INDIAN NAVY SSR EXAM

MODEL PRACTICE SET

INDIAN NAVY (SSR) AND APPRENTICE ARTIFICER EXAMS

ENGLISH

Directions (1-5) : In the following questions, some of the sentences have errors and some have none. Find out which part of a sentence has an error and select answer (1), (2) or (3). If there is no error, your answer is (4).

1. A milk (1)/ can provide protein (2)/ for nutritionally balanced diet. (3)/ No error (4).

2. When the football team walked onto the field (1)/ the crowd burst into applause, (2)/ but some cheers were heard too. (3)/ No error (4).

3. A lot of form-filling is just red tape, (1)/ and sometimes the forms are so complicated (2)/ that people can't make head or tail from them. (3)/ No error (4).

4. You are required to explain (1)/ your conduct within two days (2)/ after the receipt of this letter, (3)/ No error (4).

5. I now (1)/ am knowing (2)/ all the facts about him.(3)/ No error (4).

Directions (6-10) : In the following questions, sentences are given with blanks to be filled in with appropriate and suitable word(s). Four alternatives are suggested for each question. Choose the correct alternative out of the four.

6. I am satisfied_____his innocence.
(1) at (2) with
(3) for (4) of

7. People like to work for organisation that takes interest in their personnel and _____ growth.
(1) social (2) physical
(3) financial (4) professional

8. Ram, along with the members of the family and that of his friend, _____ the movie.
(1) was watching
(2) were watching
(3) have been watching
(4) watch

9. The manager wanted to meet you _____the theft in the office.
(1) referring to
(2) with regard to
(3) with reference to
(4) in connection with

10. I absolutely refuse to put _____ with that sort of conduct.
(1) up (2) on
(3) off (4) out

Directions (11-15) : Out of the four alternatives, choose the one which expresses the **right** meaning of the given word.

11. SOMBRE
(1) gloomy (2) quiet
(3) serious (4) sleepy

12. REGRESS
(1) seteriorate (2) degenerate
(3) backslide (4) lapse

13. TOXIC
(1) bitter (2) foul-smelling
(3) remedial (4) poisonous

14. YARDSTICK
(1) summation (2) size
(3) statistics (4) standard

15. LITTLE
(1) trivial (2) petty
(3) sample (4) simple

Directions (16-20) : Choose the word **opposite** in meaning to the given word.

16. CUMBERSOME
(1) heavy (2) convenient
(3) confident (4) automatic

17. LOQUACIOUS
(1) talkative (2) confident
(3) diffident (4) bashful

18. INTELLIGIBLE
(1) dull
(2) incomprehensible
(3) garbled (4) confused

19. PHILANTHROPIST
(1) philistine (2) moralist
(3) spendthrift (4) miser

20. ANXIOUS
(1) fearful (2) worried
(3) calm (4) concerned

Directions (21-25) : In the following questions, you have a brief passage with five questions. Read the passage carefully and choose the best answer to each question out of the four alternatives.

All of us have enormous capabilities. In many of us however, our achievements fail to correlate with our potential, because of lack of self-discipline-the effort needed to channel our energy for productive uses. To maximise your effectiveness you must "learn to put your nose to the grindstone, work against boredom and learn to take the long, hard way in life rather than the short, easy way".

Here are a few suggestions that focus on "How to do what you want to do." Take risks. It is important to realise that nothing in life is achieved unless you risk something. That's how self-confidence develops. Every chance you take offers you valuable spinoffs in terms of learning. Earn a reward. Sometime back I had to face the rather unenviable task of preparing for two examinations simultaneously. I had to be ruthless in driving myself from one goal to another hard nosed attitude saw me sail through the courses. I rewarded myself at the end of it indulging in my favourite pastime and taking a short holiday.

21. Why do our achievements fail to correlate with our potential?
(1) Because of lack of intelligence
(2) Because of lack of discipline
(3) Because of lack of external help
(4) Because of lack of self-discipline

22. How does one's self-confidence develop?
(1) By taking risks
(2) By always meeting with success
(3) By being cautious
(4) By being garrulous

23. What does every chance in our life teach us?
(1) It helps us to become philosophical
(2) It helps us to become idealistic

(3) It helps us to learn
(4) It shows us our limitation

24. How does the author reward him after his success?
(1) By taking a short holiday
(2) By doing more work
(3) By visiting friends
(4) By thanking God

25. What does the author try to convey?
(1) One has to be complacent with his present self.
(2) One has to work hard and at least learn from failures.
(3) Only inborn genius succeed in life
(4) One has to believe in luck.

