SOLVED PAPER
SSC COMBINED GRADUATE LEVEL
Tier-I EXAM

Held on: 01.07.2012 (First Sitting)

GENERAL INTELLIGENCE & REASONING

Directions (1 - 9): In each of the following questions, select the related letters / word in umber from the given alternatives.

1. 8 : 12 : : 6 : ?
   (1) 8   (2) 11
   (3) 5   (4) 7

2. 13 : 19 : : 21 : ?
   (1) 41   (2) 81
   (3) 141   (4) 14

3. Eagle : Swoops :: Duck : ?
   (1) waddles   (2) floats
   (3) swims   (4) flits

4. APPLE : 50 : : ORANGE : ?
   (1) 60   (2) 69
   (3) 61   (4) 63

5. Accommodation : Rent :: Journey : ?
   (1) Freight   (2) Octrol
   (3) Fare
   (4) Expense

6. Fire : Smoke : : ?
   (1) Children : School
   (2) Cloud : Rain
   (3) Moon : Sky
   (4) Shoe : Polish

7. Grenade : Gun : : ?
   (1) Sister : Brother
   (2) Father : Mother
   (3) Man : Woman
   (4) Head : Brain

8. TSH : IRQ : : QPK : ?
   (1) LNO   (2) LON
   (3) PWK   (4) PON

9. AEZ : FPY : : BGX : ?
   (l) HWW   (2) IYY
   (3) HTX   (4) HYW

Directions (10 - 17) : In each of the following questions, find the odd number /letters/word / number pair from the given alternatives.

10. (1) SP   (2) NL
    (3) ZW   (4) TQ

11. (1) Major   (2) Colonel
    (3) Brigadier (4) Admiral

12. (1) Life Insurance Corporation
    (2) New India Assurance Company Ltd.
    (3) United India Insurance Company Ltd.
    (4) National Insurance Company Ltd.

13. (1) Hurdle   (2) Disease
    (3) Barrier   (4) Obstacle

14. (1) Mar   (2) Remedy
    (3) Maim   (4) Mutilate

15. (1) Socrates (2) Beethoven
    (3) Mozart   (4) Bach

16. (1) (132, 5) (2) (125, 8)
    (3) (124, 7) (4) (112, 4)

17. (1) 6246-6296 (2) 7137-7267
    (3) 4344-4684 (4) 5235-5465

Directions (18 - 22): In each of the following questions, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.

18. YX, UTS, ONML, ?
    (1) FEDCB   (2) CFEDC
    (3) IHGFE   (4) HGFED

19. DA, HE, LI, ? , TN

(1) PJ   (2) PT
(3) PM   (4) PK

20. B E I N T ?
    (1) X   (2) Y
    (3) A   (4) Z

21. AZ, CX, EV, ?
    (1) HT   (2) HU
    (3) GS   (4) GT

22. D9Y, J27S, P81M, V243G, __?__.
    (1) A324B   (2) C729B
    (3) B729A   (4) A729B

23. Which one set of letters when sequentially placed at the gaps in the given letter series shall complete it ?

    __c__bd__cbcda__a__db__a
    (1) daabbc   (2) bdbcba
    (3) adabcd   (4) cdbbca

Directions (24 - 27): In each of the following questions, identify the wrong number in the series.

24. 9,19,40,83, 170,340
    (1) 83.   (2) 40
    (3) 340   (4) 170

25. 21,28,33,35.37,36
    (1) 21   (2) 36
    (3) 33   (4) 35

26. 5,13,29,61,120,253
    (1) 120   (2) 253
    (3) 61   (4) 29

27. 0,7,28,63, 124,215
    (1) 28   (2) 215
    (3) 7   (4) 63

28. Some relationships have been expressed through symbols which are explained below:

    0 = greater than

    Δ = not equal to

    $\times$ = not less than

    $+$ = equal to

    ϕ = not greater than

    ∇ = less than

$a \nabla b \nabla c$ implies
(1) a Δ A b ϕ c
(2) a b + c
(3) a o b + c
(4) a o b x c

29.

2	3
4	5

= ?

(1) 14400   (2) 15600
(3) 23040   (4) 17400

30. If PEAR is written a GFDN how is REAP written in this code?
    (1) FDNG   (2) NFDG
    (3) DNGF   (4) NDFG

31. If $54 + 43 = 2$, $60 + 51 = 10$, then $62 + 72 =$?
    (1) 30   (2) 18
    (3) 20   (4) 9

32. If L denotes x
    M denotes ÷
    P denotes +
    Q denotes –
   then 16 P 24 M 8 Q 6 M 2 L 3 = ?
    (1) 10   (2) 9
    (3) 12   (4) 11

33. In this question, from the given alternatives select the word which **cannot** be formed by using the letters of the given word.

    APPROPRIATE
    (1) PIRATE   (2) APPROVE
    (3) PROPER   (4) RAPPORT

34. If FLATTER is coded as 7238859 and MOTHER is coded as 468159, then how is MAMMOTH coded?
    (1) 4344681   (2) 4344651
    (3) 4146481   (4) 4346481

35. If l6 - 2= 2,9 - 3 = 0, 81 -1 = 8, then what is 64 - 4 = ?
    (1) 4   (2) 2
    (3) 6   (4) 8

Directions (36 - 37) : In each of the following questions, select the missing number from the given responses.

36.
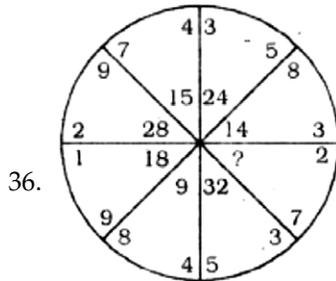
(1) 20   (3) 10
(2) 25   (4) 15

37.

10	11	15
12	12	8
4	12	10
10	5	13
18	20	?

(1) 21   (2) 20
(3) 23   (4) 22

38. Four aeroplanes of Airforce viz, A,B,C,D, started for a demonstration flight towards east. After flying 50 km planes A and D flew towards right, planes B and C flew towards left. After 50 km, planes B and C flew towards their left, planes A and D also towards their left. In which directions are the aeroplanes A, B, D, C respectively flying now?

(l) North, South" East, West
(2) South, North, West, East
(3) East, West, West, East
(4) West, East, West, East

39. Satish start from A and walks 2 km east upto B and turns southwards and walks 1 km upto C. At C he turns to east and walks 2 km upto D. He then turns northwards and walks 4 km to E. How far is he from his starting point?

(1) 5km   (2) 6km
(3) 3km   (4) 4km

Directions (40 - 41): In each of the following questions, one/two statements are given, followed by two conclusions I and II. You have to consider the statements to be true, even if they seem to be at variance from commonly known facts. You have to decide which of the given conclusions, if any follow from the given statement.

40. **Statements** :

Temple is a place of worship. Church is also a place of worship.

Conclusions:

I.   Hindus and Christians use the same place for worship.
II. All churches are temples.

(1) Neither conclusion I nor II follows
(2) Both conclusions I and II follow
(3) Only conclusion I follows
(4) Only conclusion II follows

41. **Statement:**

The human organism grows and develops through stimulation and action.

Concluslons:

I. Inert human organism cannot grow and develop.
II. Human organisms do not react to stimulation and action.

(l) Neither conclusion I nor II follows
(2) Both conclusions I and II follow
(3) Only conclusion I follows
(4) Only conclusion II follows

42. If the first four letters of a term HIPPNOWADIASM are written in reverse order, the next five letters are written without changing their order and then, the remaining letters are again written in reverse order, then which letter is in the middle of the word?

(1) O   (2) W
(3) A   (4) I

43. In the following letter series how many times

do PQR occur in such away hat Q is in the middle of P and R.

Q M P N P Q R R O P N O P P R P
M Q R O P Q R P P R R P Q R P

(1) 5   (2) 6

(3) 4   (4) 3

44. Volume of a sphere is equal to the volume of a hemisphere. If the radius of the hemisphere is $3\sqrt[3]{2}$ cm, then the radius of the sphere is equal to

(l) $9\sqrt[3]{2}$ cm

(2) $6\sqrt[3]{2}$ cm

(3) 27 cm

(4) 3 cm

45. A sheet of paper has been folded as shown by the question figures. You have to figure out from amongst the four answer figures how it will appear when opened?

Question Figures
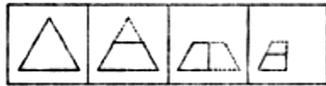
Answer Figures
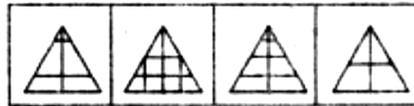
(a)   (b)   (c)   (d)

46. Which of the answer figure is exactly the mirror image of the question figure if a mirror is placed on the line MN?

Question Figure
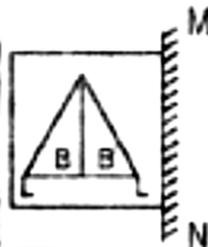
Answer Figures
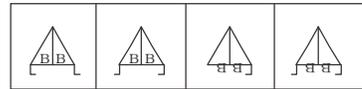
(a)   (b)   (c)   (d)

47. If SEARCH is coded as TFBSDI. how will PENCIL be coded?

(1) RGPEN   (2) LICNEP

(3) QFODJM   (4) QLMBHK

48. Which answer Figure completes the form in question figure?

Question Figure
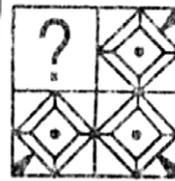
Answer FIgures
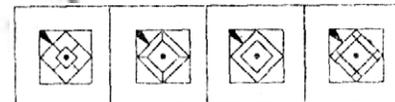
(a)   (b)   (c)   (d)

49. From the answer figures, select the one in which the question figure is hidden/embedded.

Question Figure
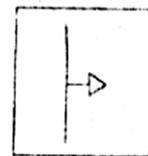
Answer Figures
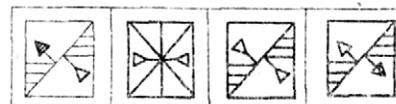
(a)   (b)   (c)   (d)

50. A word is represented by only one set of numbers as given in anyone of the alternatives. The sets of numbers given in the alternatives are represented by two classes of alphabets as in two matrices given below. The columns and rows of Matrix I are numbered from 0 to 4 and that of Matrix II are numbered from 5 to 9. A letter from these matrices can be represented first by its row and next by its column, e.g. 'A' can be represented by 10. 33, etc and 'H' can be represented by 59. 78. etc. Similarly you have to identify the set for the word GUIDE.

