SOLUTIONS

PROGRESS TEST-4

GZRM-1903-1904, GZRK-1903-1904

GZBS-1902-1903

JEE MAIN PATTERN

Test Date: 11-11-2017

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PHYSICS

1. **(A)** **2.** **(D)** **3.** **(C)** **4.** **(D)**

5. **(B)**

$f = \mu (m_1 + m_2 + m_3) g = 0.4 (3 + 2 + 1) \times 10 = 24$ N

To move the blocks $F \ge f$, $3t \ge 24$, $t \ge 8$s

6. **(C)**

For no slipping $f_{max} \ge \frac{mv^2}{R}$.

7. **(A)**

The inclined plane exerts a force of $mg \cos\theta$ perpendicular to inclination and $mg \sin\theta$ along inclination.

8. **(B)**

$$\frac{\Delta T}{T} \times 100 = \frac{\frac{1}{5}}{25} \times 100 = 0.8\%$$

9. **(A)**

Dimension of $\frac{a}{V^2}$ must be that of pressure

$$\frac{MLT^{-2}}{L^2} = \frac{a}{L^6}$$

$$a = ML^5T^{-2}$$

10. **(B)**

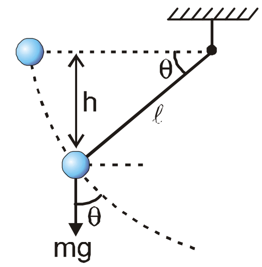
$$a = -s, \quad v\frac{dv}{ds} = -s, \quad \int_{v_0}^{0} vdv = -\int_0^s sds, \frac{v_0^2}{2} = \frac{s^2}{2} \Rightarrow s = v_0$$

11. **(B)**

v_{avg} = slope of line $PQ = \frac{6-4}{5-2} = \frac{2}{3}$ m/s

12. (D)

(Moderate) From conservation of energy



$$mgh = \frac{1}{2}mv^2$$

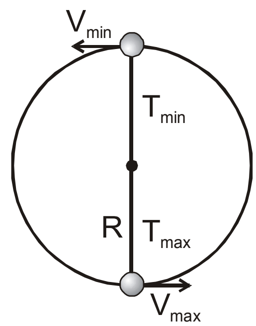
$$\Rightarrow\ mg\ell\sin\theta = \frac{1}{2}mv^2 \Rightarrow 2g\sin\theta = \frac{v^2}{\ell} = a_c$$

$$g\cos\theta = a_t$$

Total acceleration $a = \sqrt{a_c^2 + a_t^2} = g\sqrt{\cos^2\theta + (2\sin\theta)^2} = g\sqrt{3\sin^2\theta + 1}$

13. (C)

$$T_{max} - mg = \frac{mv_{max}^2}{R}$$



$$mg + T_{min} = \frac{mv_{min}^2}{R}$$

$$\frac{T_{max}}{T_{min}} = \frac{\frac{v_{max}^2}{R} + g}{\frac{v_{min}^2}{R} - g} = \frac{\frac{v_{min}^2 + 2.g.2R}{R} + g}{\frac{v_{min}^2}{R} - g}$$

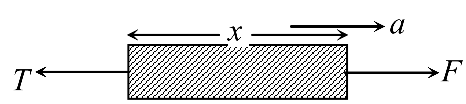
$\Rightarrow v_{min} = 10$ m/s.

14. (C)

15. (B)

16. (C)

Acceleration $a = \frac{F}{M}$



Drawing F.B.D.

$$F - T = \frac{M}{L}(x)a \quad \Rightarrow \quad T = F\left(1 - \frac{x}{L}\right)$$

17. (A)

On cutting of string *QR*, the resultant force m_1 remains zero because its weight m_1g is balance by the tension in the spring but on block m_2 a resultant upward force $(m_1 - m_2)g$ is developed. Thus block m_1 will have no resultant acceleration whereas m_2 does have an upward acceleration given by $\frac{(m_1 - m_2)g}{m_2}$.

