# MENTAL ABILITY TEST (MAT)

1. The value of
$$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}} \text{ is}$$
1. 4
2. 2
3. 0
4. 1

2. If $5\tan\theta=3$ then $\frac{5\tan\theta-3\cos\theta}{5\sin\theta+3\cos\theta}=$___
1. 0
2. $\frac{5}{3}$
3. $\frac{3}{5}$
4. $\frac{4}{5}$

3. A regular polygon is drawn with 35 diagonals. Its interior angle will be
1. $154^o$
2. $164^o$
3. $144^o$
4. None of these

4. If x means –, + means ÷, – means x and ÷ means + then $15-2\div900+90\times100=?$
1. 190
2. 180
3. 90
4. – 60

5. If one root of quadratic equation $(K+1)x^2-5x+2k=0$ is reciprocal of other then value of K is
1.2
2. 0
3. –1
4. 1

6. What will be the ratio of volume of cube is to volume of sphere inscribed in the cube
1. 3 : $\pi$
2. 6 : $\pi$
3. 6 : 5
4. 2 : $\pi$

7. If $\alpha$, $\beta$ are the roots of the equation $2x^2-5x+16=0$, then value of $\left(\frac{\alpha^2}{\beta}\right)^{\frac{1}{3}}+\left(\frac{\beta^2}{\alpha}\right)^{\frac{1}{3}}$ is
1. $\frac{1}{4}$
2. $\frac{5}{4}$
3. $\frac{1}{3}$
4. $\frac{5}{12}$

8. Divisor is 10 times of quotient and 10 times of reminder. If quotent is 10 then what is divided
1. 1010
2. 1100
3. 1001
4. 101

9. Value of $\left[(0.111)^3+(0.222)^3-(0.333)^3+(0.333)^2(0.222)\right]^2$ will be
1. 222
2. 0
3. 333
4. 2

10. If n is a natural number the $9^{2n} - 4^{2n}$ is always divisible by
1. 13
2. both 5 and 13
3. 5
4. none of the above

11. If sum of LCM and HCF of two number is 50 and their LCM is 20 more than their HCF, then the product of two numbers will be
1. 525
2. 425
3. 625
4. 325

12. A 320 m long train moving at an average speed of 120 km/h crosses a platform in 24 seconds. A man crossed the same platform in 4 minutes. The speed of the man in m/sec is
1. 2.0
2. 2.4
3. 1.6
4. 1.5

13. If $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the AM (arithmetic mean) between a and b, then find the value of n
1. 1
2. 3
3. 2
4. 0

14. In a certain office, $\frac{1}{3}$ of the workers are women, $\frac{1}{2}$ of the same are married and $\frac{1}{3}$ of the married women have children. If $\frac{3}{4}$ of the men married and $\frac{2}{3}$ of the married men have children, then what part of worker are without children?
1. 5/18
2. 4/9
3. 11/18
4. 17/36

15. If in a business, Alok gain 75% more profit than Akash, then by what percentage profit of Akash is less than the profit of Alok
1. 25%
2. 12.63%
3. 30.8%
4. 42.85%

16. The height of three towers are in the ratio of 5:6:7. If a spider takes 15 minutes to climb the smallest tower, how much time it will take to climb the highest one
1. 15 minutes
2. 18 minutes
3. 21 minutes
4. 54 minutes

17. The two vertices of a Triangle are (4, –2) and (2, –6). If centerod of a triangle is (0, 1) then third vertex of triangle will be
1. (–6, 11)
2. (11, –6)
3. (6, –11)
4. (6, 11)

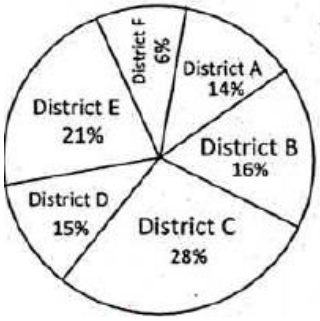
18. If $\sin\alpha, \cos\alpha, \tan\alpha$ are in GP, GP means $\cos^2\alpha = \sin\alpha.\tan\alpha$ $\cot^6\alpha - \cot^2\alpha =$
1. 1
2. 0
3. 4
4. 2

19. Eight members of a group shake hand with one another once. How many hand shakes were done altogether
1. 64
2. 16
3. 28
4. 18

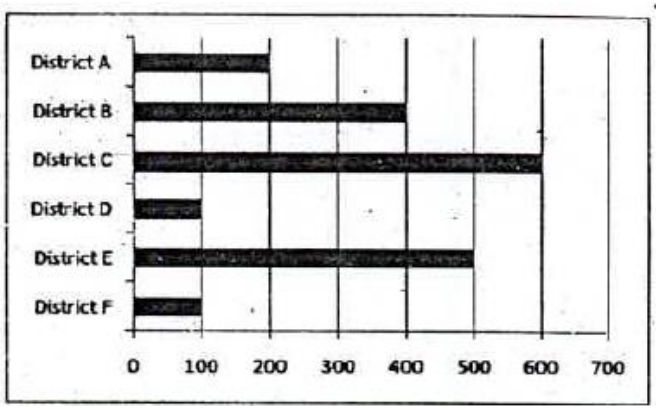
20. Three of the six vertices of a regular hexagon are chosen at random. The probability that triangle formed by these vertices is equilateral is
1. 1/20.
2. 1/10
3. 1/5
4. ½

**Directions: Question 21 – 25**

Study the following pie- chart and bar graph and answer the following questions percentage distribution of teachers in six different districts. Total numbers of teacher = 4500.




Number of male out of 4500




21. What is the total number of male teachers in District F, Female teachers in District C and Female teachers in District B together?
    1. 1180
    2. 1080
    3. 1020
    4. 1120

22. The numbers of female teachers in District D is approximately what percent of the total number of teachers (both male and female) in District A
    1. 70
    2. 80
    3. 75
    4. 90

23. In which district is the number of male teachers more than the number of female teachers?
    1. B only
    2. D only
    3. Both B and E
    4. Both E and F

24. What is the difference between the number of female teachers in district F and total number of teachers (both male and female) in district E?
    1. 625
    2. 775
    3. 675
    4. 725

25. What is the ratio of the number of male teachers in district C to number of female teachers in district B?
    1. 11:15
    2. 15:11
    3. 15:8
    4. 8:15

26. Complete the given series:
    25, 255, 2545, 25455, …
    1. 254545
    2. 25555
    3. 254555
    4. 255454

27. Find the missing letter:

| | | |
|---|---|---|
| 3 | L | 4 |
| 1 | Q | 17 |
| 5 | ? | 4 |

1. V
2. P
3. Q
4. T

28. In the given arrangement of numbers after removing all even numbers which is the middle most number?
1 8 5 9 4 7 1 2 5 8 3 6 5 9 2 7 6 4 5 2 9 2 6 4 1 2 3 5 1 4 2 8 3
1. 5
2. 7
3. 6
4. 9

29. A clock is set right at 5 am. The clock loses 16 minutes in 24 hours. What will be the right time when the clock indicates 10 pm on the 4th day?
1. 8 pm
2. 9 pm
3. 10 pm
4. 11 pm

**Directions (Q. No 30 – 31):**

Answer the questions based on the following information. Numbers are written on the Chess Board as given below.

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

30. If $a_8 = a_1 + a_2 + a_3 + ...a_7$
$b_8 = b_1 + b_2 + b_3 + ... + b_7$
. .
. .
. .
$h_8 = h_1 + h_2 + h_3 + ...h_7$
What is $a_8 + b_8 + ...h_8 =$ ___

1. 2080
2. 1596
3. 399
4. 741

31. The total number of odd numbers on the white box are
1. 8
2. 16
3. 24
4. 32

**Directions:** Read the information given below carefully and answer the question.
x + y means x is the sister of y.
x – y means x is the son of y.
x × y means x is the mother of y
x ≠ y means x is the father of y
x ÷ y means x is brother of y
x = y means x is daughter of y

32. Which of the following alternative means 'F is father of J'?
    1. F ÷ G ≠ H x I – J
    2. J = I + H ≠ G ÷ F
    3. F + G – H x I – J
    4. J + I – H x G – F

33. Five persons are standing in a line facing North. One of the two persons standing at the extreme ends is a teacher and the other is a businessman. A doctor is standing to the right of a student. A clerk is to left of the businessman. The student is standing between the teacher and the doctor. Counting from the left the doctor is at which place?
    1. I
    2. III
    3. II
    4. IV

**Directions (Q. 34 – 36):**

Read the information given below.
Ten friends A, B, C, D, E, F, G, H, I, J are sitting on the opposite sides of a rectangular table, five on each side of a pair of opposite sides of the table. J and F are sitting next to each other. B is sitting at middle position on one of the sides and C is sitting as far from B as B is sitting from A. A , B and C are sitting on the same side of the table. G and I are sitting opposite to each other, D is on one of the ends. E has an equal number of persons sitting on his either side. I is sitting to the immediate right of D.

34. Who is sitting opposite to G?
    1. H
    2. I
    3. J
    4. A

35. In between in which two persons I is sitting?
    1. D – E
    2. J – E
    3. B – C
    4. D – B

36. In which of the following pairs, given persons cannot be sitting opposite to each other?
    1. D – C
    2. F – C
    3. E – B
    4. G – H

37. A fruit seller does not use currency. Instead of he uses the following exchange rates
    10 strawberries = 2 Apples
    1 Apple = 2 Bananas
    4 Bananas = 1 Mango

    On the basis of the above exchange rates, how many strawberries are equal to one mango?
    1. 4
    2. 8
    3. 10
    4. 12

38. If > stands for +
    < stands for –
    ∧ stands for x
    ∨ stands for ÷
    Then what is the value of 52 < 4 ∧ 5 > 8 ∨ 2
    1. 38
    2. 36
    3. 124
    4. 312

39. The time shown by the reflection of a clock in a mirror is 4 hours 35 minutes. What is the actual time in that clock?

