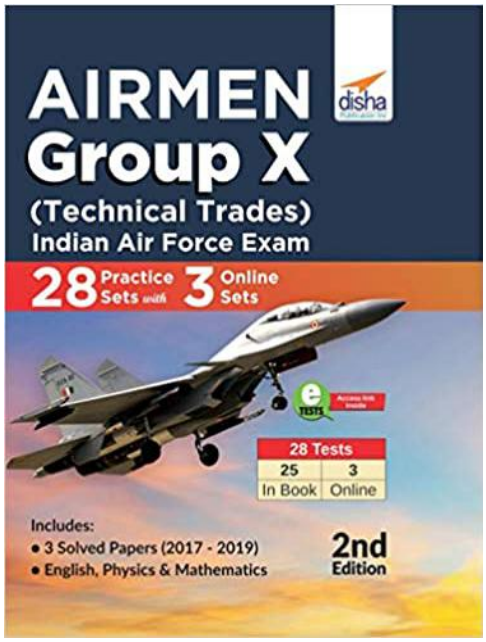
Practice Set for Airmen Group -X

This Section is taken from the Book:



ISBN : 9789389986549

This book is available at all leading physical book stores and online book stores.

To view complete books visit.

To download complete catalogue click **https://amzn.to/2GXTMyA** or visit **QR.**

PRACTICE SET 1

ENGLISH LANGUAGE

1. Find the meaning of the given word.
. Luxuriant
(a) Luxury loving (b) Lovely
(c) Rich (d) Abundant

2. Find the word opposite in meaning to the given word.
Florid
(a) Weak (b) Pale
(c) Monotonous (d) Ugly

DIRECTIONS (Qs. 3-7) : *Find the correct alternative out of the four.*

3. The hotel was not too expensive,_____
(a) was it ? (b) wasn't it ?
(c) is it ? (d) isn't it ?

4. Like humans, zoo animals must have a dentist _____ their teeth.
(a) fill (b) filled
(c) filling (d) to be filled

5. It was very kind of you to do the washing-up, but you _____ it.
(a) didn't have to do (b) hadn't to do
(c) mightn't have done (d) mustn't have done

6. He went _____ sea alone.
(a) in (b) to
(c) into (d) on

7. The _____ of our civilization from an agricultural society to today's complex industrial world was accompanied by war.
(a) adjustment (b) migration
(c) route (d) metamorphosis

DIRECTIONS (Qs. 8-9) : *Find out which part of a sentence has an error. The number of that part is your answer. If there is no error, Your answer is (d) i.e., No error.*

8. He is a university professor (a)/ but of his three sons (b)/ neither has any merit. (c)/ No error (d)

9. After knowing truth, (a)/ they took the right decision (b)/ in the matter. (c)/ No error (d)

DIRECTIONS (Qs. 10-11): *Find the one which can be substituted for the given words/sentence.*

10. An underhand device resorted to in order to justify misconduct
(a) Subterfuge (b) Manoeurce
(c) Stratagem (d) Complicity

11. Impossible to describe
(a) Miraculous (b) Ineffable
(c) Stupendous (d) Appalling

12. Find the correctly spelt word.
(a) collaborate (b) comemorate
(c) colate (d) choclate

13. Find the alternative which best expresses the meaning of the Idiom/Phrase.
A bolt from the blue
(a) a delayed event
(b) an inexplicable event
(c) an unexpected event
(d) an unpleasant event

14. Change the voice
India won the match.
(a) The match had been won by India.
(b) The match was won by India.
(c) The match were won by India.
(d) None of the above.

15. Identify the indirect speech
She says, "Reema comes late".
(a) She said that Reema comes late.
(b) She says that Reema comes late.
(c) She says that Reema came late.
(d) She says that Reema was coming late.

