1. **(b)** $qE = Mg$

$neE = \rho\left(\frac{4}{3}\pi r^3\right) \times g$

$n \times 1.6 \times 10^{-19} \times 3.55 \times 10^5$

$= 3 \times 10^3 \times \frac{4}{3} \times \pi \times (2 \times 10^{-3})^3 \times 9.81$

$n = 173 \times 10^{(3-9-5+19)}$

$n = 1.73 \times 10^{10}$

2. **(a)** Order of atmosphere stratification from bottom Troposphere, stralospherre, Mesosphre, Thermosphere

(a) → (iv) (b) → (iii) (c) → (ii) (d) → (i)

3. **(b)** $E \propto \frac{1}{r}$ $r \propto \frac{1}{m}$

$E \propto m$

Ionization potential $= 13.6 \times \frac{(\text{Mass}_{\mu})\text{eV}}{(\text{Mass}_{e})}$

$= 13.6 \times 207\text{eV} = 2815.2\text{eV}$

4. **(c)** $E = BC = 6$

(Dir. of wave) ∥ $(\vec{E} \times \vec{B})$

$\hat{\imath} = \hat{\jmath} \times \hat{k}$

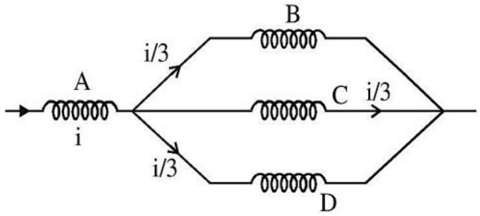
$\vec{E} = 6\hat{\jmath}\text{V/m}$

5. **(c)** Using conservation of angular momentum

$(Mr^2)\omega = (Mr^2 + 2mr^2)\omega'$

$\omega' = \frac{M\omega}{M + 2m}$

6. **(d)**



$\phi \propto i$

$\Rightarrow B \propto i$

so, field at centre of C $= \frac{3}{3} = 1$ T

7. (b) $g = \frac{4\pi^2\ell}{T^2}$

$$\frac{\Delta g}{g} = \frac{\Delta \ell}{\ell} + 2\frac{\Delta T}{T} = \frac{0.1}{10} + 2\left(\frac{\frac{1}{200}}{0.5}\right)$$

$$\frac{\Delta g}{g} = \frac{1}{100} + \frac{1}{50}$$

$$\frac{\Delta g}{g} \times 100 = 3\%$$

8. (b) $P = C$

$FV = C$

$$M\frac{dV}{dt}V = C$$

$$\frac{V^2}{2} \propto t$$

$V \propto t^{1/2}$

$$\frac{dx}{dt} \propto t^{1/2}$$

$x \propto t^{3/2}$

9. (a) Energy associated with each degree of freedom per molecule $= \frac{1}{2}k_B T$.

10. (c) $\lambda_{eq} = \lambda_1 + \lambda_2$

$$\frac{1}{T_{1/2}} = \frac{1}{T_{1/2}^{(a)}} + \frac{1}{T_{1/2}^{(b)}}$$

$$T_{1/2} = \frac{T_{1/2}^{(a)} T_{1/2}^{(b)}}{T_{1/2}^{(a)} + T_{1/2}^{(b)}}$$

11. (a) Adiabatic process is from C to D

$$\begin{aligned} WD &= \frac{P_2 V_2 - P_1 V_1}{1-\gamma} \\ &= \frac{P_D V_D - P_C V_C}{1-\gamma} \\ &= \frac{200(c) - (100)(d)}{1-1.4} \\ &= -500 \text{ J} \end{aligned}$$

12. (b) $\beta = \frac{\lambda D}{d} = \frac{5890\times10^{-10}\times0.5}{0.5\times10^{-3}}$

$= 589 \times 10^{-6}$ m

Distance between first and third bright fringe is $2\beta = 2 \times 589 \times 10^{-6}$ m

$= 1178 \times 10^{-6}$ m

13. (d) $\lambda = \frac{h}{p}$

$$\frac{\lambda_p}{\lambda_e} = \frac{p_e}{p_p} = \frac{m_e v_e}{m_p v_p}$$

$$2 = \frac{m_e}{m_p}\left(\frac{v_e}{4v_e}\right)$$

$$\therefore m_p = \frac{m_e}{8}$$

14. (b) represent correct graph for particle moving with constant acceleration, as for constant acceleration velocity time graph is straight line with positive slope and $x - t$ graph should be an opening upward parabola.

