 units/hr

=> Time taken to fill the tank = Total Work ÷ Net Efficiency

=> Time = 40/13 hr

Therefore The correct answer is 40/13 hr.

Additional Information

Inlet and Outlet Pipes

Inlet pipes add water (positive efficiency), while outlet pipes remove water (negative efficiency).

Time and Work Relation

Total Work = Efficiency × Time. If the net efficiency is negative, the tank will never be filled.

Combined Rate Formula

For two pipes A and B filling a tank, the net rate is (1/A + 1/B). For an outlet C, it is (1/A + 1/B − 1/C).

Q81. Answer: (d) 3/5

Calculation:

5/8 = 0.625, 5/6 = 0.8333, 4/3 = 1.33, 3/5 = 0.60

As we can se 3/5 is the smallest fraction.

Q82. Answer: (d) 6 cm

Shortcut Trick

For any right-angled triangle with perpendicular sides P, B and hypotenuse H, the radius of the incircle (inradius, r) is given by the direct formula:

r = (P + B − H) ÷ 2

Here, the sides are 14 cm, 48 cm, and 50 cm. Since $14^2 + 48^2 = 196 + 2304 = 2500 = 50^2$, it is a right-angled triangle.

r = (14 + 48 − 50) ÷ 2 = 12 ÷ 2 = 6 cm

Therefore The correct answer is 6 cm.

Alternate Method

Given:

Sides of the triangle: a = 14 cm, b = 48 cm, c = 50 cm

Formula Used:

Inradius of any triangle (r) = Area of triangle (A) ÷ Semi-perimeter (s)

Semi-perimeter (s) = (a + b + c) ÷ 2

Area of a right-angled triangle (A) = (1 ÷ 2) × Base × Height

Calculations:

First, verify if the triangle is right-angled:

=> $14^2 + 48^2 = 196 + 2304 = 2500$

=> $50^2 = 2500$

=> Since $14^2 + 48^2 = 50^2$, the triangle is a right-angled triangle with base = 48 cm, height = 14 cm, and hypotenuse = 50 cm.

Now, calculate the semi-perimeter (s):

=> s = (14 + 48 + 50) ÷ 2

=> s = 112 ÷ 2 = 56 cm

Calculate the area of the triangle (A):

=> A = (1 ÷ 2) × 48 × 14

=> A = 24 × 14 = 336 cm^2

Calculate the inradius (r):

=> r = A ÷ s

=> r = 336 ÷ 56

=> r = 6 cm

Option Analysis:

=> Option (1) - 5 cm: Incorrect, as the calculated inradius is 6 cm, not 5 cm.

=> Option (2) - 7 cm: Incorrect, as the calculated inradius is 6 cm, not 7 cm.

=> Option (3) - 8 cm: Incorrect, as the calculated inradius is 6 cm, not 8 cm.

=> Option (4) - 6 cm: Correct, as the calculated inradius is exactly 6 cm.

Therefore The correct answer is 6 cm.

Additional Information

Circumradius of a Right-Angled Triangle

The circumradius (R) of a right-angled triangle is exactly half of its hypotenuse: R = Hypotenuse ÷ 2.

Inradius of an Equilateral Triangle

For an equilateral triangle of side a, the inradius is given by r = a ÷ (2 × √3).

Relation between Inradius and Circumradius

For any right-angled triangle, the relation between inradius (r), circumradius (R), and perpendicular sides (a, b) is given by: r = a + b − 2R.

Q83. Answer: (d) 48

Shortcut Trick

Identify the triangle sides: 52, 56, 60. These are multiples of (13, 14, 15) triangle by factor 4.

Area of (13, 14, 15) triangle is 84 sq. units.

Area of (52, 56, 60) triangle → 84 × 4^2 = 1344 sq. units.

Height PS = (2 × Area) ÷ Base = (2 × 1344) ÷ 56 = 2688 ÷ 56 = 48.

Therefore The correct answer is 48.

Alternate Method

Given: Sides of ΔPQR: p = 56 (QR), q = 60 (PR), r = 52 (PQ).

Formula Used: Semi-perimeter s = (a + b + c)/2 and Area A = √[s(s−a)(s−b)(s−c)].

