Solutions **to NTSE-I** (2018)
(For Class X Students)
(SAT)

Time: 90 Minutes   **Max Marks: 100**

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you open the Question Booklet.

1.   Use blue/black ball point pen only.

2.   Write your Roll No. very clearly (only one digit in on block) on this booklet and on the **ANSWER SHEET**.

3.   This test consists of 100 questions of one mark each. All the questions are **COMPULSORY.**

4.   Answer to each question by filling the correct alternative among the four choices on the answer sheet.

Example:

Q.No.	Alternatives			
1	①	②	⬤	④

Correct way:

Q.No.	Alternatives			
1	⊗	⊖	③ √	④

Wrong way:

5.   Separate sheet has been provided for rough work in this test booklet.

101.

u = 0
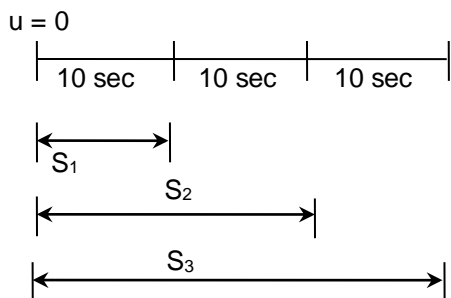
$x_1 = S_1$; $x_2 = S_2 - S_1$; $x_3 = S_3 - S_2$

Using $s = ut + \dfrac{1}{2}at^2$

$x_1 = \dfrac{1}{2}a(100)$

$x_2 = \dfrac{1}{2}a(300)$

$x_3 = \dfrac{1}{2}a(500)$

$x_1 : x_2 : x_3 = 1 : 3 : 5$.

102. Using momentum conservation

$0 = (2m)v + (16)(m)$

$v = -8\ \text{m/sec}$

$KE_{net} = KE_1 + KE_2$

$= \dfrac{1}{2}m(16)^2 + \dfrac{1}{2}(2m)(8)^2$

$= 192\ \text{mJ}$.

103. Using snell's law

$\mu_2 \sin 45° = \mu_1 \sin x$

$\sin x = \dfrac{\mu_2}{\mu_1}\sin 45°$

$x = 60°$.

104. $f = \dfrac{1}{P}$

$f = \dfrac{1}{-4} = -0.25\ \text{m}$

Power is negative so lens is concave.

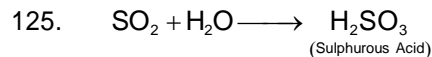105. Using right hand thumb rule.

106. $P_{initial} = I^2 R$

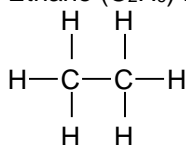$P_{new} = I'^2 R$; $I' = \dfrac{3}{2}I$

$\dfrac{P_{new} - P_{initial}}{P_{initial}} \times 100\% = 125\%$.

107. Slope of the graph is increasing and positive.

108. Cylindrical lens is used in astigmatism.

109. Distance between a consecutive compression and a rarefaction is $\frac{\gamma}{2}$.

110. $2_\lambda + \dfrac{\lambda}{2} = 20$ cm

$\lambda = 8$ cm

$v = f\,\lambda$

$f = 4000$ Hz .

111. Using $Q = ms\Delta T$

$x = (15)\,(1)\,(24 - 20)$

$x = 60$.

112. Potential energy possessed by the stored water is converted into electricity.

113. Given, mass of body = 5 kg

Using $g = \dfrac{GM}{R^2}$

$g' = \dfrac{G(2M)}{(3R)^2} = \dfrac{2}{9}g$

$g' = \dfrac{2}{9}(9.8) = 2.177$ m / sec^2

$W = mg' = 10.88$ N.

114. Vanilla essence, onion and clove are olfactory indicators.

115. When acid reacts with metals, salt and hydrogen gas are evolved.

116. Methyl orange gives red colour in acidic medium.

117. Salts of weak base and strong acid give acidic solution. So, $NH_4Cl(NH_4OH + HCl)$ forms an acidic solution.

118. Mercury offers higher resistance to passage of electricity than copper.

119. Gold and silver are most ductile and malleable metals.

120. INVALID QUESTION

121. Gold, silver and platinum do not corrode easily.

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

123. Methyl orange shows colour change in the pH range of 3.1 – 4.4.

124. $Zn + 2NaOH \longrightarrow \underset{(\text{Sodium zincate})}{Na_2ZnO_2} + H_2$.