Matrix I

	0	1	2	3	4
0	I	E	A	O	U
1	A	O	U	I	E
2	E	I	O	U	A
3	O	U	E	A	I
4	U	A	I	E	O

Matrix II

	5	6	7	8	9
5	F	D	B	G	H
6	B	G	H	F	D
7	D	F	G	H	B
8	G	H	D	B	F
9	H	B	F	G	D

(1) 85, 23, 21, 87, 32
(2) 58, 31, 12, 57, 41
(3) 77, 13, 42, 99, 32
(4) 66, 31, 43, 78, 14

GENERAL AWARENESS

51. The National Commission for Minorities was constituted in the year
    (a) 1990   (b) 1992
    (c) 1980   (d) 1989

52. The first Indian who was chosen as the Secretary General of Commonwealth is
    (a) Rakesh Verma
    (b) Gopalaswami
    (c) Krishna Murthy
    (d) Kamalesh SHarma

53. In which of the following systems of government is bicameralism an essential feature?
    (1) Federal system
    (2) Unitary system
    (3) Parliamentary system
    (4) Presidential system

54. Kuldip Nayer, a journalist, was appointed as a High Commissioner in
    (1) Sri Lanka   (2) Australia
    (3) UK   (4) Pakistan

55. Which king is referred to as Devanampiya Piyadassi (Beloved of the Gods) in the inscriptions?
    (1) Asoka   (2) Harsha
    (3) Bindusara
    (4) Chandragupta Maurya

56. Socialism succeeds in achieving
    (1) higher standard of living of the people
    (2) equal distribution of income in the society.
    (3) higher individual welfare in the society
    (4) maximum social welfare in the society

57. Monopolist resorts to price discrimination depending upon the
    (1) Elasticity of supply
    (2) Elasticity of demand
    (3) Law of demand
    (4) Law of supply

58. Economic planning is an essential feature of

(1) Socialist economy
(2) Capitalist economy
(3) Mixed economy
(4) Dual economy

59. The HYV programme in India is also' called as
    (1) Traditional Agriculture
    (2) New Agricultural Strategy
    (3) White Revolution
    (4) Blue Revolution.

60. The National Policy for Empowerment of Women was adopted in the year
    (1) 2001   (2) 2005
    (3) 1991   (4) 1995

61. Ballots were first used in
    (1) Australia
    (2) USA
    (3) Ancient Greece
    (4) England

62. The Rashtrtya Barh Ayog (RBA) is related with
    (1) Droughts and Floods
    (2) Poverty Alleviation
    (3) Floods
    (4) Disaster Management

63. Which of the following criteria is not used for the classification of human races?
    (1) Nose   (2) Hair
    (3) Eyes   (4) Ear

64. Railway coaches are manufactured at
    (1) Jamshedpur
    (2) Chittaranjan
    (3) Perambur
    (4) Varanasi

65. Fertilization occurs normally in the
    (1) Cervix
    (2) Vagina
    (3) Fallopian tube
    (4) Uterus

66. People consuming alcohol in heavy quantities generally die of
    (1) liver or stomach cancer
    (2) weakening of heart muscles leading to cardiac arrest
    (3) blood cancer
    (4) Cirrhosis

67. The organisms at the base of the grazing food-chain are
    (1) Carnivores   (2) Decomposers
    (3) Producers   (4) Herbivores

68. Who among the following was credited with the destruction of Chinalgani, a group of powerful nobles?
    (1) Balban
    (2) Qutb-ud-din Aibak
    (3) Iltutmish
    (4) Razia- Sultan

69. Bombay was given away as dowry to the English King Charles II for marrying the Princess of
    (1) France   (2) Portugal
    (3) Holland   (4) Denmark

70. The 'Grand Trunk Road built by Shershah connected Punjab with
    (1) Agra   (2) East Bengal
    (3) Lahore   (4) Multan

71. Nam the Maratha Saint who was a contemporary of Shivaji.
    (1) Saint Eknath
    (2) Saint Tukaram
    (3) Saint Dhyaneshwar
    (4) Namdev

72. The study of lake is called
    (1) Topology
    (2) Hydrology
    (3) Limnology
    (4) Potomology

73. A series of lines connecting places having a quake at the same time are called
    (1) Homoseismal lines
    (2) Seismolines
    (3) Coseisrnal lines
    (4) Isoseismallines

74. 'Lumen' is the unit of
    (1) Illuminance

(2) Brightness
(3) Luminous flux
(4) Luminous intensity

75. The transfer of date from a CPU to peripheral devices of computer is achieved through
(1) interfaces
(2) buffer memory
(3) modems
(4) computer ports

76. Which of the following items is not used in Local Area Networks (LANs) ?
(1) Interface Card
(2) Cable
(3) Computer (4) Modem

77. The mass of 10 moles of water is ___.
(1) 90 g   (2) 45 g
(3) 18 g   (4) 180 g

78. Vitamin A is rich in
(1) Carrot   (2) Lime
(3) Beans   (4) Rice

79. The high boiling point of water compared to hydrogen sulphide or hydrogen chloride is due to
(1) Dipole insulation
(2) Vander Waal's attraction
(3) Polar covalent bonding
(4) Hydrogen bonding

80. Which of the following determines the chemical properties of an element?
(1) Number of electrons
(2) Number of neutrons
(3) Number of protons
(4) All of the above

81. The Central Drug Research Institute of India is located at
(1) Madras   (2) Lucknow
(3) Delhi   (4) Bangalore

82. Which of the following cereals was among the first to be used by man ?
(1) Rye   (2) Wheat
(3) Rarley   (4) Oat

83. What of the following wheat species are being cultivated in India?
(1) Club wheat   (2) Durum wheat
(3) Emmer wheat   (4) Bread wheat

84. Which one of the following forces is a 'dissipative force'?
(1) Electrostatic force
(2) Magnetic force
(3) Gravitational force
(4) Frictional force

85. If a resistive wire is elongated, its resistance
(1) decreases
(2) remains constant
(3) increases
(4) All of the above

86. If a magnet has a third pole, then the third pole is called
(1) defective pole
(2) consequent pole
(3) extra pole
(4) arbitrary pole

87. How many spokes are there in the Dharmachakra of the National Flag?
(1) 14   (2) 18
(3) 22   (4) 24

88. The latest official language of the U.N. is
(1) Russian   (2) Arabic
(3) Chinese   (4) Spanish

89. Srikrishna Committee Report which was made public in 2011, is related to
(1) rejuvenation of higher education
(2) demand for a separate Telangana State
(3) ragging in educational institutions
(4) impeachment of Justice Dinakaran

90. The latest book "*Kurukshetra* to *Kargil'* is written by
(1) Suryanath Singh
(2) Kunal Bhardwaj
(3) Karan Singh
(4) Kuldip Singh

91. The Educational Development Index (EDI) Report., released in 2011, is led by
(l) Tamil Nadu   (2) Puducherry
(3) Kerala
(4) Lakshadweep

92. Shunglu Committee, which submitted its report in 2011, is related to
    (1) Commonwealth Games scandal
    (2) reforms in the Insurance sector
    (3) revamp of Defence management
    (4) management of Co-operative Sector

93. The 65th National Football Championship (Santosh Trophy 2011) was won by
    (1) Bangal   (2) Punjab
    (3) Manipur   (4) Goa

94. The organisation involved primarily with environmental planning is
    (1) CIFRI   (2) ICAR
    (3) CSIR   (4) NEERI

95. What would be the impact of global warming on mangrove forests?
    (1) They will grow more luxurious
    (2) Large areas of mangroves will be submerged
    (3) Their role as carbon sinks will become more important
    (4) Both (1) and (3) above

96. The sweet taste of fruits is due to
    (1) Lactose   (2) Fructose
    (3) Maltose   (4) Ribose

97. The most endangered Asiatic top predator on the edge of extinction is
    (1) Black Bear
    (2) Asiatic Lion   (3) Siberian Tiger
    (4) Dhole

98. Analects is the sacred book of
    (1) Confucianism
    (2) Judaism
    (3) Shintoism
    (4) Taoism

99. The seat of Madhya Pradesh High Court is located at
    (1) Gwalior   (2) Indore
    (3) Bhopal   (4) Jabalpur

100. The brightest planet is
    (1) Venus   (2) Mercury
    (3) Jupiter
    (4) Mars

QUANTITATIVE APTITUDE

101. P and Q are two points observed from the top of a building $10\sqrt{3}$ m high. IF the angles of depression of the points are complementary and PQ = 20 m, then the distance of P from the building is
    (a) 25 m
    (b) 45 m
    (c) 30 m
    (d) 40 m

102. If A and are complementary angles, then the value of
    Sin A cos B + cos A sin B – tan A tan B + sec^2 A – cot^2 B is
    (a) 2   (b) 0
    (c) 0   (d) -1

