NTSE STAGE – I (DELHI STATE)
05 – A (2018 – 19)
(For Class – X)
MENTAL ABILITY TEST (MAT)
HINTS & SOLUTIONS

1. 4

1. $x+\frac{25}{x}=10 \Rightarrow x^2-10x+25=0 \Rightarrow (x-5)^2=0 \Rightarrow x=5$

$x^2+\frac{50}{x^2}=25+\frac{50}{25}=25+2=27$

2. 1

2. $x + y = 3,\ x^2 + y^2 = 15$

$(x – y)^2 = ?,\quad (x^2 + y^2 + 2xy) = 9 \quad \Rightarrow \quad 15 + 2xy = 9$

$\Rightarrow \quad xy = –3$

$(x – y)^2 = x^2 + y^2 – 2xy = 15 + 6 = 21$

3. 2

3. $\frac{a}{3}=\frac{b}{5}=\frac{c}{7}=K \Rightarrow a=3K, b=5K, c=7K$

$\therefore \quad \frac{a+b+c}{b}=\frac{3K+5K+7K}{5K}=3$

4. 3

4. $x + y = 25,\quad x^2 + y^2 = 425$

$\Rightarrow \quad x^2 + y^2 + 2xy = 625$

$\Rightarrow \quad 425 + 2xy = 625 \Rightarrow xy = 100$

5. 1

5. $0.64 \div a^2 = 64$

$\Rightarrow \frac{0.64}{a^2}=64 \Rightarrow a^2=\frac{1}{100} \Rightarrow a=\frac{1}{10}=0.1$

6. 2

6. Dividend = divisor × quotient + remainder

Divisor = 30 × q

Divisor = 4 × r

$\because$ q = 20 $\Rightarrow$ Divisor $\Rightarrow$ 600 & remainder $=\frac{600}{4}=150$

$\therefore \text{Dividend} = 600 \times 20 + 150 = 12{,}150$

7. 4

7. $3^{a-2b} = 27 \Rightarrow 3^{a-2b} = 3^3 \Rightarrow a – 2b = 3$ …(1)

$9^{a+b} = 3 \Rightarrow 3^{2a+2b} = 3^1 \Rightarrow 2a + 2b = 1$ …(2)

by equation (1) and (2)

$3a = 4 \Rightarrow a = 4/3, b = -5/6$

$\therefore \quad -a/b = -\left(\frac{4/3}{-5/6}\right) = 8/5$

8. 4

8. $\sqrt{17+x\sqrt{11}}=\sqrt{11+6+2.\sqrt{11}.\sqrt{6}}$

$\Rightarrow x=2\sqrt{6}$

$\therefore x^2=24$

9. 1

9. $\sqrt{0.02\times0.2\times a}=0.2\times0.2\times\sqrt{b}$

$\Rightarrow 0.02\times0.2\times a=0.2\times0.2\times0.2\times0.2\times b$

$\Rightarrow \frac{a}{b}=\frac{0.2\times0.2\times0.2}{0.02}=0.4$

10. 1

10. $\alpha=7-\sqrt{3},\quad \beta=7+\sqrt{3}$

$\alpha+\beta=14,\quad \alpha\beta=46$

$\therefore \quad x^2-14x+46=0$

11. 2

11. Q = 3R = 2(P + R)

Q = 2P + 2R

3R = 2P + 2R

R = 2P

$\therefore$ Q = 2P + 4P = 6P

$\therefore$ P + 6P + 2P = 180° $\Rightarrow$ 9P = 180° $\Rightarrow$ P = 20°

$\therefore$ Q = 6 × 20 = 120°

12. 2

12. $\frac{p}{q}=\frac{x+3}{x-3}, p=(x+3)K, q=(x-3)K$

$$\frac{p^2-q^2}{p^2+q^2}=\frac{\left[(x+3)K\right]^2-\left[(x-3)K\right]^2}{\left[(x+3)K\right]^2+\left[(x-3)K\right]^2}$$

$$=\frac{(x+3)^2-(x-3)^2}{(x+3)^2+(x-3)^2}$$

$$=\frac{(x+3+x-3)(x+3-x+3)}{2(x^2+9)}$$

$$=\frac{2x\times6}{2(x^2+9)}$$

$$=\frac{6x}{x^2+9}$$

13. 1

13. Perimeter of square = 4a = 2(l + b)

l = 24 = 2b $\Rightarrow$ b = 12

$\therefore$ 4a = 72 $\Rightarrow$ a = 18

$\therefore$ Area of square = 18^2 = 324

14. 1

14. $\frac{V_1}{V_2}=\frac{\frac{1}{3}\pi r_1^2h_1}{\frac{1}{3}\pi r_2^2h_2}=\frac{2}{3}=\frac{1}{4}\times\frac{h_1}{h_2}\Rightarrow\frac{h_1}{h_2}=\frac{8}{3}$

15. 3

15. $2^x = 8^{y-1} \Rightarrow x = 3y - 3$ …(1)
$9^y = 3^{x-6} \Rightarrow 2y = x - 6$ …(2)
by (1) & (2)
x = 24, y = 9
$\therefore$ x + y = 33