15. (3.9)

$$R = \frac{\rho \ell}{A} = \frac{V}{I}$$

$$\rho = \frac{AV}{I\ell} = \frac{\pi d^2 V}{4I\ell} \quad \left(A = \frac{\pi d^2}{4}\right)$$

$$\therefore \frac{\Delta\rho}{\rho} = \frac{2\Delta d}{d} + \frac{\Delta V}{V} + \frac{\Delta I}{I} + \frac{\Delta \ell}{\ell}$$

$$\frac{\Delta\rho}{\rho} = 2\left(\frac{0.01}{5.00}\right) + \frac{0.1}{5.0} + \frac{0.01}{2.00} + \frac{0.1}{10.0}$$

$$\frac{\Delta\rho}{\rho} = 0.004 + 0.02 + 0.005 + 0.01$$

$$\frac{\Delta\rho}{\rho} = 0.039$$

% error $= \frac{\Delta\rho}{\rho} \times 100 = 0.039 \times 100 = 3.90\%$

16. (a) Bandwidth $= R/L$

Bandwidth $\propto$ R

So, bandwidth will increase

17. (2.5) $i = i_0 \cos(\omega t)$

$i = i_0$ at $t = 0$

$i = \frac{i_0}{\sqrt{2}}$ at $\omega t = \frac{\pi}{4}$

$$t = \frac{\pi}{4\omega} = \frac{\pi}{4(2\pi f)} = \frac{1}{8f}$$

$$t = \frac{1}{400} = 2.5 \text{ ms}$$

18. (b) If distant objects are blurry then problem is Myopia.

If objects are distorted then problem is Astigmatism

19. (a) Every part ($d\ell$) of the wire is pulled by force $i(d\ell)B$ acting perpendicular to current & magnetic field giving it a shape of circle.

20. (b) $T^2 \propto R^3$

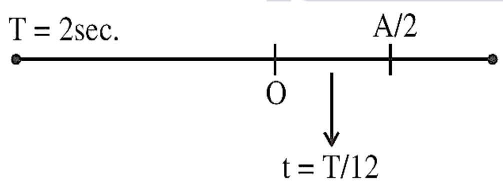
$$\left(\frac{T'}{T}\right)^2 = \left(\frac{9R}{R}\right)^3$$

$$T^2 = T^2 \times 9^3$$

$$T' = T \times 3^3$$

$$T'' = 27\ T$$

21. (6)



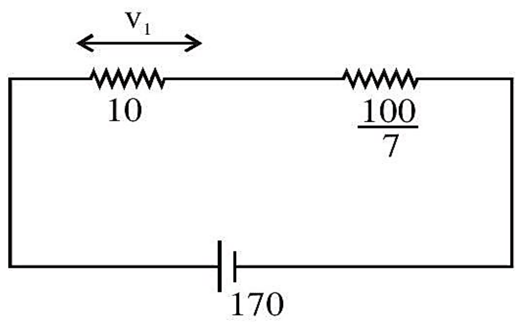
$$t = \frac{2}{12} = \frac{1}{6}$$

$\therefore$ Correct answer $= 6.00$

22. (2) $i_0 = \frac{V}{R} = \frac{30/3}{5\times10^6} = 2 \times 10^{-6}$

$= 2.00$

23. (70) $R_{eq_1} = \frac{50\times20}{70} = \frac{100}{7}$



$$R_{eq} = \frac{170}{7}$$

$v_1 = \left[\frac{170}{\frac{170}{7}}\right] \times 10 = 70v \ = 70.00$

24. (32)

For $A \frac{E}{\pi r^2} = y\frac{2mm}{a}$

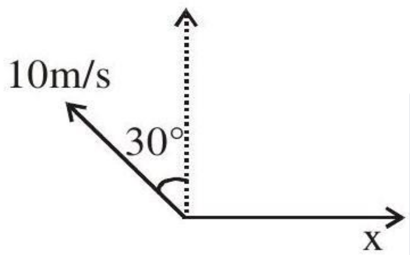
For $B \frac{E}{\pi \cdot 16r^2} = y\frac{4\text{ mm}}{\text{b}}$

$\therefore (1)/(2)$

$16 = \frac{2b}{4a}\frac{\text{a}}{\text{b}} = \frac{1}{32}$

$= 32$

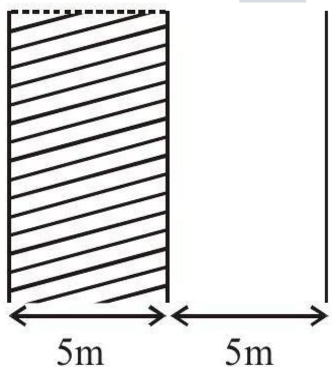
25. (5)



$10\sin 30^\circ = \text{x}$

$\text{x} = 5 \text{ m/s}$

26. (161)



$\text{A} = 100 \text{ m}^2$

Using $C = \frac{k\in\in_0 A}{d}$

$$C_1 = \frac{10 \in_0 (100)}{5}$$

$= 200\epsilon_0$

$$C_2 = \frac{\epsilon_0(100)}{5} = 20\epsilon_0$$

C_1&C_2 are in series so $C_{eqv.} = \frac{C_1C_2}{C_1+C_2}$

$= \dfrac{4000 \in_0}{220}$

$= 160.9 \times 10^{-12} \simeq 161\text{pF}$

27. (20) Let velocity of 2nd fragment is $\vec{v}$ then by conservation of linear momentum