125. $SO_2 + H_2O \longrightarrow H_2SO_3$
     (Sulphurous Acid)

126. Ethane (C_2H_6) has 7 covalent bonds.

$$\begin{array}{ccc} & H & H \\ & | & | \\ H- & C-C & -H \\ & | & | \\ & H & H \end{array}$$

127. Leishmania is a protozoan which has flagella at its one end.

128. Ribosomes are the membraneless smallest cell organelle that do not contain DNA.

129. The wings of housefly and the wings of a sparrow are analogous organs as both perform the similar function but have different structure.

130. Transpiration is loss of water in the form of vapours from aerial parts of the plant.

131. Pulmonary veins carry oxygenated blood from lungs to left auricle.

132. Cytokinin helps in cell division.

133. Loop of Henle is a part of nephron.

134. Adrenaline is fight, flight and fright hormone which is secreted from adrenal medulla of the adrenal gland.

135. According to 10% law, only 10% of energy is transferred from one trophic level to other.

136. Jaya and Ratna are the varieties of rice.

137. Kattas, Kulhs and Surangam are ancient water harvesting structures.

138. A photosynthesizing plant cell also perform respiration. So photophosphorylation produces ATP during photosynthesis while oxidative and substrate level phosphorylation produces ATP during respiration.

139. Medulla oblongata (the part of hind brain) controls breathing rate.

140. 31 pair of nerves arise from spinal cord.

141. let a = 2k, b = 3k
     and x = 3m, y = 4m
     now $\dfrac{2ax - 25by}{3ay + 4bx} = \dfrac{12km - 300km}{24km + 36km} = \dfrac{-288km}{60km} = \dfrac{-24}{5}$

142. let AB = x
     Then $AB^2 + AD^2 = 4a^2$
     $\Rightarrow x^2 = 2a^2$
     $\Rightarrow x = \sqrt{2}a$
     Now, $EF^2 + EH^2 = 2a^2$
     $\Rightarrow 2EF^2 = 2a^2$
     $\Rightarrow EF = a$
     $\Rightarrow$ side = a
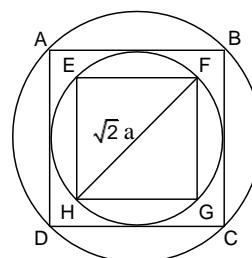
143. $a\cos\theta - b\sin\theta = c$ ...(i)
$a\sin\theta + b\cos\theta = x$ ...(ii)
squaring and adding (i) and (ii)
$a^2(\sin^2\theta + \cos^2\theta) + b^2(\sin^2\theta + \cos^2\theta) = c^2 + x^2$
$\Rightarrow x^2 = a^2 + b^2 - c^2$
$\Rightarrow x = \pm\sqrt{a^2 + b^2 - c^2}$

144. $x^2 - 3x + 2$
$\Rightarrow (x - 1)(x - 2)$ is a factor of $p(x) = x^4 - px^2 + q$
$\Rightarrow p(1) = 0$
$\Rightarrow p - q = 1$ ...(i)
and $p(2) = 0$
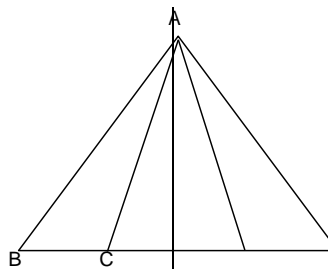$\Rightarrow 4p - q = 16$ ...(ii)
$\Rightarrow p = 5, q = 4$

145. $\because x_2 - x_1 = x_3 - x_2 = ... = x_n - x_{n-1} = d$ (common difference)
Now, $\dfrac{1}{x_1 x_2} + \dfrac{1}{x_2 x_3} + \dfrac{1}{x_3 x_4} + ... + \dfrac{1}{x_{n-1} x_n}$

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

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

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

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

$= \dfrac{1}{d}\left[\dfrac{x_1 + (n-1)d - x_1}{x_1 x_n}\right]$

$= \dfrac{n-1}{x_1 x_n}$

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

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

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

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

$\Rightarrow x^2 = 1$ and $y^2 = 1$

$\Rightarrow x^2 + y^2 = 1 + 1 = 2$

147. Let CP = x

Then $\dfrac{ar(\triangle APC)}{ar(\triangle ABD)} = \dfrac{\dfrac{1}{2} \times x \times height}{\dfrac{1}{2} \times 4x \times height}$