DIRECTIONS (Qs. 16-18): *Read the following passage carefully and choose the best answer to each question out of the four given alternatives.*

On a surface which is free from obstacles, such as a clear road or path, only two or three species of snakes can hope to catch up with a human being, even if they are foolish to try. A snake seems to move very fast but its movements are deceptive. In spite to the swift, wave-like motions of its body, the snake crawls along the ground at no more than the speed of a man's walk. It may, however, have an advantage inside a jungle, where the progress of a man is obstructed by thorny bushes. But in such places, the footsteps of a man are usually more than enough to warn snakes to keep away. Although they have no ears of the usual kind, they can feel slight vibrations of the ground through their bodies, and thus get an early warning of danger.

16. What is deceptive about the snake is its
(a) speed (b) crawling
(c) sense of direction (d) movement

17. The snake has an advantage over men inside a jungle, because there
(a) it can crawl faster
(b) man's movement is obstructed
(c) it is dark (d) it gets warning

18. What helps snakes to receive advance warning is their sensitivity to
(a) light (b) smell
(c) darkness (d) movements

19. Form an adjective from the given word
Hero
(a) The hero (b) Heroes
(c) Heroic (d) Heroism

20. Give the plural of the given word
Bacterium
(a) Bacterias (b) Bacteria
(c) Bactrias (d) Bacteriums

PHYSICS

21. The velocity of sound in any gas depends upon
(a) wavelength of sound only
(b) density and elasticity of gas
(c) intensity of sound waves only
(d) amplitude and frequency of sound

22. Number of electrons in 1 mC charge will be
(a) 1.8×10^{-16} (b) 1.6×10^{16}
(c) 6.25×10^{15} (d) 6.25×10^{17}

23. The angle of contact between pure water and pure glass, is
(a) 0° (b) 45°
(c) 90° (d) 135°

24. Newton's second law gives the measure of
(a) acceleration
(b) force
(c) momentum
(d) angular momentum

25. The dimensional formula of pressure is
(a) $[MLT^{-2}]$ (b) $[ML^{-1}T^{2}]$
(c) $[ML^{-1}T^{-2}]$ (d) $[MLT^{2}]$

26. According to Hooke's law of elasticity, if stress is increased, then the ratio of stress to strain
(a) becomes zero
(b) remains constant
(c) decreases
(d) increases

27. A particle executing S.H.M. having amplitude 0.01 m and frequency 60 Hz. Determine maximum acceleration of particle.
(a) $128\ \pi^2\ m/s^2$ (b) $512\ \pi^2\ m/s^2$
(c) $144\ \pi^2\ m/s^2$ (d) $676\ \pi^2\ m/s^2$

28. The ratio of the numerical values of the average velocity and average speed of a body is always
(a) unity (b) unity or less
(c) unity or more (d) less than unity

29. According to Kepler, the period of revolution of a planet (T) and its mean distance from the sun (r) are related by the equation
(a) T^3r^3 = constant
(b) T^2r^{-3} = constant
(c) Tr^3 = constant
(d) T^2r = constant

30. What temperature is the same on celsius scale as well as on Fahrenheit scale?
(a) −212°C (b) −40°C
(c) −32°C (d) 32°C

31. A moves with 65 km/h while B is coming back of A with 80 km/h. The relative velocity of B with respect to A is
(a) 80 km/h (b) 60 km/h
(c) 15 km/h (d) 145 km/h

32. In changing the state of thermodynamics from A to B state, the heat required is Q and the work done by the system is W. The change in its internal energy is
(a) Q + W (b) Q – W
(c) Q (d) $\frac{Q-W}{2}$

33. The spring extends by x on loading, then energy stored by the spring is
(if T is the tension in spring and k is spring constant)
(a) $\frac{T^2}{2k}$ (b) $\frac{T^2}{2k^2}$
(c) $\frac{2k}{T^2}$ (d) $\frac{2T^2}{k}$

34. Two bodies of masses 2 kg and 4 kg are moving with velocities 2 m/s and 10 m/s respectively along same direction. Then the velocity of their centre of mass will be
(a) 8.1 m/s (b) 7.3 m/s
(c) 6.4 m/s (d) 5.3 m/s

