identified, which makes them controllable. With the exception, perhaps, of the elimination of sulphur dioxide, technical means and technological processes exist which can be used for the elimination of all excessive impurities of the air from the Various emissions.

Atmospheric pollution caused by the private property of individuals (their dwellings, automobiles, etc) is difficult to control. Some sources such as motor vehicles are very mobile, and they are thus capable of polluting vast territories. In this particular case, the cost of anti-pollution measures will have to be borne, by a considerable extent, by individuals, whether in the form of direct costs or indirectly in the form of taxes, dues, surcharges, etc.

The problem of noise is a typical example of an environmental problem which cannot be solved only passively, ie merely by protective measures, but will require the adoption of active measures, ie direct interventions at the source. The costs of a complete protection against noise are so prohibitive as to make it unthinkable even in the economically most developed countries. At the same time, it would not seem feasible, either economically or politically, to force the population to carry the costs of individual protection against noise, for example, by reinforcing the sound insulation of their homes. A solution of this problem probably cannot be found in the near future.

169. Scientific forecasts have shown that clear and biologically valuable air
    1) Is likely to remain abundant for some time
    2) May soon be dangerously lacking
    3) Creates fewer economic difficulties than does water pollution
    4) May be beyond the capacity of our technology to protect

170. The costs involved in the maintenance of pure water are determined primarily by
    I. Production costs
    II. Transport costs
    III. Research costs
    1) I only
    2) I and II only
    3) III only
    4) II and III only

171. According to the passage, the problem of noise can be solved through
    I. Active measures
    II. Passive measures
    III. Tax levies
    1) I only
    2) I and II only
    3) III only
    4) II and III only

172. According to the passage, the costs of some anti-pollution measures will have to be borne by individuals because
    1) Individuals contribute to the creation of pollution
    2) Industry is not willing to bear its share
    3) Governments do not have adequate resources
    4) Individuals are more easily taxed than producers

PASSAGE-IV

Much as an electrical lamp transforms electrical energy into heat and light, the visual "apparatus" of a human being acts as a transformer of light into sight. Light projected from a source or reflected by an object enters the cornea and lens of the eyeball. The energy is transmitted to the retina of the eye whose rods and cones are activated. The stimuli are transferred by nerve cells to the optic nerve and then to the brain, man is a binocular animal, and the impressions from his two eyes are translated into sight—a rapid, compound analysis of the shape, form, colour, size, position, and motion of the things he sees. Photometry is the science of measuring light. The illuminating engineer and designer employ photometric data constantly in their work. In all fields of application of light and lighting, they predicate their choice of equipment, lamps, wall finishes, colours of light and backgrounds, and other factors affecting the luminous and environmental pattern to be secured, in great part from data supplied originally by photometric laboratory. Today, extensive tables and charts of photometric data are used widely, constituting the basis for many details of design. Although the lighting designer may not be called upon to the detailed work of making measurements or plotting data in the form of photometric curves and analyzing them, an understanding of the terms used and their derivation form valuable background knowledge. The perception of colour is a complex visual sensation, intimately related to light. The apparent colour of an object depends primarily upon four factors : its ability to reflect various colours of light, the nature of the light by which it is seen, the colour of its surroundings, and the characteristics and state of, adaptation of the eye. In most discussions of colour, a distinction is made between white and coloured objects. White is the colour name most usually applied to a material that diffusely transmits a high percentage of all the hues of light. Colours that have no hue are termed neutral or achromatic colours. They include white, off-white, all shades of gray, down to black. All coloured objects selectively absorb certain wavelengths of light and reflect or transmit others in varying degrees. Inorganic materials, chiefly metals such as copper and brass, reflect light from their surfaces. Hence we have the term "surface" or "metallic" colours, as contrasted with "body" or "pigment" colours. In the former, the light reflected from the surface is often tinted. Most paints, on the other hand, have body or pigment colours. In these, light is reflected from the surface without much colour change, but the body material absorbs some colours and reflects others; hence, the diffuse reflection from the body of the material is coloured but often appears to be overlaid and diluted with a "white" reflection from the glossy surface of the paint film. In

paints and enamels, the pigment particles, which are usually opaque, are suspended in a vehicle such as oil or plastic. The particles of a dye, on the other hand, are considerably finer and may be described as colouring matter in solution. The dye particles are more often transparent or translucent.

