SOLUTIONS

NTSE TEST

FULL TEST-1

Test Date : 06.10.2017

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MENTAL ABILITY

1.	**(A)**	**2.**	**(D)**	**3.**	**(A)**	**4.**	**(C)**	**5.**	**(D)**	**6.**	**(A)**	**7.**	**(C)**
8.	**(B)**	**9.**	**(C)**	**10.**	**(C)**	**11.**	**(B)**	**12.**	**(A)**	**13.**	**(A)**	**14.**	**(C)**
15.	**(C)**	**16.**	**(A)**	**17.**	**(B)**	**18.**	**(C)**	**19.**	**(C)**	**20.**	**(C)**	**21.**	**(D)**
22.	**(B)**	**23.**	**(B)**	**24.**	**(C)**	**25.**	**(B)**	**26.**	**(B)**	**27.**	**(C)**	**28.**	**(B)**
29.	**(D)**	**30.**	**(D)**	**31.**	**(D)**	**32.**	**(A)**	**33.**	**(A)**	**34.**	**(C)**	**35.**	**(B)**
36.	**(C)**	**37.**	**(C)**	**38.**	**(A)**	**39.**	**(B)**	**40.**	**(C)**	**41.**	**(A)**	**42.**	**(C)**
43.	**(A)**	**44.**	**(A)**	**45.**	**(B)**	**46.**	**(A)**	**47.**	**(B)**	**48.**	**(C)**	**49.**	**(C)**
50.	**(B)**												

ENGLISH

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

PHYSICS

101. (C)

$2mg - T = 2\,ma$ ...(i)

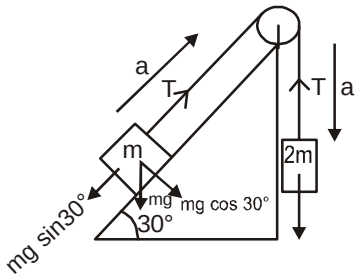
$T - mg\sin 30° = ma$ ...(ii)

from (i) and (ii)

$$2mg - \frac{mg}{2} = 3\,ma$$

$$\Rightarrow \frac{3mg}{2} = 3ma$$

$$\therefore \boxed{a = \frac{g}{2}}$$



102. (B)

$$g = \frac{4}{3}\pi R.\rho.G. \quad \text{...(i)}$$

$$g' = \frac{4}{3}\pi R'\rho'G \quad \text{...(ii)}$$

Given $\rho' = 2\rho$

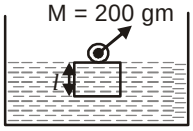
and $g' = g$

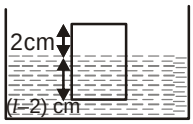
$$\therefore \quad \frac{4}{3}R\rho G = \frac{4}{3}\pi R'\rho'G$$

or $R' = \frac{R\rho}{\rho'} = \frac{R\rho}{2\rho}$ $\therefore$ $\boxed{R' = \frac{R}{2}}$

103. (C)

$\because$ Let the mass of the cube be 'm' gm and length of edge be 'l' cm then





$(m + 200)g = \rho l^3 g$ ...(i) $mg = \rho\ (l-2)\ l^2\ g$ ...(ii)

from (i) & (ii)

$200 = \rho\left[l^3 - (l-2)\ l^2\right]$

for water $\rho = 1\ gm/cm^3$

$200 = l^3 - l^3 + 2l^2$

or $\boxed{l = 10\ cm}$

104. (C)

Total resistance of the circuit

$R = [\{(4\ ||\ 4) + 4\}\ ||\ 4] + 1.6 = 4\ \Omega$

Total current through battery $= \frac{4}{4} = 1\ Amp$. and shown current.

$I = 1 \times \frac{4}{4+6} = 0.4\ Amp.$

105. (C)

$$\frac{\frac{1}{2}g(t-1)^2}{\frac{1}{2}gt^2} = \frac{1}{2} \qquad \Rightarrow t^2 = 2(t-1)^2$$

$$\Rightarrow \left(\frac{t}{t-1}\right)^2 = 2 \qquad \Rightarrow \frac{t}{t-1} = \pm\sqrt{2}$$

Taking $\frac{t}{t-1} = +\sqrt{2}$

$\Rightarrow t = \sqrt{2}\ (t-1)$

$\Rightarrow t = \frac{\sqrt{2}}{\sqrt{2}-1} = (2+\sqrt{2})s$

Taking $\frac{t}{t-1} = -\sqrt{2}$

$\Rightarrow t = -\sqrt{2}\ (t-1)$

$\Rightarrow t = \frac{\sqrt{2}}{\sqrt{2}+1} = (2-\sqrt{2})s$

which is not possible.