16. 1

16. x – y : (x + y) : xy = 1 : 7 : 24

$$\frac{x-y}{x+y} = \frac{1}{7} \Rightarrow 7x - 7y = x + y$$

$$= 6x = 8y$$

$$= x = \frac{4}{3}y$$

$$\frac{x-y}{xy} = \frac{\frac{4}{3}y - y}{\frac{4}{3}y \cdot y} = \frac{1y}{4y^2} = \frac{1}{4y} = \frac{1}{24} \Rightarrow y = 6$$

$$\therefore \quad x = \frac{4}{3} \times 6 = 8$$

$\therefore$ xy = 48

17. 1

17. 6, 7, 7, 7, 9, 9, 14, 15
mode = 7
range = 15 – 6 = 9
median = 8

$$\therefore \text{mean} = \frac{7+9+8}{3} = 8$$

18. 4

18. Let initial income be x
$\therefore$ initial expenditure = 0.8 x
New expenditure = 1.375 (0.8 x)
= 1.1 x

$$\text{New income} = \frac{7x}{6}$$

$$\therefore \text{ Saving} = \frac{7x}{6} - \frac{11x}{10}$$

$$= \frac{2x}{30} = \frac{x}{15}$$

$$\therefore \text{present percent saving} = \frac{\frac{x}{15}}{\frac{7x}{6}} \times 100 = 5\frac{5}{7}\%$$

19. 3

19. Let the cost of 1 chair be ‘c’ and the cost of 1 table be ‘t’
5c + 3t = 3110
c = t – 210
So, we get,
5t – 1050 + 3t = 3110 $\Rightarrow$ 8t = 4160 $\Rightarrow$ t = 520
$\Rightarrow$ c = 310

$\therefore$ Rs.1660

20. 2

20. $5 = a + \dfrac{1}{1 + \dfrac{1}{6 + \dfrac{1}{2}}}$

$\Rightarrow 5 = a + \dfrac{1}{1 + \dfrac{2}{13}}$

$\Rightarrow 5 = a + \dfrac{13}{15}$

$\Rightarrow a = 5 - \dfrac{13}{15}$

$\Rightarrow a = \dfrac{62}{15}$

21. 4

21. Let number be x

$\dfrac{7}{8}x = \dfrac{5}{7}x + 5$

$\dfrac{7x}{8} - \dfrac{5x}{7} = 5$

$\dfrac{49x - 40x}{56} = 5 \Rightarrow x = \dfrac{5 \times 56}{9}$

$\Rightarrow 9x = 9 \times 5 \times \dfrac{56}{9} = 5 \times 56 = 280$

22. 3

22. $\dfrac{1}{3}\pi(6)^2 \times 24 = \dfrac{4}{3} \times \pi \times R^3$

$\Rightarrow R = 6$

$\therefore$ TSA = $4\pi R^2 = 4 \times \pi \times 36 = 144\ \pi$ sq cm

23. 4

23. $2\left(\dfrac{1}{P} + \dfrac{1}{Q} + \dfrac{1}{R}\right) = \dfrac{1}{10} + \dfrac{1}{15} + \dfrac{1}{20}$

$\dfrac{1}{P} + \dfrac{1}{Q} + \dfrac{1}{R} = \dfrac{6 + 4 + 3}{60 \times 2} = \dfrac{13}{60 \times 2}$

$\dfrac{1}{P} + \dfrac{1}{Q} + \dfrac{1}{R} - \left(\dfrac{1}{P} + \dfrac{1}{Q}\right) = \dfrac{13}{120} - \dfrac{1}{10}$

$\Rightarrow \dfrac{1}{R} = \dfrac{13 - 12}{120} = \dfrac{1}{120}$

R will complete in 120 days

24. 3

24. $3^{1/2}, 2^{1/3}, 2^{1/2}, 4^{1/3}$

$3^{3/6}, 2^{2/6}, 2^{3/6}, 4^{2/6}$

$\Rightarrow \quad (3^3)^{1/6}, (2^2)^{1/6}, (2^3)^{1/6}, (4^2)^{1/6}$

$\Rightarrow \quad (27)^{1/6}, (4)^{1/6}, (8)^{1/6}, (16)^{1/6}$

25. 4
25. Putting symbols in option (4)
$8 \times 8 + 8 \div 8 - 8 = 64 + 1 - 8 = 57$

26. 4
26. Out of 60 litres 12 litres is taken out
i.e. $\frac{12}{60} \times 100 = 20\%$
milk remained after two replacement
$= 60 \times \frac{80}{100} \times \frac{80}{100} = 38.4$ litres

27. 4
27. Except option (4) all follows.
x : 3x + 1

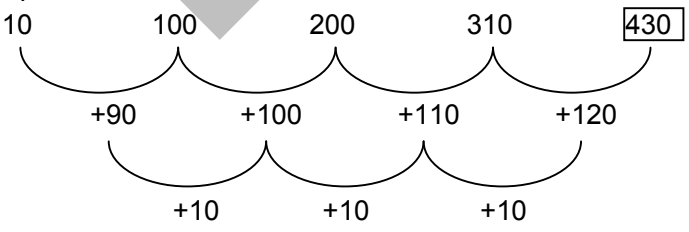
28. 3
28. Between A and B $\rightarrow$ 30 – 20 – 1 = 09
total = 20 + 9 + 16 = 45

29. 1
29. $n = \frac{15}{3} = 5$
one face painted $= (n-2)^2 \times 6$
$= 3^2 \times 6 = 54$

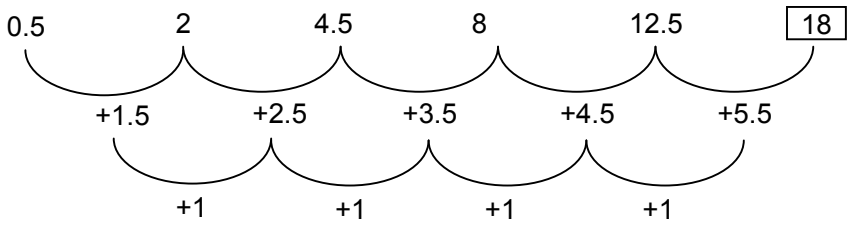
30. 2
30. Let son's present age $\rightarrow$ s
S = 48 – 3S
$\Rightarrow$ S = 12
Son is 12 years now, so 4 years ago he would be 8.