173. According to the passage, lighting engineers need not
    1) Plot photometric curves
    2) Utilize photometric data
    3) Understand photometric techniques
    4) Have mathematical expertise
174. The colour black is an example of
    1) A surface colour
    2) An achromatic colour
    3) An organic colour
    4) A diffuse colour
175. Paint is an example of a substance containing
    1) Inorganic material
    2) Body colours
    3) Surface colours
    4) Metallic colours
176. The perception of colour is
    1) A photometric phenomenon
    2) A complex visual sensation
    3) Activated by the brain
    4) Light reflected by a source

PASSAGE-V

At the Fourth World Water Forum held in Mexico City in March 2006, the 120-nation assembly could not reach a consensus on declaring the right to safe and clean drinking water a human right. Millions of people the world over do not have access to potable water supply. But it is good times for the bottled-water industry, which is cashing in on the need for clean drinking water and the ability of urban elite to pay an exorbitant price for this very basic human need. The fortunes of this more-than-$100-billion global industry are directly related to the human apathy towards the environment—the more we pollute our water bodies, the more the sales of bottled-water. It is estimated that the global consumption of bottled-water is nearing 200 billion litres—sufficient to satisfy the daily drinking water need of one-fourth of the Indian population or about 4.5 per cent of the global population.

In India, the per capita bottled-water consumption is still quite low—less than five litres a year as compared to the global average of 24 litres. However, the total annual bottled-water consumption has risen rapidly in recent times—it has tripled between 1999 and 2004—from about 1.5 billion litres to five billion litres. These are boom times for the Indian bottled-water industry—more so because the economics are sound, the bottom line is fat and the Indian government hardly cares for what happens to the nation's water resources. India is the tenth largest bottled-water consumer in the world. In 2002, the industry had an estimated turnover of Rs 10 billion (Rs 1,000 crore). Today it is one of the India's fastest growing industrial sectors. Between 1999 and 2004, the Indian bottled-water market grew at a compound annual growth rate (CAGR) of 25 per cent—the highest in the world. With over a thousand bottled-water producers, the Indian bottled-water industry is big by even international standards. There are more than 200 brands, nearly 80 per cent of which are local. Most of the small-scale producers sell non-branded products and serve small markets. In fact, making bottled-water is today a cottage industry in the country. Leave alone the metros, where a bottled-water manufacturer can be found even in a one-room shop, in every medium and small city and even some prosperous rural areas there are bottled-water manufacturers.

Despite the large number of small producers, this industry is dominated by the big players—Parle Bisleri, Coca-Cola, PepsiCo, Parle Agro, Mohan Meakins, SKN Breweries and so on. Parle was the first major Indian company to enter the bottled-water market in the country when it introduced Bisleri in India 25 years ago. The rise of the Indian bottled water industry began with the economic liberalisation process in 1991. The market was virtually stagnant until 1991, when the demand for bottled-water was less than two million cases a year. However, since 1991-1992 it has not looked back, and the demand in 2004-05 was a staggering 82 million cases. Bottled-water is sold in a variety of packages: pouches and glasses, 330 ml bottles, 500 ml bottles, one-litre bottles and even 20 to 50 litre bulk water packs. The formal bottled-water business in India can be divided broadly into three segments in terms of cost: premium natural mineral water, natural mineral water and packaged drinking water.

Attracted by the huge potential that India's vast middle class offers, multinational players such as Coca-Cola and PepsiCo have been trying for the past decade to capture the Indian bottled-water market. Today, they have captured a significant portion of it. However, Parle Bisleri continues to hold 40 per cent of the market share. Kinley and Aquafina are fast catching up, with Kinley holding 20-25 per cent of the market and Aquafina approximately 10 per cent. The rest, including the smaller players, have 20-25 per cent of the market share.