Hence option (C) is correct.

106. (B)

$$d = \frac{vt}{2}$$

$$d = \frac{1400\ m/s \times 15\ s}{2} = 10.5 Km$$

107. (A)

$R_t - R_0 \propto \Delta t$

and $R_t = R_0(1 + \alpha \Delta t)$

108. (B)

$P = P_0 + \rho gh$

Pressure decreases linearly when we move from sea bed to the surface of sea.

109. (B)

$$B = \frac{\mu_0 I}{4R} \quad \Rightarrow \frac{4 \times 3.14 \times 4 \times 10^{-7}}{4 \times 0.5 \times 10^{-2}} = 2.51 \times 10^{-4}\ T$$

110. (C)

$$\frac{v}{u} = 2 \Rightarrow v = 2u \qquad ...(i)$$

$u + v = 10$

$$u = -\frac{10}{3}\ cm$$

111. (A)

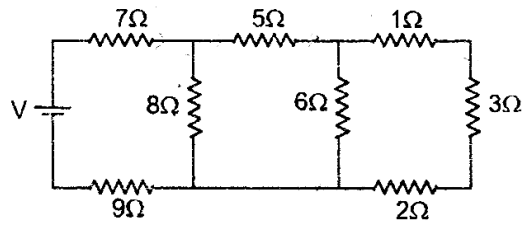
$$\alpha = \frac{R_2 - R_1}{R_1 t_2 - R_2 t_1}$$

$$\Rightarrow \quad 10^{-2} = \frac{1.2 - 1}{1 \times t_2 - 1.2 \times 20}$$

$$\Rightarrow \quad t_2 - 24 = \frac{0.2}{10^{-2}}$$

$\Rightarrow \quad t_2 = 20 + 24 = 44°C$

112. (B)



Current through 3Ω resistor is $0.25\ A$

$\Rightarrow$ Current through 5Ω resistance is

$$I_{5\Omega} = I_{6\Omega} + I_{3\Omega} = 0.25 + 0.25 = 0.5\ A$$

$\Rightarrow$ Current through 7Ω resistance is

$$I_{7\Omega} = I_{5\Omega} + I_{8\Omega} = 0.5 + 0.5 = 1\ A$$

$\therefore$ $V = I \times R_{eq} = 1A \times 20\ \Omega = 20\ V$

113. (C)

$$\sin\theta_c = \frac{\mu_r}{\mu_d} = \frac{4/3}{3/2} = \frac{8}{9}$$

$\Rightarrow \theta_c = \sin^{-1}(8/9)$

CHEMISTRY

114. (A)

Unlike other metal carbonates that usually decomposes into metal oxides liberating carbon dioxide, silver carbonate on heating decomposes into elemental silver liberating mixture of carbon dioxide and oxygen gas as

$$\underset{MW=276g}{Ag_2CO_3(s)} \xrightarrow{Heat} 2Ag(s) + \underset{2\times108=216g}{CO_2(g)} + \frac{1}{2}O_2(g)$$

Hence, 2.76 g of Ag_2, CO3 on heating will give

$$\frac{216}{276} \times 2.76 = 2.16\,g\ Ag \text{ as residue.}$$

115. (A)

The balanced chemical reaction of zinc with sulphuric acid and NaOH are

$$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2(g)\uparrow$$

$$Zn + 2NaOH + 2H_2O \longrightarrow Na_2\left[Zn(OH)_4\right] + H_2(g)\uparrow$$

Since one mole of H2 (g) is produced per mole of zinc with both sulphuric acid and NaOH respectively, hydrogen gas is produced in the molar ratio of 1 : 1 in the above reactions.