GENERAL KNOWLEDGE

26. The term *nishka* which meant an ornament in the Vedic period was used in later times to denote a/an :
(1) coin
(2) weapon
(3) script
(4) agricultural implement

27. Lord Buddha was born in
(1) Lumbini (2) Vaishali
(3) Bodh Gaya (4) Pavapuri

28. *The Puranas* are ____ in number.
(1) 25 (2) 18
(3) 52 (4) 108

29. *Bimbisara* was the ruler of
(1) Avadh (2) Kanauj
(3) Magadh (4) Gandhara

30. In 1498 Vasco da Gama landed at :
(1) Bombay (2) Cochin
(3) Calicut (4) Goa

31. The term 'Macedonia's Madman' referred to :
(1) Philip 11 (2) Xerxes
(3) Darius (4) Alexander

32. Solar system was discovered by:
(1) Kepler (2) Galileo
(3) Copernicus
(4) Eratosthenes

33. The temperature of the Sun's outer surface is :
(1) 600000°C (2) 6000°C
(3) 60°C (4) 0°C

34. The word used to describe the shape of earth is :
(1) Flat
(2) Circle
(3) Sphere
(4) Oblate spheroid

35. What is the longitude of a town if its local time is 6 p.m. when Greenwich mean time is 4 p.m.?
(1) 20°E (2) 30°E
(3) 20°E (4) 30°W

36. Myopia is a defect of :
(1) Eye (2) Ear
(3) Teeth (4) Mouth

37. Which gas is filled in balloons ?
(1) Oxygen (2) Ozone
(3) Nitrogen (4) Hydrogen

38. The term 'checkmate' is associated with _____.
(1) Golf (2) Badminton
(3) Tennis (4) Chess

39. Thomas cup is associated with _____.
(1) Badminton (2) Golf
(3) Lawn tennis (4) Basket ball

40. The national emblem of France is _____.
(1) Eagle (2) Lily
(3) Lion (4) Rose

41. The currency Thailand is :
(1) Waht (2) Dinar
(3) Dirham (4) Dong

42. Who was the first man to reach North pole ?
(1) Robert Peary
(2) Amundsen
(3) Yuri Gagrin
(4) None of these

43. The book '*Raghuvamsa*' was written by :
(1) Tulsidas (2) Valmiki
(3) Kalidas (4) Minoo Masani

44. The height of Mt. Everest is :
(1) 8880 m (2) 8848 m
(3) 8511 m (4) 8484 m

45. In northern hemisphere, the longest day falls on :
(1) June 25 (2) June 21
(3) December 21
(4) June 27

46. Marble is a _____ rock.
(1) Igneous
(2) Sedimentary
(3) Metamorphic
(4) None of these

47. The Headquarters of Universal Postal Union is :
(1) Berne (2) Rome
(3) Geneva (4) New York

48. First world war ended in :
(1) 1914 (2) 1916
(3) 1918 (4) 1920

49. India signed an agreement for 57 hawk AJT aircraft in July 2010 with
(1) England
(2) France
(3) Germany
(4) America

50. Who invented aeroplane ?
(1) W. Roentgen
(2) Wright brothers
(3) Z. Jansen
(4) Pitman

GENERAL SCIENCE

51. The heaviest among the inner planets is the
(1) Earth (2) Mars
(3) Mercury (4) Venus

52. Which comet was seen in 1910 and again in 1986 ?
(1) Kohoutek Comet
(2) Halley's Comet
(3) Great Comet
(4) Holme's Comet

