Test Date: 12/08/2020

A
CODE

Aakash
Medical | IIT-JEE | Foundations
(Divisions of Aakash Educational Services Limited)

***Regd. Office*:** Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

Mock Test
for JEE (Advanced) - 2020
Test – 5A (Paper - I)

ANSWERS

PHYSICS	CHEMISTRY	MATHEMATICS
1. (A)	19. (B)	37. (C)
2. (A)	20. (B)	38. (D)
3. (C)	21. (A)	39. (C)
4. (A)	22. (B)	40. (C)
5. (B, C)	23. (A, B, C, D)	41. (A, B, C, D)
6. (B, C)	24. (B, D)	42. (A, C)
7. (B, C)	25. (A, C, D)	43. (A, B)
8. (B, C, D)	26. (B, D)	44. (A, C, D)
9. (A, C)	27. (A, B, D)	45. (A, B, C)
10. (A, D)	28. (A, B, C)	46. (A, C, D)
11. (D)	29. (A)	47. (A, B, D)
12. (A, C)	30. (A, C)	48. (A, C)
13. (09)	31. (13)	49. (43)
14. (25)	32. (04)	50. (05)
15. (03)	33. (06)	51. (03)
16. (20)	34. (14)	52. (50)
17. (02)	35. (11)	53. (02)
18. (25)	36. (03)	54. (02)

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ANSWERS & SOLUTIONS

PART – I : PHYSICS

1. Answer (A)

$$Q = \left[m\left(Al^{25}\right) - m\left(Mg^{25}\right) - 2m_e \right] C^2$$

2. Answer (A)

Particle comes to rest after collision

3. Answer (C)

$v_f = V_0 / 5$

$$\int N dt = m\left(v - v_f\right)$$

$$= \frac{4m}{5}\sqrt{2gh_0}$$

4. Answer (A)

$V = 12 - iR$

$$\frac{V}{2} = 12 - 2iR$$

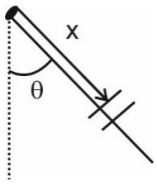
$2V = 24 - 2iR$

$$\frac{3V}{2} = 12$$

$V = 8$ volts

Final Voltage is $\frac{V}{2} = 4V$

5. Answer (B, C)



$$Mg\frac{l}{2}\sin\theta = \frac{M\omega^2 x^2 \sin\theta\cos\theta dx}{L}$$

$$\cos\theta\omega^2 = \frac{3g}{2l}$$

$$\omega^2 = \frac{3g}{l}$$

$$R_x = M\left(\frac{3g}{l}\right) \times \frac{l}{2} \times \frac{\sqrt{3}}{2}$$

$$= \frac{3\sqrt{3}Mg}{4}$$

6. Answer (B, C)
Force small oscillation tensions in string will be constant and force acting will be towards mean position