$10(10\sqrt{3})\hat{i} = (10)(10\hat{j}) + 10\vec{v}$

$\Rightarrow \vec{v} = 10\sqrt{3}\hat{i} - 10\hat{j}$

$|\vec{v}| = \sqrt{300+100} = \sqrt{400} = 20\text{ m/s}$

28. (10) Using work energy theorem,

$W_g = \Delta K.E.$

$(10)\,(g)(5) = \frac{1}{2}(10)v^2 - 0$

$v = 10\text{ m/s}$

29. (100)

$10^6 = \beta^2 \times \dfrac{R_0}{R_i}$

$10^6 = \beta^2 \times \dfrac{10^4}{10^2}$

$\beta^2 = 10^4 \Rightarrow \beta = 100$

30. (10)

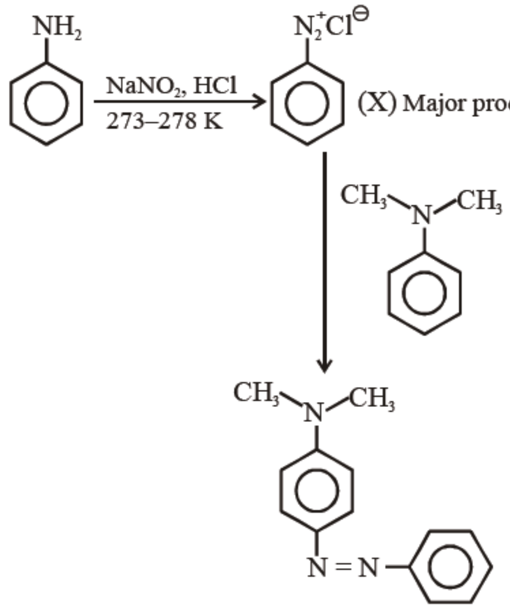
$v^2 = u^2 + 2\text{ as}$

$0 = (10)^2 + 2(-a)\left(\dfrac{1}{2}\right)$

$a = 100\text{ m/s}^2$

$F = ma = (0.1)(100) = 10\text{ N}$

31. (b)



(X) Major product

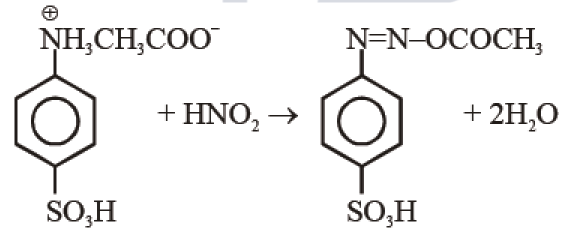
(Y)
Major product

32. **(b)** The ionic radii order is

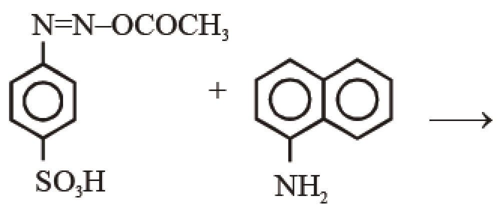
$Na^+ > Mg^{2+} > Al^{3+}$

33. **(c)**

34. **(d)** For detection of NO_2^-, the following test is used. $NO_2^- + CH_3COOH \rightarrow HNO_2 + CH_3COO$

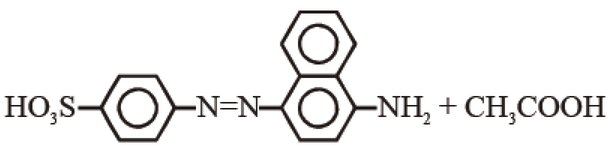


(Sulphanilic acid solution)



Diazotized acid

1-napthyl amine



(Red azo dye)

35. **(d)**

Sucrose $\xrightarrow{H_2O}$ glucose + Fructose

(Non reducing sugar) (Reducing sugar) (Reducing sugar)

36. (a)

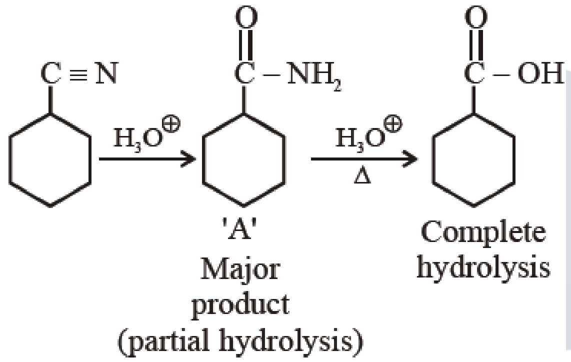
(a) Antacid: Cimetidine

(b) Artifical Sweetener: Alitame

(c) Antifertility: Novestrol

(d) Tranquilizers: Valium

37. (c)



38. (b) Chlorophyll is a coordination compound of magnesium.