18. (C)

$$\mu mg = m\left(\frac{mg}{4m}\right) \Rightarrow \mu = \frac{1}{4}$$

19. (A)

$$T = kp^x d^y E^z$$

$$[T] = [ML^{-1}T^{-2}]^x [ML^{-3}]^y [ML^2T^{-2}]^z$$

$$x + y + z = 0 \qquad \ldots(1)$$

$$-x - 3y + 2z = 0 \qquad \ldots(2)$$

$$-2x - 2z = 1 \qquad \ldots(3)$$

$$x + z = -\frac{1}{2} \qquad \ldots(4)$$

$$-y = -\frac{1}{2} \qquad \Rightarrow \qquad y = \frac{1}{2}$$

by equation (2) $-x - \frac{3}{2} + 2z = 0$

$$-x + 2z = \frac{3}{2} \qquad \ldots(5)$$

Adding (4) & (5)

$$3z = 1,\ z = \frac{1}{3} \qquad \Rightarrow \qquad x = -\frac{1}{2} - \frac{1}{3} = -\frac{5}{6}$$

20. (C)

$$I = \frac{6}{400 + 800} = 5 \times 10^{-3}\ \text{A}$$

$\therefore$ Voltage drop across 400 Ω = 5 × 10^{-3} × 400 = 2 V

Because of the presence of the voltmeter having resistance *G* = 10,000Ω in parallel with 400Ω, the effective resistance is

$$\frac{400 \times 10{,}000}{10{,}400} = \frac{10{,}000}{26}\Omega$$

$\therefore$ Voltage measured = $\frac{10{,}000}{26} \times 5 \times 10^{-3} = \frac{50}{26}\text{V}$

$\therefore$ Relative error in the measurement = $\frac{1}{26}$ = 0.04 volt

21. (C)

$$S_r = u_r t + \frac{1}{2}a_r t^2 ; 0 = ut - \frac{1}{2}(g+a)t^2 \qquad \Rightarrow \quad a = \frac{2u - gt}{t}$$

22. (B)

$$\frac{2u\sin(\alpha-\beta)}{g\cos\beta} = \frac{u\cos(\alpha-\beta)}{g\sin\beta}$$

$$\therefore \quad \tan(\alpha-\beta) = \frac{1}{2}\cot\beta$$

23. (C)

Horizontal component of velocity of *A* is 10 cos 60° or 5 m/s which is equal to the velocity of *B* in horizontal direction. They will collide at *C* if time of flight of both the particles are equal i.e.

$t_A = t_B$

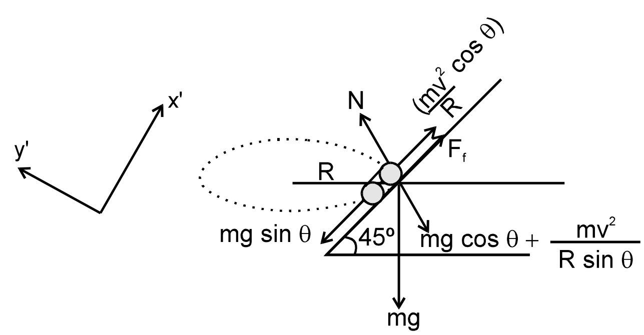
$$\frac{2u\sin\theta}{g} = \sqrt{\frac{2h}{g}} \quad \left(h = \frac{1}{2}gt_B^2\right)$$

or $\quad h = \dfrac{2u^2\sin^2\theta}{g}$

$$\frac{2(10)^2\left(\frac{\sqrt{3}}{2}\right)^2}{10} = 15 \text{ m}$$

24. (D)

F.B.D. for minimum speed (w.r.t. automobile) :



$$\Sigma f_{y'} = N - mg\cos\theta - \frac{mv^2}{R}\sin\theta = 0.$$

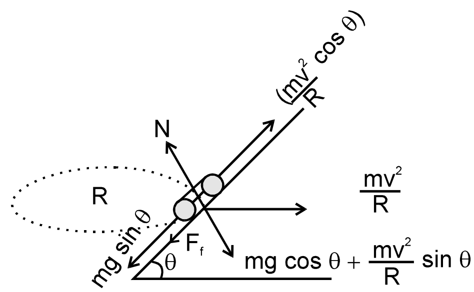
$\Sigma f_{x'} = \frac{mv^2}{R}\cos\theta + \mu N - mg\sin\theta = 0$

