NTSE STAGE – I (DELHI STATE)
05 – A (2019 – 20)
(For Class – X)
SCHOLASTIC APTITUDE TEST

HINTS & SOLUTIONS

101. 2

101. $P_i = 0$

$P_f = 18 \times 6 + 12\ V$

$P_i = P_f$

$V = -9$ m/s

$$K.E. = \frac{1}{2} \times 12 \times (9)^2 \Rightarrow 6 \times 81 \Rightarrow 486\ J$$

102. 4

102. Slope of v – t graph gives acceleration and acceleration is constant from time t = 0 to t = T. After t = T, velocity is constant.

103. 1

103. $u = -\infty$ $v = -40$ cm

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{-40} = \frac{1}{f}$$

$P = -(2)5$ D

104. 2

104. Convection is caused by gravity pulling heavier elements in a gas or liquid down.

105. 3

105. $V_o = 4$ m/s

$V_I = -4$ m/s

$V_{Io} = V_I - V_o$

$= -4 - 4 = -8$ m/s

106. 1

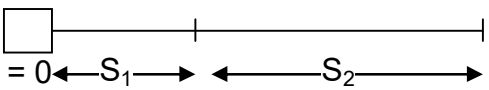
106. $$I = \frac{V}{R_{eq}}$$

$$2 = \frac{6}{2 + R}$$

$R = 1\ \Omega$

107. 4

107. t = 0 t = 10 t = 20



$$S_1 = \frac{1}{2} a (10)^2 \Rightarrow S_1 = 50a$$

$$S_1 + S_2 = \frac{1}{2} a (20)^2 \Rightarrow S_2 = 150a$$

$$S_2 = 3S_1$$

108. 1

108. $g = \frac{4}{3} G\pi dR$

$\frac{g_1}{g_2} = \frac{r_1}{r_2}$

109. 2

109. $f = -15$ cm $\qquad m = -\frac{v}{u} = 2$

$v = -2u$

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\frac{1}{-2u} + \frac{1}{u} = \frac{1}{-15}$

$u = -7.5$ cm

110. 1

110. $\frac{\ell}{4} = \frac{1}{2}(g\sin\theta)(2)^2$ …(i)

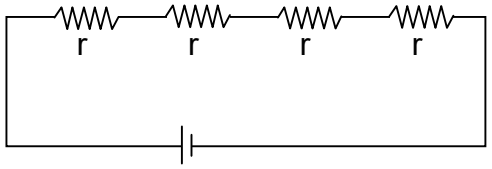
$\ell = \frac{1}{2}(g\sin\theta)t^2$ …(ii)

$\frac{t^2}{4} = 4$

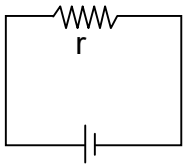
$t = 4$ sec.

111. 1

111. $P = \frac{V^2}{R}$



$10 = \frac{V^2}{4r}$



$P_1 = \frac{V^2}{r}$

$P_1 = 40$ W

112. 4

112. $F = qVB \sin\theta$

If V is parallel to B $\qquad \theta = 0°$

$F = 0$

113. 2

113. $I = \frac{5}{50} \Rightarrow \frac{1}{10}$ A

$5 = I\left(\frac{100R}{100+R}\right)$

$R = 100\ \Omega$

114 1, 2 & 4

114. Epsom salt ($MgSO_4.7H_2O$)

Green vitriol ($FeSO_4.7H_2O$)

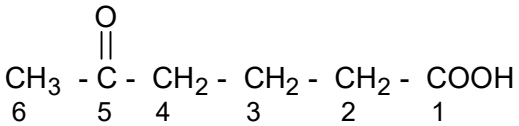
White vitriol ($ZnSO_4.7H_2O$)

115. 1
115. Element Zn & Sn are used for galvanization.

116. 3
116. $\underset{A}{Zn} + \underset{M}{CuSO_4} \longrightarrow \underset{N}{ZnSO_4} + Cu$

117. 4
117. Hydrogen has highest calorific value.

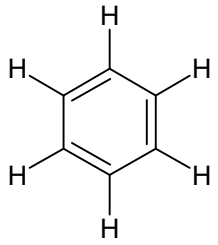
118. 1
118. pH of acid rain is less than 5.6

119. 2
119. 

5-Keto hexanoic acid

120. 4
120. $2NaCl(aq) + 2H_2O(l) \longrightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

121 1
121. $2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$

122 2
122. 
15 Covalent bond

123 4
123. No. of moles = $\frac{1000\ g}{56\ g} = 17.8$ moles
1 mole contains N_A atom of Fe
So, 17.8 mole contain
$17.8 \times 6.022 \times 10^{23} = 1.075 \times 10^{25}$ atoms

124 1
124. Alkali metal oxide are basic in nature.