31. 2
31. Series follows
$1\times 2, \quad 3\times 4, \quad 5\times 6, \quad \underbrace{7\times 8}_{56}, \quad 9\times 10, \quad 11\times 12$

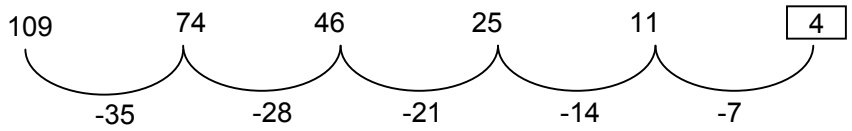
32. 4
32.



33. 4

33. 

34. 4

34. 

35. 4

35. In numerator +2, +3, +4, +5
In denominator +4, +6, +8, +10
$\Rightarrow \frac{2}{4}, \frac{4}{7}, \boxed{\frac{7}{3}}, \frac{11}{21}, \frac{16}{31}$

36. 3

36. Initially 12 dozen in basket = 12 × 12 = 144 apples
2 dozen added later = 144 + (12 × 2) = 168
10 apples got spoiled = 168 – 10 = 158
In each basket $= \frac{158}{2} = 79$

37. 2

37. To coincide between 8 and 9 O'clock
Minute hand require gain of 40 min
55 min gain occur in 60 min
1 min gain occur in $\frac{60}{55}$ min
40 min gain occur in $\frac{60}{55} \times 40 = \frac{480}{11} = 43\frac{7}{11}$ min
hands will coincide at $43\frac{7}{11}$ min past 8.

38. 4

38. From option (4)
Putting A = 9, B = 13, C = 11
9 + 9 + 12 = 30
13 + 10 + 7 = 30
8 + 11 + 11 = 30

39. 3

39. $\frac{7^{n+3} + 7 \times 2 \times 7^{n+4}}{7^{n+3}}$
$= \frac{7^{n+3}\left(1 + 7^2 \times 2\right)}{7^{n+3}} = 99$

40. 1

40. $\tan x = 5 - \sqrt{3}$;

$$22\tan(90-x)=22\cot x=\frac{22}{5-\sqrt{3}}\times\frac{5+\sqrt{3}}{5-\sqrt{3}}=5+\sqrt{3}$$

41. 4

41. $a=\frac{1}{2-\sqrt{3}}, \quad b=\frac{1}{2+\sqrt{3}} \quad \Rightarrow \quad ab=1\Rightarrow b=\frac{1}{a}$

$7a^2+11ab-7b^2$

$7a^2-7b^2+11\times1$

$=7\left(a^2-\frac{1}{a^2}\right)+11$

$=7\left(a+\frac{1}{a}\right)\left(a-\frac{1}{a}\right)+11$

$=7\times4\times\left(+2\sqrt{3}\right)+11$

$=56\sqrt{3}+11$

42. 1

42. Tank filled in one minute

$\frac{1}{A}+\frac{1}{B}-\frac{1}{C}$

$\frac{1}{12}+\frac{1}{15}-\frac{1}{10}$

$\frac{5+4-6}{60}=\frac{3}{60}=\frac{1}{20}$

Tank will be filled in 20 minutes

43. 1

43. $A=P+\frac{3\times T\times P}{100}=800 \quad \ldots(1)$

$P+\frac{5\times T\times P}{100}=1000 \quad \ldots(2)$

by (1) & (2) $\frac{2PT}{100}=200$

PT = 10,000

P = 500,

$\therefore$ T = 20

44. 1

44. $x^2 - 2x - 1 = 0$

$a + b = 2$

$ab = -1$

$\therefore a^2b + ab^2 = ab(a + b) = -1(2) = -2$

45. 3

45. $1{,}00{,}000\times\frac{60}{100}\times\frac{20}{100}=12{,}000$

46. 1

46. $1{,}00{,}000\times\frac{5}{100}\times\frac{60}{100}=3{,}000$

47. 3

47. $1,00,000 \times \frac{15}{100} \times \frac{60}{100} = 9,000$

48. 2

48. $\frac{1,00,000 \times \frac{20}{100} \times \frac{60}{100}}{1,00,000 \times \frac{5}{100} \times \frac{20}{100}} = \frac{12}{1}$

49. 3

49. $1,00,000 \times \frac{20}{100} \times \frac{20}{100} - 1,00,000 \times \frac{5}{100} \times \frac{20}{100} = 3,000$

50. 2

50. (6 – 1)! = 5! = 120

51. Incorrect Question

51. The alphabet R should not appear in the sequence. Then the next two letters will be D W.

52. 3

52. R > P > S > Q > T

53. 3

53. 7 M 4 P % J V I K 3 @ E W 2 Q © 6 T A ∗ 8 Z 1 5 $ F U # 9 H N

54. No option correct.

54. 7 M 4 P % J V I K 3 @ EW 2 Q © 6 T A ∗ 8 Z 1 5 $ F U # 9 H N
No such consonant is there in the given sequence which is immediately preceded by symbol and immediately followed by two numbers.