103. The least value of $2\sin^2\theta + 2\cos^2\theta$ is
    (a) 3   (b) 5
   (c) 1   (d) 2

104. A,O,B are three points on a line segment and C is a points not lying on AOB. IF $\angle AOC$ = 40º and OX, OY are the internal and external bisectors of $\angle AOC$ respectively, then $\angle BOY$ is
    (a) 70º   (b) 80º
    (c) 75º   (d) 68º

105. If $4x = \sec\theta$ and $\dfrac{4}{x} = \tan\theta$ then
    $8\left(x^2 - \dfrac{1}{x^2}\right)$ is
    (a) $\dfrac{1}{16}$ (b) $\dfrac{1}{8}$
    (c) $\dfrac{1}{2}$ (d) $\dfrac{1}{4}$

106. If $2 - \cos^2\theta = 3\sin\theta\cos\theta$, $\sin\theta \neq \cos\theta$ then $\tan\theta$ is

(a) $\dfrac{1}{2}$ (b) 0

(c) $\dfrac{2}{3}$ (d) $\dfrac{1}{3}$

107. If $\sin\theta + \cos\theta$ $\sqrt{2}\cos(90-\theta)$, then $\cot\theta$ is

(a) $\sqrt{2}+1$ (b) 0

(c) $\sqrt{2}$ (d) $\sqrt{2}-1$

108. If $x\sin^2\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, $\sin\theta \neq \theta$, $\cos\theta\,0$, then $x^2 + y^3$ is

(a) $\dfrac{1}{\sqrt{2}}$ (b) $\dfrac{1}{2}$

(c) 1   (d) $\sqrt{2}$

109. In the following figure, O is the centre of the circle and XO is perpendicular to OY. If the area of the triangle XOY is 32, then the area of the circle is
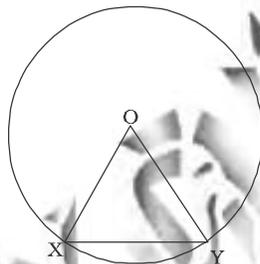
(a) 64   (b) 256
(c) 16   (d) 32

110. The side BC of ΔABC is produced to D. If $\Delta ACD = 108°$ and $\angle B = \dfrac{1}{2}\angle A$ then $\angle A$ is

(a) 36°   (b) 72°
(c) 108°   (d) 59°

111. Two circles of radii 4 cm and 9 cm respectively touch each a common tangent touches then

at the points P and Q respectively. Then the area of a square with one side PQ, is

(a) 97 sq.cm   (b) 194 sq.cm
(c) 72 sq.cm   (d) 144 sq.cm

112. Two tangent are drawn from a point P to a circle at A and B. O is the centre of the circle. If $\angle AOP = 60°$, then $\angle APB$ is

(a) 120°   (b) 90°
(c) 60°   (d) 30°

113. If each interior angle is double of each exterior angle of a regular polygon with n sides, then the value of n is

(a) 8   (b) 10
(c) 5   (d) 6

114. If the length of the side PQ of the rhombus PQRS is 6cm and $\angle PQR = 120°$, then the length of QS, in cm, is

(a) 4   (b) 6
(c) 3   (d) 5

115. The angle formed by the hour-hand and the minute-hand of a clock at 2 : 15 p.m. is

(a) $27\dfrac{1}{2}°$ (b) 45°

(c) $22\dfrac{1}{2}°$ (d) 30°

116. Two sides of a triangle are of length 4 cm and 10 cm. If the length of the third side is 'a' cm, then

(a) $a > 5$ (b) $6 \le a \le 12$
(c) $a < 6$ (d) $6 < a < 14$

117. If $x = (0.08)^2$, $y = \dfrac{1}{(0.08)^2}$ and $z = (1-0.08)^2 - 1$, then out of the following, the true relation is

(a) $y < x$ and $x = z$
(b) $x < y$ and $x = z$
(c) $y < x < x$ (d) $z < x < y$

118. In xy plane, P and Q are two points having

co-ordinates (2, 0) and (5, 4) respectively. Then the numerical value of the area of the circle with radius PQ, is

(a) 16π (b) 32π
(c) 14π (d) 25π

119. If $x^4 + \dfrac{1}{x^4} = 23$, then the value of $\left(x - \dfrac{1}{x}\right)^2$ will be

(a) 7   (b) -7
(c) -3   (d) 3

120. The value of

$$\sqrt{[6 + \sqrt{\{6 + \sqrt{(6 + ...\text{upto } \infty)}\}}]}$$ is equal to

(a) 3   (b) 10
(c) 8   (d) 2

121. If $x + \dfrac{1}{x} = 3$, the value of $x^5 + \dfrac{1}{x^5}$ is

(a) 123   (b) 126
(c) 113   (d) 129

122. $\sec^4\theta - \sec^2\theta$ is equal to

(a) $\tan^2\theta - \tan^4\theta$
(b) $\tan^2\theta + \tan^4\theta$
(c) $\cos^4\theta - \cos^2\theta$ (d) $\cos^2 - \cos^4$

123. In ΔABC, AD is the median and AD $= \dfrac{1}{2}$ BC. IF $\angle ACD = 30°$, then measure of then measure of is

(a) $90°$ (b) $45°$
(c) $30°$ (d) $60°$

124. If $\sqrt{6} \times \sqrt{15} = x\sqrt{10}$, then the value of x is

(a) 3   (b) ± 3
(c) $\sqrt{3}$ (d) $\sqrt{6}$

125. $3 - \dfrac{3 + \sqrt{5}}{4} - \dfrac{1}{3 + \sqrt{5}}$ is equal to

(a) 0   (b) $\dfrac{3}{2}$
(c) $\dfrac{\sqrt{5}}{2}$ (d) $\sqrt{5}$

126. If $a + b + 1 = 0$, then the value of $(a^3 + b^3 + 1 - 3ab)$ is

(a) 3   (b) 0
(c) -1   (d) 1

127. In the xy-coordinate system, if (a, b) and (a + 3, b + k) are two points on the line defined by the equation $x = 3y - 7$, then $k = ?$

(a) $\dfrac{7}{3}$ (b) 1
(c) 9   (d) 3

128. The average age of 4 boys, five year age was 9 years. On including a new boy, the present average age of all the five is 15 years. The present age of the new boys is

(a) 14 years   (b) 6 years
(c) 15 years   (d) 19 years

129. If the average of 39, 48, 51, 63, 75, 83, x and 69 is 60, then the value of x is

(a) 52   (b) 53
(c) 50   (d) 51

130. The cost of a piece of diamond varies with the square of its weight. A diamond of Rs. 5,185 value is cut into 3 pieces whose weights are in the ratio 1 : 2 : 3. Find the loss involved in the cutting.

(a) Rs. 3,068   (b) Rs. 3,008
(c) Rs. 3,175   (d) Rs. 3,168

131. A discount of 30% on the marked price of a toy reduces its selling price by Rs. 30. What is the new selling price (in Rs.)?

(a) 70   (b) 21
(c) 130   (d) 100

132. The capacities of two hemispherical vessels are 6.4 litres and 21.6 litres. The ratio of their inner radii is

(a) 4 : 9   (b) 16 : 81

(c) $\sqrt{2} : \sqrt{3}$ (d) 2 : 3

133. Pipe A alone can fill a tank in 8 hours. Pipe B alone can fill it in 6 hours. If both the pipes are opened and after 2 hours pipe A is closed, then the other pipe will fill the tank in

(a) 6 hours   (a) $3\frac{1}{2}$ hours

(b) 4 hours   (c) $2\frac{1}{2}$ hours

134. If $(a - b) = 3$, $(b - c) = 5$ and $(c - a) = 1$, then the value of $\dfrac{a^3 + b^3 + c^3 - 3abc}{a + b + c}$ is

(a) 17.5   (b) 20.5

(c) 10.5   (d) 15.5

135. The population of a town is 15000. If the number of males increases by 8% and that of females by 10%, then the population would increase to 16300. Find the number of females in the town.

(a) 4000   (b) 6000

(c) 3000   (d) 5000

136. If Rs. 5,0000 becomes Rs. 5,700 in a year's time, what will Rs. 7,000 become at the end of 5 years at the same rate of simple interest?

(a) Rs. 10,500   (b) Rs. 11,900

(c) Rs. 12,700   (d) Rs. 7,700

137. A thief is noticed by a policeman from a distance of 200 m. The thief starts running and the policeman chases him. The thief and the policeman run at the rate of 10 km and 11 km per hour respectively. The distance (in metres) between then after 6 minutes is

(a) 190   (b) 200

(c) 100   (d) 150

138. 'A' sells an article to 'B' at a profit of 20% and 'B' sells it to 'C' at a profit of 25%. If 'C' pays Rs. 1,200, the cost price of the article originally (in Rs.) is

(a) 700   (b) 600

(c) 1,000   (d) 800

139. The number nearest to 75070 which is divisible by 65, is

(a) 75070   (b) 75075

(c) 75010

(d) 75065

140. The number 20% more than 80 in

(a) 36   (b) 30

(c) 90   (d) 96

141. A tree is broken by the wind. If the top of the tree struck the ground at an angle of 30° and at a distance of 30m from the root, then the height of the tree is

(a) $25\sqrt{3}$ m

(b) $30\sqrt{3}$ m

(c) $15\sqrt{3}$ m

(d) $20\sqrt{3}$ m

142. If $\cos A + \cos^2 A = 1$, then $\sin^2 A + \sin^4 A$ is equal to

(a) 1   (b) 1/2

(c) 0   (d) -1

143. A farmer divides his herd of n cows among his four sons, so that the first son gets one-half the herd, the second one-fourth, the third son and the fourth son 7 cows. Then the value of n is

