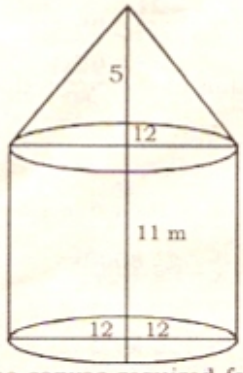
$$\therefore \frac{x+5}{\tan 60^\circ} = \frac{x}{\tan 45^\circ}$$

$$\Rightarrow \frac{x+5}{\sqrt{3}} = x \Rightarrow x+5 = x\sqrt{3}$$

$$\Rightarrow x = \frac{5}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} + \frac{5\sqrt{3}+5}{3-1} = \frac{5(\sqrt{3}+1)}{2} = 6.83$$

117. 2;



Area of the canvas required for the tent

$$= \pi \times 12 \times \sqrt{12^2+5^2} + 2\pi \times 12 \times 11$$

$$= \pi \times 12 \times 13 = \pi \times 24 \times 11$$

$$= 156\pi + 264\pi = 420\pi$$

$$= 420 \times \frac{22}{7} = 1320 \text{ sq m}$$

118. 2; $71B + 73G = 71.8(B+G)$

$$\Rightarrow 0.8B = 1.2G \Rightarrow \frac{B}{G} = \frac{1.2}{0.8} = \frac{3}{2}$$

119. 3; Mean salary of the remaining 20 workers

$$= \frac{75 \times 5680 - 25 \times 5400 - 30 \times 5700}{20}$$

$$= \frac{15 \times 5680 - 5 \times 5400 - 6 \times 5700}{4}$$

$$= 15 \times 1420 - 5 \times 1350 - 6 \times 1425$$

$$= 15[1420 - 450 - 2 \times 285]$$

$$= 15[1420 - 450 - 570]$$

$$= 15 \times 400 = 6000$$

120. 1; Prob. that the bulb drawn is defective

$$= \frac{16}{200} = \frac{2}{25}$$

Prob. that the bulb drawn is non-defective

$$= 1 - \frac{2}{25} = \frac{23}{25}$$

121. 2; 9745 – 9360 = 385 thousand tonnes of shapes.

122. 4; Demand grows from 400 thousand tonnes of RM in 1999-2000 to 450 thousand tonnes of RM in 2003-04.

∴ Expected percentage growth rate

$$= \frac{50}{400} \times 100 = 12.5$$

123. 3; Shortfall of shapes in 1999-2000 = 6960 – 5725 = 1235 thousand tonnes.

Shortfall of shapes in 2003-04 = 9745 – 9360 = 385 thousand tonnes

∴ Change in the shortfall of shapes from 1999 – 2000 to 2003 – 04 = – 850 thousand tonnes

Percentage change in shortfall of shares

$$= -\frac{850}{1235} \times 100 \approx -68$$

124. 1; (1) The demand for shapes as a percentage of the total demand for steel was 59.4% for 1999-2000, while it was 59% for 2003-04, which is almost the same as for 1999–2000.

(3) The demand for 1999-2000 was 3.4%, Railway Materials as a percentage of the total demand for 1999-2000 was 3.4%, while it was 2.72% for 2003–04.

(4) The rate of growth in demand for shapes is 40%, while it is 63.5% in supply of shapes.

125. 4; **The average speed maintained by the train**

Between Stations	**Average speed**
E and F	106 km in $1\frac{1}{4}$ hours, ie $\frac{106 \times 4}{5} = 84.8$ km/hr
F and G	176 km in 2 hours, ie 88 km/hr
G and H	110 km in $1\frac{1}{4}$ hours, ie $\frac{110 \times 4}{5} = 88$ km/hr