55. 2

55. 7 M 4 P J V I K 3 E W 2 Q 6 T A 8 Z 1 5 F U 9 H N

56. 2

56. The following table can be concluded:

Day	**Performer**	**Item performed**
Monday	D	Speech
Tuesday	A	Monologue
Wednesday	F	Dance
Thursday	B	Play
Friday	G	Mimicry
Saturday	C	Debate
Sunday	E	Music

F performs Dance

57. 4

57. D performs speech on Monday.

58. 1

58. A performs on Tuesday

59. 4

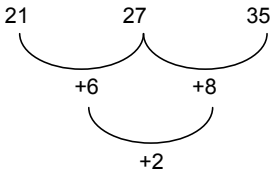
59. G performs of Friday.

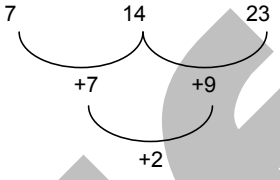
60. 4
60. C performs Debate.

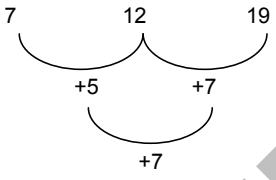
61. 3
61. Only educated non working female $\rightarrow$ 10
Non-working female $\rightarrow$ 7
$\Rightarrow$ (10 + 7) = 17

62. 1
62. There are no women who are non-educated & non working.

63. 2
63. Area which occupy square + rectangle only
i.e. 40

64. 2
64. 

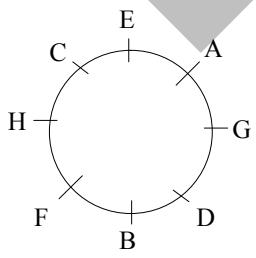


So, 

65. 2
65. +3, +3, +3, +3, series same as serial number (B)

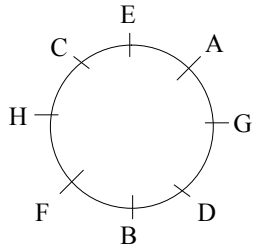
66. 1
66. –4, –4, –4, –4 series same as series number (A)

67. Incorrect Question
67. The code in the question should be QLFIMZO instead of QLFIMZQ. In that case the answer is C (Option 3).

68. 2
68. 

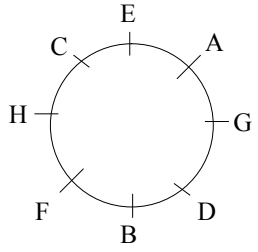
69. 1

69.



70. 4

70.



71. No option correct

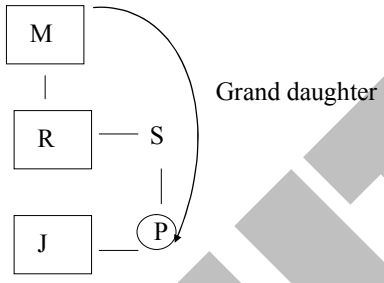
71. If $\wedge$ means $\div$ and $\vee$ means $\times$, then the answer will be 30 (Option 4)

72. 4

72. BHAGAT, BHAGIRATH, BHAGWAN, BHAGWAT

73. 1

73.



74. 3

74. $Z \rightarrow 26 \times 2 \rightarrow 52$
ACT $\rightarrow 1 + 3 + 20 \rightarrow 24 \times 2 \rightarrow 48$
BAT $\rightarrow 2 + 1 + 20 \rightarrow 23 \times 2 \rightarrow 46$

75. 3

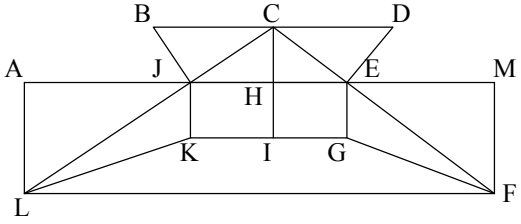
75. $20 \times (3)^2 \rightarrow 180,\ 4 \times (5)^2 \rightarrow 100.$ So, $7 \times (7)^2 \rightarrow 343$

76. 4

76. 2 opposite to 6
3 opposite to 4
1 opposite to 5

77. No option correct.

77.



The lines are AL, JK, CI, EG, MF, BD, AM, KG, LF, CL, KL, CF, GF, BJ & DE. So total 15 lines.
However, if CF & CL are not straight lines, then the number of lines will be 17.

78. 1

78. As per observation.

79. 3
79. As per observation.

80. 3
80. KILOMETER $\rightarrow$ LHMNNDUDS
Then after arranged alphabetical order.
DDHLMNNSU. So, fifth from left end is M.

81. No option correct
81. The correct answer is 2nd as in 2nd move they are together however, if we consider the symbols in the same position as in given figure, then the correct answer will be 6th. (Option 2). If they count each move of white star and each move of black star as different moves, then total moves will be 4th(Option 1) .

82. 2
82. As per observation

83. 1
83. As per observation

84. 2
84. 20 cubes in upper figure.
28 cubes in middle figure
20 cubes in lower figure
= 68 cubes total

85. 2
85. $8^2 + 7^2 + 6^2 + 5^2 + 4^2 + 3^2 + 2^2 + 1^2$
64 + 49 + 36 + 25 + 16 + 9 + 4 + 1 = 204

86. No option correct
86. None of the given dices can be formed. In (2) and (4), no white face is visible, which is not possible. In (1) and (3), one new face is shown which is different from the faces shown in the given net.