53. Treads on the shoe soles are made to increase
(1) strength (2) durability
(3) friction (4) elasticity

54. An apparatus used for locating submerged objects is known as
(1) radar (2) sonar
(3) quasar (4) pulsar

55. A GM Counter is used for detecting
(1) underground oil
(2) coal
(3) underground water
(4) radioactivity

56. The number of stars in the universe is believed to be
(1) 10^{10} (2) 10^{11}
(3) 10^{15} (4) 10^{21}

57. Rocks of which planet are likely to float on water ?
(1) Mars (2) Venus
(3) Saturn (4) Jupiter

58. The device used for converting a.c. into d.c. is called
(1) transformer (2) rectifier
(3) induction coil (4) dynamo

59. The number of chromosomes in a normal human body cell is
(1) 43 (2) 44
(3) 45 (4) 46

60. The deficiency of vitamin A causes
(1) hair to fall
(2) dysentery
(3) night blindness
(4) weakness

61. Jaundice results from the malfunctioning of the
(1) kidney (2) liver
(3) lungs (4) stomach

62. The medicine for typhoid is
(1) chloroquin (2) vitamin A
(3) chloromycetin
(4) sulpha-drugs

63. Trypansomes are transmitted from animal to animal or man by the
(1) sand fly (2) tsetse fly
(3) bacilli (4) spirochaetes

64. Excessive consumption of alcoholic drinks causes damage to the
(1) liver (2) kidney
(3) heart (4) lungs

65. Palaeontology is the study of
(1) birds (2) bones
(3) fossils (4) primates

66. Turpentine is obtained from
(1) crude petroleum
(2) deodar
(3) pine (4) oak

67. Which country is called the sugar bowl of the world ?
(1) Cuba (2) India
(3) Argentina (4) USA

68. Size of nanoparticles is in the range of
(1) 10^{-9} m (2) 10^{-9} cm
(3) 10^{-19}cm (4) 10^{19}cm

69. An example of a lyophilic colloid is
(1) milk (2) gum
(3) fog (4) blood

70. Example of a lewis acid is
(1) NaOH (2) $AlCl_3$
(3) K_2CO_3 (4) KOH

71. Morphine is
(1) a terpene (2) a flaronoid
(3) an alkaloid (4) a tannin

72. An example of an alkaloid is
(1) isomagnolol (2) psoralen
(3) magnolol (4) papaverine

73. Cocaine is isolated from
(1) opium (2) cocoa
(3) rauwalfia (4) piper

74. The compound that is not a natural product is
(1) α pinene (2) citral
(3) camphor
(4) diethyl phthalate

75. Fat-soluble pigments are
(1) tannins (2) lignins
(3) alkaloids (4) flavonoids

MATHEMATICS

76. If a, a_1 a_2 a_3 ..... a_{2n}, b are in AP and a, g_1 g_2, g_3 ....., g_{2n} b are in GP and h is the HM of a and b then

$$\frac{a_1 + a_{2n}}{g_1\ g_{2n}} + \frac{a_2 + a_{2n-1}}{g_2\ g_{2n-1}}$$

$$+ \ldots + \frac{a_n + a_{n+1}}{g_n\ g_{n+1}} \text{ is equal to}$$

(1) $\frac{2n}{h}$ (2) 2nh

(3) nh (4) $\frac{n}{h}$

77. If $\cos\theta$, $\sin\phi$, $\sin\theta$ are in GP then roots of $x^2 + 2\cot\phi . x + 1 = 0$ are always
(1) equal (2) real
(3) imaginary (4) greater than 1

78. Nonreal Complex number z satisfying the equation $z^3 + 2z^2 + 3z + 2 = 0$ are

(1) $\frac{-1 \pm \sqrt{-7}}{2}$

(2) $\frac{1+\sqrt{7}i}{2}, \frac{1-\sqrt{7}i}{2}$

(3) $-i, \frac{-1+\sqrt{7}i}{2}, \frac{-1-\sqrt{7}i}{2}$

(4) None of these

79. If $\Delta(x) =$

$$\begin{vmatrix} 1 & \cos x & 1-\cos x \\ 1+\sin x & \cos x & 1+\sin x-\cos x \\ \sin x & \sin x & 1 \end{vmatrix}$$

then, $\int_0^{\frac{\pi}{2}} \Delta(x)\, dx$ is equal to

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$

(3) 0 (4) $-\frac{1}{2}$

80. If $\{x\}$ denotes the fractional part of x then $\left\{\frac{3^{2n}}{8}\right\}$, $n \in N$, is

(1) $\frac{3}{8}$ (2) $\frac{7}{8}$

(3) $\frac{1}{8}$

(4) None of these

81. If $|x| < \frac{1}{2}$, the coefficient of x^4 in the expansion of $\frac{1}{(1+2x)(1-x^2)}$ is
(1) 1 (2) 22
(3) 21 (4) None of these