(a) 240   (b) 100

(c) 180   (d) 140

144. By what least number should 675 be multiplied to obtain a number which is a prefect cube?

(a) 7   (b) 8

(c) 5   (d) 6

145. The least number which when divided by 35, 45, 55 leaves the remainder 18, 28, 38 respectively is

(a) 3448   (b) 3482

(c) 2468   (d) 3265

Directions (146 – 150): The graph shows Income and Expenditure of a Company. Study the graph and answer the questions.
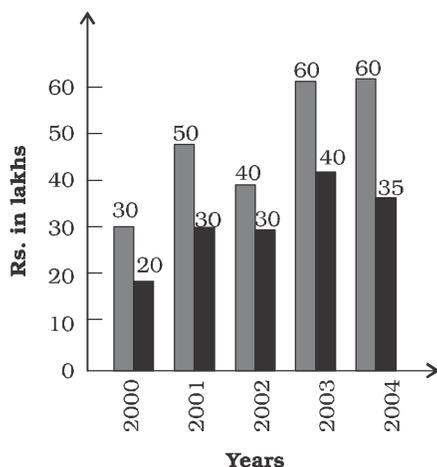
146. The expenditure from 2002 to 2003 increased by

(a) $33\frac{1}{3}\%$ (b) 40%

(c) 10%   (d) 20%

147. The income in 2002 was equal to the expenditure in the year
(a) 2003   (b) 2004
(c) 2000   (d) 2001

148. The profit was maximum in the year
(a) 2003   (b) 2004
(c) 2001   (d) 2002

149. The difference in profit between 2001 and 2002 is
(a) Rs. 25 lakhs
(b) No difference
(c) Rs. 10 lakhs
(d) Rs. 20 lakhs

150. The number of years in which the income exceeds the average income is
(a) three   (b) four
(c) one   (d) two

ENGLISH COMPREHENSION

Directions (151-155): In the following questions, some parts of the sentences have errors and some have none. Find out which part of a sentence has an error. If a sentence is free from error then your answer is (4), i.e. No error.

151. You do not (1)/ look as (2)/ your brother. (3)/ No error (4)

152. My elder brother (1)/ is six (2)/ foot high.(3)/ No error (4)

153. Without no proof of your guilt (1)/ the only course open to me (2)/ is to dismiss the case. (3)/ No error (4)

154. As we see it. (1)/ she appears to be unreasonable (2)/ anxious about pleasing her husband. (3)/ No error (4)

155. The scissor is (1)/ lying on (2)/ the table. (3)/ No error (4)

Directions (156-160): In the following questions, sentences are given with blanks to be filled in with an appropriate word(s). Four alternatives are suggested for each question. Choose the correct alternative out of the four as your answer.

156. The Union Budget is likely to be presented on February 26, two days ahead of the _____ date.
(1) critical   (2) conventional
(3) suitable   (4) convenient

157. I am sorry _____ the mistake.
(1) from   (2) with
(3) for   (4) at

158. He _____her that she would pass.
(1) insured   (2) ensured
(3) assumed   (4) assured

159. Your father __ worry. I'm a very careful driver.
(1) needn't   (2) none
(3) can't   (4) doesn't

160. The __ chosen for construction of the building is in the heart of the city.

(1) cite   (2) slight
(3) sight   (4) site

Directions (161-165): In the following questions, out of the four alternatives. choose the one which best expresses the meaning of the given word as your answer.

161. Nexus
   (1) connection   (2) distance
   (3) deficit   (4) difference

162. Mammoth
   (1) straight   (2) huge
   (3) wild   (4) greedy

163. Hyperbole
   (1) expansion   (2) imitation
   (3) decoration   (4) exaggeration

164. Eulogy
   (1) apology   (2) address
   (3) speech   (4) praise

l65. Menacingly
   (1) dangerously   (2) threateningly
   (3) harmfully   (4) hideously

Directions (166-170): In the following questions, choose the word opposite in meaning to the given word as your answer.

166. Impeccable
   (1) faulty   (2) tedious
   (3) flashy   (4) boring

167. Amalgamate
   (1) separate   (2) combine
   (3) assimilate   (4) integrate

16S. Zenith
   (1) climax   (2) crisis
   (3) acme   (4) nadir

169. Influx
   (1) reflex   (2) deflection
   (3) effluent   (4) exodus

170. Orderly
   (1) semitic   (2) colic
   (3) democratic   (4) chaotic

Directions (171-175): In the following questions, four alternatives are given for the idiom/ phrase printed in bold in the sentence. Choose the alternative which best expresses the meaning of the idiom/phrase as your answer.

171. Ram is very calculative and always has an axe to grind.
   (1) has no result
   (2) works for both sides
   (3) has a private agenda
   (4) fails to arouse interest

172. The police looked all over for him but drew a blank.
   (1) did not find him
   (2) put him in prison
   (3) arrested him
   (4) took him to court

173. On the issue of marriage, Sarita put her foot down.
   (1) stood up   (2) was firm
   (3) got down   (4) walked fast

174. His investments helped him make a killing in the stock market.
   (1) lose money quickly
   (2) plan a murder quickly
   (3) murder someone quickly
   (4) make money quickly

175. There is no gainsaying the fact that the country is in difficulties.
   (1) ignoring   (2) hiding
   (3) forgetting   (4) denying

Directions (176-1S0): in the following questions, a part of the sentence is printed in bold. Below are given alternatives to the bold part at (1). (2) and (3) which may improve the sentence. Choose the correct alternative. In case no improvement is needed, your answer is (4).

176. Sordid and sensational books tend to vitiate 'the public taste.
   (1) divide   (2) distract
   (3) distort   (4) No improvement

177. By studying AIDS has engaged many researchers in the last decade.
   (1) Important study

(2) Now that the study
(3) The study of
(4) No improvement

178. His Master's thesis was highly estimated and is now being prepared for publication.
(1) was highly discussed
(2) was highly commended
(3) is highly appraised
(4) No improvement

179. No sooner had she realized her blunder than she began to take corrective measures.
(1) then she began to take
(2) than she began taking
(3) when she began to take
(4) No improvement

18O. A good scholar must be precise and possess originality.
(1) must be precise and original
(2) must be possess precision and original
(3) must be precision and possess Originality
(4) No improvement

Directions (18l-185): In the following questions, out of the four alternatives, choose the one which can be substituted for the given. words/sentence.

18l. One who loves books
(1) Bibliophile
(2) Bibliophagist
(3) Bibliophoebe
(4) Bibliographer

182. Speaking without preparation
(1) Deliberate   (2) Fluent
(3) Loquacious   (4) Extempore

183. Special trial of the Head of State by Parliament
(1) Impingement   (2) Infringement
(3) Impeachment   (4) Impediment

184. Someone able to use both hands with equal skill
(l) Ambivalent   (2) Amphibious
(3) Ambiguous   (4) Ambidextrous

185. Cure for all diseases
(1) Curable   (2) Panacea
(3) Incurable   (4) Curative

Directions (186-190): In the following questions, there are four different words out of which one is correctly spelt. Find the correctly spelt word.

186. (1) pleintive   (2) sustein
     (3) villain   (4) alleince

187. (1) comissioner
     (2) commissionar
     (3) commistoner
     (4) commissioner

188. (1) aprentice   (2) advertise
     (3) treatrce   (4) sencitive

189. (1) suprintendent
     (2) supirentendent
     (3) superintendent
     (4) superentendent

190. (1) symetry   (2) syrnmttry
     (3) symatry   (4) symmetry

Direction (191-200): In the following questions, you have two brief passages with 5 questions following each passage. Read the passages carefully and choose the best answer to each question out of the four (alternatives.

Passage I (191-195)

Two years later, in November 1895, he signed his final will. He left the bulk of his fortune, amounting to about £ 1,75,00 to a trust fund administered by Swedish and Norwegian trustees. The annual interest shall be awarded as prizes to those persons who during the previous year have rendered the greatest services to mankind. The interest shall 'be divided into five equal parts - now amounting to about £ 8,000 each - one of which shall be awarded to the person who has made the most important discovery or invention in the- realm of physics, one to the person who has made the most important chemical discovery or improvement, one to the person who has made the most important physiological or medical discovery,

one to the person who has produced the most outstanding work of literature, idealistic in character, and one to the person who has done the best work for the brotherhood of nations, the abolition or reduction of standing armies, as well as for the formation or popularization of peace congress.

191. The said prize is awarded
 (1) once in 5 years
 (2) every year
 (3) once in 4 years
 (4) once in 2 years

192. Which is the prize that is referred to in the passage?
 (1) Nobel Prize
 (2) Magsaysay Award
 (3) Pulitzer Prize
 (4) Booker Prize

193. The number of prizes in the field of science are
 (1) Four   (2) One
 (3) Three   (4) Five

194. Total annual prize money amounts to
 (1) £ 8,000   (2) £ 1.750,000
 (3) £ 350,000   (4) £ 40,000

195. Prize is awarded for outstanding work in
 (1) Chemistry
 (2) Literature
 (3) Physics
 (4) All the above

Passage II (196-200)

If an opinion contrary to your own makes you angry, that is a sign that you are subconsciously aware of having no good reason for thinking, as you do. If someone maintains that two and two are five that Iceland is on the Equator, you feel pity rather than anger, unless you know so little of arithmetic or geography that his opinion shakes your own contrary conviction.

