FIITJEE Solutions to NTSE-I (2015)

(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
Correct way:	1	(1) (2) ● (4)
	Q.No.	Alternatives
Wrong way:	1	~~(1)~~ ~~(2)~~ (3 √) (4)

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

101. 4

101. At t = 0 u = 0
t = 4 s v = velocity of body
For time t = 0 to 4 s acceleration is constant & equal to 4 ms^{-2}
using v = u + at
v = 0 +4t
v = 16 ms^{-1}
For time t = 4 to 8 s acceleration is zero. Hence velocity is constant & equal to 16 ms^{-1}
using s = ut (s is distance)
s = 16 × (8 – 4) = 16 × 4 m
$\boxed{s = 64\ m}$.

102. 3

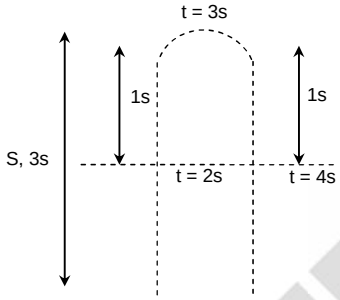
102. Magnitude of velocity is speed.
So if speed will change then velocity will always change.

103. 2

103. When two bodies collide then the force of interaction between them makes action – reaction pair.
And, force of action = force of reaction.

104. 3

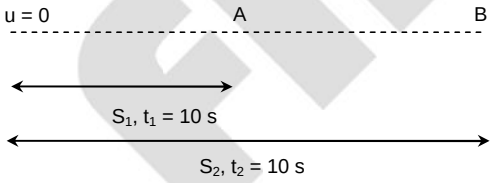
104. Time of accent = time of decent



Total time of fight = 6s
3 s to go up & 3 s to go down.
Hence 3 s – 2 s = 1 s is time to travel that 5 m up.

105. 4

105.



Force is constant that is acceleration is constant

$$S = ut + \frac{1}{2}at^2$$

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

$$S_2 = \frac{1}{2}a(20)^2$$

$$\frac{S_1}{S_2} = \frac{1}{4}$$

$\boxed{4S_1 = S_2}$.

106. 2

106. Volume = 20 cm^3 = 20 × $10^{-6}m^3$
Density of object = R.D × d_{water}
mass = v × d

$= 20 \times 10^{-6} \times 2.5 \times 10^{3}$ kg

Mass = 50 g.

107. 1

107. Velocity of sound in solid is maximum.

108. 3

108. To hear the echo minimum time delay should = $\frac{1}{10}$ s

$$\text{Velocity} = \frac{2\,d}{t}$$

$$346 = \frac{2 \times d}{\frac{1}{10}}$$

d = 17. 3 m.

109. 3

109. Change in kinetic energy = work done by all forces.

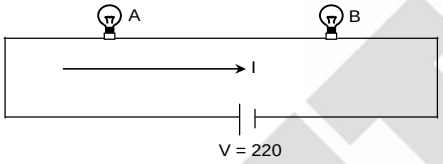
110. 1

110. $P = V^2 / R$

$V_A = V_B = V = 220$

$$P_A = \frac{V^2}{R_A}$$

$$P_B = \frac{V^2}{R_B}$$



Heat = $I^2 R$

$$\text{Heat ratio} = \frac{I^2 R_A}{I^2 R_B}$$

$$= \frac{R_A}{R_B} = \frac{P_B}{P_A} = \frac{3}{5}.$$

111. 1

111. Using left hand fleming rule

$F = q(v \times B)$

So, q is electron.

112. 4

112. Resistance depends only on dimensions & material.

113. 4

113. Least count = $\frac{2}{10} = 0.2$

So 1.9 is not multiple of 0.2.

114. 3
114. For plane mirror
$h_i = h_o$
$m = \frac{h_i}{h_o} = +1.$

115. 2
115. Anodising is the process of coating of a protective layer of aluminium oxide over aluminium metal electrolytically which protects the metal from further oxidation.

116. 4
116. 4^{th} option is wrong because 'XY' is AgCl in which the non-metallic part is chlorine which is greenish yellow in colour not violet in colour.

117. 4
117. Milk of magnesia is used as antacid & it is chemically $Mg(OH)_2$.