82. The set of all possible values of α in $[-\pi, \pi]$ such that $\sqrt{\frac{1-\sin\alpha}{1+\sin\alpha}}$ is equal to $\sec\alpha - \tan\alpha$ is

(1) $\left[0, \frac{\pi}{2}\right]$

(2) $E\left(0, \frac{\pi}{2}\right) \cup \left(\frac{\pi}{2}, \pi\right)$

(3) $[-\pi, 0]$ (4) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

83. The number of solutions of the equation $x^3 + x^2 + 4x + 2\sin x = 0$ in $0 \le x \le 2\pi$ is
(1) Zero (2) One
(3) Two (4) Four

84. $\tan\left(\frac{\pi}{4} + \frac{1}{2}\cos^{-1}x\right)$

$+ \tan\left(\frac{\pi}{4} - \frac{1}{2}\cos^{-1}x\right)$

$x \neq 0$, is equal to

(1) x (2) $2x$

(3) $\frac{2}{x}$ (4) None of these

85. The number of real values of the parameter k for which $(\log_{16}x)^2 - \log_{16}x + \log_{16}k = 0$ with real coefficients have exactly one solution is
(1) 2 (2) 1
(3) 4 (4) None of these

86. In $a\ \Delta$ ABC, $A = \frac{2\pi}{3}$, $b - c = 3\sqrt{3}$ cm and ar $(\Delta ABC) = \frac{a\sqrt{3}}{2}$ cm^2. Then side a is

(1) $6\sqrt{3}$ cm (2) 9cm
(3) 18 cm (4) None of these

87. The diagonals of a parallelogram PQRS are along the lines $x + 3y = 4$ and $6x - 2y = 7$. Then PQRS must be a
(1) rectangle (2) square
(3) cyclic quadrilateral
(4) rhombus

88. The area of the triangle formed by two rays whose combined equation is $y = |x|$ and the line $x + 2y = 2$, is

(1) $\frac{8}{3}$ sq. unit (2) $\frac{4}{3}$ sq. unit

(3) 4 sq.unit (4) $\frac{16}{3}$ sq. unit

89. If the line $y - 1 = m(x - 1)$ cuts the circle $x^2 + y^2 = 4$ at two real points then the number of possible values of m is :

(1) 1 (2) 2

(3) infinite

(4) None of these

90. The ends of a line segment are P(1, 3) and Q (1, 1)– R is a point on the line segment PQ such that PR : QR = 1 : λ. If R is an interior point of the parabola $y^2 = 4x$ then

(1) $\lambda \in (0, 1)$ (2) $\lambda \in \left(-\frac{3}{5}, 1\right)$

(3) $\lambda \in \left(\frac{1}{2}, \frac{3}{5}\right)$

(4) None of these

91. The hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ passes through the point (2, 3) and has the eccentricity 2. Then the transverse axis of the hyperbola has the length

(1) 1 (2) 3

(3) 2 (4) 4

92. The domain of the real-valued function $f(x) = \log_e \left|\log e^x\right|$ is

(1) $(1, +\infty)$ (2) $(0, +\infty)$

(3) $(e, +\infty)$

(4) None of these

93. If $f'(x) = \sqrt{2x^2 - 1}$ and $y = f(x^2)$ then $\frac{dy}{dx}$ at $x = 1$ is

(1) 2 (2) 1

(3) –2

(4) None of these

94. Let $f(x)$ be a twice-differentiable function and $f'(0) = 2$ then $\lim_{x \to 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}$ is

(1) 6 (2) 3

(3) 12

(4) None of these

95. Let $f(x) = \lambda + \mu|x| + \upsilon |x|^2$, where λ, μ, υ are real constants. Then $f'(0)$ exists if

(1) $\mu = 0$

(2) $\upsilon = 0$

(3) $\lambda = 0$

(4) $\mu = \upsilon$

96. If $y = \int_0^x \frac{t^2}{\sqrt{t^2 + 1}}\, dt$ then the rate of change of y with respect to x when $x = 1$ is

(1) $\sqrt{2}$ (2) $\frac{1}{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) None of these