1. 7 hrs 25 min
2. 8 hrs 20 min
3. 7 hrs 35 min
4. 8 hrs 25 min

**Directions (Q. No 40 – 41):**
Read the information carefully and answer the question given below:

A cube is cut into two equal parts along a plane parallel to one of its faces. One piece is coloured orange on the two largest faces and yellow on the remaining. The other piece is coloured yellow on two small adjacent faces and orange on the remaining. Each is then cut into 32 cubes of the same size. These 64 cubes are mixed up. Then:

40. How many cubes have no coloured face at all?

1. 0
2. 4
3. 8
4. 16

41. How many cubes have only one coloured face?

1. 8
2. 16
3. 20
4. 24

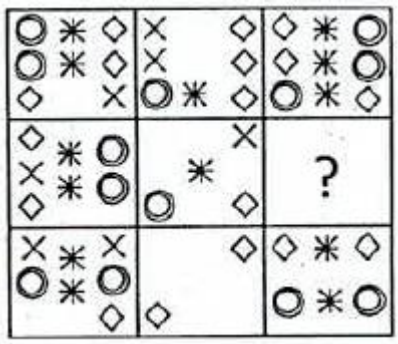
42. Choose the correct alternative that represents the relationship among illiterates, poor people and unemployed.

1. 2. 3. 4.

Directions (Q. 43 – 44):

In each of the following questions find out which of the answer figures complete the figure .

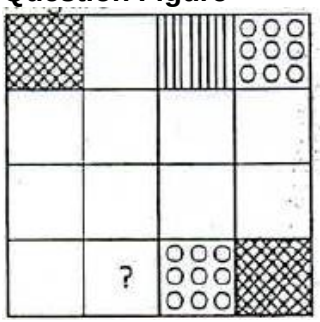
43 **Question Figure**



**Answer Figure**

1. 2. 3. 4.

44 **Question Figure**




**Answer Figure**


1.


2.


3.


4.

**Directions (Q. 45 – 46):**

Select the correct alternatives which will fit in the place of the sign of interrogation for a correct pattern.

45.

| | | | |
|---|---|---|---|
|  |  |  |  |
| 1. | 2. | 3. | 4. |

46.

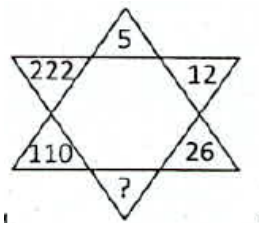
| | | | |
|---|---|---|---|
|  |  |  |  |
| 1. | 2. | 3. | 4. |

47. If ‘SKY WAS BLUE’ is 123
‘SEA IS BLUE’ is 245
‘PEOPLE SWIMMING IN SEA’ is 4678
‘PEOPLE LIKE SKY’ is 801 and
‘BIRDS IN SKY’ is 169. Then ‘PEOPLE LIKE BIRDS’ will have the number.

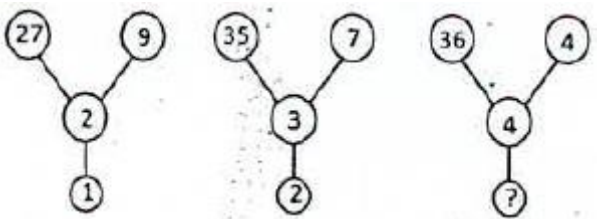
1. 809
2. 104
3. 036
4. 806

**Directions (Q 48 – 50):**

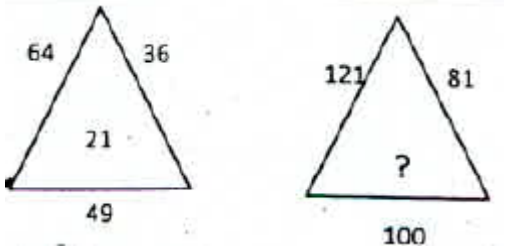
Find the missing character in each of the following questions.

48. 


1. 54
2. 51
3. 48
4. 44

49. 


1. 54
2. 51
3. 5
4. 6

50. 


1. 40
2. 30
3. 20
4. 10

# NTSE STAGE – I
# 02 – B/2017 – 18 (For Class – X)
# LANGUAGE TEST

**Direction:** Choose the word that is opposite in meaning to the given question nos. 51 – 56

51. Insolent
1. timid
2. soluble
3. bold
4. dissolving

52. Affable
1. reckless
2. rude
3. ungrateful
4. responsible

53. Mitigate
1. intensity
2. barricade
3. investigate
4. personify

54. Detrimental:
1. hurtful
2. desirable
3. profitable
4. injurious

55. Exodus
1. escape
2. exit
3. arrival
4. emigrate

56. Admonish
1. reprimand
2. chide
3. scold
4. praise

**Direction:** In question number 57 – 62, out of four alternatives, choose the one which best expresses the meaning of the given words:

57. Perseverance
1. vacillation
2. volatility
3. steadfastness
4. levity

58. Relinquish
1. recognize
2. assert
3. hold
4. forgo

59. Wanton
1. frolicsome
2. unplayful
3. joyless
4. demure

60. Exonerate
1. release
2. guilty
3. rusticate
4. mastermind

61. Disparate
1. helpless
2. different
3. needy
4. unware

62. Capricious
1. fickle
2. calm
3. careful
4. forgetful

**Direction:** In question numbers 63 – 69, choose the alternative which expresses the meaning of the given idioms/phrases.

63. To hear through the grapevine
1. To learn gardening
2. To learn about fruits
3. To learn something officially
4. To learn something from a rumour

64. To hit the nail on the head
1. To enjoy one's profession
2. To learn carpentry
3. To be violent
4. To do something in an effective way

65. A piece of cake
1. A difficult task
2. A special person
3. A memorable event
4. An easy task

66. To spill the beans
1. To grow vegetables
2. To open an old box
3. To reveal someone's secret
4. To request for support

67. An axe to grind
1. Grinding store
2. Selfish purpose
3. An axe for cutting trees
4. To take revenge

68. To beat about the bush
1. Not coming to the point
2. To cut down the bush
3. To cut expenses
4. Defeat

69. To move heaven and earth
1. To die
2. To make every possible effort
3. To rain heavily
4. To shift places

**Direction:** In question number 70 – 76, sentences are given with blanks to be filled with appropriate word out of four alternatives given:

70. Father divided his property _____ two sons.
1. among
2. to
3. in
4. between

71. Meena repented _____ her mistakes.
1. over
2. of
3. for
4. about

72. I want to dispense _____ the services of my servant.
1. of
2. off
3. with
4. about

73. There are _____ more toys in the box where this came from.
1. little
2. much
3. few
4. many

74. He had _____ friends, as he was an aggressive person.
1. few
2. some
3. many
4. those

75. My aunt lived in that house _____ five years.
1. with 2. for
3. since 4. some

76. I need _____ more time to complete the assignment.
1. few 2. a few
3. a little 4. little

**Direction:** Choose the correct alternative of the verbs given in brackets from question numbers 77 – 82

77. Ramesh _____ (b) a teacher since 1994.
1. is 2. has been
3. is being 4. was

78. Don't bring her unless she _____ (promise) to behave herself.
1. promised 2. will promise
3. promises 4. has promised

79. She _____ (work) since morning and now she wants to take rest.
1. has been working 2. had working
3. was working 4. had worked

80. When I reached the theatre, the play _____ (start)
1. had started 2. starts
3. will start 4. to be started

81. The baby _____ (laugh) with his mother in the video I watched yesterday.
1. laughs 2. was laughing
3. laughed 4. had been laughing

82. When he was unmarried, he often _____ (arrive) home late.
1. was arriving 2. had arrived
3. arrived 4. would arrived

**Direction:** In question 83 – 88, choose the alternative with correct spellings.

83 1. accommodation 2. acomodation
3. acumodation 4. accomodation

84. 1. emorous 2. emorus
3. amorous 4. ammorous

85. 1. sorcuror 2. sorcerer
3. sorsuror 4. sorsurer

86. 1. receive 2. recieve
3. receeve 4. riceive

87. 1. audeceous 2. audacious
3. audasious 4. audesious

88. 1. diskripency 2. discrepancy
3. discripancy 4. discripe

**Direction**: In question numbers 89 – 95, out of four alternatives, choose the one which can e substituted for given group of words:

89. An unexpected piece of good fortune.
    1. to turn turtle
    2. windfall
    3. philanthropy
    4. fortunate

90. Of unknown name.
    1. synonym
    2. anonymous
    3. unanimous
    4. incognito

91. Exclusive possession of anything
    1. monopoly
    2. autocratic
    3. aristocratic
    4. monogamy

92. A place for the sick to recover health
    1. sanatorium
    2. stable
    3. granary
    4. arsenal

93. Study of the interaction of people with their environment.
    1. ecology
    2. ornithology
    3. calligraphy
    4. cartography

94. Failing to discharge one's duty.
    1. recklessness
    2. dereliction
    3. submission
    4. reluctant

95. A person who is an expert in fine arts.
    1. conductor
    2. contemporary
    3. connoisseur
    4. artist

**Direction**: In question numbers 96 – 100, read the passage and choose the correct answer from the options.

At every stage, SLV-2 3 team was blessed with some extra-ordinary courageous people. Alongwith Sudhakar and Sivarama-krishanan, there was also Sivakaminathan. He was entrusted with brining the C-Band transponder from Trivandrum to SHAR for integration with the SLV-3. The transponder is a device is fitted with the rocket system to give the signals which are powerful enough to help it track the vehicle from the take off site to the final impact point. The SLV-3 launch schedule was dependent on the arriaval and integration of this equipment. On landing at the Madras airport, the aircraft which Sivakami was traveling in, skidded and overshot the runway. Dense smoke engulfed the aircraft. Everyone jumped out of the aircraft through emergency exits, and desperately fought to save themselves – all except Sivakami, who stayed in the aircraft till he removed the transponder from his baggage. He was among the last few persons, the others being mostly aircrafts crew, to emerge from the smoke and he was hugging the transponder close to his chest.