Vitamin B-12, cyanocobalamine is a coordination compound of cobalt.

Cisplatin is used as an anti-cancer drug and is a coordination compound of platinum.

Grubbs catalyst is a compound of Ruthenium.

39. (b)

(A) Alcoholic potassium hydroxide → used for β-elimination

(B) $Pd/BaSO_4$ → Lindlar's catalyst

(C) BHC (Benzene hexachloride) → Obtained by addition reactions

(D) Polyacetylene → Electrodes in batteries

40. (a) Methane leads to both global warming & photochemical smog.

Methane is generated in large amounts from paddy fields.

CO_2 can be absorbed by photosynthesis, or by formation of acid rain etc., while no such activities are there for methane.

Hence methane is stronger global warming gas than CH_4.

Methane is not a part of reducing smog.

41. **(c)** $Ca(OCl)_2$ is Bleach.

$CaSO_4 \cdot \frac{1}{2}H_2O$ is plaster of paris.

$CaCO_3$ is used as an antacid.

CaO is major component of cement.

42. **(d)**

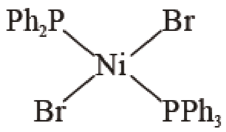
$C_3H_6O \Rightarrow CH_3-CH_2-CH=O$

$\& \ CH_3-\underset{\underset{O}{\|}}{C}-CH_3$

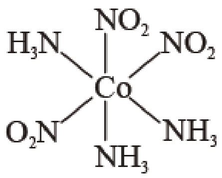
They are functional group isomerism.

43. **(d)**

trans-$[Ni\ Br_2(PPh_3)_2]$ is



meridional - $[Co(NH_3)_3(NO_2)_3]$ is



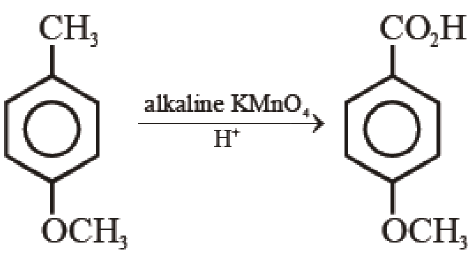
44. **(b)** $1 = 0 \Rightarrow$'s' orbital

$n - l - 1 = 2$

$n - 1 = 2$

$n = 3$

45. **(c)**



(X)

46. **(a)** In manufacture of H_2SO_4 (contact process), V_2O_5 is used as a catalyst. Ni catalysts enables the hydrogenation of fats. $CuCl_2$ is used as catalyst in Deacon's process. ZSM-5 used as catalyst in cracking of hydrocarbons.

47. **(d)** For temporary hardness,

$$Mg(HCO_3)_2 \xrightarrow{\text{heating}} Mg(OH)_2 \downarrow + 2CO_2 \uparrow$$

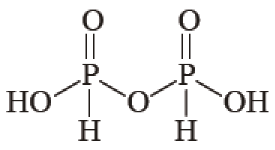
Assertion is false.

$MgCO_3$ has high solubility product than $Mg(OH)_2$.

According to data of NCERT table 7.9

(Equilibrium chapter), the solubility product of magnesium carbonate is 3.5×10^{-8} and solubility product of $Mg(OH)_2$ is 1.8×10^{-11}. Hence Reason is incorrect.

48. (c) $PCl_3 + H_3PO_3 \rightarrow H_4P_2O_5$



(Two ionisable H)

49. (b) $M_{12\times\frac{2}{3}} A_6$

$M_8\ A_6$

$M_4\ A_3$

50. (a) To reduce the melting point of reaction mixture, cryolite is added.

51. (15) AX is a covalent diatomic molecule.

The molecule is NO.

Total no. of electrons is 15.

52. (10)

$$\mathrm{pH} = \mathrm{pKa} + \log\frac{[\mathrm{CB}]}{[\mathrm{WA}]}$$

$$5.74 = 4.74 + \log\frac{[\mathrm{CB}]}{1}$$

$$\Rightarrow [\mathrm{CB}] = 10\mathrm{M}$$

53. (3) $r = k[NO]^m[Cl_2]^n$

$= k(0.1)^m(0.1)^n$

$= k(0.1)^m(0.2)^n$

$= k(0.2)^m(0.2)^n$

$n = 1$

$m = 2$

$m + n = 3$

54. (128)

$$\Delta_r H = [\epsilon_{C-C} + 2\epsilon_{C-H}] - [\epsilon_{C=C} + \epsilon_{H-H}]$$

$= [347 + 2 \times 414] - [611 + 436]$

$= 128$

55. (16.00)

$$\underset{(HO)H_2C}{}\overset{C_2}{C_2}\underset{CHO}{\overset{\Delta}{64\%}}C_3H_4O + H_2O$$