97. Let $f(x) = 1 + 2x^2 + 2^2x^4 + ... + 2^{10}x^{20}$. Then $f(x)$ has

(1) more than one minimum

(2) exactly one minimum

(3) at least one maximum

(4) None of these

98. The curve given by $x + y = e^{xy}$ has a tangent parallel to the y-axis at the point

(1) (0, 1) (2) (1, 0)

(3) (1, 1)

(4) None of these

99. If $f(x) = a \log_e |x| + bx^2 + x$ has extremums at $x = 1$ and $x = 3$ then

(1) $a = \frac{-3}{4}, b = \frac{-1}{8}$

(2) $a = \frac{3}{4}, b = -\frac{1}{8}$

(3) $a = \frac{-3}{4}, b = \frac{1}{8}$

(4) None of these

100. Let $f(x) = 2 \sin^3 x - 3 \sin^2 x + 12 \sin x + 5$, $0 \le x \le \frac{\pi}{2}$. Then $f(x)$ is

(1) decreasing in $\left[0, \frac{\pi}{2}\right]$

(2) increasing in $\left[0, \frac{\pi}{2}\right]$

(3) increasing in $\left[0, \frac{\pi}{4}\right]$ and decreasing in $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

(4) None of these

ANSWERS

1.(1)	**2.**(3)	**3.**(3)	**4.**(4)
5.(2)	**6.**(2)	**7.**(4)	**8.**(1)
9.(4)	**10.**(1)	**11.**(3)	**12.**(3)
13.(4)	**14.**(4)	**15.**(1)	**16.**(2)
17.(4)	**18.**(2)	**19.**(4)	**20.**(3)
21.(4)	**22.**(1)	**23.**(3)	**24.**(1)
25.(2)	**26.**(1)	**27.**(1)	**28.**(2)
29.(3)	**30.**(3)	**31.**(4)	**32.**(3)
33.(2)	**34.**(4)	**35.**(2)	**36.**(1)
37.(4)	**38.**(4)	**39.**(1)	**40.**(2)
41.(1)	**42.**(1)	**43.**(3)	**44.**(2)
45.(2)	**46.**(3)	**47.**(1)	**48.**(3)
49.(1)	**50.**(2)	**51.**(4)	**52.**(2)
53.(3)	**54.**(2)	**55.**(4)	**56.**(4)
57.(3)	**58.**(2)	**59.**(4)	**60.**(3)
61.(2)	**62.**(3)	**63.**(2)	**64.**(1)
65.(3)	**66.**(3)	**67.**(1)	**68.**(1)
69.(2)	**70.**(2)	**71.**(3)	**72.**(4)
73.(2)	**74.**(4)	**75.**(2)	**76.**(1)
77.(2)	**78.**(3)	**79.**(4)	**80.**(3)
81.(3)	**82.**(4)	**83.**(2)	**84.**(3)
85.(1)	**86.**(2)	**87.**(4)	**88.**(2)
89.(3)	**90.**(1)	**91.**(3)	**92.**(4)
93.(1)	**94.**(1)	**95.**(1)	**96.**(3)
97.(2)	**98.**(2)	**99.**(1)	**100.**(2)

EXPLANATIONS

1. (1) Article 'A' should be replaced.

2. (3) 'Cheers' should be replaced with 'abuses'.

3. (3) 'From' should be replaced with 'of'.

4. (4) No error

5. (2) 'Am knowing' should be replaced with 'know'.

6. (2) with

7. (4) professional

8. (1) was watching

9. (4) in connection with

10. (1) up

11. (3) **Sombre (Adjective)** means : very sad or serious ; dull.

12. (3) **Regress (Verb)** means : return to an earlier or less advanced state.

13. (4) **Toxic (Adjective)** means : poisonous or relating to or caused by poison.