35. At constant pressure, the ratio of increase in volume of an ideal gas per degree rise in kelvin temperature to its original volume is (T = absolute temperature of the gas)
(a) T^2 (b) T
(c) $1/T$ (d) $1/T^2$

36. Two charges are at a distance d apart. If a copper plate of thickness $\frac{d}{2}$ is kept between them, the effective force will be
(a) F/2 (b) zero
(c) 2F (d) $\sqrt{2}$ F

37. The magnetism of magnet is due to
(a) the spin motion of electron
(b) earth
(c) pressure of big magnet inside the earth
(d) cosmic rays

38. How many NAND gates are used in an OR gate?
(a) four (b) two
(c) three (d) five

39. Which of the transitions in hydrogen atom emits a photon of lowest frequency?
(a) n = 2 to n = 1 (b) n = 4 to n = 3
(c) n = 3 to n = 1 (d) n = 4 to n = 2

40. Lenz's law gives
(a) the magnitude of the induced e.m.f.
(b) the direction of the induced current
(c) both the magnitude and direction of the induced current
(d) the magnitude of the induced current

41. The energy in monochromatic X-rays of wavelength 1 Å is roughly equal to
(a) 2×10^{-15} J (b) 2×10^{-16} J
(c) 2×10^{-17} J (d) 2×10^{-18} J

42. The phenomenon by which light travels in an optical fibres is
(a) Reflection
(b) Refraction
(c) Total internal reflection
(d) Transmission

43. Which of the following shows green house effect ?
(a) Ultraviolet rays (b) Infrared rays
(c) X-rays (d) None of these

44. The half life of a radio isotope is 5 years. The fraction which will decay in 15 years, will be
(a) 1/16 (b) 3/4
(c) 7/8 (d) 5/8

45. Two lenses of power + 12 and –2 dioptres are placed in contact. The combined focal length of the combination will be
(a) 8.33 cm (b) 16.6 cm
(c) 12.5 cm (d) 10 cm

MATHEMATICS

46. A set contains $(2n + 1)$ elements. The number of subsets of the set which contain at most n element is
(a) 2^n (b) 2^{n+1}
(c) 2^{n-1} (d) 2^{2n}

47. If R = $\{(x, y) : x, y \in \text{I and } x^2 + y^2 \leq 4\}$ is a relation in I, the domain of R is
(a) $\{0, 1, 2\}$ (b) $\{-2, -1, 0\}$
(c) $\{-2, -1, 0, 1, 2\}$ (d) I

48. If z_1 and z_2 are two non-zero complex numbers such that $|z_1 \quad z_2| = |z_1| + |z_2|$, then arg $z_1 -$ arg z_2 is equal to

(a) $\frac{\pi}{2}$ (b) $-\pi$

(c) 0 (d) $\frac{-\pi}{2}$

49. If $3 < |x| < 6$, then x belongs to
(a) $(-6,-3) \cup (3,6)$ (b) $(-6,6)$
(c) $(-3,-3) \cup (3,6)$ (d) None of these

50. Total number of four digit odd numbers that can be formed using 0, 1, 2, 3, 5, 7 (using repetition allowed) are
(a) 216 (b) 375
(c) 400 (d) 720

51. The last digit in 7^{300} is :
(a) 7 (b) 9
(c) 1 (d) 3

52. Consider the sequence $8A + 2B$, $6A + B$, $4A$, $2A - B$, ..., Which term of this sequence will have a coefficient of A which is twice the coefficient of B?
(a) 10^{th} (b) 14^{th}

(c) 16^{th} (d) None of these

53. A triangle with vertices (4, 0), (–1, –1), (3, 5) is
(a) isosceles and right angled
(b) isosceles but not right angled
(c) right angled but not isosceles
(d) neither right angled nor isosceles

54. The lines $2x-3y \quad 5$ and $3x-4y=7$ are diameters of a circle having area as 154 sq.units.Then the equation of the circle is