$\Rightarrow \quad \frac{mv^2}{R}\cos\theta + \mu(mg\cos\theta + \frac{mv^2}{R}\sin\theta) - mg\sin\theta = 0$

$\Rightarrow \quad v^2 = \frac{(\mu Rg\cos\theta - Rg\sin\theta)}{(\cos\theta + \mu\sin\theta)}$

for $\theta = 45^\circ$ and $\mu = 1 : v_{min} = \frac{Rg - Rg}{1+1} = 0$

F.B.D for maximum speed (w.r.t. automobile)



$\Sigma f_{x'} = \frac{mv^2}{R}\cos\theta - mg\sin\theta - \mu(mg\cos\theta + \frac{mv^2}{R}\sin\theta) = 0$

for $\theta = 45^\circ$ and $\mu = 1$

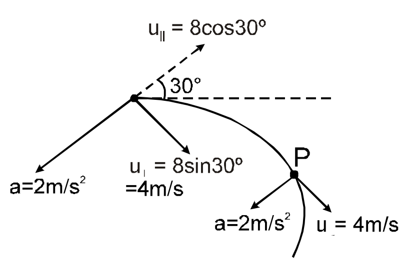
$v_{max} = \infty$ (infinite)

25. (C)

The acceleration vector shall change the component of velocity $u_{\parallel}$ along the acceleration vector.

$r = \frac{v^2}{a_n}$

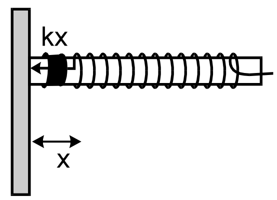
Radius of curvature r_{min} means v is minimum and a_n is maximum. This is at point P when component of velocity parallel to acceleration vector becomes zero, that is $u_{\parallel} = 0$.



$\therefore \quad R = \frac{u_{\perp}^2}{a} = \frac{4^2}{2} = 8$ meter.

26. (B)

For the ring to move in a circle at constant speed the net force on it should be zero. Here spring force will provide the necessary centripetal force.



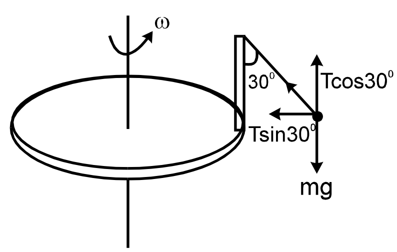
$\therefore \quad kx = mx\omega^2$

$\Rightarrow \quad \omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{300}{3}} = 10$ rad/sec.

27. **(D)**

The bob of the pendulum moves in a circle of radius $(R + R\sin 30^0) = \frac{3R}{2}$

(D) $(R + R\sin 30^0) = \frac{3R}{2}$



Force equations : $T\sin 30^0 = m\left(\frac{3R}{2}\right)\omega^2$

$T\cos 30^0 = mg$

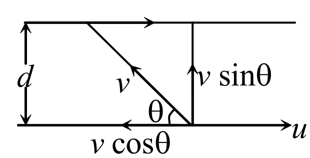
$\Rightarrow \quad \tan 30^0 = \frac{3}{2}\frac{\omega^2 R}{g} = \frac{1}{\sqrt{3}} \qquad \Rightarrow \quad \omega = \sqrt{\frac{2g}{3\sqrt{3}R}}$

28. **(A)**

Maximum friction force is 50 N which is greater than 40 N. Block does not move.

29. **(B)**

The swimmer must swim as shown



$v = \frac{5}{60}$ km/min

$15 = \frac{1}{v\sin\theta}$ or $v \sin\theta = \frac{1}{15}$ or $\frac{5}{60}\sin\theta = \frac{1}{15}$

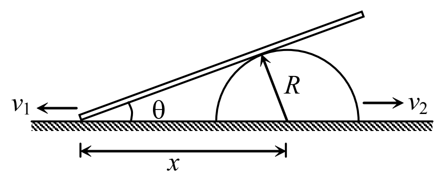
$\therefore \sin\theta = \frac{4}{5}$

$\cos q = \frac{3}{5}$ and $u = v\cos q = \frac{5}{60}\times\frac{3}{5} = \frac{1}{20}$ km/min = 3 km/h