=> Semi-perimeter s = (52 + 56 + 60) ÷ 2 = 168 ÷ 2 = 84

=> Area = √[84 × (84−56) × (84−60) × (84−52)]

=> Area = √[84 × 28 × 24 × 32]

=> Area = √[(28 × 3) × 28 × (8 × 3) × (8 × 4)]

=> Area = 28 × 3 × 8 × 2 = 1344 sq. units

=> Area of ΔPQR = (1/2) × Base × Height

=> 1344 = (1/2) × 56 × PS
=> 1344 = 28 × PS
=> PS = 1344 ÷ 28 = 48
Therefore The correct answer is 48.
Additional Information
Heron's Formula
Used to find the area of any triangle when all three sides are known: Area = √[s(s−a)(s−b)(s−c)].
Height of a Triangle
The altitude or height h corresponding to a base b is calculated as h = (2 × Area) ÷ b.
Standard 13-14-15 Triangle
A triangle with sides 13, 14, and 15 always has an area of 84. Scaling the sides by k scales the area by k^2.

Q84. Answer: (c) 9 m

Shortcut Trick
Speed of person 1 (s1) = 10.8 km/h × 5/18 = 3 m/s
Speed of person 2 (s2) = 12 km/h × 5/18 = 10/3 m/s
Let Bus speed be V. Length L = (V − 3) × 9 = (V − 10/3) × 13.5
9V − 27 = 13.5V − 45 => 4.5V = 18 => V = 4 m/s
Length = (4 − 3) × 9 = 9 m
Therefore The correct answer is 9 m.
Alternate Method
Given:
Speed of Cyclist 1 = 10.8 km/h = 10.8 × (5/18) = 3 m/s
Speed of Cyclist 2 = 12 km/h = 12 × (5/18) = 10/3 m/s
Time taken for Cyclist 1 (t1) = 9 s
Time taken for Cyclist 2 (t2) = 13.5 s
Formula Used:
Distance (Length) = Relative Speed × Time
Calculations:
Let the speed of the bus be V m/s and length of the bus be L meters.
=> L = (V − 3) × 9 --- (i)
=> L = (V − 10/3) × 13.5 --- (ii)
Equating (i) and (ii):
=> 9V − 27 = 13.5V − 45
=> 13.5V − 9V = 45 − 27
=> 4.5V = 18
=> V = 4 m/s
Substituting V in equation (i):
=> L = (4 − 3) × 9
=> L = 1 × 9 = 9 m
Therefore The correct answer is 9 m.
Additional Information
Relative Speed Concept
When two objects move in the same direction, relative speed = S1 − S2. In the opposite direction, relative speed = S1 + S2.
Unit Conversion
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.
Train/Bus Crossing Rule
When a vehicle crosses a point object (man, cyclist, pole), the distance covered is equal to the length of the vehicle itself.

Q85. Answer: (d) Ovary

The correct answer is Ovary.
• The ovary is the swollen bottom part of the flower which contains the female gamete.

• The inflated portion of the underside of the Carpel is called Ovary.
• Carpels form the central female reproductive organs of the flowers.
• Each carpel has a basal, swollen structure called the ovary and a style and stigma above it.

Additional Information

• The ovary contains the ovule and ovum.
• A typical flower has four main parts - calyx, corolla, androecium, and gynoecium.
• Petals that are usually brightly colored are collectively known as Corolla.

Q86. Answer: (a) 3/5

Shortcut Trick

Using the M1D1/W1 = M2D2/W2 chain rule.

Total work (W1) = 1 unit.

Work part (W2) = (M2 × D2) ÷ (M1 × D1)

W2 = (207 × 20) ÷ (138 × 50) = 4140 ÷ 6900 = 3/5

Therefore The correct answer is 3/5.

Alternate Method

Given:

Initial Men (M1) = 138, Days (D1) = 50, Work (W1) = 1

Final Men (M2) = 207, Days (D2) = 20, Work (W2) = ?

Formula Used:

M1 × D1 × W2 = M2 × D2 × W1

Calculations:

=> 138 × 50 × W2 = 207 × 20 × 1

=> 6900 × W2 = 4140

=> W2 = 4140 ÷ 6900

=> W2 = 414 ÷ 690

=> W2 = (69 × 6) ÷ (69 × 10)

=> W2 = 6 ÷ 10 = 3/5

Therefore The correct answer is 3/5.

Additional Information

The MDH Formula

Total work is proportional to Men × Days × Hours. The general formula is (M1D1H1)/W1 = (M2D2H2)/W2.

Efficiency and Work

If efficiencies (E) are different, the formula becomes M1D1E1/W1 = M2D2E2/W2.