96. The speaker calls Sivakami courageous because
    1. he was blessed
    2. he looked after the transponder over his own safety
    3. the team was blessed
    4. the transponder was brought to Chennai by him

97. The aircraft was in danger because
    1. it crash landed
    2. it made an emergency landing
    3. it skidded and overshot the runway
    4. it was covered in smoke

98. Sivakami was the last to come out because
1. he stayed back to bring the transponder safely
2. he was blinded by the smoke
3. he helped save other pasangers
4. he was in a panic

99. The transponder was a device that
1. was used to test the rocket
2. launched the rocket
3. for it to carry out the take off
4. for it to be integrated to the rocket

100. The transponder was needed in time.
1. for the rocket to be seen as the radar
2. for the launch to take place
3. for it to carry out the take off
4. for it to be integrated to the rocket

# NTSE STAGE – I
# SCHOLASTIC APTITUDE TEST (SAT)

101. If a body is in equilibrium under the effect of some collinear forces, then the minimum number of such forces acting upon the body are
1. 3
2. 2
3. 5
4. 4

102. A heater coil is cut into two equal parts and only one part is used in the heater the heat generated now will be
1. doubled
2. four times
3. one fourth
4. halved

103. A bar magnet placed in non – uniform magnetic field experiences
1. only torque
2. only force
3. both torque and force
4. neither force nor torque

104. How much water a pump of 2kW power can raise in one minute to a height of 10 m? ($g = 10\ m/s^2$)
1. 1000 litre
2. 1200 litre
3. 10 litre
4. 2000 litre

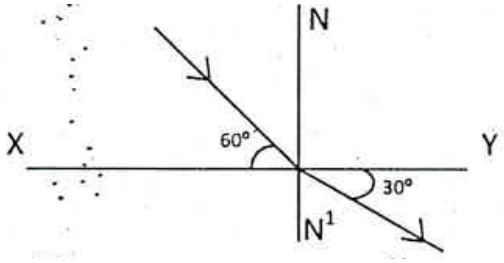
105. The Kinetic energy of a body becomes 4 times of its initial value. The new linear momentum will be
1. Same as initial momentum
2. Four times the initial momentum
3. Two times the initial momentum
4. Eight times the initial momentum

106. In a simple pendulum mass of bob is m and effecting length is L. Work done on the pendulum in one complete oscillation in gravitational field of earth is
1. $\frac{1}{4}mgL$
2. $\frac{1}{2}mgL$
3. zero
4. mgL

107. The mass of earth is 80 times that of moon and its diameter is double that of moon. If the value of acceleration due to gravity on earth is 9.8 $ms^{-2}$ then the value of acceleration due to gravity on moon will be
1. 0.98 $ms^{-2}$
2. 0.49 $ms^{-2}$
3. 9.8 $ms^{-2}$
4. 4.9 $ms^{-2}$

108. Two lenses of focal length $f_1$ and $f_2$ are kept in contact coaxially. The power of the combination will be
1. $\frac{f_1 f_2}{f_1 + f_2}$
2. $\frac{f_1 + f_2}{f_1 f_2}$
3. $\frac{f_1 f_2}{f_1 - f_2}$
4. $f_1 + f_2$

109. In figure a ray of light undergoes refraction from medium A to medium B. If the speed of light in medium A is $\nu$ then the speed of light in medium B will be




1. $\sqrt{3}\nu$
2. $\frac{\nu}{\sqrt{3}}$
3. $2\nu$
4. $\frac{\nu}{2}$

110. A body falls freely from a tower and travels a distance of 40 m in its last two seconds. The height of the tower is

1. 54 m
2. 45 m
3. 80 m
4. 65 m

111. The resistance of a wire is R. After melting it is remoulded such that its area of cross section becomes n times its initial area of cross section. Its new resistance will be

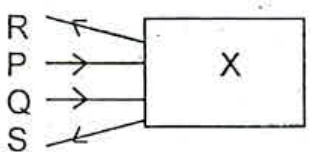
1. $nR$
2. $\frac{R}{n}$
3. $n^2R$
4. $\frac{R}{n^2}$

112. Which of the following is/are true for an ammeter

(A) An ammeter always reads lesser than actual current
(B) An ammeter always reads more than actual current
(C) An ammeter is always connected in series because it is a low resistances device
(D) An ammeter is always connected in series because it is a high resistance

1. Only A
2. A and B
3. A and C
4. only D

113. Two light rays P and Q are incident an optical device 'X' which finally goes along 'R' and 'S', identify optical device 'X',




1. Concave lens
2. Concave mirror
3. Convex lens
4. Convex mirror

114. Work is said to be done if the force and displacement are

1. Parallel to each other
2. opposite to each other
3. inclined at an angle with each other $\theta\left(\neq 90^{o}\right)$
4. All of the above

115. Which metal is used to connect solar cell to solar panels

1. Gold
2. Silver
3. Copper
4. Aluminum

116. What is the correct electronic configuration of Cr. (At No – 24)

1. $[Ar]^{18}\ 4s^1 3d^5$
2. $[Ar]^{18}\ 4s^2 3d^4$
3. $[Ar]^{18}\ 4s^0 3d^6$
4. None of these

117. Nature of $Al_2O_3$ (Aluminum oxide) is

1. Acidic
2. Basic
3. Amphoteric
4. Neutral

118. What is the pH of dil – HCI solution which conc. $10^{-8}$ MoL/L

1. 7
2. 8
3. 6.98
4. 10

119. Which colour appears when few drops of phenapthalin put into test tube contains lime water

1. Yellow
2. Orange
3. Pink
4. Colourless

120. Which is the correct answer, if n = 4 (Where n is number of shell) then number of sub shells and electron present in atom.

1. 16, 32
2. 32, 16
3. 32, 32
4. 16, 16

121. During preparation of soap, sodium – is used as

1. Precipitate the soap
2. Dehydration of soap
3. As a catalyst
4. for smoothness of soap

122. Buckminister fullerenes is

1. Isotope of carbon
2. Isobar of carbon
3. Allotrope of carbon
4. None of these

123. Which salts are responsible for yellow colour of Taj Mahal in Agra due to Acid rain

1. $CaCl_2$ & $CaSO_4$
2. $Ca(NO_3)_2$ & $CaSO_4$
3. $Ca(NO_3)_2$ & $BaSO_4$
4. $CaSO_4$ & $BaCl_2$

124. Which of the following are the Green house gases

1. $CO_2, CH_4, N_2O$ and $O_3$
2. $CO_2$, Octane, Chlorine, Nitrogen
3. Methane, Oxygen, Helium, Neon
4. None of these

125. Which of the following sub shells present in atom

1. s, p, d, f
2. a, b, c, d
3. s, d, n, g
4. None

126. Which elements are used in Atomic Reactors to control the speed of Neutrons

1. Boron and Cadmium
2. Cadmium and Aluminum
3. Boron and Iron
4. Sodium and Potassium

127. How many atoms are present in 1 kg of silver (Atomic mass of silver = 108)

1. $2.03\times10^{23}$ atoms
2. $5.57\times10^{24}$ atoms
3. $4.27\times10^{-23}$ atoms
4. $6.23\times10^{23}$ atoms

128. Which of the following carry hereditary characters to the off spring in the organism?

1. Ribosome
2. Chromosome
3. Plasma
4. Lysosome

129. Which organelle of the cell is called the power house of the cell?
1. Cell – wall
2. Nucleus
3. Mitochondria
4. Complete cell

130. Plasma membrane is made up of
1. Protein
2. Lipid
3. Carbohydrate
4. Both (1) and (2)

131. Which of the following is the side of fertilisation in humans?
1. Uterus
2. Oviduct
3. Ovary
4. Vagina

132. What is the time of rest in the heart?
1. Never
2. While sleeping
3. Between two beats
4. While doing yogasan

133. Lacteal present in the villi of the small intestine:
1. Help to absorb fatty acids and glycerol
2. Secrete enzymes for digestion
3. Secrete hormones
4. Help to absorb proteins

134. How primitive life might have originated on earth was experimentally shown by
1. Urey and Miller
2. Watson and Crick
3. Oparin and Haldane
4. Hershey and Chase

135. Bicuspid valve is present in the human heart in between which of the following
1. Right atrium and right ventricle
2. Left atrium and left ventricle
3. Right and left atria
4. Left atrium and systemic aorta

136. Which of the following products of light dependent phase are used during the light independent phase of photosynthesis?
1. RUBP and ATP
2. $H_2O$ and $O_2$
3. NADPH and ATP
4. ATP and $O_2$

137. Grafting in monocot plants is not possible because they have
1. Parallel venation
2. Have only one cotyledon
3. Have cambium
4. Have scattered vascular bundles

138. Haemophilia disease is linked with
1. Sex chromosome
2. Autosome
3. Bacteria
4. Virus

139. The primary building blocks of DNA are
1. Nitrogenous base, phosphorus and ribose
2. Nitrogenous base, Sulphur and deoxyribose
3. Nitrogenous base, phosphorus deoxyribose
4. Nitrogenous base, sulphur and ribose

140. Which of the following helps in formation of insulin
1. Islets of Langerhans
2. Pituitary gland
3. Thyroid gland
4. Adrenal gland

141. The value of n for which the expression $x^4 + 4x^3 + nx^2 + 4x + 1$ becomes a perfect square is:
1. 3
2. 4
3. 5
4. 6

142. Deepak's salary is reduced by 10%. In order to have his salary back to the original amount, it must be raised by how much percent?