118. 2
118. On moving from left to right across the periods of modern periodic table the effective nuclear charge increases so atoms lose electrons with difficulty.

119. 4
119. aq. NaCl solution – Neutral
aq.Na_2CO_3 solution – Basic
aq.NH_4Cl solution – Acidic
aq.CaO solution – Basic

120. 3
120. Number of moles of methane = $\frac{16}{16}$ = 1 mole
1 mole = 6.023×10^{23} molecules
Number of e^- in 1 mole of CH_4 = $6.023 \times 10^{23} \times 10$
= 60.023×10^{23} electrons.

121. 3
121. PbS gets oxidized into $PbSO_4$, so it is reductant and H_2O_2 gets reduced to H_2O, so it is oxidant.

122. 3
122. On increasing temperature of pure water above 25°C the pH of water will decrease but it remains neutral.

123. 2
123. $Na_2O < CaO < ZnO < CO_2$, CO_2 is a non-metallic oxide which is an acidic oxide, ZnO is a metallic oxide but it is an amphoteric oxide and Na_2O, CaO are metallic oxide which are basic oxide.

124. 1
124. Option 1 is wrong because CH_3COOH and $HCOOCH_3$ will have different boiling point. CH_3COOH have higher boiling point because of the presence of hydrogen bonding.

125. 3
125. (% composition of isotope 1 × mass of isotope 1) + (% composition of isotope 2 × mass of isotope 2) = Average atomic mass.
x (16) + (1 – x) 18 = 16.2
(18 – 16.2) = 2x
1.8 = 2x
x = 0.9
x = 90%
y = 10%

126. 1
126. The path of light gets illuminated when passed through the blood solution because it's a colloidal solution which exhibits Tyndall effect.

127. 1
127. Total number of moles of CO_2 = $\frac{\text{Wt. in g}}{\text{Molecular wt.}}$

$= \frac{0.2}{44}$

$= 0.00454$

Number of moles removed = $\frac{10^{21}}{6.022 \times 10^{23}} = 0.00166$

Number of moles of CO_2 left = 0.00454 – 0.00166 = 0.00288 = 2.88×10^{-3}.

128. 2
128. Pepsin present in gastric juice helps in the digestion of proteins in the stomach. Hence, absence of pepsin will prevent the breakdown of proteins into peptides and amino acids.

129. 3
129. Membrane biogenesis requires the synthesis of several proteins and lipids. RER helps in the synthesis of various integral and peripheral proteins of the membrane. SER helps in the synthesis of lipid components of the membrane.

130. 1
130. Cerebellum helps in maintaining the posture and body balance. It enables us to make precise and accurate movements.

131. 1
131. Elimination of uric acid as the main nitrogenous waste material is called uricotelism. E.g. Insects, land reptiles, birds.

132. 4
132. Abscisic acid is a plant hormone which functions as a growth inhibitor. It promotes dormancy in seeds and buds.

133. 4
133. The decomposers in an ecosystem helps in the breakdown of organic substances present in the dead bodies of plants and animals into simple inorganic substances.

134. 2
134. Phloem helps in the translocation of organic and inorganic materials, hormones etc. multidirectionally i.e., which are synthesized in one part and exported to different parts of the plant body.

135. 3
135. *Apis mellifera* is the Italian variety while *Apis florae, Apis cerana indica* and *Apis dorsata* are Indian varieties.

136. 1
136. "Gymno" – naked, "Sperma" – seed. The seeds produced by these plants are naked and not enclosed within fruits.

137. 4
137. The time period from implantation till birth of the baby is known as gestation period also referred as pregnancy.

138. 2

138. The pollen tube carries the non motile male gamete to the female gamete as it enters the ovule in the ovary.

139. 3

139. The permanent stoppage of menstruation in the woman is called menopause. A woman stops ovulating at menopause and is the end of the reproductive life of the woman.

140. 1

140. Tracheids are the imperforated cells. They are less efficient in water transportation due to the absence of perforated walls.