Unitary Method

1 man 1 day work = 1 / (M1 × D1). Therefore, work by M2 in D2 = (M2 × D2) / (M1 × D1).

Q87. Answer: (c) Zero

The correct answer is Zero.

• This concept is known as the Conservation of linear momentum.
• In this, the total momentum of the system will always remain constant.
• The first particle of mass m collides with another particle of the same mass, then the momentum of the first transferred to the second, and the momentum (which equals zero) is transferred to the first.
• Therefore, the velocity of the first is equaled to zero.
• This concept is explained in Newton's Third law of motion.

Additional Information

Newton First law of the Motion	**An object will not change its motion unless an external or internal force acts on it.**
Newton Second law of the Motion	The force on an object is equal to its mass times its acceleration.
Newton Third law of the Motion	When two objects interact, they apply forces to each other of equal magnitude and opposite direction.

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Q88. Answer: (d) Group 1

The correct answer is Group 1.

• As the outermost orbit has only one electron so it comes under Group 1.

• Sodium has an atomic number 11.

• Group 18 of the periodic table consists of Noble Gases.

• The outermost orbit of the Noble Gases is completely filled that is why they are completely stable and unreactive.

• Group 17 consists of electronegative elements that have a deficiency of a single electron to become stable.

• Group 2 consists of electropositive elements that have only a single electron in their outermost orbit.

• Carbon is a unique element in that it is known to form up to 10 million different compounds.

• Francium is the rarest element on earth.

• The country Argentina is named after the element silver (symbol Ag) which is Argentum in Latin.

Additional Information

• The only letter not in the periodic table is the letter J.

• When we move down in the periodic table electronegativity decrease.

• When we move left to right in the periodic table electronegativity of the elements increases.

• 17 elements in the periodic table that are classified as nonmetals.

Q89. Answer: (a) BH

The given series: DL : BF, HR : DI, DP : ?

In DL : BF

The position value of D and L is 4 and 12 as per the English alphabetical series. The half of these two numbers are 2 and 6. 2 and 6 are the position values of B and F respectively as per the English alphabetical series.

Similarly, HR : DI

The position values of H and R are 8 and 18 respectively and half of these two numbers are 4 and 9 which are the position values of D and I respectively as per the English alphabetical series.

Following the same criteria, the position values of D and P are 4 and 16 respectively and half of these numbers are 2 and 8 which are the position values of B and H as per the English alphabetical series.

Hence, B and H will come in place of the question mark.

Q90. Answer: (a) Statement 3 is not correct if only statement 2 is correct.

Shortcut Trick

If only Statement 2 is correct, it implies Statement 1 is false (batsmen do change sides at the end of the over).

To maximize individual score while changing sides, the batsman must take an odd number of runs (1 or 3) on the 6^(th) ball.

Max runs per over (Overs 1 to 19) = (5 × 4) + 3 = 23 runs.

Max runs in the last over (Over 20) = 6 × 4 = 24 runs.

Total maximum score = (19 × 23) + 24 = 437 + 24 = 461 runs.

Therefore The correct answer is Statement 3 is not correct if only statement 2 is correct.

Alternate Method

Given:

Statement 1: Batsmen do not change sides (False if only statement 2 is correct).

Statement 2: Max runs per delivery = 4 (True).

Statement 3: Max score = 423 (To be verified).

=> If batsmen change sides, the striker must score 3 runs on the last ball to retain strike for the next over.

=> Max runs in one over (except last) = (4 + 4 + 4 + 4 + 4 + 3) = 23 runs.

=> Total runs for 19 overs = 19 × 23 = 437 runs.

=> Max runs in the 20^(th) over = 6 × 4 = 24 runs.

=> Calculated Maximum Score = 437 + 24 = 461 runs.

=> Since 461 > 423, the claim that 423 is the maximum score is mathematically incorrect under these conditions.

Therefore The correct answer is Statement 3 is not correct if only statement 2 is correct.

Additional Information

Strike Rotation Logic

To retain strike when ends are changed after 6 balls, a batsman must score an odd number of runs (1, 3, or 5) on the final delivery of the over.

Max Possible Score (Standard Rules)

In a standard T20 match where 6 runs are possible, the theoretical max score for a single batsman (with side changes) is 19 × 33 + 36 = 663 runs.

Rule Verification

If Statement 1 were correct (no side change), the max score with 4 runs per ball would be 20 × 6 × 4 = 480 runs.