1. 8%
2. 10%
3. $11\frac{1}{9}\%$
4. $12\frac{3}{7}\%$

143. Suppose x and y are positive real numbers such that $x\sqrt{x}+y\sqrt{y}=183$ and $x\sqrt{y}+y\sqrt{x}=182$ then value of $\frac{18}{5}(x+y)$ is:

1. 73
2. 146
3. 63
4. 126

144. Let m and n be integers such that all the roots of the equation $\left[\left(x^2+mx+20\right)\left(x^2+17x+n\right)\right]=0$ are negative integers. The smallest possible value of (m + n) is

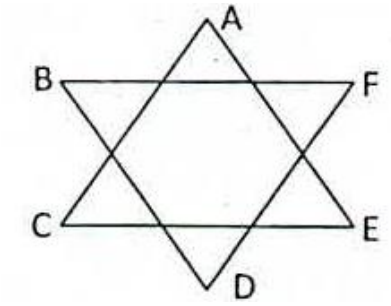
1. 24
2. 20
3. 25
4. 32

145. If the real numbers a, b, c are such that $a^2+4b^2+16c^2=48$ and $ab+4bc+2ca=24$. Then what is the value of $a^2+b^2+c^2$?

1. 12
2. 16
3. 21
4. 31

146. In given figure the measure of $\angle A+\angle B+\angle C+\angle D+\angle E+\angle F$ is

1. $120^o$
2. $720^o$
3. $360^o$
4. $540^o$




147. If $\sin^4 x+\sin^2 x=1$, then value of $\cos^4 x+\cos^2 x$ is

1. $\cos^2 x$
2. $\sin^2 x$
3. $\tan^2 x$
4. 1

148. If 1, 2, 3 are the roots of the equation $x^4+ax^2+bx+c=0$ then the value of c is:

1. 18
2. 36
3. 30
4. 32

149. If $x=\frac{1}{4-\sqrt{15}}$, $y=\frac{1}{4+\sqrt{15}}$, then value of $x^3 + y^3$ is

1. 486
2. 439
3. 488
4. 476

150. If the altitudes of triangle are 10 cm, 12 cm and 15 cm then its semi perimeter is:

1. $\frac{45}{\sqrt{7}}$cm
2. $\frac{7}{\sqrt{2}}$cm
3. $\frac{15}{\sqrt{14}}$cm
4. $\frac{60}{\sqrt{7}}$cm

151. If $12\cot^2\theta - 31\operatorname{cosec}\theta + 32 = 0$, then value of $\sin\theta$ is:

1. $\frac{3}{5}$ or 1
2. $\frac{2}{3}$ or $\frac{-2}{3}$
3. $\frac{4}{5}$ or $\frac{3}{4}$
4. $\pm\frac{1}{2}$

152. Let ABCD be a rectangle and E and F be the points on CD and BC respectively such that area of ($\Delta$ADE) = 16, area ($\Delta$CEF) = 9 and area ($\Delta$ABC) = 25. What is the area of triangle $\Delta$AEF?

1. 28
2. 30
3. 32
4. 36

153. The edge of a cube is doubled then the percentage increase in the volume of cube is

1. 100%
2. 500%
3. 300%
4. 700%

154. The radii of two cylinders are in the ratio 2:3 and their heights are in the ratio 5 : 3. The ratio of their volumes is

1. 10 : 17
2. 20 : 27
3. 10 : 27
4. 20 : 37

155. A cone, a right circular cylinder and a hemisphere standing on equal base and have same height. The ratio of their volumes is

1. 1 : 2 : 3
2. 1 : 3 : 2
3. 2 : 3 : 1
4. 2 : 1 : 3

156. A shopkeeper sold two bicycle for Rs. 15000 each, on first he gains 50% and on the other a loss of 25%. His profit of loss is

1. 0
2. 162
3. 125
4. 632

157. Average of 8 numbers is 20, that of the first two is 15.5 and that of the next three is $21\frac{1}{3}$, the $6^{th}$ is less than the $7^{th}$ by 4 and 7 less than the $8^{th}$. The last number is:

1. 25
2. 28
3. 35
4. 32

158. An equilateral triangle has its side of $3\sqrt{3}$ cm, then radius of its circum-circle is:

1. 3 cm
2. 4 cm
3. $2\sqrt{3}$ cm
4. 2 cm

159. If $\sqrt[3]{\frac{x}{729}} + \sqrt[3]{\frac{8x}{729}} + \sqrt[3]{\frac{27x}{5832}} = 1$ then find the value of x.

1. 1
2. 8
3. 3
4. 4

160. When 10 is subtracted from each of the given observations, the mean is reduced by 60%. If 5 is added to all the given observations, the mean will be:

1. 25
2. 30
3. 30
4. 65

161. Kheda Satyagrah was related to
1. Against the oppressive plantation system
2. Movement of cotton mill workers
3. Relaxation in revenue collection
4. None of the above

162. The first Iron and steel plant was set up in India at
1. Bhilai
2. Kolkata
3. Chennai
4. Jamshedpur

163. Architect of national unification of Prussia was
1. Otto Von Bismark
2. William I
3. Mazzini
4. Emmanuel II

164. What do you mean by “Hind Swaraj”?
1. Political Party of Tilak
2. Book of Mahatma Gandhi
3. Symbol of Indian National congress
4. Political Party of Mahatma Gandhi

165. The first Historical novel written in Bengal was
1. Chemmin
2. Anguriya Binimoy
3. Chomna Dudi
4. Anandmath

166. Gandhi-Irwin Pact was held in
1. $5^{th}$ March 1931
2. $6^{th}$ Dec. 1931
3. $13^{th}$ March 1931
4. $14^{th}$ April 1931

167. Tax lavied by the church comprising $\frac{1}{10}$th of the agriculture produce was
1. Livre
2. Taille
3. Tithe
4. Suffrage

168. The writer of ‘Declaration of the Right of women and citizen is
1. Olympe de Gouges
2. Camille Desmoulins
3. Napoleon Bonaparte
4. Henry Mayhew

169. During the first world war Russia was ruled by
1. Tsar Nicholas I
2. Tsar Nicholas II
3. Tsar Nicholas III
4. Tsar Nicholas IV

170. Which of the following were known as Axis Powers?
1. UK and USA
2. USSR and UK
3. Germany, Italy, Japan
4. Germany, Japan, USA

171. Who decided to partition Bengal in 1905
1. Lord Clive
2. Lord Bantik
3. Lord Curzon
4. Lord Rippen

172. Which crop takes almost a year to grow?
1. Cotton
2. Jute
3. Rice
4. Sugarcane

173. Who proclaimed dams as the temple of Modern India?
1. Jawahar Lal Nehru
2. Mahatma Gandhi
3. Rabindra Nath Tagore
4. Subhash Chandra Bose

174. On which river is Sardar Sarovar Dam built?
1. Tapi
2. Narmada

3. Krishna
4. Kaveri

175. Which soil type is made up of Lava Flows?
1. Red Soil
2. Yellow Soil
3. Black Soil
4. Laterite Soil

176. In which state 'Kalpakkam Nuclear Power Plant is situated?
1. Kerela
2. Karnataka
3. Andhra Pradesh
4. Tamil Nadu

177. Maruti Udyog Limited is an example of which type of industry?
1. Joint sector
2. Public sector
3. Private sector
4. Co-operative sector

178. The coriolis force is caused due to
1. Wind movement
2. Earth rotation
3. Cyclonic depression
4. Jet stream

179. Width of two tracks of Broad gauge is
1. 0.610 mts
2. 0.762 mts
3. 1.000 mts
4. 1.676 mts

180. Which one of the following causes rainfall during winter in N.W. parts of India?
1. Cyclonic depression
2. Retreating monosoons
3. Western disturbances
4. South-West monsoon

181. Roof top rain water harvesting is the most common practice in
1. Shillong
2. Guwahati
3. Imphal
4. Patna

182. S.T.P. is the abbreviation of
1. System Tech Park
2. Software Technology Park
3. State Thermal Plant
4. Software Tech Picket

183. 'FEDECOR' is an organization from:
1. India
2. America
3. Japan
4. Bolivia

184. Why was International Monetary Fund established?
1. To maintain peace and security
2. Lends money to the government of member nation when in need
3. To impalement trade agreements
4. To take decision regarding misery and poverty of western countries

185. A person who is not a member of parliament is appointed as a minister he has to get elected to the houses of parliament within
1. A month
2. Three month
3. Six month
4. Stimulated time fixed by the president

186. Finance Bill is introduced only in
1. Loksabha
2. Rajyasabha
3. District Council
4. Legislative Council

187. By whom the "Right to Constitutional Remedies" was considered as the soul and heart of Indian constitution?
1. Mahatma Gandhi
2. Dr. Rajendra Prasad
3. B. R. Ambedkar
4. Jawahar Lal Nehru

188. The distinguish feature of a federal government is
1. National government gives some power to the provincial government.
2. Power is distributed among the legislature executive and judiciary.
3. Elected officials exercise supreme power in the government.
4. Governmental power is divided between different level of government.