30. (A)

$\frac{dx}{dt} = v_1 + v_2$

$\sin\theta = \frac{R}{x}$



$x = R \operatorname{cosec}\theta$

$\frac{dx}{dt} = -R\operatorname{cosec}\theta\cot\theta\,\frac{d\theta}{dt}$

$\frac{d\theta}{dt} = \frac{-(v_1+v_2)\sin^2\theta}{R\cos\theta}$ (–ve sign shows that θ decreasing with time)

CHEMISTRY

31. (C)

Comp. is $MSO_4.7H_2O$

% by wt_M = 20%

$\frac{M}{(M+222)}\times 100 = 20$

5M = M + 222

$M = \frac{222}{4} = 55.5$ = 56

32. (A)

(i) 1 molecule of O_2 : 32 amu

(ii) 1 atom of N : 14 amu

(iii) 1×10^{-10} g molecules wt of $O_2 = 1 \times 10^{-10} \times 32$ g

$= 32 \times 10^{-10}$ g

(iv) 1×10^{-10} g At wt of Cu $= 1 \times 10^{-10} \times 63.5$

63.5×10^{-10} g

So, (II) < (I) < (III) < (IV)

33. (A)

$$H_2C_2O_4 \cdot 2H_2O + 2NaOH \rightarrow Na_2C_2O_4 + 4H_2O.$$

$$n_{H_2C_2 \cdot 2H_2O \cdot 2H_2O} = \frac{n_{NOOH}}{2}$$

$$\frac{6.3}{126} \times \frac{10}{250} = \frac{0.1 \times V_{ml} \times 10^{-3}}{2}$$

V = 40 ml

34. (B)

$$2\pi r = 3\lambda$$

$$\lambda = \frac{2}{3}\pi (a)\ \ (3)^2 = 6\pi a$$

35. (A)

$$\Delta x = \Delta P$$

$$\Delta x \cdot \Delta P \Rightarrow \frac{h}{4\pi}$$

$$\Rightarrow (\Delta P)^2 \geq \frac{h}{4\pi}$$

$$m^2 (\Delta v)^2 \geq \frac{h}{4\pi}$$

$$\Delta v \geq \frac{1}{m}\sqrt{\frac{h}{4\pi}}$$

$$(\Delta v)_{min} = \frac{1}{2m}\sqrt{\frac{h}{\pi}}$$

36. (B)

$$\frac{1}{\lambda} = 5 \times 10^5\ m^{-1}$$

$$E = \frac{hc}{\lambda}$$

$$= 6.626 \times 10^{-34} \times 3 \times 10^8 \times 5 \times 10^5 = 9.93 \times 10^{-20}\ J$$

37. (B)

Cr has maximum no. of unpaired electron equals to 6.

Hence, highest magnetic moment.

38. (B)

39. (A)

Charle's law

$v = kt$ at constant P and n.

$\left(\frac{dv}{dT}\right)_P = k$ for fixed amount of gas.

40. (A)

$$C_xH_y + O_2(\text{excess}) \longrightarrow xCO_2 + Y/2H_2O$$

0.2 mole 0.5 mole 1.0 mole

$\Rightarrow 0.2x = 0.8 \Rightarrow x = 4$

$0.2Y/2 = 1.0 \Rightarrow Y = 10$

Compound : C_4H_{10}

41. (B)

At constant P & V

$nT = \text{constant}$

$n_1T_1 = n_2T_2$

$n_1 \times 400 = \frac{4}{5}n_1 \times T_2$

$T_2 = 500\,K = 227°C$

42. (C)

$\frac{Tf}{T_2} = \frac{P_f}{P_2} = \frac{14.9}{12}$

$Tf = \frac{14.9}{12} \times 300 = 372.5\,K$ = 99.5°C

43. (A)

$P_{O_2} = X_{O_2}P_T$

$= (0.21 \times 750)$ mm of Hg.

$= 157 \cdot 5$ mm of Hg

44. (A)

$Cr\ O_2\ Cl_2$

Let O.S. of $Cr = x$

$\therefore\ x + 2(-2) + 2(-1) = 0$

$x = +6$

45. (A)

Compound	O.S. of I.
HI	–1
I_2	0
ICl	+ 1
HIO_4	+ 7.