125. 1
125. The pH value of solution will be 7 to 9.

126. 1
126. No. of valence electron will remain same for any group element.

127. 3
127. Oxidation-reduction reactions takes place during break down of molecules in the respiration in our body. Oxidation of glucose and reduction of oxygen.

128. 4
128. Lactic acid is produced when pyruvate is broken down in absence of oxygen in muscle cell.

129. 1
129. Separation of oxygenated deoxygenated blood allows a highly efficient supply of oxygen to the body, also useful in animals that have high energy needs such as birds and mammals which constantly use energy to maintain their body temperature.

130. 2
130. Root pressure is effective way transporting water in xylem during night.

131 4
131. A Growth hormone
B Growth hormone releasing factor
C Insulin
D Thyroxine

132 1
132. Wrinkled seed = rr
Heterozygous tall plant = Tt

rrTt X rrTt

	rT	rt
rT	rTrT	rTrt
rt	rTrt	rtrt

rTrT – Homozygous wrinkled seed Homozygous tall
rTrt – Homozygous wrinkled heterozygous tall
rtrt – Homozygous wrinkled homozygous dwarf
100% Homozygous wrinkled
75% plants will be Tall and have wrinkled seed and 25% will be dwarf with wrinkled seed.

133 1
133. Two similar pea plants are growing in two different islands separated by vast ocean. The phenomenon of geographical isolation will not be seen as the plants get self pollinated.

134 3
134. DDT is non-biodegradable when it enters in food chain it gets accumulated in each trophic level. This phenomenon is called Biomagnification.

135. 2
135. Presence of coliform bacteria is an indicator of pollution level in water

136. 2
136. Leaves of tendu are the source of income of large number of people of India. These leaves are used to make bidis.

137. 4
137. Maximum number of trophic levels supported in any ecosystem is four.

138. 4
138. Correct sequence of reflex arc is
Receptor $\rightarrow$ Sensory Neuron $\rightarrow$ Relay Neuron $\rightarrow$ Motor Neuron $\rightarrow$ Effector organ

139. 1

139. Tricuspid valve is present in right atrium and right ventricle

140. 2

140. BCG vaccine provide protection against TB.

141. 1

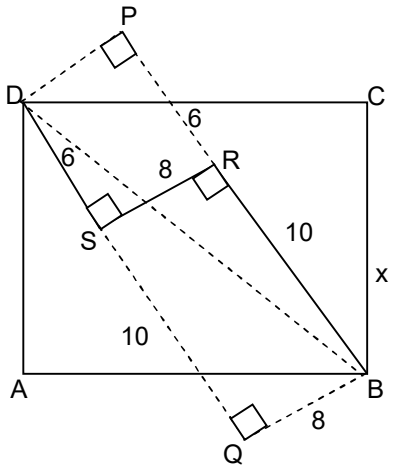
141. Extend BR and drawn $DP \perp BR$ on extended part.

Extend DS and draw $BQ \perp DS$ on extended part then DPBQ is rectangle having sides 8 m and 16 m

Diagonal of rectangle $= 8\sqrt{5}$

If x is side of square then

$2x^2 = 320 \Rightarrow x^2 = 160\,m^2$



142. 4

142. $\left(2^x-4\right)^3+\left(4^x-2\right)^3=\left(4^x+2^x-6\right)^3$

$\Rightarrow \left(2^x-4\right)^3+\left(4^x-2\right)^3+\left(6-4^x-2^x\right)^3=0$

Now $\left(2^x-4\right)+\left(4^x-2\right)+\left(6-4^x-2^x\right)=0$

$\Rightarrow \left(2^x-4\right)^3+\left(4^x-2\right)^3+\left(6-4^x-2^x\right)^3$

$=3\left(2^x-4\right)\left(4^x-2\right)\left(6-4^x-2^x\right)=0$

Now $2^x-4=0 \Rightarrow x=2$

$4^x-2=0 \Rightarrow x=\frac{1}{2}$

$6-4^x-2^x=0 \Rightarrow \left(2^x+3\right)\left(2^x-2\right)=0$

$\Rightarrow 2^x-2=0$ or $2^x+3=0$

$\Rightarrow 2^x=2$ or $2^x=-3$ (Not possible)