The majority of the bottling plants whether they produce bottled-water or soft drinks—are dependent on ground-water. They create huge water stress in the areas where they operate because groundwater is also the main source—in most places the only source—of drinking water in India. This has created huge conflict between the community and the bottling plants. Private companies in India can siphon out, exhaust and export groundwater free because the groundwater law in the country is archaic and not in tune with the realities of modern capitalist societies. The existing law says that "the person who owns the land

owns the groundwater beneath". This means that, theoretically, a person can buy one square metre of land and take all the groundwater of the surrounding areas and the law of land cannot object to it. This law is the core of the conflict between the community and the companies and the major reason for making the business of bottled-water in the country highly lucrative.

177. According to the passage, which one of the following statements is not true?
1) Private companies are exploiting groundwater resources in India due to outdated law.
2) The growth of Indian bottled-water industry is a pre-economic liberalisation process.
3) Manufacturers excluding bigger players have approximately 20-25% of the market share of bottled-water.
4) Bottled-water production in India is a cottage industry today.

178. Which brand is having the largest pie in the Indian bottled-water market?
1) Coca-Cola 2) Parle Bisleri
3) Pepsi Cola 4) Mohan Meakins

179. What is/are the reason(s) for the global growth of bottled-water industry?
1) Pollution of water bodies
2) Basic human need for clean drinking water
3) Paying capacity of the elite
4) All of the above

180. According to the passage, which of the following statements is/are true?
A. In India, the increase in total annual bottled-water consumption is followed by increase in per capita bottled-water consumption.
B. Indian bottled-water market grew at the highest CAGR.
C. The formal bottled-water business in India is divided into broadly two segments in terms of cost.
1) A only 2) A and C both
3) B only 4) A, B and C

181. A polygon has 25 sides, the lengths of which starting from the smallest side are in AP. If the perimeter of the polygon is 2100 cm and the length of the largest side is 20 times that of the smallest, then the length of the smallest side and the common difference of the AP are
1) 8 cm and $6\frac{1}{3}$ cm respectively
2) 8 cm and $5\frac{1}{3}$ cm respectively
3) 6 cm and $6\frac{1}{3}$ cm respectively
4) None of these

182. A car travels 25 km an hour faster than a bus for a journey of 500 km. If the bus takes 10 hours more than the car, then the speeds of the bus and the car are
1) 25 km/hr and 40 km/hr respectively
2) 25 km/hr and 60 km/hr respectively
3) 25 km/hr and 50 km/hr respectively
4) None of these

183. When a group photograph is taken, all the seven teachers should be in the first row and all the twenty students should be in the second row. If the two corners of the second row are reserved for the two tallest students, interchangeable only between them, and if the middle seat of the front row is reserved for the principal, then the number of such possible arrangements is
1) 720 × 18! 2) 1440 × 18!
3) 1370 × 18! 4) None of these

184. In a certain city, all telephone numbers have six digits, the first two digits always being 41 or 42 or 46 or 62 or 64. The number of telephone numbers having all the six digits distinct is
1) 8400 2) 9200
3) 7200 4) None of these

185. A person standing on the bank of a river finds that the angle of elevation of the top of a tower on the opposite bank is 45°. Which of the following statements is correct?
1) Breadth of the river is twice the height of the tower.
2) Breadth of the river is half of the height of the tower.
3) Breadth of the river and the height of the tower are the same.
4) None of these

186. Three groups A, B and C are contesting for a position on the Board of Directors of a company. The probabilities of their winning are 0.5, 0.3 and 0.2 respectively. If the group A wins, then the probability of introducing a new product is 0.7 and the corresponding probabilities for group B and C are 0.6 and 0.5 respectively. The probability that the new product will be introduced is
1) 0.52 2) 0.74
3) 0.63 4) None of these

187. An article manufactured by a company consists of two parts A and B. In the process of manufacture of part A, 9 out of 100 are likely to be defective. Similarly 5 out of 100 are likely to be defective in the process of manufacture of part B. The probability that the assembled part will not be defective is
1) 0.8645 2) 0.9645
3) 0.6243 4) None of these

188. A firm of readymade garments makes both men's and women's shirts. Its average profit is 6% of the sales. Its profit in men's shirts average 8% of the sales and women's shirts comprise 60% of the output. The average profit per sales rupee in women's shirts is
1) 0.0466 2) 0.0666
3) 0.0166 4) None of these