126. 4; Overall average speed of the entire trip: 860 km in 11 hours 25 minutes, ie $11\frac{25}{60}$ hours, ie $11\frac{5}{12}$ hours, ie $\frac{137}{12}$ hours, ie

$$\frac{860 \times 12}{137} = 75.3 \text{ km/hr}$$

Average speed maintained by the train

Between Stations	**Average Speed**
A and B	140 km in $1\frac{2}{3}$ hours,

ie, $\frac{5}{3}$ hours,

ie, $\frac{140\times3}{5}=84$ km/hr

B and C 91 km in $1\frac{1}{3}$ hours,

ie $\frac{4}{3}$ hours, ie

$91\times\frac{3}{4}=68.25$ km/hr

C and D 149 km in $1\frac{43}{60}$ hours,

ie $\frac{103}{60}$ hours, ie

$\frac{149\times60}{103}=86.8$ km/hr

D and E 88 km in $1\frac{1}{3}$ hours,

ie $\frac{4}{3}$ hours, ie $\frac{88\times3}{4}=66$ km/hr

For E and F, F and G, G and H, See Q. 125.

127. 3; The train stops at station B for 3 minutes more.
The train stops at station C for 36 sec more.
The train stops at station D for 1.5 minutes more.
The train stops at station E for 3 minutes more.
The train stops at station F for 3 minutes more.
The train stops at station F for 4.5 minutes more.
In all, the train stops for 15 min and 36 sec more.
∴ The train will reach city H after departing from city A at 16 hours 40 min 36 sec ie 16 hours 41 min approx.

128. (None): Let the distance between city H and city M be x km. Time taken by the train from H to A (Return)

$=\frac{860}{90}=\frac{86}{9}$ hrs $=9\frac{5}{9}$ hrs

Given,

The train reaches from city A (Return) at 2.25 AM, ie at 26 : 25 hours)

(Return) at 2.25 AM, ie at 26 : 25 hours.)

⇒ The train reaches at H (Return)

at $26\frac{25}{60}-9\frac{5}{9}=\left(26\frac{5}{12}-9\frac{5}{9}\right)$ hrs,

ie $\frac{317}{12}-\frac{86}{9}=\frac{951-344}{36}$

$=\frac{607}{36}$ hrs $=16\frac{31}{36}$ hours

Time taken from H to M and back

$\frac{607}{36}-16\frac{5}{12}=\frac{607}{36}-\frac{197}{12}$

$=\frac{607-591}{12}=\frac{16}{12}=\frac{4}{3}$ hrs.

Since the train runs from G to H @ 88 km/hr, therefore the train runs @ 88 km/hr from city H to city M also.
Also speed between city M and city H = 90 km/hr.

$\Rightarrow \frac{x}{80}+\frac{x}{90}=\frac{4}{3}\Rightarrow x=59$ km

129. 3; From W_2 to X:
20 units shipped @ Rs 5 per unit = Rs 100
From W_2 to Y:
80 units shipped @ Rs 3 per unit = Rs 240.
From W_2 to Z:
130 units shipped @ Rs 7 per unit = Rs 910
[**Note:** From W_1 to Z, 70 units can be shipped.
From W_3 to Z, 50 units can be shipped. Outlet Z requires 250 units only. Therefore from W_3 to Z, 250 – 70 – 50 = 130 units are shipped]
∴ Minimum cost at which W_2 can supply all the units = 100 + 240 + 910 = Rs 1250.

130. 1; W_1 can supply 150 units to Y @ Rs 5 per unit
W_2 can supply 250 units to Z @ Rs 7 per unit
W_3 can supply 300 units to X @ Rs 8 per unit.
∴ Total cost be incurred = 750 + 1750 + 2400 = Rs 4900

131. 3; Cost of transporting 100 units from W_1 to Y = 100 × 5 = Rs 500
Cost of transporting 100 units from W_2 to Y = 100 × 3 = Rs 300
Cost of transporting 100 units from W_3 to Y = 100 × 6 = Rs 600

132. 2; Transportation cost from W_2 to X = 20 × 5 = Rs 100
Transportation cost from W_2 to Y = 80 × 3 = Rs 240
Transportation cost from W_3 to X (100 of W_3 and 50 of W_1) = 120 × 10 = Rs 1200