196. If someone else's opinion makes us angry, it means that

(1) we are subconsciously aware of having no good reason for becoming angry
(2) there may be good reasons for his opinion but we are not consciously aware of them
(3) our own opinion is not based on good reason and we know this subconsciously
(4) we are not consciously aware of any reason for our own opinion

197. "Your own contrary conviction" refers to
 (1) the fact that you feel pity rather than anger
 (2) The opinion that two and two are five and that Ice-land is one the Equator
 (3) The opinion that two and two are five and that Ice-land is on the Equator
 (4) The fact that you know so little about arithmetic or geography

198. Conviction means
 (1) persuasion
 (2) disbelief
 (3) strong belief
 (4) ignorance

199. The writer says if someone maintains that two and two are five you feel pity because you
 (1) have sympathy
 (2) don't agree with him
 (3) want to help the person
 (4) feel sorry for his ignorance

200. The second sentence in the passage
 (1) builds up the argument of the first sentence by restarting it from the opposite point of view
 (2) makes the main point which has only been introduced by the first sentence
 (3) simply adds, a further point to the agreement already stated in the first sentence
 (4) illustrates the point made in the first sentence

ANSWERS

1. (1)	2. (1)	3. (1)	4. (1)	5. (3)	6. (2)	7. (4)	8. (2)	9. (1)	10. (2)
11. (4)	12. (1)	13. (2)	14. (2)	15. (1)	16. (4)	17. (1)	18. (2)	19. (1)	20. (3)
21. (4)	22. (3)	23. (3)	24. (3)	25. (4)	26.(1)	27. (2)	28. (1)	29.(1)	30. (2)
31. (4)	32. (1)	33. (2)	34. (1)	35. (1)	36.(4)	37. (3)	38. (3)	39. (1)	40. (1)
41. (J.)	42. (2)	43. (3)	44.(4)	45. (2)	46. (4)	47. (3)	48.(2)	49.(4)	50. (1)
51. (2)	52. (4)	53. (1)	54. (3)	55. (1)	56. (2)	57. (2)	58. (1)	59. (2)	60.(1)
61. (1)	62. (3)	63. (4)	64. (3)	65. (3)	66. (4)	67. (3)	68.(1)	69. (2)	70. (1)
71. (2)	72. (3)	73. (1)	74. (3)	75. (1)	76. (3)	77. (4)	78. (1)	79. (4)	BO. (1)
81. (2)	82. (2)	83. (2)	84. (4)	85. (3)	86. (2)	87. (4)	88.(2)	89. (2)	90. (4)
91. (3)	92. (1)	93. (1)	94. (4)	95. (4)	96.(2)	97. (4)	98. (1)	99. (4)	100. (1)
101. (3)	102. (3)	103. (4)	104. (1)	105. (3)	106. (1)	107. (4)	108. (3)	109. (1)	110. (2)
111. (4)	112. (3)	113. (4)	114.m	115. (3)	116. (4)	117. (4)	118. (4)	119. (4)	120.(1)
121. (1)	122. (2)	123. (4)	124. (1)	125. (2)	126. (2)	127. (2)	128. (4)	129. (1)	130. (4)
131. (1)	132. (4)	133. (4)	134. (1)	135. (4)	136. (2)	137. (3)	138. (4)	139. (2)	140. (4)
141. (3)	142.(1)	143. (4)	144. (3)	145. (1)	146. (1)	147. (1)	148. (2)	149. (3)	150. (1)
151. (2)	152. (3)	153. (1)	154. (2)	155. (1)	156. (2)	157. (3)	158. (4)	159. (1)	160. (4)
161. (1)	162. (2)	163. (4)	164. (4)	165. (2)	166. (1)	167. (1)	168. (4)	169. (4)	170. (4)
171. (3)	172. (1)	173. (2)	174. (4)	175. (4)	176. (2)	177. (3)	178. (2)	179. (4)	180. (1)
181. (1)	182. (4)	183. (3)	184. (4)	185. (2)	186. (3)	187. (4)	188. (2)	189. (3)	190. (4)
191. (2)	192. (1)	193. (3)	194. (1)	195. (4)	196. (3)	197. (1)	198. (3)	199. (4)	200. (4)

EXPLANATIONS

1. The relationship is $x : (2x - 4)$

   $8 \times 2 - 4 = 16 - 4 = 12$

   Similary, $6 \times 2 - 4 = 12 - 4 = 8$

2. $(1)^2 = 1: (3)^2 = 9 \Rightarrow 19$

   Similarly, $(2)^2 = 4; (1)^2 = 1 \Rightarrow 41$

3. Eagle swoops down on anything. The movement of eagle is like swooping. Similarly, the movement of duck is called waddle.

4.

$$\begin{array}{cccccc} A & P & P & L & E \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 1 & + 16 & + 16 & + 12 & + 5 = 50 \end{array}$$

Similarly,

$$\begin{array}{cccccc} O & R & A & N & G & E \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 15 & + 18 & + 1 & + 14 & + 7 & + 5 = 60 \end{array}$$

5. We pay rent for accommodiation. Similarly, we pay fare for journey.

6. Fire causes smoke, smoke comes out when something is burnt in fire. Similarly, cloud causes rain.

7. Grenade and gun are fire arms. Similarly, head and brain sensitive organs.

8.

$$\begin{array}{ccc} T & S & H \\ +1 & -2 & -2 \\ \downarrow & \downarrow & \downarrow \\ I & R & Q \end{array}$$

Similarly,

$$Q \quad P \quad K$$
$$+1 \quad -2 \quad -2$$
$$L \quad O \quad N$$

9.
$$A \quad E \quad Z \longrightarrow F \quad P \quad Y$$
$$+5$$
$$+11$$
$$-1$$

Similarly,

$$B \quad G \quad X \longrightarrow H \quad W \quad W$$
$$+6$$
$$+16$$
$$-1$$
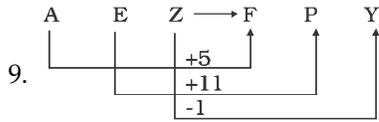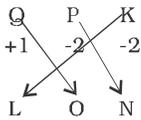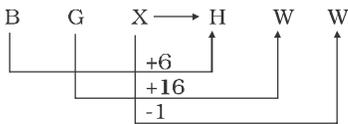
10. $S \xrightarrow{\;-3\;} P$

$N \xrightarrow{\;-2\;} L$

$Z \xrightarrow{\;-3\;} W$

$T \xrightarrow{\;-3\;} Q$

11. Major, Colonel and Brigandier are different ranks in the Indian Army. Admiral is the topmost rank in the Indian Navy.

12. Expect Life Insurance Corporation, all others are insurance companies for general insurance, i.e., vehicles, property etc.

13. Except disease, all other terms denote obstruction, hindrance or interruption.

14. Except remedy, all other terms denote loss of something.

15. Socrates was a Greek philosopher. Ludwing Van Beethowen was a German Composer and Musician. Bach was also a German Composer. WA Mozard was a Austrain Composer.

16. 112 is completely divisible by 4.

$$= \frac{112}{4} = 28$$

$$= \frac{132}{5} = 26.4;$$

$$\frac{125}{8} = 15.625;$$

$$= \frac{124}{7} = 17.21$$

17. The difference between the two numbers in the number pair 6246 - 6296 is least.

6296 - 6246 = 50

7267 - 7137 = 130

4684 - 4344 = 340

5465 - 5235 = 230

18.
$$Y \longrightarrow X$$
$$U \xrightarrow{-1} T \xrightarrow{-1} S$$
$$O \xrightarrow{-1} N \xrightarrow{-1} M \xrightarrow{-1} L$$
$$G \xrightarrow{-1} F \xrightarrow{-1} E \xrightarrow{-1} D \xrightarrow{-1} C$$
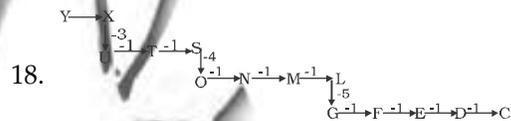
19.
$$D \xrightarrow{+4} H \xrightarrow{+4} L \xrightarrow{+4} \boxed{P} \xrightarrow{+4} T$$
$$D \xrightarrow{+4} E \xrightarrow{+4} I \xrightarrow{+4} \boxed{J} \xrightarrow{+4} N$$

20. $B \xrightarrow{+3} E \xrightarrow{+4} I \xrightarrow{+5} N \xrightarrow{+6} T \xrightarrow{+7} A$

21.
$$A \xrightarrow{+2} C \xrightarrow{+2} E \xrightarrow{+2} \boxed{G}$$
$$Z \xrightarrow{-2} X \xrightarrow{-2} V \xrightarrow{-2} \boxed{T}$$

22.
$$D \xrightarrow{+6} J \xrightarrow{+6} P \xrightarrow{+6} V \xrightarrow{+6} \boxed{B}$$
$$9 \xrightarrow{\times 3} 27 \xrightarrow{\times 3} 81 \xrightarrow{\times 3} 243 \xrightarrow{\times 3} \boxed{729}$$
$$Y \xrightarrow{-6} S \xrightarrow{-6} M \xrightarrow{-6} G \xrightarrow{-6} \boxed{A}$$

23. $\boxed{a}\, c\, \boxed{d}\, b\, /\, d\, \boxed{a}\, cb\, /\, c\, d\, a\, \boxed{b}\, /\, a\, \boxed{c}\, db\, /\, \boxed{d}\, a$

24. $9 \times 2 + 1 = 18 + 1 = 19$

$19 \times 2 + 2 = 38 + 2 = 40$

$40 \times 2 + 3 = 80 + 3 = 83$

$83 \times 2 + 4 = 166 + 4 = 170$

$170 \times 2 + 5 = 340 + 5 = \boxed{345}$

Therefore, the number 340 is wrong in th series.

25. $21 + 7 = 28$

$28 + 5 = 3$

$33 + 3 = \boxed{36}$

$36 + 1 = 37$

$37 - 1 = 36$

Therefore, the number 35 is wrong in the series.