116. (B)

From the given relative abundance, the average weight of Fe can be calculated as

$$A = \frac{25\times5 + 56\times90 + 57\times5}{100} = 55.95$$

117. (C)

$$\text{Molarity} = \frac{\text{Moles of solute}}{\text{Volume of solution}(L)} \text{moles of urea} = \frac{120}{60} = 2$$

weight of solution = weight of solvent + weight of solute

$$= 1000 + 120 = 1120\ g$$

$$\Rightarrow \text{Volume} = \frac{1120\,g}{1.15\,g/mL} \times \frac{1}{1000\,mL/L}$$

$$= 0.974\ L$$

$$\Rightarrow \text{Molarity} = \frac{2.000}{0.974} = 2.05\,M$$

118. (D)

Neutron has no charge, hence e/m is zero for neutron. Next, α -particle (He^{2+}) has very high mass compared to proton and electron, therefore very small e/m ratio. Proton and electron have same charge (magnitude) but former is heavier, hence has smaller value of e/m.

$$\frac{e}{m}: n < \alpha < p < e$$

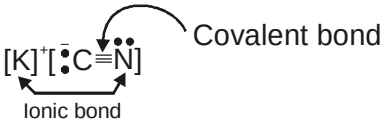
119. (A)

$$Cr(24): \underbrace{1s^2 2s^2 2p^6 3s^2 3p^6}_{Ar}\ 3d^5\ 4s^1$$

The above configuration is exception to aufbau's principle.

120. (C)

In KCN, the bonding between potassium ion and cyanide ion is ionic while carbon and nitrogen are covalently bonded in cyanide ion as :



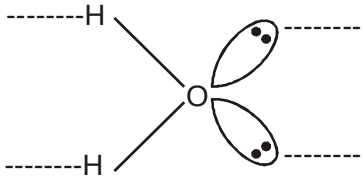
121. (A)

CO has a total of 14 electrons and CN^- also has 14 electrons :

$$C(6e^-) + N(7e^-) + e^- \longrightarrow CN^-(14e^-)$$

122. (B)

A water molecule can form at the most four H-bonds :



Four sites of H-bonding

123. (C)

Gun metal has a composition of Cu = 88%

Sn = 10%, Zn = 2%

124. (D)

Zinc sulphate hepta hydrate ($ZnSO_4.7H_2O$) is called white vitriol. When it is heated with barium sulphide, it forms a white pigment lithopone.

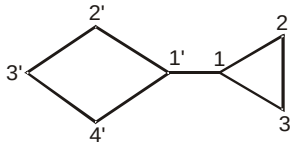
125. (D)

C_nH_{2n}

e.g. cyclopropane is C_3H_6 : $H_2C\overset{CH_2.}{\diagup\diagdown}CH_2.$

cyclobutane is C_4H_8 : $CH_2 - CH_2$ / $CH_2 - CH_2$

126. (A)



1-cyclopropyl cyclobutane

BIOLOGY

127. (D)

128. (B)

129. (B)

Afferent nerve fiber in also known as sensory nerve, which conducts impulse from receptor to CNS.

130. (D)

Basal Metabolic Rate (BMR) in the amount of energy expended while the rest.

131. (A)

Brain cell has lack of centrosome.

132. (B)

Function of cerebellum is to maintain body balance & posture.

133. (B)

Endometrium is the innermost lining of uterus.

134. (A)

Since, horses only ingest plant fats hence very little amount of bile is needed as compared to what a carnivore ingesting animal fats require.

135. (A)

136. (A)

137. (B)

Sex cell in formed by meiotic cell division.

138. (C)

139. (C)

140. (C)

Endoperm is triploid structure, whereas zygote is diploid.

MATHEMATICS

141. (B)

$a = 8 + \sqrt{60}$

$a = 8 + 2\sqrt{15} = \left(\sqrt{5} + \sqrt{3}\right)^2$

$\therefore \sqrt{a} = \sqrt{5} + \sqrt{3} \Rightarrow \frac{1}{\sqrt{a}} = \frac{1}{\sqrt{5}+\sqrt{3}} = \frac{\sqrt{5}-\sqrt{3}}{2}$

Now $\sqrt{a} - \frac{1}{\sqrt{a}} = \sqrt{5} + \sqrt{3} - \left(\frac{\sqrt{5}-\sqrt{3}}{2}\right)$

$= \frac{2\left(\sqrt{5}+\sqrt{3}\right) - \left(\sqrt{5}-\sqrt{3}\right)}{2} = \frac{2\sqrt{5}+2\sqrt{3}-\sqrt{5}+\sqrt{3}}{2} = \frac{\sqrt{5}+3\sqrt{3}}{2}$