46. (A)

Lattice α Hardness

(A) Ti > ScN > MgO > NaF – order of lattic energy

(B) NaCl < CsCl – Co-ordinate no. NaCl = 6

CsCl = 8

(C) $BeCl_2 < MgCl_2 < CaCl_2$ – Melting point

47. (D)

48. (A)

49. (D)

$$En\ \alpha \frac{1}{size}$$

Order of size = N < C < P < Si

EN = N > C > P > Si

50. (A)

51. (A)

Allred-Roschev's scale

$$En = 0.359\frac{Zeff}{r^2} + 0.744$$

Zeff = Z – σ

r = 1.175 Å

52. (D)

$$\overbrace{O > F}^{\text{Same period}}$$
$$\wedge \quad \wedge$$
$$\underbrace{O^{2-} > F^{-}}_{\text{Isoelectronic}}\} \text{ Anion}$$

53. (C)

$I.E._1 = 100$ eV

$I.E._2 = 150$ eV

$I.E._1 + I.E._2 = 250$ eV

54. (D)

O^{2+} because of high effective nuclear charge as compared to others.

55. (D)

Cs has lowest I.E. (Out of all stable elements).

56. (A)

$$\text{Size} = \underset{3d^1}{Sc} > \underset{3d^{10}}{Zn}$$

57. (A)

58. (D)

Ge

$\left.\begin{matrix} Sn \\ Pb \end{matrix}\right\}$ (Exception) Lanthanide Contraction

$I.E_1$ = Ge > Pb > Sn

59. (D)

$\underline{1S}^2$, $\underline{2S}^2$, $2P^6$, $\underline{3S}^2$, $3d^{10}$, $\underline{4S}^2$, $4p^6$, $4d^{10}$, $\underline{5S}^2$,5electrons are having same spin

60. (D)

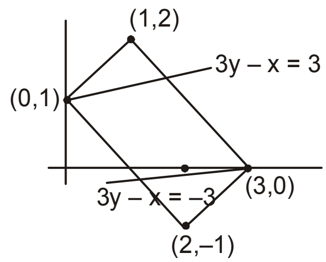
Lattic energy depends upon.

Size of cation and anion both product of charges of cation and anion.

MATHEMATICS

61. (D)

62. (A)



line is 3y – x = 0

63. (D)

$S_1\ S_3\ S_2$ or $S_3\ S_1\ S_2$

Three places can be chosen in $^{10}C_3$ ways and there are only 2 possible arrangements = $^{10}C_3$

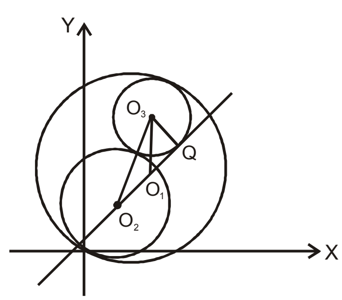
Now remaining seven can be arranges in 7! ways

Total ways = $^{10}C_3 \times 2 \times 7!$

64. (C)

Let O_1 and O_2 be the centres of the circles of radius R = 5 and r = 3 respectively and O_3 be the centre of the third circle, Let α be the radius of the third circle.

$$\therefore (r+\alpha)^2 = \alpha^2 + \left(R - r + \sqrt{(R-\alpha)^2 - \alpha^2}\right)^2$$



$$\therefore \alpha = \frac{4Rr(R-r)}{(R+r)^2} = \frac{15}{8} \Rightarrow \lambda = 8$$

65. (A)

66. (A)

If A + B + C = π

then, tanA+tanB+tanC = tanA.tanB.tanC

$\because\ \tan\frac{\pi}{11}+\tan\frac{4\pi}{11}-\tan\frac{5\pi}{11}=\tan\frac{\pi}{11}+\tan\frac{4\pi}{11}+\tan\frac{6\pi}{11}$

And, $\tan\frac{\pi}{11}.\tan\frac{4\pi}{11}.\tan\frac{5\pi}{11}=-\tan\frac{\pi}{11}.\tan\frac{4\pi}{11}.\tan\frac{6\pi}{11}\quad\Rightarrow \text{Ans}: -1$