$\Rightarrow x=1$

So sum of all real values of

$x=2+\frac{1}{2}+1=\frac{7}{2}=3.5$

143. 4

143. Let $2019^x=y$ then given question reduces to $y+\frac{1}{y}=3$

$\Rightarrow y^3+\frac{1}{y^3}=18$ and $y^2+\frac{1}{y^2}=7$

Now $\sqrt{\frac{2019^{6x}-2019^{-6x}}{2019^x-2019^{-x}}}=\sqrt{\frac{y^6-\frac{1}{y^6}}{y-\frac{1}{y}}}$

$$= \sqrt{\frac{\left(y-\frac{1}{y}\right)\left(y^2+1+\frac{1}{y^2}\right)\left(y^3+\frac{1}{y^3}\right)}{\left(y-\frac{1}{y}\right)}} = \sqrt{144} = 12$$

144. 1

144. Since p is root of $x^2 - 5x + 7 = 0$

$\Rightarrow p^2 - 5p + 7 = 0$

$\Rightarrow p^2 - 5p = -7$

Now radius of circle

$r = \sqrt{(p-1)^2 + (p-4)^2}$

$= \sqrt{2(p^2 - 5p) + 17} = \sqrt{3}$ units

Area of circle $= 3\pi$ sq.units

145. 4

145. $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y} \Rightarrow x^2 + y^2 + xy = 0$

Dividing both sides by y^2 we get

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

Let $\frac{x}{y} = k$ then $k^2 + k + 1 = 0$

Now $\left(\frac{x}{y}\right)^6 + \left(\frac{x}{y}\right)^3 = k^6 + k^3$

Since $k^6 + k^3 = (k^2 + k + 1)(k^4 - k^3 + 2k - 2) + 2$

$\Rightarrow k^6 + k^3 = 2$ (since $k^2 + k + 1 = 0$)

146. 2

146. $x^3 - 597x - 5236 = 0$

Sum of roots = a + b + c = 0

Also, abc = 5236

Since a + b + c = 0

$\Rightarrow a^3 + b^3 + c^3 = 3abc$

= 15708

147. 3

147. $\cos ec\, x + \cot x = a$

$\Rightarrow \cos ec\, x - \cot x = \frac{1}{a}$

On adding both equations

$\cos ec\, x = \frac{a^2+1}{2a} \Rightarrow \cos x = \frac{a^2-1}{a^2+1}$

148. 2

148. Mean $= \frac{a_{15} + a_{16} + a_{136} + a_{137}}{4}$

$$= \frac{(a+14d)+(a+15d)+(a+135d)+(a+136d)}{4}$$

$$= a + 75d$$

$$= 2 + 75 \times 3 = 227$$

149. 3

149. Using AM $\geq$ GM

$$\Rightarrow \frac{\tan^2 x + \cot^2 x}{2} \geq \sqrt{\tan^2 x \cot^2 x}$$

$$\Rightarrow \tan^2 x + \cot^2 x \geq 2$$

So minimum value is 2.

150. **No option is correct**

150. $f(x) = x^4 + ax^3 + bx^2 + cx + d$

$f(1) = 5,\ f(2) = 10,\ f(3) = 15,\ f(4) = 20$

On the basis of given information

Let $f(x) = (x-1)(x-2)(x-3)(x-4) + 5x$

$f(12) = 7980,\ f(-8) = 11840$

Now $\frac{f(12) + f(-8)}{100} = 198.2$

151. 3

151. Let numbers are 12x and 12y, HCF (x, y) = 1

then $(12x)(12y) = 2160$

$\Rightarrow xy = 15 = 5 \times 3$

$\Rightarrow x = 5,\ y = 3$

So, numbers are 60 and 36

Sum = 96

152. 4

152. Let angles are $x - 2d, x - d, x, x + d, x + 2d$ then $5x = 540^\circ$

$\Rightarrow x = 108^\circ$

Sum of largest and smallest angle $= 2x = 216^\circ$

153. 1

153. $\sqrt{p} - \sqrt{q} = 20$

$$\Rightarrow p = \left(20 + \sqrt{q}\right)^2 = 400 + q + 40\sqrt{q}$$

$$p - 5q = 400 + q + 40\sqrt{q} - 5q = 400 + 40\sqrt{q} - 4q$$

$$= 400 - 4\left(q - 10\sqrt{q}\right)$$

$$= 400 - 4\left(q - 10\sqrt{q} + 25 - 25\right)$$

$$= 400 + 100 - 4\left(\sqrt{q} - 5\right)^2 = 500 - 4\left(\sqrt{q} - 5\right)^2$$