26. $5 + 8 = 13$

$13 + 16 = 29$

$29 + 32 = 61$

$61 + 64 = \boxed{125}$

$125 + 128 = 253$

Therefore, the number 120 is wrong in the series.

27. $0 + 7 = 7$

$7 + 21 = 28$

$28 + 35 = 63$

$63 + 61 = 124$

$124 + 87 = \boxed{211}$

Therefore, the number 215 is wrong in the series.

28. $a \nabla b \nabla c$

$\Rightarrow a < b < c$

Option (1)

$a \triangle b \phi c$

$\Rightarrow a < b \le c$ or,

$a < b \le c$

option (2)

$a \phi b + c$

$\Rightarrow a \le b = c$

option (3)

$a \, 0 \, b + c \Rightarrow a > b = c$

option (4)

$a \, 0 \, b \times c \Rightarrow a > b \ge c$

29. $2 \times 3 \times 5 \times 4 = 120$

$120 \times 120 = 14400$

30. P E A R
    ↓ ↓ ↓ ↓
    G F D N

Therefore,

R E A P
↓ ↓ ↓ ↓
N F D G

31. $5 - 4 = 1$

$4 - 3 = 1$

$1 + 1 = 2$

$6 - 2 = 4;$

$7 - 2 = 5$

$4 + 5 = \boxed{9}$

32.

L ⇒ ×	M ⇒ +
P ⇒ +	Q ⇒ −

16P 24 M 8 Q 6 M 2 L 3 = ?

$\Rightarrow ? = 16 + 24 \div 8 - 6 \div 2 \times 3$

$\Rightarrow ? = 16 + 3 - 3 \times 3$

$\Rightarrow ? = 16 + 3 \quad - 9 = \boxed{10}$

33. There is no 'V' letter in the given word.

34. F L A T T E R
    ↓ ↓ ↓ ↓ ↓ ↓ ↓

7	2	3	8	8	5	9
M	O	T	H	E	R	
↓	↓	↓	↓	↓	↓	
4	6	8	1	5	9	

Therefore,

M	A	M	M	O	T	H
↓	↓	↓	↓	↓	↓	↓
4	3	4	4	6	8	1

35. $16 \Rightarrow (2+2)^2 = (4)^2$

$9 \Rightarrow (3+0)^2 = (3)^2$

Similarly, 64

$\Rightarrow (4+4)^2 = (8)^2$

36. The product of two numbers in a sector is equal to the central number in the previous sector.

$3 \times 5 = 15$

$8 \times 3 = 24$

$7 \times 2 = 14$

$5 \times 3 = \boxed{15}$

$8 \times 4 = 32$

$9 \times 1 = 9$

$7 \times 4 = 28$

37. First Column

$10 + 12 + 4 + 10 = 36$

$\dfrac{36}{2} = 18$

= 18 (Lowermost number)

Second Column

$11 + 12 + 15 + 5 = 40$

$\dfrac{40}{2} = 20$

Third Column

$15 + 8 + 10 + 13 = 46$

$\dfrac{46}{2} = \boxed{23}$

38.
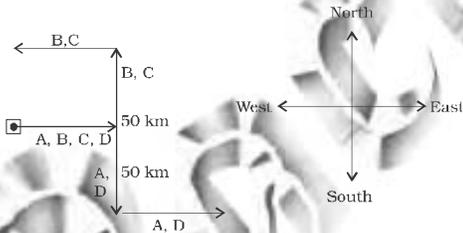
$A \Rightarrow$ East, $B \Rightarrow$ West,

$C \Rightarrow$ West, $D \Rightarrow$ East,

39.
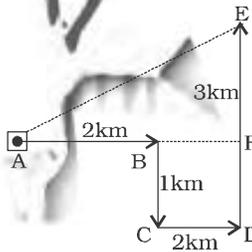
Required distance AE

$= \sqrt{(AF)^2 + (EF)^2}$

$= \sqrt{(4)^2 + (3)^2}$

$= \sqrt{16 + 9}$

$= \sqrt{25}$

$= 5$ km

40. Temple and Church are place of worship. It does not imply that Hindus and Christians use the same place for worship. Church is difference temple. Therefore, neither Conclusion I nor II follows.

41. Growth and development of human organism is a continuous process. Some changes take place in human body now and then. Therefore, neither and then. Therefore, neither Conclusion I nor II follows.

42. H I P P N O W A D I A S M

   P P I H N O $\boxed{W}$ A D M S A I

43. QMPN $\boxed{PQR}$ ROPQNOP $\boxed{PQR}$

   MQRO $\boxed{PQR}$ PPRR $\boxed{PQR}$ P

44. Volume of sphere = $\dfrac{4}{3}\pi r^3$

   Volume of hemisphere = $\dfrac{2}{3}\pi r^3$

   Now,

   $\dfrac{4}{3}\pi r^3 = \dfrac{2}{3}\pi r^3$

   or, r^3 = $\dfrac{2}{3} \times \dfrac{3}{4} \times 27 \times 2$

   $\therefore$ r = 3cm

47.

   S E A R C H $\longrightarrow$ T F B S D I

   (+1, +1, +1, +1, +1, +1)

   Similarly,

   P E N C I L $\longrightarrow$ Q F O D J M

   (+1, +1, +1, +1, +1, +1)
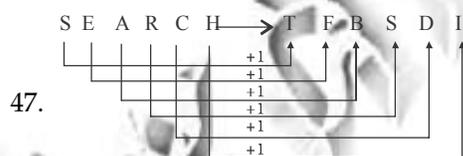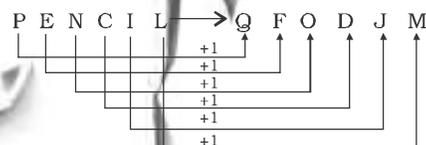
48.
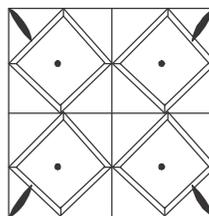
49.
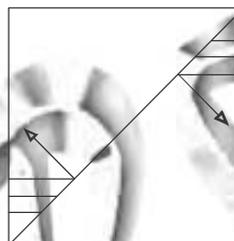
50. G $\Rightarrow$ 58, 66, 77, 85, 98
    U $\Rightarrow$ 04, 12, 23, 31, 40
    I $\Rightarrow$ 00, 13, 21, 34, 42
    D $\Rightarrow$ 56, 69, 75, 87, 99
    E $\Rightarrow$ 01, 14, 20, 32, 43

101.

   AB = Building = $10\sqrt{3}$ metre

   PQ = 20 metre

   BQ = x metre (let)
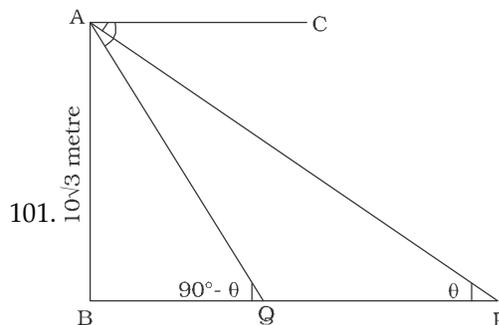
If $\angle AQB = 90° - \theta$

From $\triangle ABP$,

$\tan \theta = \dfrac{AB}{BP}$

$= \dfrac{10\sqrt{3}}{x + 20}$ (i)

From $\triangle ABQ$,

$\tan (90° - \theta) = \dfrac{AB}{BQ}$

$\Rightarrow \cot \theta = \dfrac{10\sqrt{3}}{x}$ (ii)

By multiplying both equations,

$\tan \theta . \cot \theta = \dfrac{10\sqrt{3}}{x + 20} \times \dfrac{10\sqrt{3}}{x}$

$\Rightarrow x^2 + 20x = 10 \times 10 \times 3$

$\Rightarrow x^2 + 20x - 300 = 0$

$\Rightarrow x^2 + 30x - 10x - 300 = 0$

$\Rightarrow x(x + 30) - 10(x + 30) = 0$

$\Rightarrow (x - 10)(x + 30) = 0$

$\Rightarrow x = 10$

$x \neq -30$

$\therefore BP = 10 + 20 = 30$ metre

102. $A + B = 90°$

$\Rightarrow A = 90° - B$

$\Rightarrow \sin A = \sin (90° - B) = \cos B$

Similarly,

$\Rightarrow \cos A = \sin B, \tan A = \cot B$

$\therefore \sin A, \cos B + \cos A. \sin B - \tan A. \tan B + \sec^2 A - \cot^2 B$

$= \cos^2 B + \sin^2 B - \cot B. \tan B + \sec^2 A - \tan^2 A$

$= 1 - 1 + 1 = 1$

$[\because \tan B. \cot B = 1]$

$\sec^2 A - \tan^2 A = 11$

103. $2 \sin^2 \theta + 3 \cos^2 \theta = 2 \sin^2 \theta + 2\cos^2 \theta + \cos^2 \theta$

$= 2 (\sin^2 \theta + \cos^2 \theta) + \cos^2 \theta$

$= 2 + \cos^2 \theta$

$\therefore$ Least value $= 2 + 0 = 2$

$[\because \cos^2 \theta \geq 0]$

104.
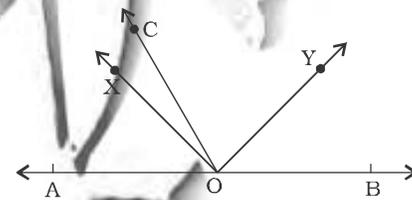
OY is the bisector of $\angle AOC = 2 \angle COX$.