189. Following is a minority community in Belgium
1. Italian - speaking
2. French - Speaking
3. Dutch - speaking
4. English – speaking

190. Who gives recognition to political parties as National parties or regional parties?
1. Parliament
2. President of India
3. Election Commission of India
4. Prime Minister of India

191. The retirement age of the Supreme Court Judge is
1. 60 years
2. 65 years
3. 68 years
4. 70 years

192. How many seats are reserved for women under Panchayati Raj Elections in India?
1. $\frac{2}{3}$ seats
2. $\frac{1}{4}$ seats
3. $\frac{1}{3}$ seats
4. $\frac{1}{2}$ seats

193. What is the procedure that transfers some of the power of the centre or state government to the local government called?
1. Power sharing
2. Decentralization
3. Centralization
4. Democracy

194. Which of the following is considered as a component of social infrastructure?
1. Transport
2. Education
3. Communication
4. Energy

195. The revenue and expenditure policy of government is called
1. Monetary Policy
2. Economic Policy
3. Fiscal Policy
4. Foreign Trade Policy

196. In which five year plan, Mahalanobis Model was adopted in India
1. Fifth
2. First
3. Second
4. Third

197. Which treaty provided for a common currency for member countries of European community?
1. Brussels Treaty
2. Geneva Convention
3. Treaty of Versailles
4. Maastricht Treaty

198. Which bank first introduced credit card in India
1. Central Bank of India
2. State Bank of India
3. ICICI Bank
4. HDFC Bank

199. The Chhota Nagpur Plateau famous for its mineral deposits is in which state?
1. Uttar Pradesh
2. Jharkhand
3. Madhya Pradesh
4. Orissa

200. What is the name given to an economy which has no relation with rest of the world?
1. Capitalist Economy
2. Mixed Economy
3. Socialist Economy
4. Closed Economy

# ANSWER KEYS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | **2** | 2. | **no correct option** | | | 3. | **3** |
| 4. | **4** | 5. | **4** | 6. | **2** | 7. | **2** |
| 8. | **1** | 9. | **2** | 10. | **2** | 11. | **1** |
| 12. | **1** | 13. | **4** | 14. | **3** | 15. | **4** |
| 16. | **3** | 17. | **1** | 18. | **1** | 19. | **3** |
| 20. | **2** | 21. | **2** | 22. | **4** | 23. | **3** |
| 24. | **2** | 25. | **3** | 26. | **1** | 27. | **4** |
| 28. | **4** | 29. | **4** | 30. | **2** | 31. | **2** |
| 32. | **4** | 33. | **2** | 34. | **2** | 35. | **1** |
| 36. | **4** | 37. | **3** | 38. | **2** | 39. | **1** |
| 40. | **1** | 41. | **2** | 42. | **2** | 43. | **1** |
| 44. | **4** | 45. | **3** | 46. | **4** | 47. | **1** |
| 48. | **1** | 49. | **3** | 50. | **2** | | |

# NTSE STAGE – I DELHI STATE
# 02 – B/2017 – 18 (For Class – X)
# LANGUAGE TEST
# ANSWER KEYS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 51. | **1** | 52. | **2** | 53. | **1** | 54. | **2** |
| 55. | **3** | 56. | **4** | 57. | **3** | 58. | **4** |
| 59. | **4** | 60. | **1** | 61. | **2** | 62. | **1** |
| 63. | **4** | 64. | **4** | 65. | **4** | 66. | **3** |
| 67. | **2** | 68. | **1** | 69. | **2** | 70. | **4** |
| 71. | **2** | 72. | **3** | 73. | **4** | 74. | **1** |
| 75. | **2** | 76. | **3** | 77. | **2** | 78. | **3** |
| 79. | **1** | 80. | **1** | 81. | **2** | 82. | **3** |
| 83. | **1** | 84. | **3** | 85. | **2** | 86. | **1** |
| 87. | **2** | 88. | **2** | 89. | **2** | 90. | **2** |
| 91. | **1** | 92. | **1** | 93. | **1** | 94. | **2** |
| 95. | **3** | 96. | **2** | 97. | **3** | 98. | **1** |
| 99. | **4** | 100. | **2** | | | | |

# NTSE STAGE – I (2017 – 18) DELHI – STATE SCHOLASTIC APTITUDE TEST
# ANSWER KEYS

## PHYSICS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 101. | **1** | 102. | **1** | 103. | **3** | 104. | **2** |
| 105. | **3** | 106. | **3** | 107. | **2** | 108. | **2** |
| 109. | **1** | 110. | **2** | 111. | **4** | 112. | **3** |
| 113. | **4** | 114. | **4** | | | | |

## CHEMISTRY

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 115. | **2** | 116. | **1** | 117. | **3** | 118. | **3** |
| 119. | **3** | 120. | **1** | 121. | **1** | 122. | **3** |
| 123. | **2** | 124. | **1** | 125. | **1** | 126. | **1** |
| 127. | **2** | | | | | | |

## BIOLOGY

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 128. | **2** | 129. | **3** | 130. | **4** | 131. | **2** |
| 132. | **1** | 133. | **1** | 134. | **1** | 135. | **2** |
| 136. | **3** | 137. | **4** | 138. | **1** | 139. | **3** |
| 140. | **1** | | | | | | |

## MATHEMATICS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 141. | **4** | 142. | **3** | 143. | **2** | 144. | **3** |
| 145. | **3** | 146. | **3** | 147. | **No option is correct** | | |
| 148. | **No option is correct** | | | 149. | 3 | 150. | **4** |
| 151. | 3 | 152. | **No option is correct** | | | 153. | **4** |
| 154. | 2 | 155. | 2 | 156. | 1 | 157. | **1** |
| 158. | 1 | 159. | 2 | 160. | **No option is correct** | | |

## SST

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 161. | **3** | 162. | **4** | 163. | **1** | 164. | **2** |
| 165. | **2** | 166. | **1** | 167. | **3** | 168. | **1** |
| 169. | **2** | 170. | **3** | 171. | **3** | 172. | **4** |
| 173. | **1** | 174. | **2** | 175. | **3** | 176. | **4** |
| 177. | **1** | 178. | **2** | 179. | **4** | 180. | **3** |
| 181. | **1** | 182. | **2** | 183. | **4** | 184. | **2** |
| 185. | **3** | 186. | **1** | 187. | **3** | 188. | **4** |
| 189. | **2** | 190. | **3** | 191. | **2** | 192. | **3** |
| 193. | **2** | 194. | **2** | 195. | **3** | 196. | **3** |
| 197. | **4** | 198. | **1** | 199. | **2** | 200. | **4** |

# MENTAL ABILITY TEST (MAT)
# HINTS & SOLUTIONS

1. 2

1. $\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+\frac{1}{\sqrt{4}+\sqrt{5}}+\frac{1}{\sqrt{5}+\sqrt{6}}+\frac{1}{\sqrt{6}+\sqrt{7}}+\frac{1}{\sqrt{7}+\sqrt{8}}+\frac{1}{\sqrt{8}+\sqrt{9}}$

$\left[\left(\frac{1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1}\right)+\left(\frac{1}{\sqrt{3}+\sqrt{2}}\times\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}\right)+\left(\frac{1}{\sqrt{4}+\sqrt{3}}\times\frac{\sqrt{4}-\sqrt{3}}{\sqrt{4}-\sqrt{3}}\right)+\ldots+\left(\frac{1}{\sqrt{9}+\sqrt{8}}\times\frac{\sqrt{9}-\sqrt{8}}{\sqrt{9}-\sqrt{8}}\right)\right]$

$\Rightarrow\left[\left(\sqrt{2}-1\right)+\left(\sqrt{3}-\sqrt{2}\right)+\left(\sqrt{4}-\sqrt{3}\right)+\ldots+\left(\sqrt{9}-\sqrt{8}\right)\right]$

$\Rightarrow\left(-1+\sqrt{9}\right)=-1+3=2$

2. **No option correct.**

3. 3

3. $\frac{n(n-3)}{2}=35$

$n^2-3n-70=0$

n = 10

$\frac{(n-2)\times180}{n}=\frac{8\times180}{10}=144^0$

4. 4

4. $15-2\div900+90\times100=?$

$\Rightarrow 15\times2+900\div90-100=15\times2+10-100$

$\Rightarrow 30+10-100=40-100=-60$

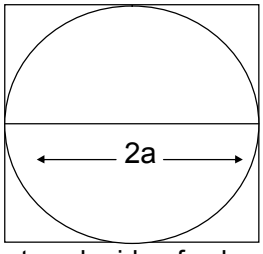
5. 4

5. $(k+1)x^2-5x+2k=0$

Product of roots = $\alpha.\frac{1}{\alpha}=\frac{2k}{k+1}$

$\Rightarrow$ k + 1 = 2k $\Rightarrow$ k = 1

6. 2

6. 