(a) $x^2+y^2-2x+2y=62$

(b) $x^2+y^2+2x-2y=62$

(c) $x^2+y^2+2x-2y=47$

(d) $x^2+y^2-2x+2y=47$

55. Value of $\lim_{x \to 0} \frac{\sqrt{1-\cos 2x}}{\sqrt{2}x}$ is
(a) 1 (b) –1
(c) zero (d) does not exist

56. $\lim_{x \to 0} \cos\frac{1}{x}$:
(a) is continuous at $x = 0$
(b) differentiable at $x = 0$
(c) does not exist
(d) none of the there

57. If p, q, r are simple propositions, and $(p \wedge q) \wedge (q \wedge r)$ is true then
(a) p, q, r are all false
(b) p, q, r are all true
(c) p, q are true and r is false
(d) p is true and q and r are false

58. In a class of 100 students there are 70 boys whose average marks in a subject are 75. If the average marks of the complete class is 72, then what is the average of the girls?
(a) 73 (b) 65
(c) 68 (d) 74

59. From eighty cards numbered 1 to 80, two cards are selected randomly. The probability that both the cards have the numbers divisible by 4 is given by
(a) $\frac{21}{316}$ (b) $\frac{19}{316}$
(c) $\frac{1}{4}$ (d) None of these

60. Let R = $\{(1,3),(4,2),(2,4),(2,3),(3,1)\}$ be a relation on the set $A = \{1,2,3,4\}$.. The relation R is
(a) reflexive (b) transitive
(c) not symmetric (d) a function

61. The trigonometric equation $\sin^{-1} x = 2\sin^{-1} a$ has a solution for
(a) $|a| \geq \frac{1}{\sqrt{2}}$ (b) $\frac{1}{2} \quad |a| \quad \frac{1}{\sqrt{2}}$
(c) all real values of a (d) $|a| \leq 1/\sqrt{2}$

62. If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A-B)(A \quad B)$, then which of the following will be always true?
(a) $A \quad B$
(b) $AB \quad BA$
(c) either of A or B is a zero matrix
(d) either of A or B is identity matrix

63. If $1, \omega, \omega^2$ are the cube roots of unity, then

$$\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix}$$ is equal to

(a) ω^2 (b) 0
(c) 1 (d) ω

64. If $A + B + C = \pi$, then
$\cos 2A \quad \cos 2B \quad \cos 2C + 4 \sin A \sin B \sin C$ is equal to :
(a) 0 (b) 1
(c) 2 (d) 3

65. If $f(x) = \frac{1}{1-x}$, then the points of discontinuity of the function $f[\, f\{f(x)\}]$ are
(a) $\{0, -1\}$ (b) $\{0,1\}$
(c) $\{1, -1\}$ (d) None of these

66. If function $f(x) = kx^3 - 9x^2 + 9x + 3$ is monotonic increasing in every interval then
(a) $k < 3$ (b) $k \le 3$
(c) $k > 3$ (d) $k \ge 3$

67. If $\int \frac{dx}{\sqrt{2ax - x^2}} = fog(x) + C$, then

(a) $f(x) = \sin^{-1} x, g(x) = \frac{x \quad a}{a}$

(b) $f(x) = \sin^{-1} x, g(x) = \frac{x - a}{a}$

(c) $f(x) = \cos^{-1} x, g(x) = \frac{x - a}{a}$

(d) $f(x) = \tan^{-1} x, g(x) = \frac{x - a}{a}$

68. The area bounded by y = logx, x -axis and ordinates $x = 1, x = 2$ is :
(a) $\frac{1}{2}(\log 2)^2$ (b) $\log 2 / e$
(c) $\log 4 / e$ (d) $\log 4$

69. The solution of the differential equation
$2x \frac{dy}{dx} - y = 3$ represents –
(a) Straight lines (b) Circles
(c) Parabola (d) Ellipse

70. The solution of $x^3 \frac{dy}{dx} \quad 4x^2 \tan y \quad e^x \sec y$ satisfying $y(1) = 0$ is :
(a) $\tan y = (x-2) e^x \log x$
(b) $\sin y = e^x (x-1) x^{-4}$
(c) $\tan y = (x-1) e^x x^{-3}$
(d) $\sin y = e^x (x-1) x^{-3}$