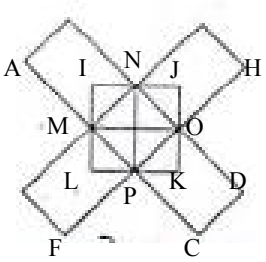
87. 4
87. As per observation

88. 3
88. 

89. No option correct
89. Option 2 is closest but is not completely correct.

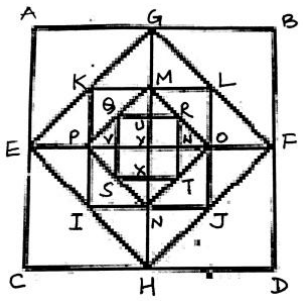
90. 4
90.
B G

E



ABCD, ABOP, ABNM, CDPO, CDMN, EFGH, EFNO, EFMD, GHNO, GHMP, IJMO, MOLK, INPL, NJKP

91. 2

91. 

E

AGYE, GBFY, FYHD, HCEY, ABCD, GFHE, KMYP, MLOY, OJNY, PYNI, KLIJ, MONP, QUVX, RWYU, TXYW, SUYX, QRTS

92. No option correct

92. The correct answer should be  which is not there in the options.

93. 4

93. One line remove from the outer figure for the bottom.

94. No option correct

94. The correct answer should be  which is not there in the options.

95. 3

95. As per observation

96. No option correct

96. Option 2 and 4 are same. But the actual answer should be 

97. 4

97. As per observation

98. 1

98. As per observation

99. 2

99. As per observation

100. 4
100. As per observation

NTSE STAGE – I (DELHI STATE)
05 – A (2018 – 19)
(For Class – X)
SCHOLASTIC APTITUDE TEST

HINTS & SOLUTIONS

101. **3**

101. $S = \frac{1}{2}a\left(t_2^2 - t_1^2\right)$

$x_1 = \frac{1}{2}a(10^2 - 0^2)$; $x_2 = \frac{1}{2}a(20^2 - 10^2)$; $x_3 = \frac{1}{2}a(30^2 - 20^2)$

So, $x_1 : x_2 : x_3 = 1 : 3 : 5$

102. **1**

102. $M_1V_1 = M_2V_2$

$m \times 16 = 2m \times V$

$\Rightarrow \quad V = 8$ m/s

K.E. = $\frac{1}{2} \times m \times 16^2 + \frac{1}{2} \times 2m \times 8^2 = 192$ mJ

103. **2**

103. $\mu_1 \sin x = \mu_2 \sin 45°$

Sin x = $\frac{\sqrt{3}}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = \frac{\sqrt{3}}{2}$

$\Rightarrow \quad x = 60°$

104. **4**

104. $P = \frac{1}{f} \quad \Rightarrow \quad f = \frac{1}{-4}m = -0.25$ m

105. **2**

105. Using Maxwell's right hand thumb rule.

106. **4**

106. Let $i_1 = i$; $i_2 = \frac{3}{2}i$

$\frac{P_2 - P_1}{P_1} \times 100\% = \frac{i_2^2 - i_1^2}{i_1^2} \times 100\%$

$\left\{\left(\frac{i_2}{i_1}\right)^2 - 1\right\} = \frac{5}{4} \times 100 = 125\%$

107. **3**

107. As slope of v–t gives acceleration and slope is positive as well as increasing.

108. **3**

108. Astigmatism is corrected by using cylindrical lens.

109. **2**

109. Distance between consecutive compression and rarefaction is half of wavelength.

110. **No option**

110. $\frac{5\lambda}{2} = 20 \quad \Rightarrow \lambda = 8$ cm

$\nu = \frac{v}{\lambda} = \frac{320}{8} \times 100 = 4000$ Hz.

111. **4**

111. $H = mC\Delta T$

$x = 15 \times 1 \times (24 - 20) = 60$ cal

112. **2**

112. In a hydro-Power Plant potential energy possessed by the stored water is converted into electricity.

113. **2**

113. Weight = $5 \times \frac{G \times 2M}{9R^2} = \frac{10}{9} \times 9.8$

= 10 .88 N

Where M & R are mass of earth and radius of earth.

114. 4

114. An olfactory indicator is a substance whose odour varies depending whether it is mixed with an acidic or basic solution

115. 3

115. $\underset{\text{Metal}}{M} + 2\underset{\text{Acid}}{HCl} \longrightarrow \underset{\text{Salt}}{MCl_2} + \underset{\text{Hydrogen}}{H_2}$

116. 2

116.

Methyl orange	Acidic	Base
	Red	Yellow

117. 3

117. $\underset{\text{W.B}}{NH_4OH} + \underset{\text{S.A}}{HCl} \longrightarrow \underset{\text{Salt}}{NH_4Cl} + H_2O$

118. 3

118. Order of electricity

Ag > Cu > Au > Al > W > Hg

Hg has very high resistance

119. 2

119. Gold & silver both are malleable as well as ductile

120. No correct option

121. 4

121. Au, Ag & Pt are noble metal does not corrode easily.

122. 1

122. pH = $-\log[H_3O^+]$

123. 2

123. The solution turns methyl orange into yellow the approximate pH of solution is 3.1 – 4.4

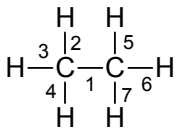
124. 2

124. $Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$

125. 1

125. $SO_2 + H_2O \longrightarrow H_2SO_3$ (Sulphorus acid)

126. 2

126. 