∴ Transportation cost from W_3 to Z (50 of W_3 and 70 of W_1) = 120 × 10 = Rs 1200

∴ Total cost incurred in transporting the shipped quantity

= Rs (100 + 240 + 1200 + 1200)

= Rs 2740

133. 1; 63 + 18 + 21 : 15 + 5 + 1.5

= 102 : 21.5

= 1020 : 215

= 204 : 43 ≈ 10 : 4

134. 2; 15 + 5 + 1.5 to 47 + 17 + 3 ie 21.5 to 67

∴ Growth of the average population of LMVs = 45.5,

ie $\frac{45.5}{21.5}\times 100\%$, ie 212%

135. 4

136. 3; Italy: 239%, UK : 213%

Canada: 240%

Switzerland: 100%

137. 2; No. of applicants who applied for 3100 – 10000 shares = 1633 × 6 = 9798

No. of applicants who applied for 10200 – 21000 shares

$= \frac{404\times 5}{2} = 1010$

No. of applicants who applied for 25000 shares = 11

∴ Total number of applicants who applied for 3100 – 25000 shares = 9798 + 1010 + 11 = 10819

138. 3; Average number of shares allotted to an allottee

$$= \frac{100\times 8001+100\times 7624+200\times 6202+200\times 1515+200\times 1633+300\times 404+350\times 11}{8001+7624+6202+1515+1633+404+11}$$

$$= \frac{800100+762400+1240400+303000+326600+121200+3850}{25390}$$

$$= \frac{355750}{25390} \approx 140$$

139. No. of applicants who applied for 1000 – 3000 shares $= \frac{1515\times 28}{3} = 505\times 28 = 14140$

No. of applicants who applied for 10200 – 21000 shares

$= \frac{404\times 5}{2} = 1010$

∴ Required ratio $= \frac{14140}{1010} = 14$

140. ()

141. 1; **Workforce (Region-wise)**

Calcutta	:	10305
Chennai	:	13053
Delhi	:	10992
Mumbai	:	15114
Hyderabad	:	19236
Total	**:**	**68700**

Workforce (Category-wise)

Officers	:	6183
Supervisors	:	8244
Unskilled workers	:	11679
Skilled Workers	:	29541
Technicians	:	13053
Total	**:**	**68700**

Workforce (Department-wise)

Sales	:	6183
Purchase	:	4809
Admn & Accounts	:	9618
R & D	:	14427
Production	:	33663
Total	**:**	**68700**

No. of Production Department Persons posted in Hyderabad = 22% of 33663 = 7406

∴ % of Hyderabad workforce in Production

$= \frac{7406}{19236}\times 100 = 38.5$

142. 1; 12% of 10305 ≈ 1237

143. 2; No. of officers in Administration & Accounts Department = 11% of 6183 = 680

No. of officers in Admn & Accounts Department posted at Calcutta = 75% of 680 = 510

∴ % of officers posted at Admn & Accounts, Calcutta

$= \frac{510}{6183}\times 100 = 8.25$

144. 3; **Workforce after Recruitment and Retirement**

Calcutta	:	10305 – 6% = 9687
Chennai	:	= 13053
Delhi	:	= 10992
Mumbai	:	15114 + 12% = 16928
Hyderabad	:	19236 + 12% = 21544
Total	**:**	**72204**

145. 3; No. of votes cast in constituencies A, B, C, D and E to parties R, S and T

Constituencies	Party R	Party S	Party T
A (5000)	1250	1250	2500
B (4000)	1000	2000	1000
C (6000)	3750	750	1500
D (7000)	0	1750	5250
E (4000)	2500	1500	0
Total	**8500**	**7250**	**10250**

146. 4

147. 5

148. 1; 19500 to 30750

149. 4; 10, 12 and 14 are the three consecutive even numbers.