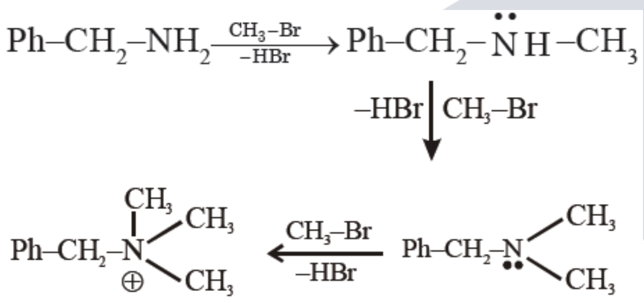
$\frac{x}{74}$ mol

$\frac{x}{74} \times 0.64 = \frac{7.8}{56}$

$x = 16.10$

$\simeq 16.00$

56. (3)



no of moles = 3

57. (3) $K_3[Cr(\text{ oxalate })_3]$

Chromium is in +3 oxidation state.

Number of unpaired electrons in Cr^{+3} will be 3.

58. (50) $\Delta T_f = (1 + \alpha)K_f m$

$\alpha = 0.05 = 50 \times 10^{-3}$

59. (46)

60. (18) $C_2H_6 \rightarrow\ 3H_2O$

$0.1\ 0.3 = 0.3 \times 6 \times 10^{23} = 18 \times 10^{22}$

mol mol

No. of molecules $= 0.3 \times 6.023 \times 10^{23}$

$= 18.069 \times 10^{22}$

61. (c)

$y^2 = 4ax + 4a^2$

differentiate with respect to x

$\Rightarrow 2y\frac{dy}{dx} = 4a$

$\Rightarrow a = \left(\frac{y}{2}\frac{dy}{dx}\right)$

so, required differential equation is

$y^2 = \left(4 \times \frac{y}{2}\frac{dy}{dx}\right)x + 4\left(\frac{y}{2}\frac{dy}{dx}\right)^2$

$\Rightarrow y^2\left(\frac{dy}{dx}\right)^2 + 2xy\left(\frac{dy}{dx}\right) - y^2 = 0$

$\Rightarrow y\left(\frac{dy}{dx}\right)^2 + 2x\left(\frac{dy}{dx}\right) - y = 0$

62. (b) $3x + 4y = 9$

$y = mx + 1$

$\Rightarrow 3x + 4mx + 4 = 9$

$\Rightarrow (3 + 4m)x = 5$

$\Rightarrow$ x will be an integer when

$3 + 4m = 5, -5, 1, -1$

$\Rightarrow m = \frac{1}{2}, -2, -\frac{1}{2}, -1$

so, number of integral values of m is 2

63. (b)

$(1 + x + 2x^2)^{20} = a_0 + a_1x + \cdots . + a_{40}x^{40}$ put $x =$

$1, -1$

$\Rightarrow a_0 + a_1 + a_2 + \cdots . + a_{40} = 2^{20}$

$a_0 - a_1 + a_2 + \cdots .. + a_{40} = 2^{20}$

$\Rightarrow a_1 + a_3 + \cdots . + a_{39} = \frac{4^{20} - 2^{20}}{2}$

$\Rightarrow a_1 + a_3 + \cdots + a_{37} = 2^{39} - 2^{19} - a_{39}$

here $a_{39} = \frac{20!(2)^{19}\times 1}{19!} = 20 \times 2^{19}$

$\Rightarrow a_1 + a_3 + \cdots + a_{37} = 2^{19}(2^{20} - 1 - 20)$

$= 2^{19}(2^{20} - 21)$

64. (d)

$$\begin{vmatrix} 1+\sin^2 x & \sin^2 x & \sin^2 x \\ \cos^2 x & 1+\cos^2 x & \cos^2 x \\ 4\sin 2x & 4\sin 2x & 1+4\sin 2x \end{vmatrix} = 0$$

use $R_1 \to R_1 + R_2 + R_3$

$$\Rightarrow (2+4\sin 2x)\begin{vmatrix} 1 & 1 & 1 \\ \cos^2 x & 1+\cos^2 x & \cos^2 x \\ 4\sin 2x & 4\sin 2x & 1+4\sin 2x \end{vmatrix} = 0$$

$$\Rightarrow \sin 2x = -\frac{1}{2}$$

$$\Rightarrow 2x = \pi + \frac{\pi}{6}, 2\pi - \frac{\pi}{6}$$

$$x = \frac{\pi}{2} + \frac{\pi}{12}, \pi - \frac{\pi}{12}$$

65. (c) $x^2 + y^2 - 10x - 10y + 41 = 0$

$A(5,5), R_1 = 3$

$x^2 + y^2 - 22x - 10y + 137 = 0$

$B(11,5), R_2 = 3$

$AB = 6 = R_1 + R_2$

Touch each other externally ⇒ circles have only one meeting point.