$$(p - 5q)_{max} = 500$$

$$\left(\frac{p - 5q}{100}\right)_{max} = \frac{500}{100} = 5$$

154. 1

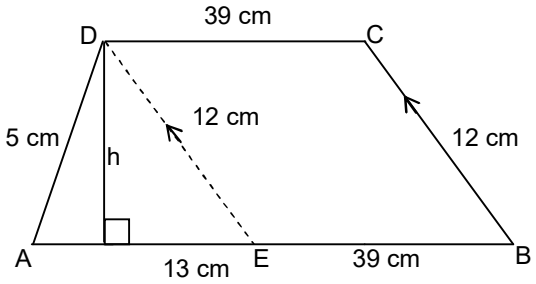
154. Draw $DE \parallel CB$

$\square BCDE$ is a parallelogram

$ar(\Delta ADE) = 30\ cm^2$

$\frac{1}{2} \times 13 \times h = 30 \Rightarrow h = \frac{60}{13}\ cm$

$ar(ABCD) = \frac{1}{2} \times (52 + 39) \times \frac{60}{13} = 210\ cm^2$



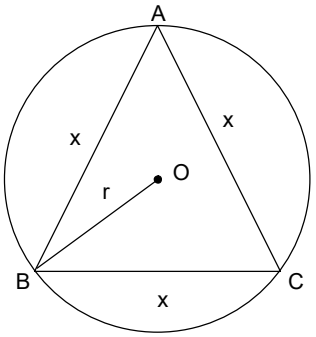
155. 4

155. Among all triangles inscribed in a circle of given radius equilateral triangle has maximum area

Let side of $\Delta ABC = x$

then $r = \frac{x^3}{4 \times \frac{\sqrt{3}}{4} x^2}$

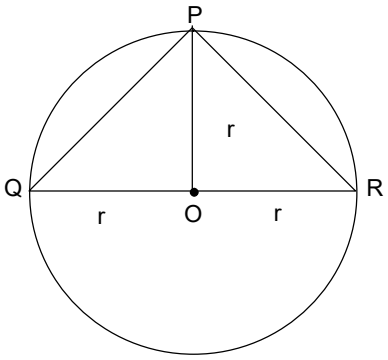
$\Rightarrow x = \sqrt{3}r$



Area of $\Delta ABC = \frac{\sqrt{3}}{4} \times x^2 = \frac{3\sqrt{3}}{4} r^2$

When largest triangle is inscribed in a semicircle of radius r then base of $\Delta = 2r$, height of $\Delta = r$

Area of $\Delta PQR = r^2$



Difference $= \left(\frac{3\sqrt{3}}{4} - 1\right) r^2 \qquad = \left(\frac{3\sqrt{3} - 4}{4}\right) r^2$

156. 1

156. Either of p or r is 2.

Let p = 2

q + r = 70

r + s = 72

q + 2r + s = 142

r = 142 – 89 = 53

if r = 2,

p + q = 70

p + s = 72

q + s = 87

2p + q + s = 142

2p = 142 – 87 = 55

$p = \frac{55}{2}$, not possible

157. 1

157. CE = 10 units.

$\Delta CFE \sim \Delta CED$

$\Rightarrow \frac{CF}{CE} = \frac{CE}{CD}$

$$\frac{m}{10}=\frac{10}{15+m}\Rightarrow m=5$$

158. 2

158. Let $y=x^2-10x-69$

$$\frac{1}{y+24}+\frac{1}{y+40}=\frac{2}{y}$$

$$y\left(2y+64\right)=2\left(y^2+64y+960\right)$$

$$32y=-960$$

$$y=-30$$

$$x^2-10x-69=-30$$

$$\left(x-13\right)\left(x+3\right)=0 \quad x=13,-3$$

Sum = 13 – 3 = 10

159. 4

159. $$N=\frac{\left(2^{2/3}+2^{1/3}+1\right)\times\left(2^{1/3}-1\right)}{\left(2^{1/3}-1\right)}=\frac{2-1}{2^{1/3}-1}$$

$$2^{1/3}-1=\frac{1}{N}\Rightarrow 2^{1/3}=\frac{1}{N}+1$$

$$\left(2^{1/3}\right)^3=\left(\frac{1}{N}+1\right)^3=\frac{1}{N^3}+1+\frac{3}{N^2}+\frac{3}{N}$$

$$2=\frac{1}{N^3}+1+\frac{3}{N^2}+\frac{3}{N}$$

$$\frac{1}{N^3}+\frac{3}{N^2}+\frac{3}{N}=1$$

160. 4

160. $x_1+x_2+.....+x_n=pn$ .....(i)

$x_1+x_2+.....+x_{10}=10q$ .....(ii)

$x_{11}+x_{12}+.....+x_n=\left(n-10\right)\times r$ .....(iii)

$$pn=10q+r\left(n-10\right)$$

$$n=\frac{10\left(q-r\right)}{p-r}$$