$\therefore \angle BOC = 2 \angle COY$

$\therefore \angle AOC + \angle BOC$

$= 2 \angle COY + 2 \angle COX = 180°$

$\Rightarrow 2(\angle COX + 2 \angle YOC = 180°$

$\Rightarrow \angle XOY = 90°$

$\therefore \angle AOX + \angle XOY + \angle BOY = 180°$

$\therefore = 180° - 90° - 20° = 70°$

105. $4x = \sec \theta$

$\Rightarrow x = \dfrac{\sec \theta}{4}$

Again, $\dfrac{4}{x} = \tan \theta$

$\Rightarrow \dfrac{1}{x} = \dfrac{\tan \theta}{4}$

$\therefore 8\left(x^2 - \dfrac{1}{x^2}\right)$

$= 8\left(\dfrac{\sec^2\theta}{16} - \dfrac{\tan^2\theta}{16}\right)$

$= \dfrac{8}{16}(\sec^2\theta - \tan^2\theta) = \dfrac{1}{2}$

106. $2 - \cos^2\theta = 3\sin\theta.\cos\theta$

Dividing by $\cos^2\theta$

$\dfrac{2}{\cos^2\theta} - 1 = \dfrac{3\sin\theta.\cos\theta}{\cos^2\theta}$

$\Rightarrow 2\sec^2\theta - 1 = 3\tan\theta$

$\Rightarrow 2(1 + \tan^2\theta) - 1 = 3\tan\theta$

$\Rightarrow 2\tan^2\theta + 2 - 1 = 3\tan\theta$

$\Rightarrow 2\tan^2\theta - 3\tan\theta + 1 = 0$

$\Rightarrow 2\tan^2\theta - 2\tan\theta - \tan\theta + 1$
$= 0$

$\Rightarrow 2\tan\theta (\tan\theta - 1) = 0$

$\Rightarrow \tan\theta = \dfrac{1}{2}$ or 1

107. $\sin\theta + \cos\theta$

$= \sqrt{2}\cos(90° - \theta)$

$\Rightarrow \sin\theta + \cos\theta = \sqrt{2}\sin\theta$

On squaring,

$\cos^2\theta + \sin^2\theta + 2\cos\theta.\sin\theta$

$= 2\sin^2\theta$

$\Rightarrow \cos^2\theta = \sin^2\theta - 2\cos\theta.\sin\theta$

On dividing by $\sin^2\theta$

$\Rightarrow \cot^2\theta + 2\cot\theta - 1 = 0$

$\therefore \cot\theta = \dfrac{-2 \pm \sqrt{4 + 4}}{2}$

$= \dfrac{-2 \pm 2\sqrt{2}}{2} = \sqrt{2} - 1$

or $-\left(\sqrt{2} - 1\right)$

108. $x\sin^3\theta + y\cos^3\theta = \sin\theta.\cos\theta$

$\Rightarrow (x\sin\theta).\sin^2\theta + (y\cos\theta)$

$\cos^2\theta = \sin\theta.\cos\theta$

$\Rightarrow x\sin\theta.\sin^2\theta + x\sin\theta.\cos^2\theta$

$= \sin\theta.\cos\theta$

$\Rightarrow x\sin\theta(\sin^2\theta + \cos^2\theta)$

$= \sin\theta.\cos\theta$

$\Rightarrow x = \cos\theta$

$\therefore \sin\theta.\cos\theta$

$\Rightarrow \cos\theta.\sin\theta = y\cos\theta$

$\Rightarrow y = \sin\theta$

$\therefore x^2 + y^2 = \cos^2\theta + \sin^2\theta = 1$

109. $\angle XOY = 90° : OX = OY = $ radius (r)

$\therefore \Delta XOY$ is a right angled triangle.
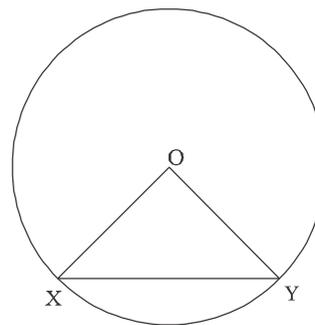

$\therefore \dfrac{1}{2} \times (OX) \times (OY) = 32$

$\Rightarrow r^2 = 2 \times 32 = 64$

$\therefore r = \sqrt{64} = 8$

$\therefore$ Area of circle $= \pi r^2$

110.
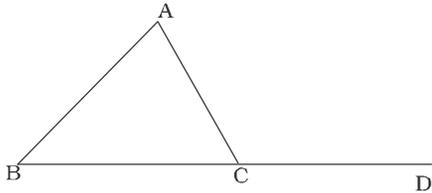
$\angle ACD = \angle ABC = \angle BAC$

$\Rightarrow 108° = \dfrac{\angle A}{2} + \angle A$

$\Rightarrow \dfrac{3\angle A}{2} = 180°$

$\Rightarrow \angle A = \dfrac{108 \times 2}{3} = 72°$

111.
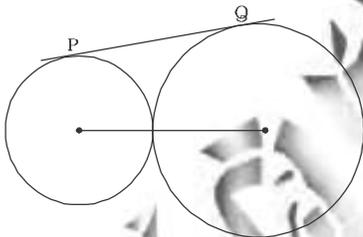
$r_1 + r_2 = 13$ cm

$r_2 - r_1 = 9 - 4 = 5$ cm

PQ

$= \sqrt{\left(\begin{array}{c}\text{distance between}\\ \text{centre}\end{array}\right)^2 - \left(r_2 - r_1\right)^2}$

$= \sqrt{\left(13^2 - 5^2\right)} = 12$ cm

$\therefore$ Area of square $= 12 \times 12 = 144$ sq.cm

112.
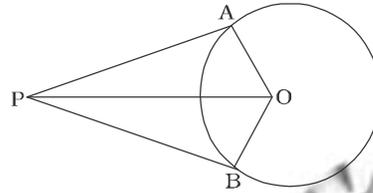
In right Δs OAP and OPB.

AP = PB, OA = OB

OP = OP

$\therefore \Delta OAP = \Delta OPB$

$\therefore \angle AOP = \angle PQB$ and $\angle APO$

$= \angle OPB$

From ΔAOP

$\Delta APO = 180° - 90° - 60° = 30°$

$\therefore \Delta APB = 2 \times 30 = 60°$

113. $\dfrac{(2n - 4) \times 90°}{n} = \dfrac{300°}{n} \times 2$

$\Rightarrow (2n - 4) \times 90° = 2 \times 360°$

$\Rightarrow 2n - 4 = 8 = 2n = 12$

$\Rightarrow n = 6$

114. $\angle PQO = \dfrac{1}{2} PQR = 60°$

From ΔPOQ,

$\angle OPQ = 180° - 90° - 60° \times 30°$
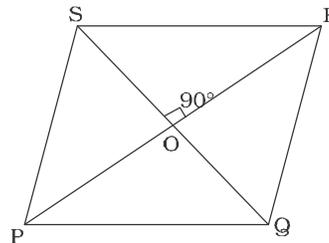
$\sin OPQ = \dfrac{OQ}{PQ}$