Q91. Answer: (b) 1 alone is sufficient, while 2 alone is not sufficient.

Shortcut Trick

To find the value of a ratio like X/4Y, we need a direct relationship between the two variables.

Statement 1 gives Y = 3X, so substituting Y makes the expression independent of X: X/12X = 1/12.

Statement 2 only gives a value for X, leaving Y as an unknown variable, which is insufficient.

Therefore The correct answer is 1 alone is sufficient, while 2 alone is not sufficient.

Alternate Method

Given: Expression = X/4Y where X and Y are positive numbers.

Checking Statement 1:

=> Y = 3X

=> Expression = X / (4 × (3X))

=> Expression = X / 12X

=> Expression = 1/12

=> Since we obtained a unique numerical value, Statement 1 is sufficient.

Checking Statement 2:

=> X = 5

=> Expression = 5 / 4Y

=> Since Y is still an unknown, the value of the expression cannot be determined. Statement 2 is not sufficient.

Therefore The correct answer is 1 alone is sufficient, while 2 alone is not sufficient.

Additional Information

Data Sufficiency for Ratios

To calculate a ratio or fraction involving two variables, a comparative relationship (like Y = kX) is often more useful than knowing the individual value of just one variable.

Unique Solution Rule

A statement is considered sufficient in Data Sufficiency only if it leads to exactly one specific numerical answer, regardless of the values of the variables involved.

Substitution Method

When Y is expressed as a function of X, substituting that function into the expression X/4Y allows the variable X to cancel out, leaving a constant value.

Q92. Answer: (b) 3

In image 1, shape b is not present and hence, it cannot be the answer.

In image 2, shape a is not present and hence, it cannot be the answer.

In image 4, shapes a and d both are not present and hence, it cannot be the answer either.

Image 3 contains all the shapes.

Hence, option 2 (3rd image) is the correct answer.

Q93. Answer: (c) Russia

The correct answer is Russia.

• Shanghai Cooperation Organization (SCO) 'Peace Mission' series formally started on 24 August 2018.

• It was started at Chebarkul, Russia.

• Russia with military contingents of all eight SCO member nations participating in this exercise.

• The contingents were addressed by Lieutenant General Alexander Pavlovich Lapin, Chief Commander Central Military District, Russia.

• The Russian Army has major participation of 1700 personnel followed by China with 700 & India with 200 personnel.

• The SCO Peace Mission Exercise is one of the major defense cooperation initiatives amongst SCO nations.

• The scope of the exercise includes professional interaction, mutual understanding of drills & procedures, the establishment of joint command and control structures, and the elimination of terrorist threats in urban counter-terrorist scenarios.

Additional Information

• Secretary-General of SCO is Vladimir Norov.

• The headquarters of SCO is in Beijing, China.

• It was founded on 15 June 2001 in Shanghai.

• SCO currently comprises EIGHT members those are - China, India, Kazakhstan, Kyrgyzstan, Russia, Pakistan, Tajikistan, and Uzbekistan.

Q94. Answer: (c) Statements 1 and 2 are not sufficient.

Given:

Latika and Geetika is a sister. Latika is 10 years old. The age of Geetika is not given. As if we want to find out the sum of the ages of both the girls then, Geetika's age should be given in the question. But, it's not given

Therefore Both the statements are not sufficient to answer the question.

Q95. Answer: (a) Venkaiah Naidu

The correct answer is Venkaiah Naidu.

• Vice-President M. Venkaiah Naidu is appointed as the Chancellor of Pondicherry Central University by Ram Nath Kovind, the President of India.

• The term of the Chancellor will be five years.

• The city is in the Puducherry district on the southeast coast of India and is surrounded by the state of Tamil Nadu.

• The mascot of Puducherry University is Lotus.

Additional Information

• Lt. Governor & Administrator of Puducherry is Tamilisai Soundararajan.

• Banwarilal Purohit is the governor and. K. Stalin is the Chief Minister of Tamil Nadu.

• Anamalai Tiger Reserve, Nilgiris Biosphere Reserve is in Tamil Nadu.

Q96. Answer: (d) 2, 8, 7

The correct answer is 2, 8, 7.

• The sequence of orbit filling is 2, 8, 8, 18,...., and so on.

• The Aufbau principle can be applied during orbit filling.

• According to the Aufbau principle, the sequence of elctron configuration is - 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p, (8s, 5g, 6f, 7d, 8p, and 9s).