142. (A)

$\log\left(A^B B^C C^A\right) + \log\left(\frac{1}{ABC}\right)$

$\Rightarrow \log\left(\frac{A^B.B^C.C^A}{ABC}\right) = \log\left[A^{B-1}.B^{C-1}.C^{A-1}\right]$

143. (B)

$x^2 = y + z$ — (I)
$y^2 = z + x$ — (II)
$z^2 = x + y$ — (III)

(I) – (II) $x^2 - y^2 = y - x \Rightarrow x + y + 1 = 0$
(II) – (III) $y^2 - z^2 = z - y \Rightarrow y + z + 1 = 0$
(III) – (I) $z^2 - x^2 = x - z \Rightarrow z + x + 1 = 0$

$\therefore \frac{1}{x+y} + \frac{1}{y+z} + \frac{1}{z+x} = \frac{1}{-1} + \frac{1}{-1} + \frac{1}{-1} = -3$

144. (D)

$kx - 12 = 3k$

$kx = 3k + 12$

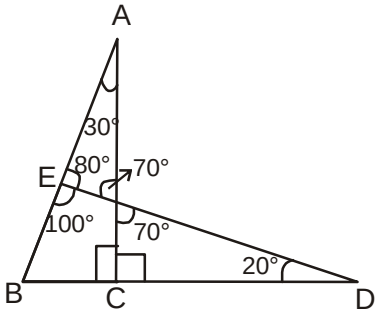
$x = \frac{3k+12}{k} = 3 + \frac{12}{k}$

For x to be integer

k= 1,2,3,4,6,12

$\therefore$ Number of positive integral value of k=6

145. (B)



clearly $\angle BDE = 20°$

146. (C)

$\therefore P \equiv \left(\frac{2\lambda+1}{\lambda+1}, \frac{7\lambda+3}{\lambda+1}\right)$

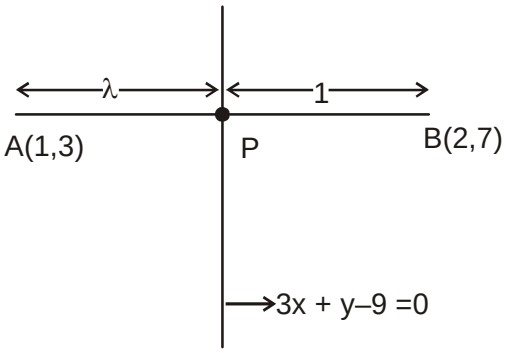
Since P lies on line $3x + y - 9 = 0$

$\therefore 3\left(\frac{2\lambda+1}{\lambda+1}\right)+\left(\frac{7\lambda+3}{\lambda+1}\right)-9=0$

$6\lambda + 3 + 7\lambda + 3 - 9\lambda - 9 = 0$

$4\lambda - 3 = 0 \Rightarrow \lambda = \frac{3}{4}$

$\therefore$ Ratio is $3 : 4$ Ans



147. (C)

$(5x + 2)^2 + (3x - 1)^2 = (5x + 2)^2 + (2x + 1)^2$

$\therefore x = 2$

Side = $\sqrt{12^2 + 5^2} = 13$ cm

Perimeter = 4 × 13 cm = 52 cm

148. (B)

$a^2 - 6a - 1 = 0$

$\Rightarrow a = \frac{6 \pm \sqrt{36+4}}{2} = \frac{6 \pm 2\sqrt{10}}{2}$

$a = 3 \pm \sqrt{10}$

Case 1,

If $a = 3 + \sqrt{10}$

$a^2 = 19 + 6\sqrt{10}$

$\frac{1}{a^2} = \frac{1}{19+6\sqrt{10}} = \frac{19-6\sqrt{10}}{19^2 - 36 \times 10} = 19 - 6\sqrt{10}$