66. (b) $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} = 0$

$$\Rightarrow -(\alpha+\beta+\gamma)(\alpha^2+\beta^2+\gamma^2-\sum\alpha\beta) = 0$$

$$\Rightarrow -(-a)(a^2 - 2\,b - b) = 0$$

$$\Rightarrow a(a^2 - 3\,b) = 0$$

$$\Rightarrow a^2 = 3\,b \Rightarrow \frac{a^2}{b} = 3$$

67. (a) $\int \frac{(2x-1)\cos\sqrt{(2x-1)^2+5}}{\sqrt{(2x-1)^2+5}}dx$

$(2x-1)^2 + 5 = t^2$

$2(2x-1)2dx = 2tdt$

$2\sqrt{t^2-5}dx = tdt$

So $\int \frac{\sqrt{t^2-5}\cos t}{2\sqrt{t^2-5}}dt = \frac{1}{2}\sin t + c$

$= \frac{1}{2}\sin\sqrt{(2x-1)^2+5}+c$

68. (a) $y = mx + c$

$3 = m + c$

$\sqrt{2} = \left|\frac{m-3\sqrt{2}}{1+3\sqrt{2}m}\right|$

$= 6m+\sqrt{2} = m-3\sqrt{2}$

$= \sin = -4\sqrt{2} \to m = \frac{-4\sqrt{2}}{5}$

$== 6\text{ m}-\sqrt{2} = \text{m}-3\sqrt{2}$

$= 7\text{ m}-2\sqrt{2} \to \text{m} = \frac{2\sqrt{2}}{7}$

According to options take $\text{m} = \frac{-4\sqrt{2}}{5}$

So $y = \frac{-4\sqrt{2}x}{5}+\frac{3+4\sqrt{2}}{5}$

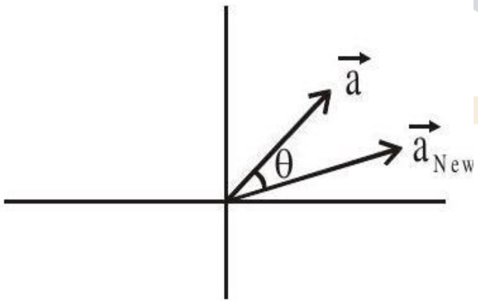
$4\sqrt{2}x+5y-(15+4\sqrt{2}) = 0$

69. (d) $\lim_{x\to0}\frac{\left(x+\frac{x^3}{3!}\ldots\right)-\left(x-\frac{x^3}{3}\ldots\right)}{3x^3} = \frac{1}{6}$

So $6\text{ L}+1 = 2$

70. (d) $\vec{a}_{\text{Old}} = 3p\hat{\imath}+\hat{\jmath}$

$\vec{a}_{\text{New}} = (p+1)\hat{\imath}+\sqrt{10}\hat{\jmath}$



$\Rightarrow |\vec{a}_{\text{Old}}| = |\vec{a}_{\text{New}}|$

$\Rightarrow ap^2+1 = p^2+2p+1+10$

$8p^2-2p-10 = 0$

$4p^2-p-5 = 0$

$(4p-5)(p+1)=0 \rightarrow p=\frac{5}{4},-1$

71. (b) $az\bar{z}+\alpha\bar{z}+\bar{\alpha}z+d=0 \rightarrow$ Circle

centre $=\frac{-\alpha}{a}\ 2=\sqrt{\frac{\alpha\bar{\alpha}}{a^2}-\frac{d}{a}}=\sqrt{\frac{\alpha\bar{\alpha}-ad}{a^2}}$

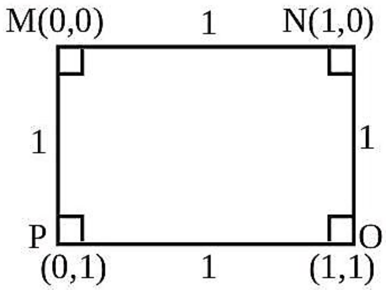
So $|\alpha|^2-ad>0\ \&\ a\in R-\{0\}$

72. (b) $M: x^2+y^2=1$

$N: x^2+y^2-2x=0$

$O: x^2+y^2-2x-2y+1=0$

$P: x^2+y^2-2y=0\ (0,1)$



73. (b)

$S=(100)(100)+(99)(101)+(98)(102)\ldots\ldots\ldots(b)(198)+(a)(199)$

$S=\sum_{x=0}^{99}(100-x)(100+x)=\sum 100^2-x^2=100^3-\frac{99\times100\times199}{6}$

$\alpha=3\ \beta=1650$

slope $=\frac{1650}{3}=550$

74. (b) $f(x)=\frac{\operatorname{cosec}^{-1}x}{\sqrt{\{x\}}}$

Domain $\in(-\infty,-1]\cup[1,\infty)$

$\{x\}\neq 0$ so $x\neq$ integers

75. (b) $T_n=\frac{1}{(2n+1)^2-1}\frac{1}{(2n+2)2n}=\frac{1}{4(n)(n+1)}$

$=\frac{(n+1)-n}{4n(n+1)}=\frac{1}{4}\left(\frac{1}{n}-\frac{1}{n+1}\right)$

$S=\frac{1}{4}\left(1-\frac{1}{101}\right)=\frac{1}{4}\left(\frac{100}{101}\right)=\frac{25}{101}$