141. 4

141. $(x - 1)(x - 3)(x - 5) \ldots\ldots\ldots(x - 99)$
zeroes of this polynomial are 1, 3, 5, ……99.
Coefficient of x^{49} will be – (sum of zeroes)
i.e. $-(1 + 3 + 5 + \ldots + 99)$
$= -(50^2) = -2500$

142. 1

142. $\alpha^2 + 3 = 5\alpha$
$\beta^2 = 5\beta - 3$
i.e. α, β are roots of $x^2 - 5x + 3 = 0$
$\Rightarrow \alpha + \beta = 5$ and $\alpha\beta = 3$

Now, $S = \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta} = \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha\beta}$

$S = \frac{25 - 6}{3} = \frac{19}{3}$

And $P = \frac{\alpha}{\beta} \times \frac{\beta}{\alpha} = 1$

Hence the req. quadratic equation is $x^2 - \frac{19}{3}x + 1 = 0$

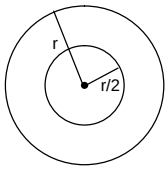
$3x^2 - 19x + 3 = 0$

143. 4

143. $x = 5^{1/3} + 2$
$\Rightarrow (x - 2)^3 = 5$
$x^3 - 8 - 3.x.2(x - 2) = 5$
$\Rightarrow x^3 - 6x^2 + 12x - 10 = 3$

144. 3

144. selected point will closer to the centre only if it lies in the inner circle of radius r/2



$P = \frac{\pi(r/2)^2}{\pi r^2} = \frac{1}{4}$

145. 1

145. $3\sin\theta + 4\cos\theta = 5$
$4\sin\theta - 3\cos\theta = x$
squaring and adding
$9\sin^2\theta + 16\cos^2\theta + 24\cos\theta\sin\theta + 16\sin^2\theta + 9\cos^2\theta - 24\cos\theta\sin\theta = 5^2 + x^2$
$9(\sin^2\theta + \cos^2\theta) + 16(\sin^2\theta + \cos^2\theta) = 25 + x^2$
$25 = x^2 + 25$
$\Rightarrow x^2 = 0$
$\Rightarrow x = 0$

146. 2

146. $\frac{2\sin\alpha}{1+\sin\alpha+\cos\alpha} = \lambda \Rightarrow \frac{2\sin\alpha}{(1+\sin\alpha)+\cos\alpha} \times \frac{(1+\sin\alpha)-(\cos\alpha)}{(1+\sin\alpha)-(\cos\alpha)}$

$\Rightarrow \frac{2\sin\alpha(1+\sin\alpha-\cos\alpha)}{(1+\sin\alpha)^2-(1-\sin^2\alpha)} = \frac{2\sin\alpha(1+\sin\alpha-\cos\alpha)}{(1+\sin\alpha)[1+\sin\alpha-1+\sin\alpha]}$

$= \frac{1+\sin\alpha-\cos\alpha}{1+\sin\alpha} = \lambda$

147. 2

147. For hemisphere, r = h $\therefore V_{hem} = \frac{2}{3}\pi r^3 = \frac{2}{3}\pi r^2 h$

$V_{cone} : V_{cyl} : V_{hem} = \frac{1}{3}\pi r^2 h : \pi r^2 h : \frac{2}{3}\pi r^2 h$

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

148. 3

148. $x + x + 1 + x + 2 + x + 3 + x + 4 + x + 5 + x + 6 = 1617$

$\Rightarrow 7x = 1596 \Rightarrow x = 228$

Required Numbers $\Rightarrow$ 228, 229, 230, 231, 232, 233 and 234

Prime numbers $\Rightarrow$ 229, 233

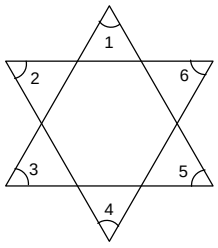
149. 4

149. $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6$

$\Rightarrow (\angle 1 + \angle 3 + \angle 5) + (\angle 2 + \angle 4 + \angle 6)$