189. In a certain town, 25% families own a phone, 15% own a car and 65% own neither a phone nor a car. 2,000 families own both a car and a phone. Consider the following statements in this regard:
I. 10% families own both a car and a phone.
II. 35% families own either a car or a phone.
III. 40,000 families live in the town.
Which of the above statements are correct?
1) I and II 2) II and III
3) I and III 4) I, II and III

190. The hands of a clock are 10 cm and 7 cm respectively. The difference between the distance traversed by their extremities in 3 days 5 hours is
1) 4552.67 cm 2) 4557.67 cm
3) 4555.67 cm 4) 4559.67 cm

191. A circular grass plot, whose diameter is 70 m, contains a gravel walk 5 m wide round it, 15 m from the edge. The cost to turf the grass plot at Rs 2 per m^2 is
1) Rs 6,000 2) Rs 6,400
3) Rs 6,200 4) Rs 6,600

192. The trunk of a tree is a right cylinder 1.5 m in radius and 10 m high. The volume of the timber which remains when the trunk is trimmed just enough to reduce it to a rectangular parallelopiped on a square base is
1) 44 m^3 2) 46 m^3
3) 45 m^3 4) 47 m^3

193. A semicircular sheet of paper of diameter 28 cm is bent to cover the exterior surface of an open conical ice cream cup. The depth of the ice cream cup is
1) 10.12 cm 2) 8.12 cm
3) 12.12 cm 4) 14.12 cm

194. If $\log_a b = \frac{1}{2}$, $\log_b c = \frac{1}{3}$ and $\log_c a = \frac{K}{5}$, then the value of K is
1) 25 2) 35 3) 30 4) 20

195. The HCF and LCM of two numbers are 21 and 4641 respectively. If one of the numbers lies between 200 and 300, then the two numbers are
1) 273, 357 2) 273, 361
3) 273, 359 4) 273, 363

196. When the price of a commodity is decreased by 10%, its consumption increases by 10%. The change in the revenue derived from it is K%. The value of K is
1) 0 2) -1 3) 1 4) 2

197. The average monthly expenditure of a family was Rs. 2200 during the first 3 months; Rs 2250 during the next 4 months and Rs 3120 during the last 5 months of a year. If the total savings during the year were Rs 1260, then the average monthly income was
1) Rs 2605 2) Rs 2805
3) Rs 2705 4) Rs 2905

198. In an express train, the number of passengers travelling in AC sleeper class, First class and Sleeper class are in the ratio 1:2:3, and the fares to each of these classes are in the ratio 5:4:2. If the total income from this train is Rs 54000, then the income from the AC sleeper class is
1) Rs 8000 2) Rs 12000
3) Rs 10000 4) Rs 6000

199. Five litres of water is added to a certain quantity of pure milk costing Rs 3 per litre. If by selling the mixture at the same price as before, a profit of 20% is made, then what is the amount of pure milk in the mixture?
1) 20 litres 2) 30 litres
3) 25 litres 4) 35 litres

200. A dishonest hair dresser uses a mixture having 5 parts pure aftershave lotion and 3 parts of pure water. After taking out some portion of the mixture, he adds equal amount of pure water to the remaining portion of the mixture such that the amount of aftershave lotion and water become equal. The part of the mixture taken out is
1) 1/3 2) 1/5 3) 1/4 4) 1/6

Answers and explanations

1. 3;

Date	Day	Name of the Play Organised
5th	Mon	D
6th	Tue	B
7th	Wed	E
8th	Thu	C
9th	Fri	F
10th	Sat	A

2. 2
3. 1
4. 1
5. 4; DBECFA
6. 1:

Members	Profession	Sex of a family
P	Nurse	Female (F)
Q	Doctor	Male (M)
R	Student	F(Q. 6)
S	Housewife	F
T	Student	F or M
U	Contractor	M

7. 3
8. 3
9. 1
10. 1; Each letter moves –1 step
11. 1
12. 3
13. 1; The given series consists of the cubes of natural numbers
14. 2; The sequence in the given series is +2.
15. 4; 'muk' means 'and'
'so' means 'body'
'tur' means 'soul'
16. 2; '5' means 'away'
'2' means 'smoking'
'8' means 'give'
17. 2
18. 4; **With respect to height:**

M < P < N < K < R
Neelam will be in third position when arranged in the ascending order of heights.