127. 4

127. A flagellum is present at one end of Leishmania.

128. 4

128. DNA is not present in Ribosomes.

129. 1

129. Wings of Housefly and wings of sparrow are an example of Analogous organs.

130. 2

130. Transpiration is not helpful in prevention of loss of water.

131. 2

131. Pulmonary veins carry oxygenated blood from lungs to heart.

132. 4

132. Cell division is promoted by cytokinin.

133. 3

133. Loop of Henle is found in Nephrons.

134. 1

134. Flight and fight hormone is Adrenalin.

135. 1

135. $\underset{T_1}{\text{Grass}} - \underset{T_2}{\text{Grasshopper}} - \underset{T_3}{\text{Frog}} - \underset{T_4}{\text{Snake}} - \underset{T_5}{\text{Hawk}}$

5000 KJ energy available at the producer level

136. 2

136. Jaya and Ratna are varieties of rice.

137. 2

137. Sargam is not a water harvesting structure.

138. 4

138. ATP is formed by photosynthesizing plant cell during respiration and photosynthesis.

139. 4

139. Breathing rate in human is controlled by medulla oblongata.

140. 2

140. 31 pairs of nerves arises from Spinal cord.

141. 3

141. Let $a = 2k,\ b = 3k$

$x = 3\ell,\ y = 4\ell$

Now $\dfrac{2ax - 25by}{3ay + 4bx} = \dfrac{-24}{5}$

142. 4

142. Diagonal of outer square = 2a

$\Rightarrow$ Side of outer square $= \sqrt{2}a$

Diameter of inner circle $= \sqrt{2}a =$ Diagonal of inner square

$\Rightarrow$ Side of inner square = a

143. 2

143. $a\cos\theta - b\sin\theta = c$

$\Rightarrow a^2\cos^2\theta + b^2\sin^2\theta - 2ab\sin\cos\theta = c^2$

$\Rightarrow a^2 - a^2\sin^2\theta + b^2 - b^2\cos^2\theta - 2ab\sin\cos\theta = c^2$

$\Rightarrow a^2 + b^2 - c^2 = (a\sin\theta + b\cos\theta)^2$

$\Rightarrow a\sin\theta + b\cos\theta = \pm\sqrt{a^2 + b^2 - c^2}$

144. 3

144. $x^2 - 3x + 2 = (x-2)(x-1)$

$x-1$ and $x-2$ are factors of $x^4 - px^2 + q$

$\Rightarrow -p + q = -1$ and $-4p + q = -16$

On solving we get $p = 5$ and $q = 4$

145. 1

145. $\dfrac{1}{x_1x_2} + \dfrac{1}{x_2x_3} + \dfrac{1}{x_3x_4} + ... + \dfrac{1}{x_{n-1}x_n}$

$= \dfrac{1}{d}\left[\dfrac{d}{x_1x_2} + \dfrac{d}{x_2x_3} + \dfrac{d}{x_3x_4} + ... + \dfrac{d}{x_{n-1}x_n}\right]$

$= \dfrac{1}{d}\left[\dfrac{x_2 - x_1}{x_1x_2} + \dfrac{x_3 - x_2}{x_2x_3} + \dfrac{x_4 - x_3}{x_3x_4} + ... + \dfrac{x_n - x_{n-1}}{x_{n-1}x_n}\right]$

$= \dfrac{1}{d}\left[\left(\dfrac{1}{x_1} - \dfrac{1}{x_2}\right) + \left(\dfrac{1}{x_2} - \dfrac{1}{x_3}\right) + \left(\dfrac{1}{x_3} - \dfrac{1}{x_4}\right) + ... + \left(\dfrac{1}{x_{n-1}} - \dfrac{1}{x_n}\right)\right]$

$= \dfrac{1}{d}\left[\dfrac{x_n - x_1}{x_n\,x_1}\right]$

$= \dfrac{1}{d}\left[\dfrac{(n-1)d}{x_nx_1}\right] = \dfrac{n-1}{x_1x_n}$

146. 1

146. $x^2 + \dfrac{1}{x^2} + y^2 + \dfrac{1}{y^2} = 4$

$\Rightarrow x^2 + \dfrac{1}{x^2} - 2 + y^2 + \dfrac{1}{y^2} - 2 = 0$

$$\Rightarrow \left(x-\frac{1}{x}\right)^2+\left(y-\frac{1}{y}\right)^2=0$$

$$\Rightarrow x-\frac{1}{x}=0 \text{ and } y-\frac{1}{y}=0$$

$$\Rightarrow x^2=1 \text{ and } y^2=1$$

$$\Rightarrow x^2+y^2=2$$

147. 4

147. Let $\text{ar}(APC)=x$

then $\text{ar}(APD)=x$

$\Rightarrow \text{ar}(ABC)=2x=\text{ar}(ADE)$

So, $\frac{\text{ar}(APC)}{\text{ar}(ABD)}=\frac{x}{4x}=\frac{1}{4}$

148. 2

148. $\frac{1}{1+x^{b-a}+x^{c-a}}+\frac{1}{1+x^{a-b}+x^{c-b}}+\frac{1}{1+x^{b-c}+x^{a-c}}$

$\Rightarrow \frac{x^a}{x^a+x^b+x^c}+\frac{x^b}{x^b+x^a+x^c}+\frac{x^c}{x^c+x^b+x^a}$