$= 180° + 180°$

$= 360°$

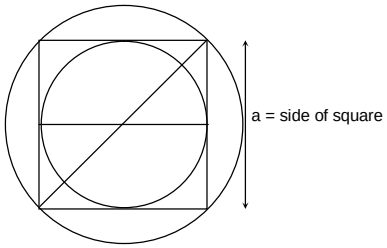


150. 2

150. In-radius = $\frac{a}{2}$

circum-radius = $\frac{a}{\sqrt{2}}$

Ratio $\frac{R_i}{R_c} = \frac{\frac{a}{2}}{\frac{a}{\sqrt{2}}} = 1 : \sqrt{2}$



151. Correct option is not available

151. $\frac{5}{7}$ of 122 = $\frac{5}{7} \times 122 = \frac{610}{7}$

$\frac{4}{5}$ of 70 = $\frac{4}{5} \times 70 = 56$

% greater = $\frac{\frac{610}{7} - 56}{56} \times 100$

$= \frac{610-392}{7\times 56}\times 100$

$= 55.6\%$

152. 1

152. $\bar{x} = 24, n = 100$

$x_1 + x_2 + x_3 + \ldots\ldots x_n = 24 \times 100 = 2400$

$$\frac{2.5\left(x_1 + x_2 + \ldots\ldots + x_{100}\right) + 2.5\times 4\times 100}{100}$$

$$\frac{\frac{5}{2}\times 2400 + \frac{5}{2}\times 4\times 100}{100}$$

$$\frac{120}{2} + \frac{20}{2} = 140$$

$60 + 10 = 70$

153. 2

153. $2^m - 2^{m-1} - 4 = 0$

$$2^m\left(1-\frac{1}{2}\right) - 4 = 0$$

$2^m = 8$

$m = 3$

$3^3 = 27$

$m^m = 27$

154. 4

154. $a^2 + b^2 = 1, c^2 + d^2 = 1$

$\frac{a^2+b^2}{2} \geq \sqrt{a^2b^2}$ (AM $\geq$ GM)

$a^2 + b^2 \geq 2ab$ …(i)

$c^2 + d^2 \geq 2cd$ …(ii)

$p^2 + q^2 \geq 2pq$ …(iii)

adding (i) + (ii) + (iii)

$a^2 + b^2 + c^2 + d^2 + p^2 + q^2 \geq 2(ab + cd + pq)$

$3 \geq 2(ab + cd + pq)$

$ab + cd + pq \leq \frac{3}{2}$

155. 2

155. $2AB = AB + AC$

$= AP + PB + AQ + QC$

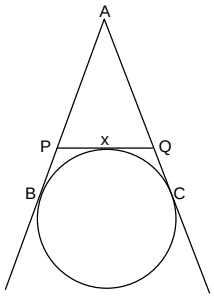
$= AP + PX + AQ + QX$

$= AP + AQ + PQ$

$2AB$ = Perimeter of ΔAPQ

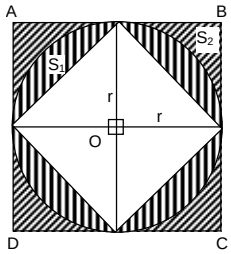
Perimeter $\Delta APQ = 2AB$

$= 2 \times 5 = 10$ cm



156. 2

156. Internal square will have diagonal equal to x.



Radius of circle = $\frac{x}{2}$

Side of internal square = $\frac{x}{\sqrt{2}}$

So area of internal square = $\frac{x^2}{2}$

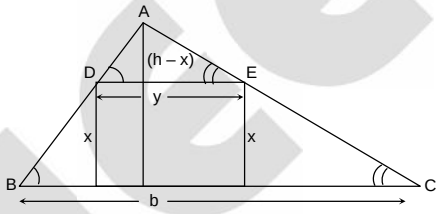
So wasted area = $x^2 - \frac{x^2}{2} = \frac{x^2}{2}$

157. 4

157. Total surface area of all cubes = 10 × T.S.A. of each cube
= $10 \times 6(\text{side})^2$
= $10 \times 6 \times (1)^2$
= 60 sq. unit

158. 1

158. Let the length of the rectangle = y
In ΔADE and ΔABC, we have
∠ADE = ∠ABC
∠AED = ∠ACB
By AA similarity, ΔADE ~ ΔABC
Thus, we get