150. 4

151. 2; share of B is Rs 129
[Hint: A + C = 946 – B]

152. 4; Mohan is 30 years old.
Sohan is 24 years old
∴ Sum of their ages = 54 years

153. 1; The two-digit number = 37

154. 4

155. 2; Newspaper Y has the maximum circulation in Delhi.

156. 4

157. 1; $(-3)^8 = +3^8, (-3)^9 = -3^9$

158. 1

159. 4

160. 3; $\frac{1}{2}\% = \frac{\frac{1}{2}}{100} = \frac{1}{200} = \frac{5}{1000} = 0.005$

161. 1 162. 4 163. 1 164. 3 165. 2 166. 2
167. 2 168. 1 169. 2 170. 2 171. 2 172. 1
173. 1 174. 2 175. 2 177. 2 176. 2 178. 2
179. 4 180. 3

181. 1; Let the smallest side of the polygon be a.
∴ the largest side of the polygon = 20a
Since the polygon has 25 sides and the sides of the polygon are in AP, therefore the sides of the polygon are respectively a, a + d, a + 2d, ..., a + 23d, a + 24d; d being the common difference.
∴ a + 24d = 20a ⇒ 19a = 24d
Sum of the lengths of the sides = 2100
⇒ a + (a + d) + ... + (a + 24d) = 2100
⇒ 25a + d(1 + 2 + ... + 24) = 2100

$$\Rightarrow 25a + d\left[\frac{24(24+1)}{2}\right] = 2100$$

⇒ 25a + 300d = 2100

$$\Rightarrow 25 \times \frac{24d}{19} + 300d = 2100$$

$$\Rightarrow \frac{600d}{19} + 300d = 2100$$

$$\Rightarrow \frac{6d}{19} + 3d = 21$$

$$\Rightarrow 63d = 19 \times 21 \Rightarrow d = \frac{19}{3}$$

∴ 19a = 24d

$$\Rightarrow 19a = \frac{24 \times 19}{3} = 8 \times 19$$

⇒ a = 8
∴ smallest side = 8 cm, and the Common Difference $= \frac{19}{3} = 6\frac{1}{3}$ cm

182. 3; Let the speed of the bus be x km/hr.
∴ Speed of the car = (x + 25) km/hr

$$\therefore \frac{500}{x} = \frac{500}{x+25} + 10$$

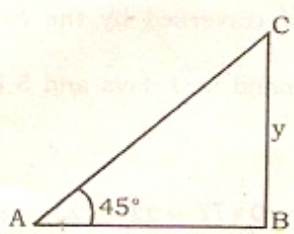
$$\Rightarrow x^2 + 25x - 1250 = 0$$

⇒ x = 25
∴ Speed of the bus = 25 km/hr
Speed of the car = 50 km/hr
Quicker Approach:
Only in choice (3), the difference in speeds is 25 km/hr which aslo satisfies the given conditions.

183. 2; $\lfloor 6 \times 2 \times \lfloor 18 = 1440 \times \lfloor 18$
In the first row, the number of ways in which the six teachers excluding the principal can be seated = $\lfloor 6$. In the second row, the two tallest students at the corners can be seated in 2 ways and the remaining 18 students can be seated in $\lfloor 18$ ways.

184. 1; $5 \times {}^8C_4 \times \lfloor 4 = 8400$
In each of the five cases, the remaining 4 digits of the telephone number can be taken from the remaining 8 digits in ${}^8C_4$ ways and then these four digits can be arranged in $\lfloor 4$ ways.