14. (4) **Yardstick (Noun)** means : a standard for comparison.
15. (1) **Little** means : small in size, amount or degree.
16. (2) **Cumbersome (Adjective)** means : difficult to carry or use through size or weight. Its opposite is **convenient**.
17. (4) **Loquacious (Adjective)** means : talkative. Its opposite is **bashful**.
18. (2) **Intelligible (Adjective)** means : that can be understood. Its opposite is **incomprehensible**.
19. (4) **Philanthropist (Noun)** is a person who donates money to good causes or otherwise helps others. Its opposite is miser.
20. (3) **Anxious (Adjective)** means : eager or apprehensive. Its opposite is calm.
21. (4) Because of lack of self-discipline
22. (1) By taking risks
23. (3) It helps us to learn
24. (1) By taking a short holiday
25. (2) One has to work hard at least from failures.
26. (1) coin **27.** (1) Lumbini
28. (2) 18 **29.** (3) Magadh
30. (3) Calicut **31.** (4) Alexander
32. (3) Copernicus
33. (2) 6000°C
34. (4) Oblate spheroid
35. (2) 30°E **36.** (1) Eye
37. (4) Hydrogen **38.** (4) Chess
39. (1) Badminton **40.** (2) Lily
41. (1) Waht
42. (1) Robert Peary
43. (3) Kalidas **44.** (2) 8848 m
45. (2) June 21
46. (3) Metamorphic
47. (1) Berne **48.** (3) 1918
49. (1) England
50. (2) Wright brothers
51. (4) Venus
52. (2) Halley's Comet
53. (3) friction **54.** (2) sonar
55. (4) radioactivity
56. (4) 10^{21} **57.** (3) Saturn
58. (2) rectifier **59.** (4) 46
60. (3) night blindness
61. (2) livers
62. (3) chloromycetin
63. (2) tsetse fly **64.** (1) liver
65. (3) fossils **66.** (3) pine
67. (1) Cuba **68.** (1) 10^{-9} m
69. (2) gum **70.** (2) $AlCl_3$
71. (3) an alkaloid
72. (4) papaverine
73. (2) cocoa
74. (4) diethyl phthalate
75. (2) lignins

76. (1) Here, $a + b = a_1 + a_{2n} = a_2 + a_2n - 1\ n - 1 = \ldots\ldots a_n + a_{n+1}$ and $ab = g_1 \cdot g_{2n} = g_2 \cdot g_{2n-1} = \ldots\ldots = g_n \cdot g_{n+1}$ and $h = \dfrac{2ab}{a+b}$

77. (2) $\sin^2\phi = \cos\theta \cdot \sin\theta$
$\therefore \cos 2\phi = 1 - \sin 2\theta$
$= (\cos\theta - \sin\theta)^2$

$$D = 4\cot^2\phi - 4 = 4.\frac{\cos 2\phi}{\sin^2\phi}$$

$$= 4.\left(\frac{\cos\theta - \sin\theta}{\sin\phi}\right)^2 > 0 \quad = 0$$

$\Rightarrow$ three numbers are equal which is a special case.

78. (3) $(z + 1)(z^2 + z + 2) = 0$; non-real complex roots are found from $z^2 + z + 2 = 0$

79. (4) $C_3 \to C_3 + C_2 - C_1$ gives

$$\Delta(x) = \begin{vmatrix} 1 & \cos x & 0 \\ 1+\sin x & \cos x & 0 \\ \sin x & \sin x & 1 \end{vmatrix}$$

$= \cos x - \cos x(1 + \sin x)$
$= -\sin x \cdot \cos x$

$$\therefore \int_0^{\frac{\pi}{2}} \Delta(x)dx = -\frac{1}{2}\int_0^{\frac{\pi}{2}} \sin 2x dx$$

$$= -\frac{1}{2}\left[-\frac{\cos 2x}{z}\right]$$

$$= \frac{1}{4}(\cos\pi - \cos 0) = -\frac{1}{2}$$

80. (3) $3^{2n} = (1 + 8)^n = {}^nC_0 + {}^nC_1 \cdot 8 + {}^nC_2 \cdot 8^2 + \ldots. + {}^nC_n 8^n$

$$\therefore \quad \frac{3^{2n}}{8} = \frac{1}{8} + \quad ({}^nC_1 + {}^nC_2 . 8 + \ldots. + {}^nC_n . 8^7)$$

$$= \frac{1}{8} + \text{ integer.}$$

81. (3) Fraction $= \dfrac{1}{(1+x)(1-x)(1+2x)}$

$$= \frac{A}{1+x} + \frac{B}{1-x} + \frac{C}{1+2x}, \text{ where}$$

$$A = \frac{1}{(1+x)(1-x)(1+2x)}$$

$$= \frac{A}{1+x} + \frac{B}{1-x} + \frac{C}{1+2x}, \text{ where}$$

$$A = \frac{1}{(1-(-1))(1+2(-1))} = -\frac{1}{2};$$

$$B = \frac{1}{(1+1)(1+2.1)} = \frac{1}{6};$$

$$C = \frac{1}{\left\{1+\left(\frac{-1}{2}\right)\right\}\left\{1-\left(\frac{-1}{2}\right)\right\}} = \frac{4}{3}$$