19. 4; **With respect to age:**
K < R = M < N
P < M = R < N
Kamini or Pooja will be in fourth position when arranged in the descending order of the ages.

20. 1 21. 1 22. 4
23. 4 24. 3

25. (1 or 4): Corporation Tax as per Budget 2006-07. Union Excise Duties as per Revised Budget 2005-06

26. 2; Goa: 3702 sq km.
Sikkim: 7096 sq km.
Tripura: 10492 sq km.
Nagaland: 16579 sq km.

27. 3; West Bengal : 904
Bihar : 880
Kerala : 819
UP : 689

28. 3 29. 4 30. 3 31. 4 32. 3 33. 2 34. 2
35. 4 36. 3 37. 4 38. 3 39. 2 40. 3 41. 1
42. 2 43. 4 44. 1 45. 3 46. 1 47. 4 48. 3
49. 2 50. 4 51. 4 52. 4 53. 1 54. 1 55. 3
56. ? 57. 1 58. 1 59. 3 60. 3 61. 2 62. 3
63. 1 64. 1 65. 4 66. 2 67. 2 68. 4 69. ?
70. 3 71. 2 72. 2 73. 3 74. 2 75. 2 76. 3
77. 2 78. 1 79. 2 80. 3 81. 4 82. 1 83. 1
84. 1

85. 2; Delete 'to'

86. 1; Delete 'may'

87. 3; That my son Sachin Dubey, a student of Vth standard.

88. 1; Replace 'nevertheless' by 'howsoever'

89. 4; Synonyms

90. 2; Synonyms

91. 2; Synonyms

92. 1; Antonyms

93. 1 94. 4 95. 3 96. 2 97. 1 98. 2
99. 3 100. 3

101. 2; A's one day's work $= \frac{1}{32}$

B's one day's work $= \frac{1}{20}$

(B + C)'s one day's work $= \frac{1}{12}$

$\therefore$ C's one day's work $= \frac{1}{12} - \frac{1}{20} = \frac{1}{30}$

D's one day's work $= \frac{1}{24}$

$\therefore$ (A + B + C + D)'s one day's work

$= \frac{1}{32} + \frac{1}{20} + \frac{1}{30} + \frac{1}{24}$

$= \frac{75 + 120 + 80 + 100}{2400} = \frac{375}{2400} = \frac{15}{96} = \frac{5}{32}$

$\therefore$ Out of $\frac{5}{32}$ of the work done, $\frac{1}{30}$ of the work is done by C.

$\Rightarrow$ Out of Rs 25 paid for the work, C will receive

Rs $\frac{1/30}{5/32} \times 25$, ie $\frac{1}{30} \times \frac{32}{5} \times 25$, ie Rs $\frac{16}{5}$

102. 3; A builds $\frac{1}{8}$ of the wall in one day.

A builds $\frac{4}{8}$ of the wall in 4 days

ie A builds $\frac{1}{2}$ of the wall in 4 days

A and B together build $\frac{1}{8} - \frac{1}{3}$ of the wall in one day

ie A and B together build $-\frac{5}{24}$ of the wall in one day

ie A and B together build $-\frac{5}{12}$ of the wall in two days.

$\therefore$ The wall built during the first six days

$= \frac{1}{2} \frac{5}{12} = \frac{1}{12}$

$\therefore$ Remaining $\frac{11}{12}$ of the wall is built by A in

$8 \times \frac{11}{12} = \frac{88}{12} = \frac{22}{3} = 7\frac{1}{3}$ days

103. 2; Both the pipes A and B can fill $\frac{1}{12} + \frac{1}{16} = \frac{7}{48}$ of the cistern in one minute, when their is no obstruction.

With obstruction, both the pipes can fill $\frac{1}{12} \times \frac{7}{8} + \frac{1}{16} \times \frac{5}{6} = \frac{7}{96} + \frac{5}{96} = \frac{1}{8}$ of the cistern in one minute.

Let the obstructions were suddenly removed after x minutes.