Hints & Explanations

1. (d) The word **Luxuriant (Adjective)** means : growing thickly and strongly; rich in something that is pleasant or beautiful; abundant.
2. (b) The word **Florid (Adjective)** means : rosy; gaudy; ornated; red; having too much decoration or detail.
The word **Pale (Adjective)** means : light in colour; not strong or bright; having skin that is almost white because of illness.
3. (a) was it ? – is the correct question tag
4. (c) Must have a dentist filling is the correct use of tense.
5. (d) Correct use of tense in the given context
6. (c) Alone supports the preposition 'into'
7. (d) It means a striking alteration in appearance, character etc.
8. (c) Neither is used for two things. For more than two things, none should be used.
9. (a) **After knowing the truth** will be correct usage.
10. (b)

11. (b) Too extreme to be described in words.

12. (a) Correct spellings of other words are : commemorate, collate and chocolate.

13. (c) Idiom '**a bolt from the blue**' means : an event or a piece of news which is sudden and unexpected; a complete surprise.

14. (b)

15. (b)

16. (d) It is mentioned in the passage that The movement of the snakes is deceptive.

17. (b) man's movement is obstructed

18. (d)

19. (c)

20. (b)

21. (b) Velocity of sound in any gas depends upon density and elasticity of gas.

22. (c) $q = ne, \quad q = 1\ mC = 10^{-3}\ C$

$\therefore \quad 10^{-3} = n \times 1.6 \times 10^{-19}$

$$\Rightarrow \quad n = \frac{10^{-3}}{1.6 \times 10^{-19}} = 6.25 \times 10^{15}$$

23. (a) We know that angle of contact is the angle between the tangent to liquid surface at the point of contact and solid surface inside the liquid. In case of pure water and pure glass, the angle of contact is zero.

24. (b) $F \quad \frac{dp}{dt}$

25. (c) $[\text{Pressure}] = [\text{Force}] / [\text{Area}] = \frac{MLT^{-2}}{L^2} =$

$[ML^{-1}T^{-2}]$.

26. (b) The ratio of stress to strain is always constant. If stress is increased, strain will also increase so that their ratio remains constant.

27. (c) Maximum acceleration

$a_{max} = \omega^2 A = 4\pi^2 n^2 A$

$= 4\pi^2 (60)^2 \times (0.01) = 144\ \pi^2\ m/s^2$

28. (b) $\frac{|\text{Average velocity}|}{|\text{Average speed}|} = \frac{|\text{Displacement}|}{|\text{Distance}|} \le 1$

29. (b) $\frac{T^2}{r^3} = \text{constant} \Rightarrow T^2 r^{-3} = \text{constant}$

30. (b) $\frac{C}{5} = \frac{F-32}{9}$ Here C = F

$\frac{C}{5} = \frac{C-32}{9} \quad \Rightarrow \quad 9C = 5C - 160$

$4C = -160 \quad \Rightarrow \quad C = -40°C.$

Thus at –40°C and –40° F the temperture is same.

31. (c) $\vec{v}_{BA} = \vec{v}_B - \vec{v}_A = 80 - 65 = 15$ km/hr

[$\because$ both are moving in the same direction]

32. (b) $\Delta Q = \Delta U + \Delta W$

$\Rightarrow \Delta U = \Delta Q - \Delta W = Q - W$

(using proper sign)

33. (a) $U = \frac{F^2}{2k} = \frac{T^2}{2k}$

34. (b) $\vec{v}_{cm} = \frac{m_1\vec{v}_1 + m_2\vec{v}_2}{m_1 + m_2}$

$= \frac{2 \times 2 + 4 \times 10}{2 + 4} = 7.3 m/s$

35. (c) At constant pressure

$V \propto T \Rightarrow \frac{\Delta V}{V} = \frac{\Delta T}{T}$

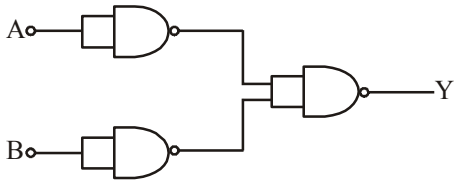
Hence ratio of increase in volume per degree rise in kelvin temperature to it's origianl volume

$= \frac{(\Delta V / \Delta T)}{V} = \frac{1}{T}$

36. (b) The dielectric constant for metal is infinity, the force between the two charges would be reduced to zero.