$\therefore$ Fraction

$$= \frac{-1}{2}(1+x)^{-1} + \frac{1}{6}(1-x)^{-1}$$

$$+ \frac{4}{3}(1+2x)^{-1}$$

$$= \frac{-1}{2}(1 - x + x^2 - x^3 + x^4 - ..)$$

$$+ \frac{1}{6}(1 + x + x^2 + x^3 + x^4 + \ldots)$$

$$+ \frac{4}{3}(1 - 2x + (2x)^2 - (2x)^3 + (2x)^4 - \ldots\ldots)$$

$\therefore$ The coefficient of x^4

$$= -\frac{1}{2} + \frac{1}{6} + \frac{4}{3} \times 2^4 = 21$$

82. (4) Clearly $\alpha \neq \pm\dfrac{\pi}{2}$

$$\sec\alpha - \tan\alpha = \frac{1-\sin\alpha}{\cos\alpha} \text{ and}$$

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

$$= \left|\frac{1-\sin\alpha}{\cos\alpha}\right| - \frac{1-\sin\alpha}{(\cos\alpha)}.$$

Hence, these will be equal if

$\cos\alpha > 0$, i.e., $-\dfrac{\pi}{2} < \alpha < \dfrac{\pi}{2}$

83. (2) Here, $x^3 + (x + 2)^2 + 2\sin x 4$,
Clearly, $x = 0$ satisfies the equation.
If $0 < x \leq \pi$,
$x^3 + (x + 2)^2 + 2\sin x > 4$.
If $\pi < x \leq 2\pi$,
$x^3 + (x + 2)^2 + 2\sin x > 27 + 25 - 2$.
So, $x = 0$ is the only solution.

84. (3) Let $\cos^{-1} x = \theta$. Then the expression

$$= \frac{1+\tan\frac{\theta}{2}}{1-\tan\frac{\theta}{2}} + \frac{1-\tan\frac{\theta}{2}}{1+\tan\frac{\theta}{2}}$$

$$= \frac{2\left(1+\tan^2\theta/2\right)}{1-\tan^2\frac{\theta}{2}} = \frac{2}{\cos\theta} = \frac{2}{x}$$

85. (1) $\log_{16} x = \dfrac{1 \pm \sqrt{1 - 41\log_{16} k}}{2}$.

For exactly one solution,
$4 \log_{16} k = 1$.
$\therefore k^4 = 16$
$\therefore k = 2, -2, 2i, -2i$.
But k is positive and real.

86. (2) $\frac{1}{2} bc \sin\frac{2\pi}{3}$

$= \frac{9\sqrt{3}}{2}$ or $\frac{1}{2}.\frac{\sqrt{3}}{2}.bc = \frac{a\sqrt{3}}{2}$

$\Rightarrow bc = 18$.

Also, $\cos\frac{2\pi}{3} = \frac{b^2+c^2-a^2}{2bc}$

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

or, $(b-c)^2 + 3bc - a^2 = 0$,
or, $27 + 54 = a^2$.

87. (4) The diagonals are perpendicular to each other.

88. (2) The lines are $y = x$, $y = -x$ and $x + 2y = 2$ as shown in the figure.
Solving $y = x$, $x + 2y = 2$, the point $A = \left(\frac{2}{3}, \frac{2}{3}\right)$

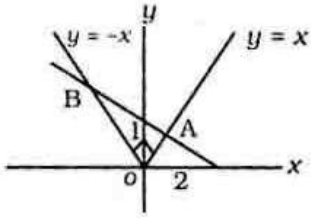
$\therefore OA = \sqrt{\frac{4}{a} + \frac{4}{a}} = \frac{2\sqrt{2}}{3}$.

Solving $y = -x$, $x + 2y = 2$, the point $B = (-2, 2)$

$\therefore OB = \sqrt{4+4} = 2\sqrt{2}$

$\therefore ar(\Delta OAB) = \frac{1}{2} \cdot OA.OB$

$= \frac{1}{2} \cdot \frac{2\sqrt{2}}{3}.2\sqrt{2} = \frac{4}{3}$.