$\therefore$ With obstruction, $\frac{x}{8}$ of the cistern could be filled in x minutes and so the remaining $1 - \frac{x}{8} = \frac{8-x}{8}$ of the cistern was filled without obstruction in 3 minutes, ie In one minute, $\frac{8-x}{24}$ of the cistern was filled with obstruc-

tion.

$\Rightarrow \frac{8-x}{24} = \frac{7}{48} \Rightarrow 16 - 2x = 7$

$\Rightarrow x = 4.5$

104. 1; SP of the 1st chair = Rs 500

Gain = 20%

$\therefore$ CP of the 1st chair

$= \frac{500 \times 100}{100+20} = \frac{500 \times 100}{120} = \frac{1250}{3}$

SP of the 2nd chair = Rs 500, Loss = 12%

$\therefore$ CP of the 2nd chair

$= \frac{500 \times 100}{100-12} = \frac{500 \times 25}{88} = \frac{6250}{11}$

Now SP of both the chairs = Rs 1000

CP of both the chairs

$= \frac{1250}{3} + \frac{6250}{11} = \frac{13750+18750}{33} = \frac{32500}{33}$

$\therefore$ Net gain $= 1000 - \frac{32500}{33} = \frac{500}{33}$

$\Rightarrow$ Gain% $= \frac{500/33}{3250/33} \times 100$

$= \frac{500}{32500} \times 100 = \frac{100}{65} = \frac{20}{13} = 1.5\%$

(To one place of decimal)

105. 3; Let the sum be Rs x and rate % be R.

According to the question,

$\frac{x \times R \times 2}{100} = 720 - x$ ... (1)

$\frac{x \times R \times 7}{100} = 1020 - x$ ... (2)

$\Rightarrow x + \frac{2Rx}{100} = 720$ and $x + \frac{7Rx}{100} = 1020$

$\Rightarrow \frac{5Rx}{100} = 300$ (Subtracting)

$\Rightarrow 5Rx = 30000 \Rightarrow Rx = 6000$

$\therefore$ (1) $\Rightarrow \frac{6000 \times 2}{100} = 720 - x$

$\Rightarrow x = 600, R = 10$

Alternative Method:

Interest for 5 yrs = 1020 – 720 = Rs 300

$\therefore$ Interest for 2 yrs = 120

$\therefore$ Sum = 720 – 120 = Rs 600

Rate% $= \frac{120 \times 100}{600 \times 2} = 10$

106. 2

107. 4; Let the length of the first train be x metres and the length of the bridge be y metres.

$\therefore$ The first train running @ 90 km/hr crosses the bridge by covering a distance of (x + y) metres in 36 seconds.

ie The first train crosses the bridge in 36 seconds running @ metres per second.

$\therefore x + y = 36 \times 25 = 900$

The second train crosses the bridge by covering a distance of [(x – 100) + y] metres @ 45 km/hr, ie @ $12\frac{1}{2}$ metres per second.

Since x + y = 900, therefore the second train crosses the bridge by covering a distance of 800 meters @ $12\frac{1}{2}$ metres per second, ie the second train crosses the bridge in

$\frac{800}{12\frac{1}{2}} = \frac{800 \times 2}{25} = 64$ seconds

108. 2; The pipes A and B together can fill

$\frac{1}{20} + \frac{1}{30} = \frac{1}{12}$ of the tank in one hour.

$\therefore \frac{1}{3}$ of the tank is filled by both the pipes A and B together in 4 hours. ... (1)

Now because of developing a leak after 4 hours, both the pipes can fill $\frac{1}{12} - \frac{1}{36} = \frac{1}{18}$ of the tank in one hour [Because $\frac{1}{3}$rd of the water supplied by both the pipes goes out]

$\therefore$ Remaining $\frac{2}{3}$ of the tank can be filled by both the pipes in $\frac{2}{3} \times 18 = 12$ hours ... (2)

$\therefore$ The total time taken to fill the tank is 16 hours.