Let each side of cube = 2a

$\therefore$ diameter of sphere = 2a

$$\therefore \frac{\text{Vol. of cube}}{\text{Vol of sphere}} = \frac{(2a)^3}{\frac{4}{3}\pi(a)^3} = \frac{8a^3}{\frac{4}{3}\pi a^3} = \frac{6}{\pi}$$

7. 2

7. $2x^2 - 5x + 16 = 0$

$$\left(\frac{\alpha^2}{\beta}\right)^{\frac{1}{3}} + \left(\frac{\beta^2}{\alpha}\right)^{\frac{1}{3}}$$

$$= \frac{\alpha^{2/3}.\alpha^{1/3} + \beta^{2/3}.\beta^{1/3}}{(\alpha\beta)^{1/3}} = \frac{\alpha+\beta}{(\alpha\beta)^{1/3}} = \frac{5/2}{2} = \frac{5}{4}$$

8. 1

8. Divided = Divisor x Quotient + Rem
Quotien = 10
$\therefore$ divisor = 100
& remainder = 10
$\therefore$ divided = 100 x 10 + 10 = 1010

9. 2

9. $\left[(0.111)^3 + (0.222)^3 - (0.333)^3 + (0.333)^2(0.222)\right]^2$
Taking common (0.111)
$(0.111)^3 + (0.111)^3(2)^3 - (0.111)^3(3)^3 + (0.111)^2(3)^2(0.111)(2)$
$= (0.111)^3(1+8-27+18)$
= 0

10. 2

10. $9^{2n} - 4^{2n}$ is of form $a^n - b^n$ (where n is even)
Therefore $a^n - b^n$ is always divisible by $(a-b)$ & $(a+b)$
So it is divisible by (9 + 4) and (9 – 4) i.e., 5 and 13

11. 1

11. LCM + HCF = 50
LCM – HCF = 20
$\therefore$ LCM = 35 & HCF = 15
$\therefore$ product of number = LCM x HCF
= 35 x 15
= 525

12. 1

12. Speed of train = $\frac{\text{length of train} + \text{length of platform}}{\text{time taken by train}}$

$\Rightarrow 120 \times \frac{5}{18} = \frac{320+x}{24}$ (Let length of platform be x m)

$\therefore$ x = 480 m

$\therefore$ Speed of man = $\frac{\text{length of platform}}{\text{time taken by man}}$

$= \frac{480}{4 \times 60} = 2\text{m/sec}$

13. 4

13. $\frac{a^{n+1}+b^{n+1}}{a^n+b^n} = \frac{a+b}{2}$ when (n = 0)

$\Rightarrow$ value of n = 0

14. 3

14. Let total workers = x

$\therefore$ women = $\frac{1}{3}x$

$\therefore$ men = $\frac{2}{3}x$

Women with children = $\frac{1}{3}\times\frac{1}{2}\times\frac{1}{3}x = \frac{x}{18}$

Men with children = $\frac{3}{4}\times\frac{2}{3}\times\frac{2x}{3} = \frac{x}{3}$

Worker with children = $\frac{x}{18}+\frac{x}{3} = \frac{7x}{18}$

Worker without children = $x - \frac{7x}{18} = \frac{11}{18}$ of x

15. 4

15. Let Akash earns x rs. As profit

Then Alok earns = $x + \frac{75x}{100} = \frac{175x}{100} = \frac{7x}{4}$

$\therefore$ Akash's profit is less than Alok by

$= \frac{\frac{7x}{4}-x}{\frac{7x}{4}}\times 100$

$= \frac{\frac{3x}{4}}{\frac{7x}{4}}\times 100$

$= \frac{3}{7}\times 100 = 42.85\%$

16. 3

16. Let height of towers, be 5x, 6x, 7x meter respectively

$\therefore$ Speed of spider = $\frac{5x}{15}$ m / min

$\therefore$ Time taken to climb the highest one = $\frac{7x}{\frac{5x}{15}}$

$= \frac{7x\times 15}{5x}$

= 21 min

17. 1

17. Centroid = $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$

$(0, 1) = \left(\frac{4+2+x_3}{3}, \frac{-2-6+y_3}{3}\right)$

$\therefore \ (x_3, y_3) = (-6, 11)$

18. 1

18. $\cos^2\alpha = \sin\alpha.\tan\alpha$

$\cos^3\alpha = \sin^2\alpha$

$\frac{\cos^2\alpha}{\sin^2\alpha} = \frac{1}{\cos\alpha} \Rightarrow \cot^2\alpha = \frac{1}{\cos\alpha}$

$\cot^6\alpha - \cot^2\alpha = \cot^2\alpha\left(\cot^4\alpha - 1\right)$

$= \frac{1}{\cos\alpha}\left(\frac{1}{\cos^2\alpha} - 1\right)$

$= \frac{1}{\cos\alpha}\left(\frac{\sin^2\alpha}{\cos^2\alpha}\right) = \frac{\sin^2\alpha}{\cos^3\alpha} = 1$

19. 3

19. 7 + 6 + 5 + 4 + 3 + 2 + 1 = 28

20. 2

20. We can choose vertices out of 6 in ${}^6C_3 = 20$ ways

Chosen vertices can form equilateral triangle in just 2 ways

Required probability = $\frac{2}{20} = \frac{1}{10}$

21. 2

21. A = 630 males teacher in F = 100

B = 720 female teacher in C = 28% of 4500 – (600)

C = 1260 = 660

D = 675

E = 945 female in B = 16% of 1500 – 400

F = 270 = 320

$\Rightarrow$ 100 + 660 + 320 = 1080

22. 4

22. $\frac{x}{100} \times 630 = 575 \Rightarrow x = 90\%$

23. 3

23. In B we have 630 total teachers

Male = 400

Female = 230

In E we have 945 total teachers

Male = 500

Female = 445

24. 2

24. Total number of teachers in E = 945

Female teachers in F = 170
Difference = 945 – 170 = 775

25. 3
25. Male in C $\rightarrow$ 600
Female in B $\rightarrow$ 320
$C_M : B_F = 600 : 320 = 15 : 8$

26. 1
26. 25 x 10 + 5 = 255, 255 x10 – 5 = 2545, 2545 x 10 + 5, 25455 x 10 – 5 = 254545

27. 4
27. 4 x 3 = 12 $\rightarrow$ Alphabet position of L
1 x 17 = 17 $\rightarrow$ Alphabet position of Q
5 x 4 = 20 $\rightarrow$ Alphabet position of T

28. 4
28. After removing even numbers
1 5 9 7 1 5 3 5 9 7 5 9 1 3 5 1 3
Answer $\rightarrow$ 9

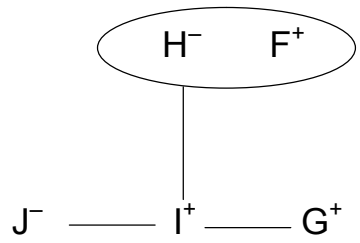
29. 4
29. Total hours = 89 hours
Faulty time 23 hours & 44 min = $23 + \frac{44}{60}$ i.e, $\frac{356}{15}$ hr
$\frac{356}{15}$ hr of incorrect watch = 24 hr of correct watch
$\therefore$ 89 hours of incorrect watch = $\frac{24 \times 15}{356} \times 89 = 90$ hrs
$\therefore$ Actually watch will be 1 hr faster than faulty watch.
i.e., 11 pm

30. 2
30. 1 + 2 + 3 …. 5 6
Sum = $\frac{n(n+1)}{2} = \frac{56 \times 57}{2} = 28 \times 57 = 1596$

31. 2

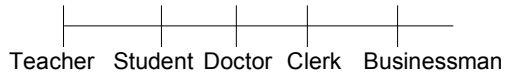
31. Total white box = $\frac{64}{2} = 32$
Now odd in white box = $\frac{32}{2} = 16$

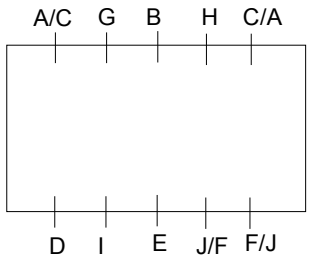
32. 4
32.

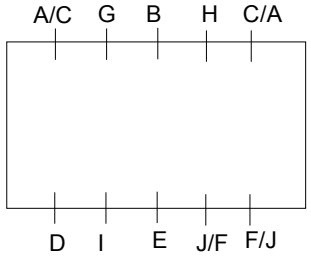


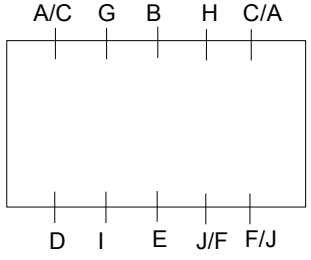

+ means male member
– means female members

⬭ means couple
—— means brother / daughter
| means son / daughter

33. 2
33. 


34. 2
34. 


35. 1
35. 

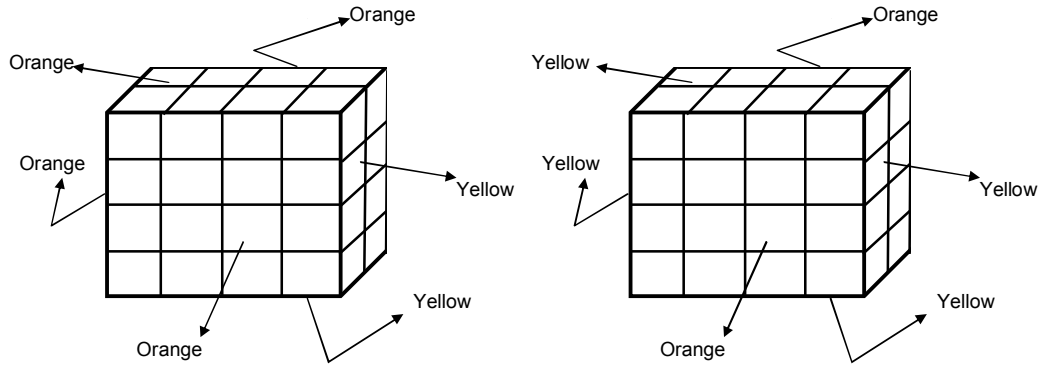

36. 4
36. 