76. (c) $f(x)+g(x)=\sqrt{x}+\sqrt{1-x}$, domain $[0,1]$ $f(x)-g(x)=\sqrt{x}-\sqrt{1-x}$, domain $[0,1]$ $g(x)-f(x)=\sqrt{1-x}-\sqrt{x}$, domain $[0,1]$ $\frac{f(x)}{g(x)}=\frac{\sqrt{x}}{\sqrt{1-x}}$, domain $[0,1)$ $\frac{g(x)}{f(x)}=\frac{\sqrt{1-x}}{\sqrt{x}}$, domain $(0,1]$ So, common domain is $(0,1)$

77. (d) $f(x)=\begin{cases}\frac{1}{|x|}, & |x|\geq 1\\ ax^2+b, & |x|<1\end{cases}$

at $x=1$ function must be continuous

So, $1=a+b$

differentiability at $x=1$

$$\left(-\frac{1}{x^2}\right)_{x=1}=(2ax)_{x=1}$$

$$\Rightarrow -1=2a\Rightarrow a=-\frac{1}{2}$$

(a) $\Rightarrow b=1+\frac{1}{2}=\frac{3}{2}$

78. (b)

$$A+2B=\begin{pmatrix}1 & 2 & 0\\ 6 & -3 & 3\\ -5 & 3 & 1\end{pmatrix}$$

$$2A-B=\begin{pmatrix}2 & -1 & 5\\ 2 & -1 & 6\\ 0 & 1 & 2\end{pmatrix}$$

$$\Rightarrow 4A-2B=\begin{pmatrix}4 & -2 & 10\\ 4 & -2 & 12\\ 0 & 2 & 4\end{pmatrix}$$

$$(a)+(b)\Rightarrow 5A=\begin{pmatrix}5 & 0 & 10\\ 10 & -5 & 15\\ -5 & 5 & 5\end{pmatrix}$$

$$A=\begin{pmatrix}1 & 0 & 2\\ 2 & -1 & 3\\ -1 & 1 & 1\end{pmatrix} \text{ and } 2A=\begin{pmatrix}2 & 0 & 4\\ 4 & -2 & 6\\ -2 & 2 & 2\end{pmatrix}$$

$$\therefore B=\begin{pmatrix}2 & 0 & 4\\ 4 & -2 & 6\\ -2 & 2 & 2\end{pmatrix}-\begin{pmatrix}2 & -1 & 5\\ 2 & -1 & 6\\ 0 & 1 & 2\end{pmatrix}$$

$$B=\begin{pmatrix}0 & 1 & -1\\ 2 & -1 & 0\\ -2 & 1 & 0\end{pmatrix}$$

$\mathrm{tr}(A)=1-1+1=1$

$\mathrm{tr}(B)=-1$

$\mathrm{tr}(A)=1$ and $\mathrm{tr}(B)=-1$

$\therefore \mathrm{tr}(A)-\mathrm{tr}(B)=2$

79. (a)

Digits are 1, 2, 2, 3

total distinct numbers $\frac{4!}{2!}=12$.

total numbers when 1 at unit place is 3 .

2 at unit place is 6

3 at unit place is 3 .

$$\text{So,} \quad \begin{aligned} \text{sum } &= (3+12+9)(10^3+10^2+10+1) \\ &= (1111)\times 24 \\ &= 26664 \end{aligned}$$

80. (a) Let $x = 3+\frac{1}{4+\frac{1}{3+\frac{1}{4+\frac{1}{3+\cdots\infty}}}}$

So, $x = 3+\frac{1}{4+\frac{1}{x}} = 3+\frac{1}{\frac{4x+1}{x}}$

$\Rightarrow (x-3) = \frac{x}{(4x+1)}$

$\Rightarrow (4x+1)(x-3) = x$

$\Rightarrow 4x^2-12x+x-3 = x$

$\Rightarrow 4x^2-12x-3 = 0$

$x = \frac{12 \pm \sqrt{(12)^2+12\times 4}}{2\times 4} = \frac{12 \pm \sqrt{12(16)}}{8}$

$= \frac{12 \pm 4\times 2\sqrt{3}}{8} = \frac{3 \pm 2\sqrt{3}}{2}$

$x = \frac{3}{2} \pm \sqrt{3} = 1.5 \pm \sqrt{3}$.