$\Rightarrow ar(\triangle APC) = \dfrac{1}{4} ar(\triangle ABD)$

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

$= \dfrac{1}{1+\dfrac{x^b}{x^a}+\dfrac{x^c}{x^a}} + \dfrac{1}{1+\dfrac{x^a}{x^b}+\dfrac{x^c}{x^b}} + \dfrac{1}{1+\dfrac{x^b}{x^c}+\dfrac{x^a}{x^c}}$

$= \dfrac{x^a}{x^a+x^b+x^c} + \dfrac{x^b}{x^b+x^a+x^c} + \dfrac{x^c}{x^c+x^b+x^a}$

$= \dfrac{x^a+x^b+x^c}{x^a+x^b+x^c} = 1$

149. CSA = $2\pi rh$

New CSA = $2\pi \left(r - \dfrac{r}{10}\right)\left(h + \dfrac{h}{10}\right) = 2\pi rh \left(\dfrac{9}{10}\right) \times \dfrac{11}{10}$

% change = $\dfrac{2\pi rh\left(1-\dfrac{99}{100}\right)}{2\pi rh} \times 100$

= 1% decrease

150. $a_1 = 0$, $a_2 = a_1 + d = d$, $a_3 = 2d$ .....$a_n = (n-1)d$

$\left[\dfrac{a_3}{a_2} + \dfrac{a_4}{a_3} + ... + \dfrac{a_n}{a_{n-1}}\right] - a_1\left[\dfrac{a_2}{a_2} + \dfrac{a_3}{a_3} + ... + \dfrac{a_n}{a_{n-2}}\right]$

$\left[\dfrac{2}{1} + \dfrac{3}{2} + \dfrac{4}{3} + ... + \dfrac{(n-1)}{(n-2)}\right] - d\left[\dfrac{d}{d} + \dfrac{d}{2d} + \square + \dfrac{1}{(n-3)d}\right]$

$\left[\dfrac{2}{1} + \dfrac{3}{2} + \square + \dfrac{(n-1)}{(n-2)}\right]\left[1 + \dfrac{1}{2} + \dfrac{1}{3} + ... + \dfrac{1}{(n-3)}\right]$

$\left[\left(1 + \dfrac{1}{1}\right) + \left(1 + \dfrac{1}{2}\right) + \left(1 + \dfrac{1}{3}\right) + ... + \left(1 + \dfrac{1}{n-2}\right)\right] - \left[1 + \dfrac{1}{2} + \dfrac{1}{3} + \square + \left(\dfrac{1}{n-3}\right)\right]$

$(n-2) + \left[1 + \dfrac{1}{2} + \dfrac{1}{3} + ... + \dfrac{1}{n-3}\right] - \left[1 + \dfrac{1}{2} + \dfrac{1}{3} + ... + \left(\dfrac{1}{n-3}\right)\right] + \dfrac{1}{n-2}$

$\Rightarrow (n-2) + \dfrac{1}{(n-2)}$

151. $AB = 2\sqrt{4r} = 4\sqrt{r}$

BC = $4\sqrt{r}$

$AC = 2\sqrt{r^2} = 2r$

$\therefore 4\sqrt{r} + 4\sqrt{r} = 2r$

$8\sqrt{r} = 2r \Rightarrow 4\sqrt{r} = r$

$\Rightarrow 16r = r^2 \Rightarrow r = 16$
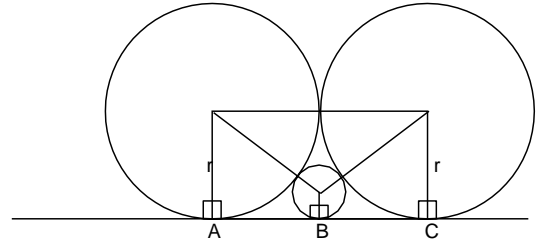
152. $\angle BAF = \dfrac{(6-2)}{6} \times 180 = 120°$

AF = 6 cm

$Ar(\triangle ABF) = \dfrac{1}{2} \times 6^2 \times \sin 120°$

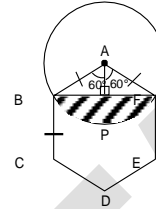$= 18 \times \dfrac{\sqrt{3}}{2} = 9 \times 1.73$