109. 2; Let the speed of the train be x km/hr and the speed of the car be y km/hr

According to the question,

$\frac{160}{x} + \frac{600}{y} = 8$ and $\frac{240}{x} + \frac{520}{y} = 8\frac{1}{5} = \frac{41}{5}$

$\Rightarrow \frac{480}{x} + \frac{1800}{y} = 24$

$\frac{480}{x} + \frac{1040}{y} = \frac{82}{5}$

$\Rightarrow \frac{760}{y} = 24 - \frac{82}{5} = \frac{38}{5} \Rightarrow y = 100$

$\Rightarrow x = 80$

$\therefore$ Speed of the train = 80 km/hr

Speed of the car = 100 km/hr

110. 3

111. 3; Let the original planned time of the flight be x hours.

$\therefore$ The average speed of the flight $= \frac{6000}{x}$ km/hr

If the average speed is $\left(\frac{600}{x} - 400\right)$ km/hr, then the time of the flight is $\left(x + \frac{1}{2}\right)$ hours.

$\therefore \left(x + \frac{1}{2}\right)\left(\frac{6000}{x} - 400\right) = 6000$

$\Rightarrow -400x + \frac{3000}{x} - 200 = 0$

$\Rightarrow -4x + \frac{30}{x} - 2 = 0$

$\Rightarrow -4x^2 + 30 - 2x = 0$

$\Rightarrow 4x^2 + 2x - 30 = 0$

$\Rightarrow 2x^2 + x - 15 = 0$

$\Rightarrow x = \frac{-1 \pm \sqrt{1 \pm 120}}{4} = \frac{-1 \pm 11}{4}, = \frac{10}{4} = \frac{5}{2} = 2\frac{1}{2}$

112. 3; Production increases @ 250 scooters every year.

113. 4; Let the face value of the national Savings Certificates purchased by Soma in the first year be Rs x.

$\therefore$ x + (x + 400) + (x + 800) + (x + 1200) + (x + 1600) + (x + 2000) + (x + 2400) + (x + 2800) = 48000

$\Rightarrow$ 8x + 11200 = 48000

$\Rightarrow$ 8x = 36800 $\Rightarrow$ x = 4600

114. 4; Cash Price = Rs 39,000 = CP

Cash Down Payment = Rs 17000 = DP

Balance Due = Rs 22000 = BD

P = Value of Instalment = Rs 4800

n = No. of Instalments = 5

R = Rate of interest

$\because \left(1 + \frac{nR}{1200}\right)BD = \left\{1 + \frac{(n-1)R}{2400}\right\}nP$

$\therefore \left(1 + \frac{5R}{1200}\right)22000 = \left\{1 + \frac{4R}{2400}\right\}5 \times 4800$

$\Rightarrow \left(1 + \frac{5R}{1200}\right)11 = \left\{1 + \frac{4R}{2400}\right\}12$

$\Rightarrow 11 + \frac{55R}{1200} = 12 + \frac{24R}{1200}$

$\Rightarrow \frac{55R}{1200} - \frac{24R}{1200} = 1 \Rightarrow \frac{31R}{1200} = 1$

$\Rightarrow R = \frac{1200}{31} = 38.71\%$

115. 3; Let the amount of each instalment be Rs x.

Amount of Rs 100 for 3 years

$= 100\left(1 + \frac{5}{100}\right)^3$

$= 100 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20} = \text{Rs}\frac{9261}{80}$

Present value of Rs $\frac{9261}{80}$ due after 3 years

= Rs 100

Present value of Rs x due after 3 years

$= \frac{100 \times 80}{9261} \times x = \text{Rs}\ \frac{8000x}{9261}$

Amount of Rs 100 for 2 years

$= 100\left(1 + \frac{5}{100}\right)^2 = 100 \times \frac{21}{20} \times \frac{21}{20} = \frac{441}{4}$

Present value of Rs x due after 2 years

$= \text{Rs}\ \frac{400}{441}x$

Similarly, Presnt value of Rs x due after 1 year

$= \text{Rs}\ \frac{20}{21}x$

$\therefore \frac{8000}{9261}x + \frac{400}{441}x + \frac{20}{21}x = 126100$

$\Rightarrow 8000x + 8400x + 8820x = 126100 \times 9261$

$\Rightarrow 25220x = 126100 \times 9261$

$\Rightarrow x = \frac{126100 \times 9261}{25220} = 46305$

116. 3;