$\Rightarrow OQ = PQ \sin 30°$

$\Rightarrow 6 \times \dfrac{1}{2} = 3$

$\therefore QS = 2 \times 3 = 6$ cm

115. Angle traced by hour hand in an hour = 30°

$\therefore$ Angle traced in $2\dfrac{1}{4}$ i.e., $\dfrac{9}{4}$ hours

$= \dfrac{9}{4} \times 30° = \dfrac{135°}{2}$

Angle traced by minute hand in 60 minutes = 360°

$\therefore$ Angle traced in 15 minutes = $\dfrac{360}{60} \times 15 =$ 90°

$\therefore$ Required angle = $90° - \dfrac{135°}{2}$

$= \dfrac{45}{2} = 22\dfrac{1}{2}°$

116. The sum of any two sides of a triangles is greater than third side and their differene is less than third side.

$\therefore a + 4 > 10 \Rightarrow a > 10 - 4$

$\therefore a > 6$

Again, a - 4 < 10 $\Rightarrow$ a < 14

$\therefore 6 < a < 14$

117. x = $(0.08)^2$,

$y = \dfrac{1}{(0.08)^2} = \dfrac{10000}{64} = 156.25$

z = $(1 - 0.08)^2 - 1$

= 1 + $(0.08)^2 - 2 \times 0.08 = -1$

= $(0.08)^2 - 2 - 2 \times 0.08$

Clearly, z < x < y

118.
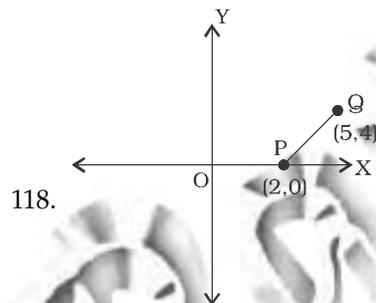
$PQ = \sqrt{(5-2)^2 + (4-0)^2}$

$= \sqrt{9 + 16} = 5$

$\therefore$ Area of circle = πr^2

25π sq. units

119. $x^4 + \dfrac{1}{x^4} = 23$

$\Rightarrow \left(x^2 + \dfrac{1}{x^2}\right)^2 - 2 = 23$

$\Rightarrow \left(x^2 + \dfrac{1}{x^2}\right)^2 = 23 + 2 = 25$

$\therefore x^2 + \dfrac{1}{x^2} = 5$

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

= 5 - 2 = 3

120. x = $\sqrt{6 + \sqrt{6 + \sqrt{6 + \ldots \ldots \infty}}}$

On squaring,

$x^2 = 6 + \sqrt{6 + \sqrt{6 + \ldots \ldots \infty}}$

$\Rightarrow x^2 = 6 + x$

$\Rightarrow x^2 - 3x + 2x - 6 = 0$

$\Rightarrow x(x - 3) + 2(x - 3) = 0$

$\Rightarrow (x - 3)(x + 2) = 0$

$\Rightarrow x = 3$ because $x \neq -2$

121. $x + \dfrac{1}{x} = 3$

On squaring,

$\left(x + \dfrac{1}{x}\right)^2 = 9$

$\Rightarrow x^2 + \dfrac{1}{x^2} = 9 - 2 = 7$

Again, $\left(x + \dfrac{1}{x}\right)^3 = 27$

$\Rightarrow x^3 + \dfrac{1}{x^3} + 3\left(x + \dfrac{1}{x}\right) = 27$

$\Rightarrow x^3 + \dfrac{1}{x^3} = 27 - 3 \times 3 = 18$

$\therefore \left(x^2 + \dfrac{1}{x^2}\right)\left(x^3 + \dfrac{1}{x^3}\right)$

$= 7 \times 18$

$\Rightarrow x^5 + \dfrac{1}{x^5} + \left(x + \dfrac{1}{x}\right) = 126$

$\Rightarrow x^5 + \dfrac{1}{x^5} = 126 - 3 = 123$

122. $\sec^4 \theta - \sec^2 \theta$

$= \sec^2 \theta (\sec^2 \theta - 1)$

$= (1 + \tan^2 \theta)(1 + \tan^2 \theta - 1)$

$= \tan^2 \theta + \tan^2 \theta$
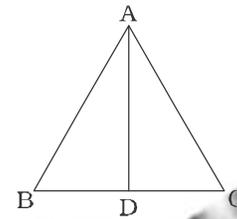
123.

$BD = DC = AD$

$\angle BAD = 30°$

From $\triangle ABD$,

$\triangle BAD = 30°$

$\therefore \triangle ABD = \triangle BAD = 30°$

$\therefore \triangle ADB = 180° - 2 \times 30° = 120°$

$\therefore \triangle ADC = 180° - 120° = 60°$

$\therefore AD = DC$

$\Rightarrow \angle DAC = \angle ACD = 60°$

124. $\sqrt{6} \times \sqrt{15} = x\sqrt{10}$

$\Rightarrow \sqrt{2 \times 3} \times \sqrt{3 \times 5} = x\sqrt{10}$

$\Rightarrow \sqrt{2} \times \sqrt{5} \times 3 = x\sqrt{10}$

$\Rightarrow 3\sqrt{10} = x\sqrt{10}$

$\Rightarrow x = 3$

125. $\dfrac{1}{3 + \sqrt{5}} = \dfrac{3 - \sqrt{5}}{(3 + \sqrt{5})(3 - \sqrt{5})}$

$= \dfrac{\sqrt{3 - \sqrt{5}}}{9 - 5} = \dfrac{3 - \sqrt{5}}{4}$

$\therefore 3 - \dfrac{3 + \sqrt{5}}{4} - \dfrac{3 - \sqrt{5}}{4}$

$$= \frac{12 - 3 - \sqrt{5} - 3 + \sqrt{5}}{4}$$

$$= \frac{6}{4} = \frac{3}{2}$$

126. If $a + b + c = 9$

then $a^3 + b^3 + c^3 - 3abc = 0$

127. Points (a,b) and $[(a + 3)], (b + k)$ will satisfy the equation

$x = 3y + 7 = 0$

$\therefore a - 3y + 7 = 0$

and $a + 3b + 7 = 0$ (i)

$\Rightarrow a + 3 - 3b - 3k + 7 = 0$

$\Rightarrow a - 3b + 7 + 3 - 3k = 0$

$\Rightarrow 3 - 3k = 0$

$\Rightarrow 3k = 3$

$\Rightarrow k = \frac{3}{3} = 1$ $[\because a - 3b + 7 = 0]$

128. Sum of the present ages of four boys

$= 9 \times 4 + 20 = 56$ years

Sum of the present ages of five boys

$= 15 \times 5 = 75$ years

$\therefore$ Present age of new boys

$= 75 - 56 = 19$ years

129. $39 + 48 + 51 + 63 + 75 + 83 + x + 69 = 60 \times 8$

$\Rightarrow 428 + x = 480$

$\Rightarrow x = 480 - 428 = 52$

130. If the weight of a piece of diamond be $6x$ units, then Original price $\alpha(6x)^2 = 36k^2$

$\therefore 36kx^2 = 5184$ (i)

Again,

New price $= k (x^2 + 4x^2 + 9x^2)$

$= 14kx^2$

$$= \frac{14 \times 5184}{36} = \text{Rs. } 2016$$

$\therefore$ Loss $= 5184 - 2016$

$= \text{Rs. } 3168$

131. $\because 30\% = \text{Rs. } 30$

$\therefore 100\% = \text{Rs. } 100$

$\therefore$ New S.P $= 100 - 30$

$= \text{Rs. } 70$

132. $\dfrac{\frac{2}{3}\pi r_1^3}{\frac{2}{3}\pi r_2^3} = \dfrac{6.4}{21.6}$

$\Rightarrow \dfrac{r_1^3}{r_2^3} = \dfrac{64}{216} = \left(\dfrac{4}{6}\right)^3 = \left(\dfrac{2}{3}\right)^3$

$\Rightarrow \dfrac{r_1}{r_2} = \dfrac{2}{3}$

133. Part of the tank filled by both pipes in two hours

$$= 2\left(\frac{1}{8} + \frac{1}{6}\right)$$

$$= 2\left(\frac{3 + 4}{24}\right) = \frac{7}{12}$$

Remaining part $= 1 - \dfrac{7}{12} = \dfrac{5}{12}$

Time taken by B in filling the remaining part

$$= \frac{5}{12} \times 6 = \frac{5}{2} = 2\frac{1}{2} \text{ hours}$$

134. $a^3 + b^3 + c^3 - 3abc$

$= (a + b + c)$

$(a^2 + b^2 + c^2 - ab - bc - ac)$

$= \frac{1}{2} (a + b + c) (2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ac)$

$= \frac{1}{2} (a + b + c) [(a - b)^2 + (b-c)^2 + (c - a)^2]$

$\therefore \frac{a^3 + b^3 + c^3 - 3abc}{a + b + c}$

$= \frac{1}{2}\left[(a - b)^2 + (b - c)^2 + (c - a)^2\right]$

$= \frac{1}{2}(9 + 25 + 1)$

$= \frac{35}{2} = 17.5$

135. If the number of femalses be x, then, number of males = 15000 - x

$\therefore x \times \frac{10}{100} + (15000 - x) \times \frac{8}{100}$

$= 16300 - 15000$

$\Rightarrow 10x + 120000 - 8c$

$= 1300 \times 100$

$\Rightarrow 2x = 130000 - 120000$

$= 10000$

$\Rightarrow x = 5000$

136. Interest = 57000 - 5000

= Rs. 700

$\therefore$ Rate $= \frac{700 \times 100}{5000 \times 1} = 14\%$

Case II,

Interest

$= \frac{\text{Principal} \times \text{Time} \times \text{Rate}}{100}$

$= \frac{7000 \times 5 \times 14}{100}$ = Rs. 4900

Amount = 7000 + 4900

Rs. 11900

137. Relative profit percent

$= \left(20 + 25 + \frac{20 \times 25}{100}\right)$

= 50%

$\therefore$ Original cost price

$= \frac{100}{150} \times 1200$ = Rs. 800

139. 65)175070)1154

$\underline{65}$

$\underline{100}$

$\underline{65}$

$\underline{357}$

$\underline{325}$

$\underline{320}$

$\underline{260}$

$\underline{60}$

$\therefore$ Required number

= 75070 + (65 - 60) = 75075

140. Required number

$= \frac{50 \times 120}{100} = 96$

141. AB = tree

BC = broken part

$\therefore$ BC = CD

AD = 30 metre

From $\triangle ACD$,

$\tan 30° = \frac{AC}{AD}$

$\Rightarrow$ AC v= AD $\times \dfrac{1}{\sqrt{3}}$

$= \dfrac{30}{3} = 10\sqrt{3}$ metre

CD = AC sin 30°

$10\sqrt{3} \times \dfrac{1}{2} = 5\sqrt{3} = 15\sqrt{3}$ metre

142. Cos A = 1 - cos²A = sin² A

∴sin²A + sin⁴A = sin²A = cos²A = 1

143. According to the question,

$\dfrac{n}{2} + \dfrac{n}{4} + \dfrac{n}{5} + 7 = 7$

$\Rightarrow \dfrac{10n + 5n + 4n + 7}{20} = n$

$\Rightarrow \dfrac{19n}{20} + 7 = n$

$\Rightarrow n = \dfrac{19n}{20} = 7$

$\Rightarrow \dfrac{n}{20} = 7$

$\Rightarrow$ n = 20 × 7 =140

144. 675 = 5 × 5 × 3 × 3

$= 3^2 \times 5^2$

∴ Required number

= 3465 - 17 = 3448

146. Required percentage increase

$= \dfrac{40 - 30}{30} \times 100 = \dfrac{100}{3}$

$= 33\dfrac{1}{3}\%$

147. Income of company in 2002

= Rs. 40 lakhs

Expdnditure of company in

2003 = Rs. 40 lakhs

148. Profit of company in 2004

= Rs. 25 lakhs

149. Required difference

20 - 10 = Rs. 10 lakhs

150. Average income of company

$= \dfrac{30 + 50 + 40 + 60 + 60}{5}$

$= \dfrac{240}{5}$ = Rs. 48 lakhs

The incomes of company in years 2001, 2003, and 2004 were greater than Rs. 48 lakhs.