Area of minor segment $= \dfrac{120}{360} \times 3.14 \times 6^2 - 9 \times 1.73$

$= 3.14 \times 12 - 9 \times 1.73$

$= 37.48 - 9 \times 1.73$

$= 21.91$

≈ 22

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

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

$\dfrac{1}{y+z} - \dfrac{1}{x+y} = \dfrac{1}{x+y} - \dfrac{1}{z+x}$

$\dfrac{x+y-y-z}{(x+y)(y+z)} = \dfrac{z+x-x-y}{(x+y)(z+x)}$

$\dfrac{x-z}{y+z} = \dfrac{z-y}{z+x}$

$x^2 - z^2 = z^2 - y^2$

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

154. $x^2 = y + z$, $y^2 = z + x$ and $z^2 = x + y$

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

$\Rightarrow x + y + z = x(x + 1)$

$\dfrac{1}{x+1} = \dfrac{x}{x+y+z}$, $\dfrac{1}{y+1} = \dfrac{y}{x+y+z}$, $\dfrac{1}{z+1} = \dfrac{z}{x+y+z}$

$\dfrac{1}{x+1} + \dfrac{1}{y+1} + \dfrac{1}{z+1} = \dfrac{x}{x+y+z} + \dfrac{y}{x+y+z} + \dfrac{z}{x+y+z} = 1$

155. $x^3 + 4x + 1 = 0 \Rightarrow \alpha + \beta + \gamma = 0$

$\Rightarrow -\alpha = \beta + \gamma$

$\Rightarrow \dfrac{1}{\beta+\gamma} = \dfrac{-1}{\alpha}$

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

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

156. $$\frac{y+z}{x}+\frac{z+x}{y}+\frac{x+y}{z}$$

$$\left(\frac{y}{x}+\frac{x}{y}\right)+\left(\frac{z}{x}+\frac{x}{z}\right)+\left(\frac{z}{y}+\frac{y}{z}\right)\geq 2+2+2=6$$

157. $$\frac{3b+4c}{a}+\frac{4c+a}{3b}+\frac{a+3b}{4c}$$

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

$$\Rightarrow \left(\frac{3b}{a}+\frac{4c}{a}+\frac{4c}{3b}+\frac{a}{3b}+\frac{a}{4c}+\frac{3b}{4c}\right)$$

$$\Rightarrow \left(\frac{3b}{a}+\frac{a}{3b}\right)+\left(\frac{4c}{a}+\frac{a}{4c}\right)+\left(\frac{4c}{3b}+\frac{3b}{4c}\right)\geq 2+2+2=6$$

158. volume of cube = (side)^3 = 12 × side
$$\Rightarrow (side)^2 = 12$$
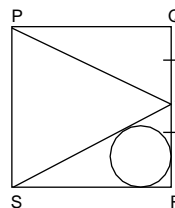Total surface area = 6 × (side)^2 = 6 × 12 = 72

159. $14^m - 6^m = 2^m(7^m - 3^m)$ is divisible by $2^3 = 8$

160. TR = 3 cm, SR = 6cm, TS = $\sqrt{6^2+3^2}=3\sqrt{5}$ cm

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

$$s = \frac{3+6+3\sqrt{5}}{2}=\frac{9+3\sqrt{5}}{2}$$

$$r = \frac{\Delta}{s}=\frac{9\times 2}{3\left(3+\sqrt{5}\right)}=\frac{6}{3+\sqrt{5}}$$

161. Democracy restored in Chile in 1988.

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

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

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

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

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

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

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

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

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

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

172. Livre was the currency of France.

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

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

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

176. "Damayanti" was made by Raja Ravi Verma.

177. Simon Commission arrived in 1928 in India.

178. Rinderpest is a term used for cattle disease.

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

180. Gudem Rebellion was led by Alluri Sitaram Raju.

181. "The Social Contract" book was written by Rousseau.

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

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

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

185. Education is considered as social infrastructure.

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

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

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

189. The first chairman of planning commission was Jawahar Lal Nehru.

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

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

192. OIL is an example of joint sector industry.

193. Pipelines reduces trans-shipment losses and delays.

194. Lake Victoria lies on the equator.

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

196. The Western cyclonic disturbances originate from Mediterranean sea.

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

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

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

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