37. 3
37. 1 mango = 4 banana
= 2 apples
= 10 strawberries

38. 2
38. $52 < 4 \wedge 5 > 8 \vee 2$
$52 - 4 \times 5 + 8 \div 2$
$52 - 4 \times 5 + 4$
$56 - 20 = 36$

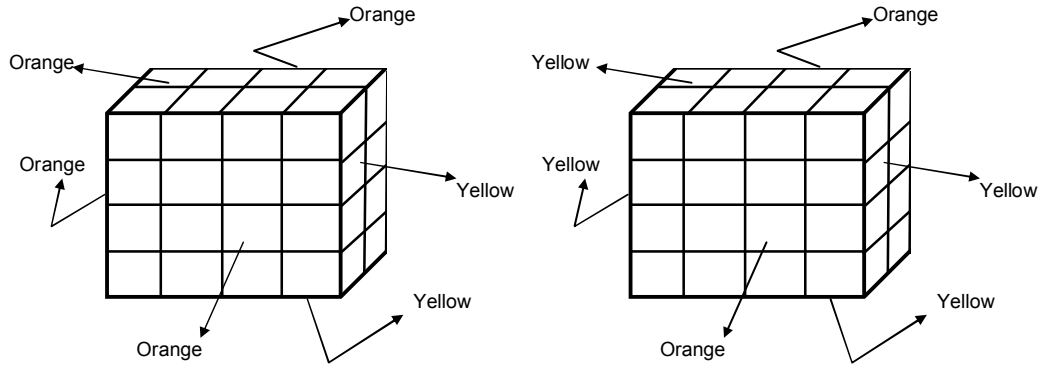
39. 1
39. 4:35
To find mirror image
11:60 – 4:35 = 7:25

40. 1

40. 

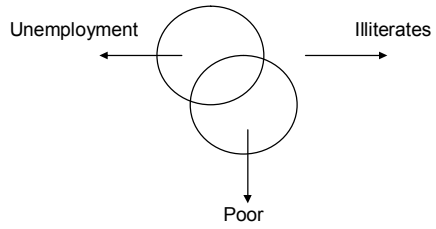

All the smaller cubes have colour on their faces,

41. 2

41. 


The larger faces will have one face coloured cube which is four on each face.
So, in total there are four larger faces.
4 x 4 = 16
16 cubes will have only one face colour.

42. 2

42. 


43. 1

43. By observation

44. 4

44. From one row to another the contents of each cell moves one place towards right.

45. 3

45. By observation

46. 4

46. By observation.

47. 1

47. Blue $\rightarrow$ 2
Sky $\rightarrow$ 1
Was $\rightarrow$ 3
People $\rightarrow$ 8
Like $\rightarrow$ 0
In $\rightarrow$ 6
Birds $\rightarrow$ 9
'People like birds' $\rightarrow$ 809

48. 1

48. 5 x 2 + 2 = 12
12 x 2 + 2 = 26
26 x 2+ 2 = 54

49. 3

49. 9 x (2 + 1) = 27
7 x (3 + 2) = 35
4 x (4 + ?) = 36
? = 9 – 4 = 5

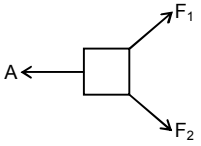
50. 2

50. $\sqrt{64} + \sqrt{36} + \sqrt{49} = 8 + 6 + 7 = 21$
$\sqrt{121} + \sqrt{81} + \sqrt{100} = 11 + 9 + 10 = 30$

# HINTS & SOLUTIONS

PHYSICS

101. 1

101. 


Minimum number of forces required is 3.

102. 1

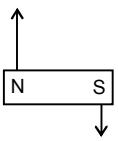
102. Resistance of the heater be R.
New resistance of heater is R/2.

Initial power = $\frac{V^2}{R}$

Final power = $\frac{V^2}{R/2} = 2\frac{V^2}{R}$

$\therefore$ Heat generated is doubled.

103. 3

103. 


Force acting at different part of the magnet is different. So both torque and force will be acting.

104. 2

104. $P = 2 \times 10^3$ watt
Energy in 1 min = $2 \times 10^3 \times 60$ J.
$\Rightarrow$ $2 \times 10^3 \times 60 = m \times 10x\ 10$
$\Rightarrow$ m = 1200 kg ; Volume = 1200 litre.

105. 3

105. Initial velocity = V
Final velocity = V′

$\frac{1}{2}mv^2 \times 4 = \frac{1}{2}m(v')^2$

V′ = 2V.
Initial momentum = mv
Final momentum = 2mv.
$\therefore$ Momentum is doubled.

106. 3

106. Total work done by gravity is zero.

107. 2

107. $\Rightarrow \quad \frac{GM_m \times 80}{(2R_m)^2} = 9.8$

$\Rightarrow \quad \frac{GMm}{Rm^2} = \frac{9.8}{40} = 0.49\ m/s^2$

108. 2

108. $P = P_1 + P_2$

$\Rightarrow \quad P = \frac{1}{f_1} + \frac{1}{f_2}$

$\Rightarrow \quad P = \frac{f_1 + f_2}{f_1 f_2}$

109. 1

109. $\frac{\text{Sin i}}{\text{Sin r}} = \frac{V_1}{V_2}$

$\Rightarrow \quad \frac{\text{Sin } 30}{\text{Sin } 60} = \frac{V}{V'}$

$\Rightarrow \quad V' = \sqrt{3}\, V$

110. 2

110. $\frac{1}{2}g(t)^2 - \frac{1}{2}g(t-2)^2 = 40$

$\Rightarrow \quad 5t^2 - 5(t-2)^2 = 40$

$\Rightarrow \quad t^2 - (t-2)^2 = 8$

$\Rightarrow \quad t = 3$

$\therefore \quad$ height $= \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times 9 = 45$ m.

111. 4

111. $R = \frac{\rho \ell}{A}$

New area = nA

$\therefore$ New length $= \frac{\ell}{n}$

$\Rightarrow \quad R' = \frac{\rho \ell}{n^2 A} = \frac{R}{n^2}$

112. 3

112. Ammeter has low resistance and due to its resistance current in the circuit decreases.

113. 4

113. As the rays are diverging so the optical device is convex mirror.

114. 4

114. Work is zero only when force and displacement are perpendicular to each other. So, work will be down in all the cases.

## CHEMISTRY

115. 2

115. Silver is a good conductor of electricity.

116. 1

116. Cr = [Ar] $4s^1\ 3d^5$

Half filled configuration of d – subshell is more symmetrical.

117. 3

117. Amphoteric.

$Al_2O_3$ can react with acid and base both.

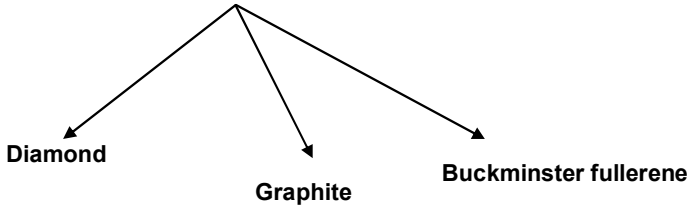
118. 3
118. As Solution is acidic so pH < 7

119. 3
119. In basic solution phenolphthalein shows pink colour.

120. 1
120. 4s, 4p, 4d, 4f
4s = one orbital, 4d = five orbital Total = 7 + 5 + 3 + 1
4p = Three orbital 4f = seven orbital = 16
So, Total no. of electron = 32

121. 1
121. Addition of NaCl results precipitation of soap to separate out soap from the solution. (as in question paper sodium is given which is considered wrong. It should be NaCl)

122. 3
122. There are 3 allotropes of carbon.




123. 2
123. Due to $Ca(NO_3)_2$ & $CaSO_4$.
As oxides of nitrogen & sulphur reacts with limestone on Taj Mahal to form nitrates and sulphates of calcium.

124. 1
124. $CO_2$, $CH_4$, $N_2O$, and $O_3$
Act as green house gases.

125. 1
125. s, p, d, f subshells are present in an atom.

126. 1
126. Boron and cadmium used in atomic reactors to control speed of neutron.

127. 2
127. $\text{Moles} = \frac{1000}{108} = 9.25$
No. of atoms = $9.25 \times 6.023 \times 10^{23}$
$= 5.571 \times 10^{24}$ atoms

## BIOLOGY

128. 2
128. Chromosomes carry genes, which are the hereditary units, which carry hereditary characters to the offspring.

129. 3
129. Mitochondria is called the power house of the cell.

130. 4
130. Plasma membrane is made up of both protein and lipid.

131. 2
131. Oviduct is the site of fertilization in humans.

132. 1
132. Heart never takes rest as it has cardiac muscles which never gets fatigue.

133. 1
133. Lacteal present in the villi of the small intestine help to absorb fatty acids and glycerol.

134. 1
134. The experiment 'origin of primitive life on Earth' was performed by Urey and Miller.

135. 2
135. Bicuspid valve is present in the human heart in between left atrium and left ventricle.