$\Rightarrow a^2 + \frac{1}{a^2} = 19 + 6\sqrt{10} + 19 - 6\sqrt{10} = 38$

Case 2,

If $a = 3 - \sqrt{10} \Rightarrow a^2 = 19 - 6\sqrt{10}$

$\frac{1}{a^2} = 19 + 6\sqrt{10}$

$\Rightarrow a^2 + \frac{1}{a^2} = 38$

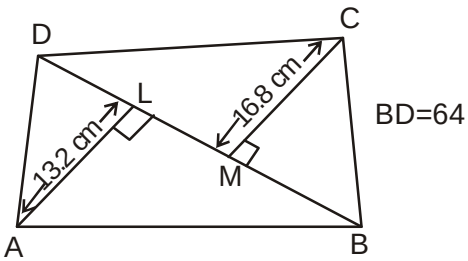
149. (D)

$Ar(\square ABCD) = Ar(\Delta ABD) + Ar(\Delta BCD)$

$= \frac{1}{2} \times 64 \times 13.2 + \frac{1}{2} \times 64 \times 16.8$

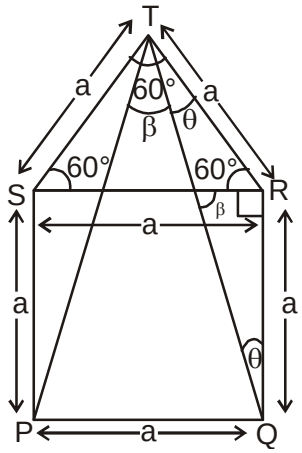
$= 32 \times 13.2 + 32 \times 16.8$

$= 32\,[13.2 + 16.8] = 32 \times 30 = 960$



150. (D)

In triangle QRT, $\theta + \theta + 90° + 60° = 180° \Rightarrow \theta = 15°$



151. (C)

$B_1, B_2, B_3, \ldots\ldots\ldots\ldots B_{10}$

$$\bar{X} = \frac{B_1 + B_2 + B_3 + \ldots\ldots\ldots\ldots + B_{10}}{10} = 100$$

$$\bar{X}' = \frac{B_1 + B_2 + \ldots\ldots\ldots\ldots + B_{10} + 10}{10} = 100 + \frac{10}{10} = 101$$

152. (A)

$$\overline{ax} = \frac{ax_1 + ax_2 + ax_3 + \ldots\ldots\ldots ax_n}{n}$$

$$\Rightarrow ax_1 + ax_2 + ax_3 + \ldots\ldots\ldots ax_n = na\bar{x}$$

Now $(ax_1 - a\bar{x}) + (ax_2 - a\bar{x}) + (ax_3 - a\bar{x}) + \ldots\ldots\ldots + (ax_n - a\bar{x})$

$= (ax_1 + ax_2 + \ldots\ldots\ldots\ldots + ax_n) - na\bar{x}$

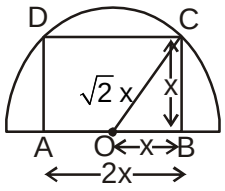
$= na\bar{x} - na\bar{x} = 0$

153. (A)

P(R) = Perimeter (rectangle) = 2 [2x + x] = 6x

D(S) = Diameter (Semicircle) $= 2\left[\sqrt{2}x\right] = 2\sqrt{2}x$

$$\therefore \frac{P(R)}{D(S)} = \frac{6x}{2\sqrt{2}x} = \frac{3}{\sqrt{2}} = 3 : \sqrt{2}$$



154. (A)

inner square having sides = 20

$\therefore$ Area (square) = 400 cm^2

$\text{Area}(4 \text{ circle}) = 4(\pi 5^2) = 25 \times 4\pi = 100\pi$

$\therefore \text{Area shaded region} = (400 - 100\pi)\,cm^2$

$= (400 - 100\pi)\ cm^2$

155. (C)

$n(S) = \{10, 11, 12, ...99\} = 90$

$n(E) = \{12, 15, ...99\}$

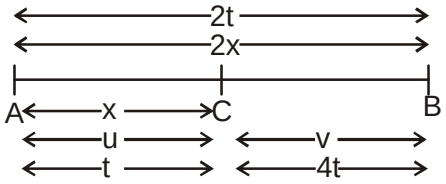
$t_n = a + (n-1)d$

$99 = 12 + (n-1) \times 3$

$$\frac{87}{3} = n - 1 \Rightarrow n = 29 + 1 = 30$$

$$P(E) = \frac{n(E)}{n(S)} = \frac{30}{90} = \frac{1}{3}$$

156. (A)



Now

$x = ut$ —(I)

$x = v \times 4t$ —(II)