67. (D)

Let circle is $x^2+y^2+2gx+2fy=0$

then

$x^2-4xy+y^2=0$ is same as

$x^2+y^2+(2gx+2fy)\,(x+y)=0$

i e $1+2g=1+2f=\frac{g+f}{-2}\qquad\Rightarrow g=f\Rightarrow g=-\frac{1}{3}=f$

i e centre is $\left(\frac{1}{3},\frac{1}{3}\right)$

circumradius $=\sqrt{\frac{1}{9}+\frac{1}{9}}=\frac{\sqrt{2}}{3}$

68. (A)

Equation of the line passing through (1, 1) and parallel to x + y = 1 is $\frac{x-1}{\frac{1}{\sqrt{2}}}=\frac{y-1}{\frac{-1}{\sqrt{2}}}=r$

$\therefore$ any point at r distance from (1,1) is $\left(1+\frac{r}{\sqrt{2}},1-\frac{r}{\sqrt{2}}\right)$ and it lie on the line 2x – 3y = 4

i.e. $2+\frac{2r}{\sqrt{2}}-3+\frac{3r}{\sqrt{2}}=4$ i.e. $r=\frac{5\sqrt{2}}{5}=\sqrt{2}$

69. (D)

$2\cos^2x+8\sec^2x+18\operatorname{cosec}^2x+2\sin^2x+1$

$=29+8\tan^2x+18\cot^2x\geq 53$

70. (A)

A three digit block from 000 to 999 mean 1000 numbers, each number constituting 3 digits. Hence, total digit which we have to write is 3000 . Since the total number of digits is 10 (0 to 9) no digit is filled preferentially.

$\Rightarrow$ number of times we write 3 = $\frac{3000}{10}$ = 300 .

71. (C)

AP I = 12, 15, 18, ... (common difference $d_1 = 3$)

AP II = 17, 21, 25 ... (common difference $d_2 = 4$)

First term of the series of common unmbers = 21

Here a = 21, common difference of the series of common number = L.C.M of d_1 and $d_2 = 12$

$\therefore$ Required sum of first hundred terms

$$= \frac{100}{2} = [2 \times 21 + (100 - 1)\ 12] = 100\ [21 + 594] = 61500$$

72. (D)

Image of $(\lambda^2, 2\lambda)$ is x – y + 1= 0 is $(2\lambda - 1, \lambda^2 + 1)$

$\therefore$ Locus of the image is

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

$$(x+1)^2 = 4(y-1)$$

$$a = -1;\ b = 4,\ c = 1$$

73. (B)

$S = 1 + 4x + 7x^2 + 10x^3 + ...$

$x.S = x + 4x^2 + 7x^3 + ...$

Subtract

$S\ (1 - x) = 1 + 3x + 3x^2 + 3x^3 + ...$

$S\ (1 - x) = 1 + 3x \left(\frac{1}{1-x}\right)$ $\qquad |x| < 1$

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

Given $\quad \frac{1+2x}{(1-x)^2} = \frac{35}{16}$

$\Rightarrow$ 16 + 32x = 35 + 35x^2 – 70x $\Rightarrow$ 35x^2 – 10x + 19 = 0

$\Rightarrow$ 7x (5x – 1) – 19 (5x – 1) = 0

$\Rightarrow$ (5x – 1) (7x – 19) = 0 $\Rightarrow$ x = $\frac{1}{5}, \frac{19}{7}$

But |x| < 1 $\therefore$ x = $\frac{1}{5}$

74. (C)

Equation of PQ:

$2x - y - 3 = 0$

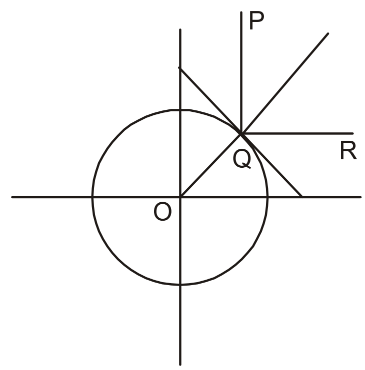
Eq^n of equation tangent at Q

$2x + y - 5 = 0$

$\therefore$ equation of QR is

$(2x - y - 3) - \frac{2(4-1)}{5}(2x + y - 5) = 0$

$2x + 11y = 15$



75. (A)

Since, A_1, A_2, A_3, ..., A_{11} be 11 A.M.s between 28 and 10.