89. (3) The line passes through the interior point (1, 1). So, m can have any real value.

90. (1) $R = \left(1, \frac{1+3\lambda}{1+\lambda}\right)$. It is an interior point of $y^2 - 4x = 0$ if $\left(\frac{1+3\lambda}{1+\lambda}\right)^2 - 4 < 0$.

Therefore, $-\frac{3}{5} < \lambda$ 1.
But $\lambda > 0$.

91. (3) $\frac{4}{a^2} - \frac{9}{b^2} = 1$ and
$b^2 = a^2(e^2 - 1) = a^2.3$.
$\therefore \frac{4}{a^2} - \frac{9}{3a^2} = 1$
$\Rightarrow a^2 = 1$.
Transverse axis $= 2a$
$= 2$

92. (4) $x > 0$ and $\log_e x \neq 0$
$\therefore x > 0$ and $x \neq 1$
$\therefore$ domain $= (0, 1) \cup (1, +\infty)$.

93. (1) $y = f(x^2) \Rightarrow \frac{dy}{dx} = f'(x^2).2x$

$= 2x.\sqrt{2(x^2)^2 - 1}$

At $x = 1$, $\frac{dy}{dx} = 2.1.\sqrt{2-1}$

94. (1) Limit $=$

$$\lim_{x\to 0} \frac{2f'(x) - 6f'(2x) + 4f'(4x)}{2x}$$

$$= \lim_{x\to 0} \frac{2f''(x) - 12''(2x) + 16f''(4x)}{2}$$

$$= \frac{6f''(0)}{2} = 6$$

95. (1) RH derivative $=$

$$\lim_{h\to 0} \frac{\lambda + \mu|0+h| + \upsilon|0+h|^2 - \lambda}{h}$$

$$= h \lim_{\to 0} \frac{\mu h + \upsilon h^2}{h} = \mu.$$

LH derivation $= \lim_{h\to 0}$

$$\frac{\lambda + \mu|0-h| + \upsilon|0-h|^2 - \lambda}{-h}$$

$$\lim_{h\to 0} \frac{\mu h + \upsilon h^2}{-h} = -\mu$$

$f'(x)$ exists
$\Rightarrow$ RH derivative $=$ LH derivative
$\Rightarrow \mu = -\mu$.

96. (3) $\frac{dy}{dx} = \frac{x^2}{\sqrt{x^2+1}}$

$\therefore \left(\frac{dy}{dx}\right)_{x=1} = \frac{1}{\sqrt{1+1}} = \frac{1}{\sqrt{2}}$

97. (2) $f'(x) = x(4 + 4.2^2.x^2 + \ldots + 20.2^{10}.x^{18})$
$\therefore f'(x) = 0 \Rightarrow x = 0$ only.
Also, $f''(0) > 0$

98. (2) Differentiating w.r.t.x,

$$1 + \frac{dy}{dx} = e^{xy}\left(y + x\frac{dy}{dx}\right)$$

or, $\frac{dy}{dx} = \frac{ye^{xy} - 1}{1 - xe^{xy}}$

$\frac{dy}{dx} = \infty$
$\Rightarrow 1 - xe^{xy} = 0$
$\Rightarrow 1 - x(x + y) = 0$
This holds for $x = 1$, $y = 0$

99. (1) Around $x = 1, 3$
we have $|x| = x$
$\therefore f(x) = a \log_e x + bx^2 + x$

$\therefore f'(x) = \frac{a}{x} + 2bx + 1$

From the question, $f'(1) = 0$,
$f'(3) = 0$,
$\therefore a + 2b + 1 = 0$,
$\frac{a}{3} + 6b + 1 = 0$.

100. (2) $f'(x) = 6\sin^2 x \cos x - 6 \sin x \cos x + 12 \cos x$
$= 6 \cos x(\sin^2 x - \sin x + 2)$

$$= 6\cos x\left\{\left(\sin x - \frac{1}{2}\right)^2 + \frac{7}{4}\right\}$$

$\therefore$ In $\left[0, \frac{\pi}{2}\right]$, $f'(x) \geq 0$.

So, $f(x)$ is increasing in $\left[0, \frac{\pi}{2}\right]$