But only positive value is accepted

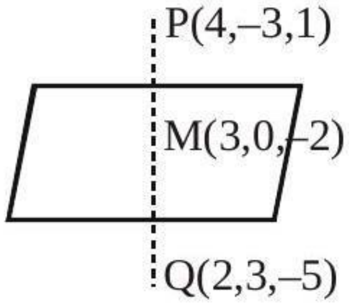
So, $x = 1.5+\sqrt{3}$

81. (300) 3_- _ $= 10\times 10 = 100$

$\_\overset{3}{\_} = 10\times 10 = 100$

$--3 = 10\times 10 = \frac{100}{300}$

82. (28)



Plane is $1(x-3)-3(y-0)+3(z+2)=0$

$x-3y+3z+3=0$

$(a^2+b^2+c^2+d^2)_{\min}=28$

83. (512) $I=2\int_0^4 f(x^2)dx$ {Even funtion}

$$=2\int_0^4(4x^3-g(4-x))dx$$
$$=2\left(\left.\frac{4x^4}{4}\right|_0^4-\int_0^4 g(4-x)dx\right)$$

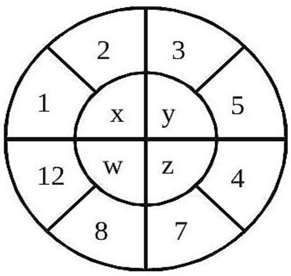
$=2(256-0)=512$

84. (4) $x=(2-1)^{1!}=1$

$w=(12-8)^{4!}=4^{24}$

$z=(7-4)^{3!}=3^6$

hence $y=(5-3)^{2!}=2^2$



85. (6) If $0, z, z_2$ are vertices of equilateral triangles

$\Rightarrow a^2+z_1^2+z_2^2=0(z_1+z_2)+z_1z_2$

$\Rightarrow (z_1+z_2)^2=3z_1z_2$

$\Rightarrow a^2=3\times 12$

$\Rightarrow |a|=6$

86. (d) Let plane is $x-2y+2z+\lambda=0$

distance from $(1,2,3)=1$

$\Rightarrow \frac{|\lambda+3|}{5} = 1 \Rightarrow \lambda = 0, -6$

$\Rightarrow a = 1, b = -2, c = 2, d = -6$ or 0

$b - d = 4$ or $-2, c - a = 1$

$\Rightarrow k = 4$ or -2

87. (35) $\frac{\sum x_i}{25} = 40 \& \frac{\sum x_i - 60 + N}{25} = 39$

Let age of newly appointed teacher is N

$\Rightarrow 1000 - 60 + N = 975$

$\Rightarrow N = 35$ years

88. (4) $f(x) = \int \frac{(5x^8 + 7x^6)dx}{x^{14}(x^{-5} + x^{-7} + 2)^2}$

Let $x^{-5} + x^{-7} + 2 = t$

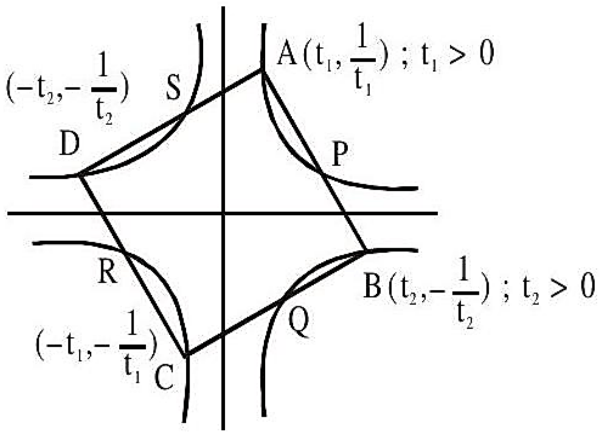
$(-5x^{-6} - 7x^{-8})dx = dt$

$\Rightarrow f(x) = \int -\frac{dt}{t^2} = \frac{1}{t} + c$

$f(x) = \frac{x^7}{x^2 + 1 + 2x^7}$

$f(a) = \frac{1}{4}$

89. (80) $xy = 1, -1$



$\frac{t_1 + t_2}{2} \cdot \frac{\frac{1}{t_1} - \frac{1}{t_2}}{2} = 1$

$\Rightarrow t_1{}^2 - t_2{}^2 = 4t_1t_2$

$\frac{1}{t_1^2} \times \left(-\frac{1}{t_2^2}\right) = -1 \Rightarrow t_1t_2 = 1$

$\Rightarrow (t_1t_2)^2 = 1 \Rightarrow t_1t_2 = 1$

$t_1{}^2 - t_2{}^2 = 4$

$\Rightarrow t_1^2 + t_2^2 = \sqrt{4^2 + 4} = 2\sqrt{5}$

$\Rightarrow t_1^2 = 2 + \sqrt{5} \Rightarrow \frac{1}{t_1^2} = \sqrt{5} - 2$

$AB^2 = (t_1 - t_2)^2 + \left(\frac{1}{t_1} + \frac{1}{t_2}\right)^2$

$= 2\left(t_1^2 + \frac{1}{t_1^2}\right) = 4\sqrt{5} \Rightarrow \text{Area}^{\ 2} = 80$

90. (1)