= 1

149. 2

149. Let height = h radius = r

CSA = $2\pi rh$

Increased height $=\frac{11h}{10}$

Decreased radius $=\frac{9}{10}r$

New CSA $=2\pi rh\times\frac{99}{100}$

Decrease in CSA $=\frac{2\pi rh}{100}$

Decrease % $=\frac{\frac{2\pi rh}{100}}{2\pi rh}\times 100=1\%$

150. 4

150. Given AP is 0, d, 2d, 3d,……, (n – 1) d

Given expression is

$$=\left(\frac{a_3}{a_2}+\frac{a_4}{a_3}+.....+\frac{a_n}{a_{n-1}}\right)-\left(\frac{a_2}{a_2}+\frac{a_2}{a_3}+.....+\frac{a_2}{a_{n-2}}\right)$$

$$=\left(\frac{2d}{d}+\frac{3d}{2d}+.....+\frac{(n-1)d}{(n-2)d}\right)-\left[\frac{d}{d}\times\frac{d}{2d}+.....+\frac{d}{(n-3)d}\right]$$

$$=\left(\frac{2}{1}+\frac{3}{2}+.....+\frac{n-1}{n-2}\right)-\left(\frac{1}{1}+\frac{1}{2}+.....+\frac{1}{n-3}\right)$$

$$= \left(\frac{2}{1}-\frac{1}{1}\right)+\left(\frac{3}{2}-\frac{1}{2}\right)+.....+\left(\frac{n-2}{n-3}-\frac{1}{n-3}\right)+\frac{n-1}{n-2}$$

$$= \underbrace{1+1+1+.....+}_{n-3\,\text{times}}\frac{n-1}{n-2}$$

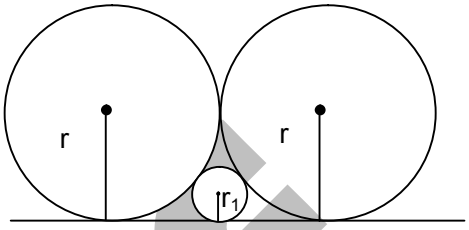
$$= n-3+\frac{n-1}{n-2}=\frac{n^2-4n+5}{n-2}=n-2+\frac{1}{n-2}$$

151. 3

151. $\frac{1}{\sqrt{r}}+\frac{1}{\sqrt{r}}=\frac{1}{\sqrt{r_1}}$

$\Rightarrow \frac{2}{\sqrt{r}}=\frac{1}{\sqrt{r_1}} \quad (\because r_1 = 4)$

$\Rightarrow \sqrt{r}=4 \Rightarrow r=16$



152. 2

152. Required area $= \frac{120}{360}\times\pi(6)^2-\frac{1}{2}\times 6^2\times\sin 120^\circ$

$= 12\pi-18\times\frac{\sqrt{3}}{2}$

$= 12\times 3.14-9\times 1.732$

$= 22.11\approx 22\ \text{cm}^2$

153. 3

153. $\frac{1}{y+z}+\frac{1}{x+z}=\frac{2}{x+y}$

$\Rightarrow \frac{x+z+y+z}{(y+z)(x+z)}=\frac{2}{(x+y)}$

$\Rightarrow (x+y+2z)(x+y)=2(y+z)(x+z)$

$\Rightarrow (x^2+xy+xy+y^2+2xz+2yz)=2(xy+yz+xz+z^2)$

$\Rightarrow x^2+2xy+y^2+2xz+2yz=2xy+2yz+2xz+2z^2$

$\Rightarrow x^2+y^2=2z^2$

154. 1

154. $x^2=y+z \Rightarrow x^2+x=x+y+z \Rightarrow x(x+1)=x+y+z$

$\Rightarrow \frac{1}{x+1}=\frac{x}{x+y+z}$

$y^2=z+x$

$z^2=x+y$

$y^2+y=x+y+z$

$\Rightarrow y(y+1)=x+y+z \Rightarrow \frac{1}{y+1}=\frac{y}{x+y+z}$

Similarly $\frac{1}{z+1}=\frac{z}{x+y+z}$

$\therefore \frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}=\frac{x}{x+y+z}+\frac{y}{x+y+z}+\frac{z}{x+y+z}=1$

155. 2

155. Roots of $x^3 + 4x + 1 = 0$ are α, β, γ

$\alpha + \beta + \gamma = 0$

$\alpha\beta + \beta\gamma + \gamma\alpha = 4$

$\alpha\beta\gamma = -1$

$\frac{1}{\alpha+\beta} + \frac{1}{\beta+\gamma} + \frac{1}{\gamma+\alpha} = ?$

$\frac{1}{-\gamma} + \frac{1}{-\alpha} + \frac{1}{-\beta} = -\left(\frac{\alpha\beta + \beta\gamma + \gamma\alpha}{\alpha\beta\gamma}\right) = \frac{-(4)}{-1} = 4$

156. 4

156. Minimum value of $\frac{y+z}{x} + \frac{z+x}{y} + \frac{x+y}{z} = ?$

Apply AM – GM on $\frac{y}{x}, \frac{z}{x}, \frac{z}{y}, \frac{x}{y}, \frac{x}{z}, \frac{y}{z}$

$\frac{y}{x} + \frac{z}{x} + \frac{z}{y} + \frac{x}{y} + \frac{x}{z} + \frac{y}{z} \geq 6\sqrt[6]{\frac{y}{x}.\frac{z}{x}.\frac{z}{y}.\frac{x}{y}.\frac{x}{z}.\frac{y}{z}}$