$\therefore$ 28, A_1, A_2, ..., A_{11}, 10 are in A.P.

Let 'd' be the common difference of A.P.

Also the number of terms = 13.

10 = T_{13} = T_1 + 12 d = 28 = 28 + 12d

$\therefore$ d = $\frac{10-28}{12} = \frac{18}{12} = -\frac{3}{2}$

$\therefore$ Number of intergral A.M's is 5.

76. (B)

$2^{\log_{\sqrt{2}}(x-1)} > x+5 \Rightarrow (\sqrt{2})^{2\log_{\sqrt{2}}(x-1)} > x+5$

$\Rightarrow (x-1)^2 > x+5 \Rightarrow x^2 - 3x - 4 > 0$

$\Rightarrow (x-4)(x+1) > 0 \Rightarrow x > 4$ or $x < -1$

But for $\log_{\sqrt{2}}(x-1)$ to be defined, $x - 1 > 0$

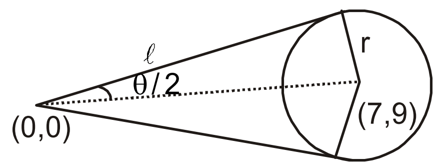
i.e., $x > 1$

$\therefore x > 4 \Rightarrow x \in (4, \infty)$.

77. (A)

Point of intersection is A (–2, 0). The required line will be one which passes through (–2,0)and is perpendicular to the line joining (–2, 0) and (2, 3)

78. (C)



Length of for origin $\ell = \sqrt{49 + 1 - 25} = 5$

Radius of circle r = 5

So, $\tan\frac{\theta}{2} = \frac{r}{\ell} = \frac{5}{5} = 1 \ \theta = 90^o$

79. (C)

a_1, a_2, a_3, a_4, a_5 are in H.P.

$\Rightarrow a_2 = \frac{2a_1 a_3}{a_1 + a_3} \qquad \Rightarrow 2a_1a_3 = a_2a_1 + a_3a_2$

$a_4 = \frac{2a_3a_5}{a_3 + a_5} \qquad \Rightarrow 2a_3a_5 = a_3a_4 + a_5a_4$

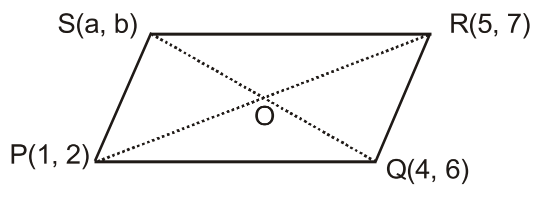
$\Rightarrow a_1a_2 + a_2a_3 + a_3a_4 + a_4a_5 = 2a_1a_3 + 2a_3a_5$ ... (i)

$a_3 = \frac{2(a_1a_5)}{a_1 + a_5} \qquad \Rightarrow a_1a_3 + a_5a_3 = 2a_1a_5$ ... (ii)

using (i) and (ii)

$a_1a_2 + a_2a_3 + a_3a_4 + a_4a_5 = 2(2a_1a_5) = 4a_1a_5$

80. (C)



$O = \left(\frac{a+4}{2}, \frac{b+6}{2}\right) = \left(\frac{1+5}{2}, \frac{2+7}{2}\right)$

$\Rightarrow a = 2, \ \ b = 3$

81. (A)

Since each, a_i is an odd number not dividible by prime greater than 5, a_i can be written as $a_i = 3^r 5^s$ where r, s are non-negative integers. thus for all $n \in N$