(I)/(II) $\quad 1 = \frac{u}{4v} \Rightarrow \frac{u}{v} = \frac{4}{1}$

$\therefore$ Ratio = 4 : 1

157. (D)

$\sin x + \sin y = a$ —(I)

$\cos x - \cos y = b$ —(II)

$$\text{Now } \frac{1}{2}\left[2 - (\sin x + \sin y)^2 - (\cos x - \cos y)^2\right]$$

$$\frac{1}{2}\left[2 - \left[1 + 1 - 2\cos x \cos y + \sin x \sin y\right]\right]$$

$$= \frac{1}{2}\left[2 - 2 + 2(\cos x \cos y - \sin x \sin y)\right]$$

$$= \frac{1}{2}\left[2\cos(x + y)\right] = \cos(x + y)$$

158. (D)

$\sin x + \sin^2 x = 1$

$\sin x = \cos^2 x$ —(I)

$$\text{Now } \cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x + 2\cos^4 x + \cos^2 x - 2$$

$$\sin^6 x + \sin^5 x + 3\sin^4 x + \sin^3 x + 2\sin^2 x + \sin x - 2$$

$$= \sin^3 x(\sin x + 1)^3 + 2\sin^2 x + \sin x - 2$$

$$= (\sin x + \sin^2 x)^3 + 2\sin^2 x + \sin x - 2$$

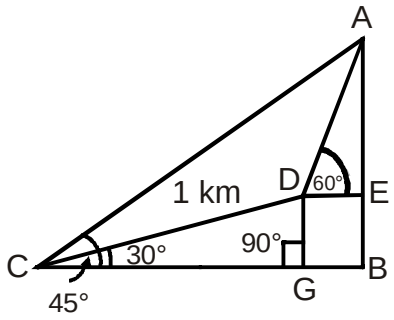
$$= 1 + 2\sin^2 x + \sin x - 2 = (\sin^2 x + \sin x + 1 - 2) + \sin^2 x = (1 + 1 - 2) + \sin^2 x = \sin^2 x$$

159. (A)

Let A be the summit and C be the foot of the mountain. Let $AB \perp CB$ and $\angle ACB = 45^0$. Let D be the point such that

$\angle DCB=30^0$ and DC=1km. Then $\angle ADE=60^0$

Draw ΔGCD



$$\frac{DG}{DC} = \sin 30^0 \text{ or } \frac{DG}{1} = \frac{1}{2}$$

$$\therefore DG = \frac{1}{2} = EB$$

Thus EB=1/2km=0.5 km

In right $\angle d \Delta$ ABC, $\angle BAC=180^0–90^0–45^0=45^0$

In right $\angle d \Delta$ DEA, $\angle DAE=180^0–90^0–60^0=30^0$

$\therefore \angle DAC= \angle BAC– \angle DAE=45^0–30^0=15^0$

and $\angle DCA= \angle BCA– \angle BCD=45^0–30^0=15^0$

$\therefore \angle DAC= \angle DCA$

$\therefore$ DA=DC=1km

Now in right ΔAED

$$\frac{AE}{AD} = \sin 60^0 \text{ or } \frac{AE}{1} = \frac{\sqrt{3}}{2} = \frac{1.732}{2} = 0.866\,\text{km} \quad \text{.....(2)}$$

From (1) and (2) we get

Height of the mountain AB=AE+EB=(0.866+0.5)km=1.366km

160. (A)

$$4n - \frac{n(n+1)}{2n} = \frac{8n-n-1}{2} = \frac{7n-1}{2}$$

161. (A)	**162. (D)**	**163. (D)**	**164. (C)**	**165. (B)**	**166. (C)**	**167. (D)**
168. (A)	**169. (C)**	**170. (D)**	**171. (A)**	**172. (A)**	**173. (A)**	**174. (B)**
175. (B)	**176. (C)**	**177. (A)**	**178. (C)**	**179. (B)**	**180. (B)**	**181. (D)**
182. (D)	**183. (C)**	**184. (C)**	**185. (C)**	**186. (B)**	**187. (B)**	**188. (C)**
189. (B)	**190. (B)**	**191. (C)**	**192. (D)**	**193. (A)**	**194. (B)**	**195. (D)**
196. (B)	**197. (D)**	**198. (B)**	**199. (B)**	**200. (B)**		