$\frac{h-x}{h} = \frac{y}{b}$

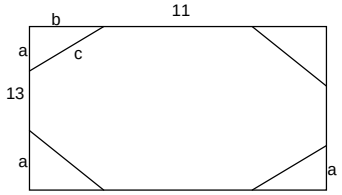
$\Rightarrow y = \frac{b(h-x)}{h}$

Thus, the area of the rectangle is

$xy = \frac{bx(h-x)}{h}$

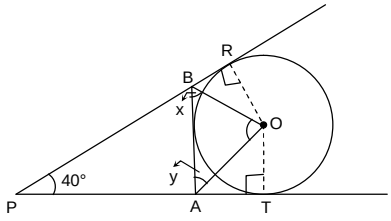
159. Option not available

159. $11 - 2b = 13 - 2a$
$b - a = -1$
$a - b = 1 \Rightarrow a = b + 1$
$a^2 + b^2 = c^2$
$b^2 + (b+1)^2 = (11 - 2b)^2$
$b^2 - 23b + 60 = 0$
$(b-3)(b-20) = 0$
b = 3 or 20 (not valid)
hence b = 3
a – b = 1
a = 4
Hence side = 13 – 2a
= 13 – 8 = 5 units



160. 4

160. O is the ex-centre of ΔPAB
Hence BO is bisector of ∠ABR
And AO is bisector of ∠TAB
And ∠ABR + ∠TAB = 360° – 140° = 220°
∴ ∠x + ∠y = 110°
so ∠ AOB = 70°



161. 1
161. Otto Van Bismarck was the Chief Minister of Germany.

162. 3
162. Giuseppe Mazzini – founded 'Young Italy'.

163. 2
163. "Swaraj Party" was founded by C. R. Das and Motilal Nehru.

164. 4
164. "National Song" of India is the part of novel Anandmath.

165. 1
165. "Mein Kampf" is the autobiography of Hitler.

166. 4
166. Gandhiji's Champaran Satyagrah was associated with Indigo farming.

167. 1
167. Vienna Congress hosted by Austrian Chancellor Duke Metternich.

168. 2
168. The founder of Hoa Hao movement was Huynh Phu So.

169. 2
169. Lord Irwin announced dominion status for India in Oct 1929.

170. 3
170. James Augustus Hicky began to edit the Bengal Gazette from 1780.

171. 3
171. FICCI was formed in 1927.

172. 2
172. Majuli in the Brahmaputra river is the largest inhabited riverine island in the world.

173. 4
173. Mica is a mineral made up of a series of plates or leaves.

174. 3
174. Core is also called "NIFE".

175. 3
175. The North-East winds pick up moisture while crossing Bay of Bengal.

176. 2
176. Meghalaya does not touch Myanmar.

177. 3
177. East West Corridor connecting Silcher (Assam) and Porbander (Gujarat).

178. 1
178. The Wular lake in Jammu and Kashmir is the result of the tectonic activity.

179. 1
179. Dakshin Gangotri is the name of the Indian Research centre located in Antarctica.

180. 2
180. Over irrigation in responsible for turning Arable land saline in the irrigated zone of India.

181. 2
181. The Monazite sands of Kerala is rich in thorium.

182. 3
182. Sandalwood is an example of deciduous forest.

183. 2
183. At present most of the countries in the world have democratic government.

184. 3
184. New Zealand started 'Adult Franchise' (1893).

185. 2
185. President of India is elected by all the elected members of parliament and state legislature.

186. 1
186. 'End of Racial Discrimination' is a part of Right to Equality.

187. 1
187. State List contains the subject agriculture and irrigation.

188. 3
188. 'Singhali and Tamil' languages are main the languages of Sri Lanka.

189. 1
189. Birth is the basis of Social Division.

190. 4
190. In India 'Women's reservation quota is available in Panchayati Raj Organisation.

191. 3
191. Community government is third kind of government in Belgium.

192. 3
192. Transparency means – When decisions are taken with honesty and proper follow of rules.

193. 2
193. Alliance means - Many parties join hands together to contest the election.

194. 3
194. The financial year in India starts from 01 April.

195. 3
195. Tertiary sector is engaged in production of services.

196. 2
196. Central statistical organization estimates national income in India.

197. 1
197. The rate at which Central Bank gives credit to commercial banks is called bank rate.

198. 3
198. Fifth five year plan was suspended one year before the time schedule. It was followed from 1974 to 1979. In 1978 the newly elected Morarji Desai government rejected the plan.

199. 2
199. NABARD is a Bank.

200. 1
200. Helping the poorest of poor was the aim of 'Antyodaya Programme'.