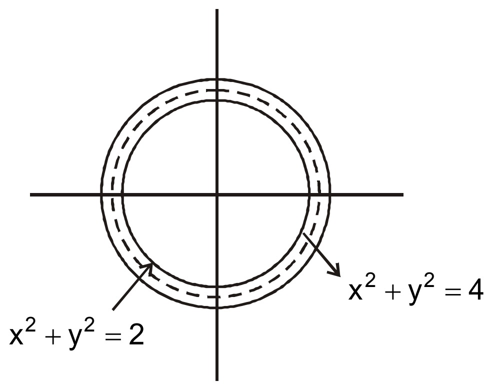
$$\frac{1}{a_1}+\frac{1}{a_2}+.....+\frac{1}{a_n}<\left(1+\frac{1}{3}+\frac{1}{3^2}+......+\right)\left(1+\frac{1}{5}+\frac{1}{5^2}+......+\right)=\frac{15}{8}$$

82. (B)

Required Area

$$=\pi(4-2)$$

$$=2\pi$$



83. (C)

$$a_n=\frac{n(n+1)}{\left(\frac{n(n+1)}{2}\right)^2}=4\left(\frac{1}{n}-\frac{1}{n+1}\right)$$

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

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

$$S_\infty=4.$$

84. (B)

Since a, b, c are in AP. Therefore, b – a = d and c – b = d, where d is the common difference of the AP.

$\Rightarrow$ a = b – d and c = b + d

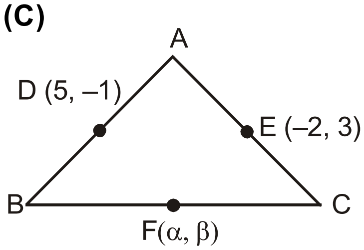
Now, abc = 4 $\Rightarrow$ (b – d)b(b + d) = 4 $\Rightarrow$ $b(b^2 - d^2) = 4$

But $b(b^2 - d^2) < b \cdot b^2$ $\Rightarrow$ $b(b^2 - d^2) < b^3$

$\Rightarrow$ $4 < b^3 \Rightarrow b^3 > 4 \Rightarrow b > 2^{2/3}$

Hence, the minimum value of b is $2^{2/3}$.

85. **(C)**



As we know that centroid of triangle ABC and triangle DEF coincide with each other so

$\alpha = -3,\ \beta = -2$

86. **(A)**

Image of A in x-axis is (1, –2)

$\therefore$ equation of reflected ray is

$$y - 3 = \frac{5}{4}(x - 5)$$

is $5x - 4y = 13$

87. (A)

Distance of (0,0) from the line $2x + 3y - 6 = 0$

$$\frac{6}{\sqrt{4+9}} = \frac{6}{\sqrt{13}}$$

$\therefore$ area of the Δ is $\left(\frac{6}{\sqrt{13}}\right)^2 = \frac{36}{13}$

88. **(A)**

$1 - 3x \geq 0$

$x \leq \frac{1}{3}$

And

$-x^2 + x + 6 \geq 0$

$x^2 - x - 6 \leq 0$

$x^2 - 3x + 2x - 6 \leq 0$

$(x-3)(x+2) \leq 0$

$x \in [-2, 3]$

The answer will be $\left[-2, \frac{1}{3}\right]$

89. (B)

Case I : When $2x - 3 \geq 0$ i.e., $x \geq \frac{3}{2}$

In this case, we have

$|2x - 3| = 2x - 3$

$\therefore \quad |2x - 3| < x - 1 \Rightarrow \quad 2x - 3 < x - 1 \Rightarrow \quad x - 2 < 0 \qquad \Rightarrow \quad x < 2$

$\Rightarrow \quad x \in [3/2, 2) \qquad [\because \ x \geq 3/2]$

Case II : When $2x - 3 < 0$ i.e., $x < \frac{3}{2}$

In this case, we have

$|2x - 3| = -(2x - 3)$

$\therefore \quad |2x - 3| < x - 1 \Rightarrow \quad -(2x - 3) < x - 1 \Rightarrow \quad 3x - 4 > 0 \qquad \Rightarrow \quad x > 4/3$

$\Rightarrow \quad x \in (4/3, 3/2) \qquad [\because \ x < 3/2]$

Thus, the set of the values of x satisfying the given inequation is $(4/3, 3/2) \cup [3/2, 2) = (4/3, 2)$

90. (D)

orthocentre of triangle of BCH is the vertex A(–1, 0)