136. 3
136. During the light reaction NADPH and ATP are synthesized which is utilized in dark reaction.

137. 4
137. Grafting in monocot plants is not possible because they have scattered Vascular Bundles.

138. 1
138. Haemophilia disease is linked with sex chromosome.

139. 3
139. The primary building blocks of DNA Nitrogenous base, phosphorus and deoxyribose.

140. 1
140. Islets of Langerhans helps in formation of insulin

## MATHEMATICS

141. 4
141. $x^4+4x^3+nx^2+4x+1=\left(ax^2+bx+c\right)^2$

$x^4+4x^3+nx^2+4x+1=a^2x^4+b^2x^2+c^2$
$+2abx^3+2bcx+2acx^2$
$=a^2x^4+2abx^3+\left(b^2+2ac\right)x^2+2bcx+c^2$

Comparing coefficients,

$a^2=1$

$c^2=1$

$2ab=4$

$b^2 + 2ac = n$

$2bc = 4$

Solving, we get $\frac{a}{c} = 1 \Rightarrow a = c$

$b = \pm 2,\ a = \pm 1,\ c = \pm 1$

$\therefore b^2 + 2ac = 4 + 2 = 6$

142. 3

142. Let initial salary be Rs. 100

After 10% reduction, salary = Rs. 90

$\therefore$ Required percent of increase $= \frac{10}{90} \times 100$

$= 11\frac{1}{9}\%$

143. 2

143. Let $\sqrt{x} = a,\ \sqrt{y} = b$

Given equation $a^3 + b^3 = 183$ and $a^2b + ab^2 = 182$

$\Rightarrow (a+b)^3 - 3ab(a+b) = 183$ and $ab(a+b) = 182$

$\Rightarrow (a+b)^3 = 183 + 3 \times 182$

$\Rightarrow a + b = 9$ and $ab = \frac{182}{9}$

Now $\sqrt{x} + \sqrt{y} = 9$ and $\sqrt{xy} = \frac{182}{9}$

So, $x + y = 81 - 2\sqrt{xy} = \frac{365}{9}$

$\Rightarrow \frac{18}{5}(x+y) = 146$

144. 3

144. Minimum value of m + n =

Minimum value of m + minimum value of n

= 9 + 16 = 25

145. 3

145. Let $x = a,\ y = 2b,\ z = 4c$

then $(a)^2 + (2b)^2 + (4c)^2 = 48 \quad \Rightarrow x^2 + y^2 + z^2 = 48$

and $2ab + 8bc + 4ca = 48 \quad \Rightarrow xy + yz + zx = 48$

Now, $(x-y)^2 + (y-z)^2 + (z-x)^2 = 0$

$x = y = z$

$a = 2b = 4c$

$\frac{a}{4} = \frac{b}{2} = \frac{c}{1} = \lambda$

So, $ab + 4bc + 2ca = 4\lambda.2\lambda + 8\lambda.\lambda + 2\lambda.4\lambda = 24$

$\lambda^2(8+8+8) = 24$

$\lambda = \pm 1$

$\Rightarrow a^2 + b^2 + c^2 = 21\lambda^2 = 21$

146. 3

146. By angle sum property of $\Delta ACE$ and $\Delta DBF$

**147. No option is correct**

147. $\sin^4 x = \cos^2 x$

$\Rightarrow \left(1-\cos^2 x\right)^2 = \cos^2 x$

$\Rightarrow \cos^4 x - 3\cos^2 x + 1 = 0$

$\Rightarrow \cos^2 x = \dfrac{3-\sqrt{5}}{2}$

Now, $\cos^4 x + \cos^2 x = \left(\dfrac{3-\sqrt{5}}{2}\right)^2 + \left(\dfrac{3-\sqrt{5}}{2}\right)$

$= 5 - 2\sqrt{5}$

**148. No option is correct**

148. The roots are 1, 2, 3 and k

$1+2+3+k=0$

$k=-6$

$c = 1\times 2\times 3\times -6$

$c = -36$

149. 3

149. $x = 4+\sqrt{15}$

$y = 4-\sqrt{15}$

$x+y=8$

$xy=1$

$x^3+y^3 = (x+y)\left((x+y)^2-3xy\right)$

$= 8(64-3)$

$= 8(61)$

= 488

150. 4

150. AD = 10 cm, BE = 12 cm, CF = 15 cm

Let BC = a cm

AC = b cm

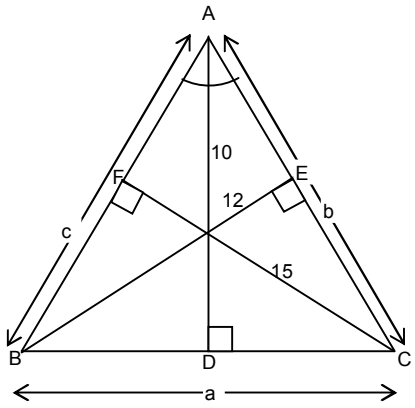
AB = c cm

Area of $\Delta = \dfrac{1}{2}\times 10a = \dfrac{1}{2}\times 12b = \dfrac{1}{2}\times 15c$

$\Rightarrow a:b:c = 6:5:4$

let sides are 6x, 5x and 4x

$\Rightarrow \dfrac{1}{2}\times 10\times 6x = \sqrt{\dfrac{15x}{2}\left(\dfrac{15x}{2}-6x\right)\left(\dfrac{15x}{2}-5x\right)\left(\dfrac{15x}{2}-4x\right)}$



$\Rightarrow x = \frac{8}{\sqrt{7}}$

So, semi perimeter $= \frac{60}{\sqrt{7}}$ cm

151. 3

151. $12\cot^2\theta - 31\operatorname{cosec}\theta + 32 = 0$

$12\left(\operatorname{cosec}^2\theta - 1\right) - 31\operatorname{cosec}\theta + 32 = 0$

$12\operatorname{cosec}^2\theta - 31\operatorname{cosec}\theta + 20 = 0$

$12\operatorname{cosec}^2\theta - 16\operatorname{cosec}\theta - 15\operatorname{cosec}\theta + 20 = 0$

$4\operatorname{cosec}\theta\left(3\operatorname{cosec}\theta - 4\right) - 5\left(3\operatorname{cosec}\theta - 4\right) = 0$

$\operatorname{cosec}\theta = \frac{5}{4}$ or $\frac{4}{3}$ $\Rightarrow \sin\theta = \frac{4}{5}$ or $\frac{3}{4}$

152. **No option is correct**

152. $\frac{1}{2}ac = 16$

$ac = 32$

$ed = 18$

$ab = 50$

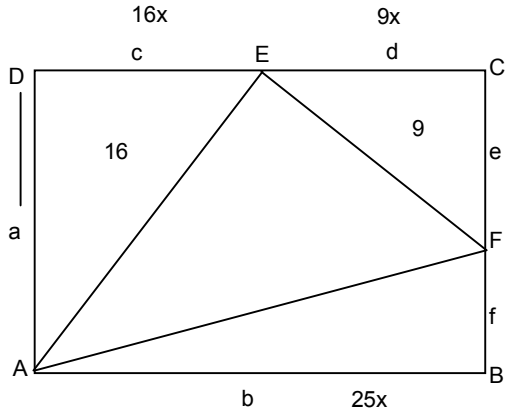
$\frac{c}{b} = \frac{32}{50} = \frac{16}{25}$

$e.\frac{9}{25}b = 18$

$eb = \frac{18 \times 25}{9} = 50$

$e = a\ f = 0$

$\therefore \Delta AEF = 25$




153. 4

153. When side changes from S to 2S volume changes from 2S to $8S^3$

$S \to S^3$

$2S \to 8S^3$

$\therefore$ Increase percent $= \frac{75^3}{5^3} \times 100$

= 700%

154. 2

154. $\frac{V_1}{V_2} = \frac{\pi(2x)^2.5y}{\pi(3x)^2.3y}$

$= \frac{20}{27}$

155. 2

155. Ratio of volumes

$$\frac{1}{3}\pi r^2 : r : \pi r^2 r : \frac{2}{3}\pi r^3$$

$$= \frac{1}{3} : 1 : \frac{2}{3}$$

$$= 1:3:2$$

156. 1

156. CP of 1 = Rs. 10000

CP of 2 = Rs. 20000

$\therefore$ No profit, No loss

157. 1

157. $a_1 + a_2 + ..... + a_7 + a_8 = 160$

$a_1 + a_2 = 31$

$a_3 + a_4 + a_5 = 64$

$a_7 - a_6 = 4$

$a_8 - a_6 = 7$

Solving we get

$a_6 = 18$

$a_7 = 22$

$a_8 = 25$

158. 1

158. $R = \frac{2}{3} \times$ altitude

$$= \frac{2}{3} \times \frac{\sqrt{3}}{2} \times 3\sqrt{3}$$

= 3 cm

159. 2

159. $\frac{1}{9}\sqrt[3]{x} + \frac{2}{9}\sqrt[3]{x} + \frac{1}{6}\sqrt[3]{x} = 1$

$$\sqrt[3]{x}\left(\frac{1}{3} + \frac{1}{6}\right) = 1$$

$$\sqrt[3]{x}\left(\frac{2+1}{6}\right) = 1$$

$$\sqrt[3]{x} = 2$$

$$x = 8$$

160. **No option is correct**

160. $\bar{x} - 10 = \frac{40}{100} \times \bar{x}$

$\Rightarrow \bar{x} = \frac{50}{3}$

If each observation is increased by 5 then new mean $= \frac{65}{3}$