185. 3;



AB is the river and BC is the tower

$$\therefore \frac{y}{x} = \tan 45^\circ = 1 \Rightarrow y = x$$

186. Prob. that the new product will be introduced
= 0.5 × 0.7 + 0.3 × 0.6 + 0.2 × 0.5
= 0.35 + 0.18 + 0.10 = 0.63

187. 1; Prob. that the article will be defective

$$= \frac{9}{100} \times \frac{95}{100} + \frac{91}{100} \times \frac{5}{100} + \frac{9}{100} \times \frac{5}{100}$$

$$= \frac{171}{2000} + \frac{91}{2000} + \frac{9}{2000} = \frac{271}{2000}$$

∴ Prob. that the article will be non-defective

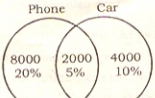
$$= 1 - \frac{271}{2000} = \frac{1729}{2000} = 0.8645$$

Note: The article will be defective if any one of the

parts A and B is defective or both the parts are defective.

188. 1; Women's shirts comprise 60% of the output.
∴ Men's shirts comprise 40% of the output.
∴ Average profit from men's shirts = 8% of 40 = 3.2 out of 40
Overall average profit = 6 out of 100
∴ Average profit from women's shirts = 2.8 out of 60, ie 0.0466 out of each shirt.

189. (None)



Out of 35% of the families, 20% have only phone, 10% have only car and 5% have both phone and the car.
∴ 5% = 2000 [Given]
⇒ Total no. of families
$= \frac{2000 \times 100}{5} = 40000 \Rightarrow$ III

Note: 30% of the families have a car or a phone but not both.

190. 2; Distance traversed by the extremity of the minute-hand in one hour $= 2 \times \frac{22}{7} \times 10$

Distance traversed by the extremity of the minute-hand in 3 days and 5 hours, ie in 77 hours

$= 2 \times \frac{22}{7} \times 10 \times 77 = 22 \times 220 = 4840$ cm

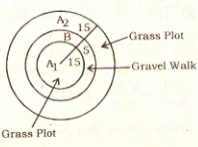
Distance traversed by the hour-hand in 12 hours

$= 2 \times \frac{22 = 44}{7} \times 7 = 44$ cm

Distance traversed by the hour-hand in 77 hours

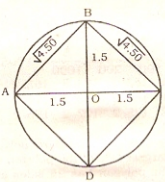
$= \frac{44}{12} \times 77 = \frac{11 \times 77}{3} = \frac{847}{3} = 282.33$ cm
∴ Required difference = 4840 − 282.33 = 4557.67 cm

191. 4;



Area of the Grass Plot
$= A_1 + A_2$
$= \pi \times (15)^2 + (\pi \times 35^2 - \pi \times 20^2)$
$= 225\pi + \pi(35^2 - 20^2)$
$= 225\pi + \pi(35 + 20)(35 - 20)$
$= 225\pi + \pi \times 55 \times 15 = 225\pi + 825\pi$
$= 1050\pi = 1050 \times \frac{22}{7}$
$= 150 \times 22 = 3300$ sq m.
∴ Cost of turf the grass plot $= 3300 \times 2 =$ Rs 6600

192. 3;



Base of the trunk of a tree
From ΔAOB,
$AB = \sqrt{1.5^2 + 1.5^2} = \sqrt{2.25 + 2.25} = \sqrt{4.50}$
∴ Area of the square base of the tree
$= \sqrt{4.50} \times \sqrt{4.50} = 4.50\,m^2$
∴ Volume of the timber which remains after trimming the trunk of the tree just enough to reduce it to a rectangular parallelopiped on a square base $= 4.50 \times 10 = 45\,m^2$

193. (None): Circumference of the top of the cone = Diameter of the sheet = 28 cm
or, $2\pi r = 28$ cm
∴ $r = \frac{14}{\pi}$ cm ≈ 4.5 cm

Slant height of cone = radius of the sheet = 14 cm
∴ $14^2 = (4.5)^2 + h^2$ or $h^2 = 196 - 20.25 \approx 176$
$h = 13.3$ cm

194. 3; $\log_a b = \frac{1}{2}, \log_b c = \frac{1}{3}, \log_c a = \frac{k}{5}$
$\Rightarrow \frac{\log b}{\log a} = \frac{1}{2}, \frac{\log c}{\log b} = \frac{1}{3}, \frac{\log a}{\log c} = \frac{k}{5}$