$\Rightarrow \frac{y+z}{x} + \frac{z+x}{y} + \frac{x+y}{z} \geq 6$

$\therefore$ Min. value is = 6

157. 3

157. Min. value of the expression $\frac{3b+4c}{a} + \frac{4c+a}{3b} + \frac{a+3b}{4c} = ?$

Apply AM. GM on $\frac{3b}{a}, \frac{4c}{a}, \frac{4c}{3b}, \frac{a}{3b}, \frac{a}{4c}, \frac{3b}{4c}$

$\Rightarrow \frac{\frac{3b}{a} + \frac{4c}{a} + \frac{4c}{3b} + \frac{a}{3b} + \frac{a}{4c} + \frac{3b}{4c}}{6} \geq \sqrt[6]{\frac{3b}{a}.\frac{4c}{a}.\frac{4c}{3b}.\frac{a}{3b}.\frac{a}{4c}.\frac{3b}{4c}}$

$\Rightarrow \frac{\frac{3b}{a} + \frac{4c}{a} + \frac{4c+a}{3b} + \frac{a+3b}{4c}}{6} \geq 1$

$\Rightarrow \frac{3b+4c}{a} + \frac{4c+a}{3b} + \frac{a+3b}{4c} \geq 6$

$\therefore$ Minimum value = 6

158. 3

158. $a^3 = 12a$

$\Rightarrow a^2 = 12 \Rightarrow a = \sqrt{12}$

$\therefore$ TSA = $6a^2 = 6 \times 12 = 72$

159. 1

159. $14^m - 6^m$

$a^n - b^n$ is always divisible by a – b

$\therefore 14^m - 6^m$ is divisible by 8

160. 2

160. $TS = 3\sqrt{5}$

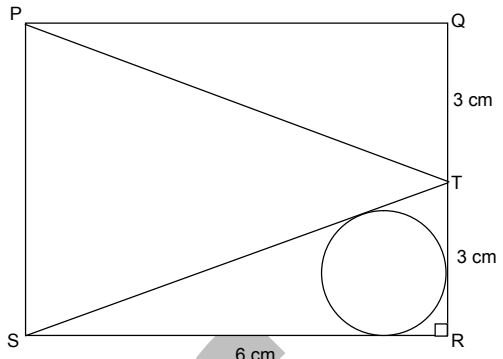
$TR = 3$

$SR = 6$

$r = \dfrac{\Delta}{s}$

$\Delta = \dfrac{1}{2} \times 6 \times 3 = 9$

$r = \dfrac{9}{\dfrac{9 + 3\sqrt{5}}{2}} = \dfrac{18}{3\left(3 + \sqrt{5}\right)} = \dfrac{6}{3 + \sqrt{5}}$



161. 2

161. Democracy restored in Chile in 1988.

162. 3

162. Germany is not a operational member of security council.

163. 1

163. Mahatma Gandhi was not a member of the constituent assembly.

164. 1

164. General secretary Kofi A Anan said that US war on Iraq was not legal.

165. 3

165. President can declare emergency when the council of ministers in writing advices him to do so.

166. 4

166. KOSOVO was a province of try before the split of Yugoslavia.

167. 2

167. Nagaland state was born out of culture, ethnicity and geography.

168. 2

168. End of Racial discrimination is a part of right to equality fundamental right of citizen.

169. 3

169. Narivadi Aandolan is movement for Individual and family right of women.

170. 4

170. In transparency when decision are take with honesty and proper of rules.

171. 2

171. Amnesty International is the International Organisation that works for human rights.

172. 1

172. Livre was the currency of France.

173. 3

173. Elizabeth I was granted role right to trade with East to East India Company.

174. 4
174. Non-cooperation programme was adopted in Nagpur, in 1920 congress session.

175. 1
175. First Modern Novel published in Malayalam was Indulekha in 1889.

176. 3
176. “Damayanti” was made by Raja Ravi Verma.

177. 1
177. Simon Commission arrived in 1928 in India.

178. 1
178. Rinderpest is a term used for cattle disease.

179. 4
179. Giuseppe Garibaldi was a famous freedom fighter of Italy.

180. 3
180. Gudem Rebellion was led by Alluri Sitaram Raju.

181. 2
181. “The Social Contract” book was written by Rousseau.

182. 3
182. The Principle of the Garden City was developed by Ebenezer Howard.

183. 3
183. NABARD organization looks after the credit needs of agriculture and rural development in India.

184. 2
184. 3 phases are there in circular flow of income.

185. 2
185. Education is considered as social infrastructure.

186. 3
186. Cultivating more than one crop on the same field in a year called multiple cropping.

187. 1
187. Infant mortality rate refers to the death of child under the age of 1.

188. 2
188. The Integrated Child Development Service (ICDS) introduced in 1975.

189. 3
189. The first chairman of planning commission was Jawaharlal Nehru.

190. 3
190. The total surface area of India covered by mountains is 30%.

191. 4
191. Mica has excellent dielectric strength insulating properties, low power loss factor and resistance to high voltage.

192. 2

192. OIL is an example of joint sector industry.

193. 4
193. Pipelines reduce trans-shipment losses and delays.

194. 1
194. Lake Victoria lies on the equator.

195. 4
195. The longitudinal valleys lying between lesser Himalayas and Shivaliks are known as Duns.

196. 3
196. The Western cyclonic disturbances originate from Mediterranean sea.

197. 3
197. Balancing the head to use resources and also conserve them for future is called sustainable development.

198. 1
198. The maximum number of National Park is in Andaman and Nicobar Islands.

199. 1
199. When some plates come towards each others is formed convergent boundary.

200. 2
200. The largest producer of cotton in the world is China.