37. (a)

38. (c) Three NAND gates can be grouped as follows to get an OR gate.

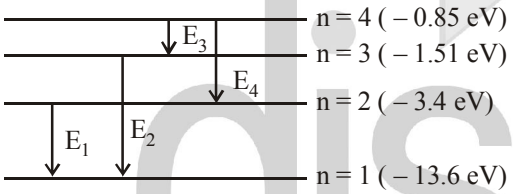


Boolean expression

$Y \quad (\overline{\overline{A}\ \overline{B}}) = \overline{\overline{A}} + \overline{\overline{B}}$

$\Rightarrow Y = A + B$, which is Boolean expression for a two input OR-gate.

39. (b) From diagram



$E_1 = -13.6 - (-3.4) = -10.2$ eV
$E_2 = -13.6 - (-1.51) = -12.09$ eV
$E_3 = -1.51 - (-0.85) = -0.66$ eV
$E_4 = -3.4 - (-0.85) = (-2.55)$ eV
E_3 is least i.e., frequency is lowest.

40. (b)

41. (a) $E = hc/\lambda = 6.6 \times 10^{-34} \times 3 \times 10^8 / 1 \times 10^{-10}$
$= 2 \times 10^{-15}$ J

42. (c) In optical fibre, light travels inside it, due to total internal reflection.

43. (b) Infrared radiations reflected by low lying clouds and keeps the earth warm.

44. (c) $T_{1/2} = 5$ years ; 15 years $= 3T_{1/2}$

N $\frac{N_0}{2^n}$ $\frac{N_0}{8}$; Fraction decayed

$= \frac{N_0 - N}{N_0}$ $\frac{7}{8}$

45. (d) The combined power
$P = P_1 + P_2 = 12 - 2 = 10$ dioptres

$\therefore \quad F = \frac{1}{10} m = 10$ cm

46. (d) Let N $^{2n\ 1}C_0$ $^{2n\ 1}C_1$ ..... $^{2n\ 1}C_n$

Multiplying by 2 on both side

2N $2[^{2n\ 1}C_0$ $^{2n\ 1}C_1$ ..... $^{2n\ 1}C_n]$

$(^{2n\ 1}C_0$ $^{2n\ 1}C_{2n\ 1})$ $(^{2n\ 1}C_1$ $^{2n\ 1}C_{2n})$

$+ ....+ (^{2n\ 1}C_n$ $^{2n\ 1}C_{2n\ 1})$

$^{2n\ 1}C_0$ $^{2n\ 1}C_1$ ..... $^{2n\ 1}C_{2n\ 1}$

$= 2^{2n+1}$

$2N = 2^{2n}.2$

$\therefore \quad N = 2^{2n}$

47. (c) $x^2 + y^2 \le 4$, represents all points interior to the circle x^2 y^2 4 , hence

$-2 \le x \le 2$ and $-2 \le y \le 2$

$\therefore$ integral values of x are $-2, -1, 0, 1, 2$

48. (c) $|z_1$ $z_2| = |z_1| + |z_2|$ $\Rightarrow$ z_1 and z_2 are collinear and are to the same side of origin; hence

arg z_1 – arg $z_2 = 0$.