• S orbital holds 2 electrons, P orbital holds 6 electrons, D orbital holds 10 electrons.

• Here, the Atomic number is 17, the configuration is - 2, 8, 7.

Additional Information

• The outermost orbit of Noble gases is completely filled which is why they are highly unreactive.

• The names of the four recently discovered elements are out for public review. Elements 113, 115, 117, and 118 are given names of-- Nihonium, Moscovium, Tennessine, and Oganesson, respectively.

• Fluorine is the most electronegative element in the periodic table.

• The more electronegative the element is the more reactive it is.

Q97. Answer: (c) 108 cm

Shortcut Trick

Ratio of Areas of similar triangles = 2304 : 1296

Ratio of Corresponding Sides = √2304 : √1296 = 48 : 36 = 4 : 3

Given, longest side of ΔXYZ (4 units) = 144 cm

So, 1 unit = 144 ÷ 4 = 36 cm

Longest side of ΔRST (3 units) = 3 × 36 = 108 cm

Therefore The correct answer is 108 cm.

Alternate Method

Given:

Area of ΔXYZ = 2304 cm^2

Area of ΔRST = 1296 cm^2

Longest side of ΔXYZ = 144 cm

Formula Used:

For two similar triangles, the ratio of their areas is equal to the square of the ratio of their corresponding sides:

Area(ΔXYZ) ÷ Area(ΔRST) = (Side_(XYZ) ÷ Side_(RST))²

Q98. Answer: (b) Rs 2,080

Shortcut Trick

The ratio of Teesta's income to Torsa's income is constant.

Ratio = 1625 : 2125 = 13 : 17 (dividing by 125).

Given Torsa's new income = 17 units = Rs. 2,720.

1 unit = 2720 ÷ 17 = 160.

Teesta's new income = 13 units = 13 × 160 = Rs. 2,080.

Therefore The correct answer is Rs. 2,080.

Alternate Method

Given:

Initial income of Teesta (S1) = Rs. 1,625

Initial income of Torsa (T1) = Rs. 2,125

New income of Torsa (T2) = Rs. 2,720

Formula Used:

Since the ratio is fixed (Direct Proportion): S1 ÷ T1 = S2 ÷ T2

Calculations:

=> S1 / T1 = S2 / T2

=> 1625 / 2125 = S2 / 2720

=> 13 / 17 = S2 / 2720

=> S2 = (13 / 17) × 2720

=> S2 = 13 × 160

=> S2 = 2080

Therefore The correct answer is Rs. 2,080.

Additional Information

Direct Proportion

Two quantities are in direct proportion if an increase in one leads to a proportional increase in the other, represented as y = kx or y1/x1 = y2/x2.

Unitary Method

A technique where you find the value of a single unit first (by division) and then multiply to find the value of the required number of units.

Ratio Simplification

To simplify a ratio a:b, divide both terms by their Highest Common Factor (HCF) to reach the simplest integer form.

Q99. Answer: (c) Lichen

The correct answer is Lichen.

- Litmus solution is a purple dye that is extracted from lichen and is commonly used as an indicator.
- A lichen is a composite organism that arises from algae or cyanobacteria living among filaments of multiple fungi species.
- Lichens have properties different from those of their component organisms.
- Lichens come in many colors, sizes, and forms and are sometimes plant-like, but lichens are not plants.
- A macro lichen is a lichen that is either bush-like or leafy; all other lichens are termed microlichens.
- The shape of a lichen is usually determined by the organization of the fungal filaments.

Additional Information

- If the pH value is less than 7 then the substance is acidic.
- Some indicators to determine Acid/Base are - Litmus Paper, Methyl orange, Olfactory indicator, etc.
- pH values are discovered by Søren Sørensen.

Q100. Answer: (c) A - 3, B - 1, C - 2

The correct answer is A - 3, B - 1, C - 2.

- The first user of symbols for elements was John Dalton.

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• The Latin name of Potassium is Kalium.
• The atomic radius of a Hydrogen atom is 10^(-10)m.
• John Dalton was born on 6 September 1766, he was an English chemist, physicist, and meteorologist.
• He researched Color Blindness.
• Sometimes Color Blindness is also referred to as Daltonism in his honor.
• John Dalton gave Atomic theory.

Additional Information

• John Dalton won the Royal award.
• Hydrogen Atom is the smallest atom in the periodic table.
• Latin name of Calcuim is Calx.

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