49. (a) We have,
$3 < |x| < 6 \quad \Rightarrow \quad -6 < x < -3$
or $3 < x < 6$
$\therefore \quad x \in (-6, -3) \cup (3, 6)$

50. (d) Required number of numbers
$= 5 \times 6 \times 6 \times 4 = 36 \times 20 = 720.$

51. (c) We have, $7^1 = 7, 7^2 = 7 \times 7 = 49$
$7^3 = 7 \times 7 \times 7 = 343$
$7^4 = 7 \times 7 \times 7 \times 7 = 2401$
$7^5 = 7 \times 7 \times 7 \times 7 \times 7 = 16807$
Last digit of $7^1 = 7$, $7^2 = 9$, $7^3 = 3$, $7^4 = 1$ and $7^5 = 7$ thus cycle of last digit repeats at 7^5.
$\therefore$ Last digit of $7^{300} = 1$

52. (d) $8+(n-1)(-2)=2(2+(n-1)(-1))$
$\Rightarrow 10=6$ which is absurd

53. (a) $AB=\sqrt{(4+1)^2+(0+1)^2}=\sqrt{26}$;

$BC=\sqrt{(3+1)^2+(5+1)^2}=\sqrt{52}$

$CA=\sqrt{(4-3)^2+(0-5)^2}=\sqrt{26}$;

$\therefore \quad AB=CA$

$\because \quad (\sqrt{26})^2+(\sqrt{26})^2=52$

$\Rightarrow \quad BC^2=AB^2+AC^2$

So, the given triangle is isosceles right angled.

54. (d) $\pi r^2=154\Rightarrow r \quad 7$

To find the centre we some equations

$2x-3y=5$ and $3x-4y \quad 7$,

we get $x \quad 1, y \quad -1$

$\therefore$ centre $=(1,-1)$

Equation of circle, $(x-1)^2 \quad (y \quad 1)^2 \quad 7^2$

$x^2+y^2-2x \quad 2y \quad 47$

55. (d) Consider

$$\lim_{x\to 0}\frac{\sqrt{1-\cos 2x}}{\sqrt{2}x} \quad \lim_{x\to 0}\frac{\sqrt{1-(1-2\sin^2 x)}}{\sqrt{2}x};$$

$$\lim_{x\to 0}\frac{\sqrt{2\sin^2 x}}{\sqrt{2}x} \quad \lim_{x\to 0}\frac{|\sin x|}{x}$$

The limit of above does not exist as
LHS $=-1\neq$ RHL $=1$

56. (c) $\lim_{x\to 0}\cos\frac{1}{x}$ does not exist because

$\cos\frac{1}{0}=\cos\infty$ does not exist.

and $\cos\frac{1}{x}$ is an oscillation function.

57. (b) $(p\wedge q)\wedge(q\wedge r)$ is true means $p\wedge q\wedge q\wedge r$ are both true. $\Rightarrow p, q, r$ are all true.

58. (b) Total student = 100;
For 70 students total marks $=75\times 70=5250$
$\Rightarrow$ Total marks of girls $=7200-5250$
$=1950$

Average of girls $=\frac{1950}{30}=65$

59. (b) Total no. of divisible by 4 between 1 to 80
$80=4+(n-1)4$
$80=4n$
$\Rightarrow \quad n=20$

$\therefore$ Required probability $=\frac{{}^{20}C_2}{{}^{80}C_2}=\frac{19}{316}$

60. (c) $(2,3)\in R$ but $(3,2)\notin R$
$\therefore$ R is not symmetric

61. (d) $\sin^{-1}x=2\sin^{-1}a$

$$\Rightarrow -\frac{\pi}{2}\le\sin^{-1}x\le\frac{\pi}{2}\Rightarrow -\frac{\pi}{2}\le 2\sin^{-1}a\le\frac{\pi}{2}$$

$$\Rightarrow -\frac{\pi}{4}\le\sin^{-1}a\le\frac{\pi}{4}\Rightarrow \sin\left(-\frac{\pi}{4}\right)\le a\le\sin\frac{\pi}{4}$$

or, $\frac{-1}{\sqrt{2}}\le a\le\frac{1}{\sqrt{2}} \quad \therefore |a|\le\frac{1}{\sqrt{2}}$

62. (b) $A^2-B^2=(A-B)(A \quad B)$

$A^2-B^2 \quad A^2 \quad AB-BA-B^2$

$\Rightarrow \quad AB \quad BA$

63. (b) $\Delta=\begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix}$

$= 1\ \omega^{3n} - 1\ - \omega^{n}\ \omega^{2n} - \omega^{2n}\ + \omega^{2n}\ \omega^{n} - \omega^{4n}$

$= \omega^{3n} - 1 - 0 + \omega^{3n} - \omega^{6n}$

$= 1 - 1 + 1 - 1 = 0 \left[\because \omega^{3n}\ \ 1\right]$

64. (b) If $A + B + C = \pi$,

then $\cos mA\ \ \cos mB\ \ \cos mC$

$= 1 - 4 \sin \frac{mA}{2} \sin \frac{mB}{2} \sin \frac{mC}{2}$

$\therefore$ For $m = 2$

$\cos 2A\ \ \cos 2B\ \ \cos 2C$

$= 1 - 4 \sin A \sin B \sin C$

$\Rightarrow \cos 2A\ \ \cos 2B\ \ \cos 2C$

$4 \sin A \sin B \sin C\ \ 1$

65. (b) We have, $f(x) = \frac{1}{1-x}$.

As at $x = 1$, $f(x)$ is not defined, $x = 1$ is a point of discontinuity of $f(x)$.

If $x \neq 1$, $f[f(x)] = f\left(\frac{1}{1-x}\right) = \frac{1}{1 - 1/(1-x)} = \frac{x-1}{x}$

$\therefore x = 0, 1$ are points of discontinuity of $f[f(x)]$.

If $x \neq 0, x \neq 1$

$f[f\{f(x)\}] = f\left(\frac{x-1}{x}\right) = \frac{1}{1 - \frac{(x-1)}{x}}\ \ x$.

66. (d). $f(x)$ is monotonic increasing

$\Rightarrow f'(x) > 0$

$\Rightarrow 3kx^2 - 18x + 9 > 0$

$\Rightarrow kx^2 - 6x + 3 > 0$

which is positive only when $k > 0$ and $b^2 - 4ac \leq 0$

i.e. when $(-6)^2 - 4(k)(3) \leq 0$ or when $k \geq 3$

67. (b) $\int \frac{dx}{\sqrt{2ax - x^2}} = \int \frac{dx}{\sqrt{a^2 - (x^2 - 2ax\ \ a^2)}}$

$= \int \frac{dx}{\sqrt{a^2 - (x-a)^2}} = \sin^{-1}\left(\frac{x-a}{a}\right)\ \ C$

$\therefore f(x) = \sin^{-1} x$ and $g(x) = \frac{x-a}{a}$

68. (c) The area bounded by $y = \log x$ x-axis and ordinates $x = 1$, $x = 2$ is equal to

$\int_1^2 y\ dx\ \ \int_1^2 \log x\ dx\ \ \int_1^2 (1 \times \log x)\ dx$

We integrate it by parts by taking log x as 1st function and 1 as 2nd function.

$= x \log x \big|_1^2 - \int_1^2 \frac{1}{x}.x dx$

$= (2 \log 2 - \log 1) - x \big|_1^2$

$= (\log 2^2 - \log 1) - (2 - 1)$

$= \log 2^2 - \log 1 - 1$

$= \log 4 - \log e = \log \frac{4}{e}$

69. (c) $2x \frac{dy}{dx} = y + 3 \Rightarrow 2 \frac{dy}{y\ \ 3}\ \ \frac{dx}{x}$

$\Rightarrow \quad 2 \log (y+3) = \log x + \log c$

$\Rightarrow \quad (y+3)^2 = cx$, which is a parabola

70. (b) Rewriting the given equation in the form

$x^4 \cos y \frac{dy}{dx}\ \ 4x^3 \sin y\ \ xe^x$

$\Rightarrow \frac{d}{dx}(x^4 \sin y)\ \ xe^x$

$\Rightarrow x^4 \sin y\ \ \int xe^x dx\ \ c = (x-1)e^x\ \ c$

Since, $y(1)\ \ 0$ so, $c = 0$.

Hence, $\sin y = x^{-4}(x-1)e^x$