7. Answer (B, C)

$$\int_{40^\circ}^{30^\circ} \frac{dT}{T - 20^\circ} = -kt$$

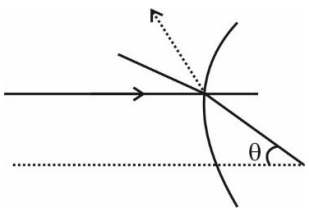
$$T_0 = \frac{\ln 2}{k}$$

8. Answer (B, C, D)

Tangential component of field to surface will be zero

9. Answer (A, C)

$$dF = \frac{2IRh}{C}\int_{-\pi/2}^{\pi/2} \cos^2\theta\cos\theta$$



$$F = \frac{8IhR}{3C}$$

10. Answer (A, D)

Finally terminal velocity is non-zero giving

$$BVl = \frac{Q}{C}$$

11. Answer (D)

$$\frac{dL}{dt} = qB_0\left(1-\frac{Kr}{2a}\right)r\frac{dr}{dt}$$

$$\overrightarrow{dL} = 0$$

12. Answer (A, C)

$$\tau = n\times 2\pi r\left(r\frac{d\omega}{dr}\right)r$$

$$\tau\int_R^{2R}\frac{dr}{r^3} = 2\pi n\int d\omega$$

$$\frac{\tau}{2}\left[\frac{1}{4R^2}-\frac{1}{R^2}\right] = 2\pi n\omega$$

$$3\tau = 2\pi n\omega = \frac{16\pi n\omega R^2}{3}$$

13. Answer (09)

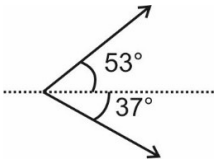
$$I_0 = \frac{P}{4\pi(1)^2}$$

$$I_1 = \frac{P}{4\pi(0.3)^2}$$

$$I = \frac{P}{4\pi}\left[1+\frac{1}{0.09}\right]$$

$$= \frac{P}{4\pi}\left[\frac{1.09}{0.09}\right]$$

14. Answer (25)



Power factor = cos8°

$\cos 16 = 2\cos^2 8 - 1$

$$\cos 8 = \frac{7}{5\sqrt{2}}$$

15. Answer (03)

$2V_1\cos\theta = V$

$$V_1 = \frac{V}{2}\sec\theta$$

$$a_1 = \frac{V}{2}\sec\theta\tan\theta\frac{d\theta}{dt}$$

$$d\,\text{cosec}\,\theta\cot\theta\frac{d\theta}{dt} = V$$

16. Answer (20)

. $Y_R = A(1 + 2\cos 4\pi t)$

$$\cos 4\pi t = \frac{1}{2}$$

$$t = \frac{1}{12}, \frac{5}{12}$$

$$\Delta t = \frac{1}{3}\text{S}$$

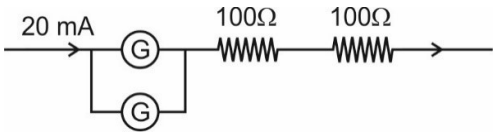
$n = 20$

17. Answer (02)

$$2Tl\frac{y}{a} = \lambda l g$$

$$T = \frac{\lambda a g}{2y}$$

18. Answer (25)



$V = 20 \times 10^{-3}[250]$

$=5$ V

PART – II : CHEMISTRY

19. Answer (B)

PbS is black

$Pb(OH)_2$ is white ppt which dissolves in excess NaOH to form $[Pb(OH)_4]^{2-}$.

Pb^{2+} does not form complex with excess of KCN

20. Answer (B)

Meq of Base = 250 × 0.4 = 100

$\therefore$ Meq of Acid = 100 = 0.05 × (x) × 1000

$\Rightarrow x = 2$

$\therefore$ The cationic charge on complex is +2

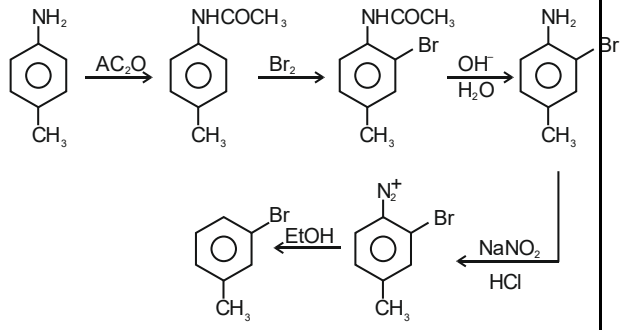
$\therefore$ Complex is $[M(H_2O)_5Cl]Cl_2.H_2O$

21. Answer (A)

Curve 1 and Curve 3 are for real gas

Curve 2 and Curve 4 are for ideal gas

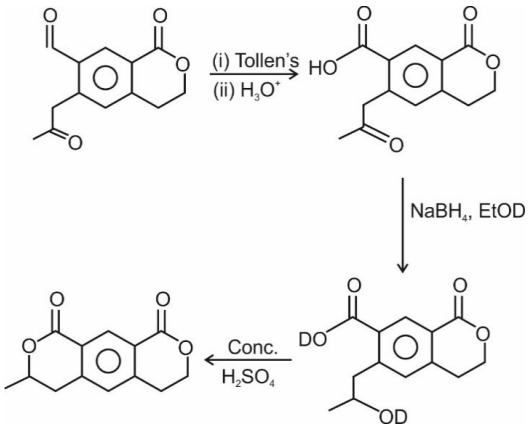
22. Answer (B)



23. Answer (A, B, C, D)

All given statements are correct

24. Answer (B, D)



25. Answer (A, C, D)

(B) will also give racemic mixture as for formation of Meso compound symmetric substrate is required

26. Answer (B, D)

Benzene is more Volatile than Toluene

$y_B(550) = 600x_B$

$y_T\ (550) = 400x_T$

$$550\left(\frac{y_B}{600}+\frac{1-y_B}{400}\right)=1$$

$$\frac{550}{1200}(3-y_B)=1$$

$$y_B = 3-\frac{1200}{550}=\frac{9}{11}$$

$$\therefore y_T = \frac{2}{11}$$

27. Answer (A, B, D)

$K_{Na_2SO_4} = 2.6\times10^{-2}\ \text{s m}^{-1} = 2.6\times10^{-4}\ \text{S cm}^{-1}$

$K_{CaSO_4} = 4.4\times10^{-2}\ \text{s m}^{-1} = 4.4\times10^{-4}\ \text{S cm}^{-1}$

Now, $\Lambda_{m,Na_2SO_4} = \dfrac{K_{Na_2SO_4}\times1000}{C}$

$= \dfrac{2.6\times10^{-4}\times1000}{10^{-3}}$

$= 260\ \text{S cm}^2\ \text{mol}^{-1}$

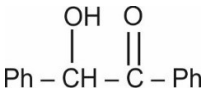
$\therefore \lambda_{m,SO_4^{2-}} = 260-2\times50$

$= 160\ \text{S cm}^2\ \text{mol}^{-1}$

$\therefore \wedge_m, CaSO_4 = 160+120 = 280\ \text{S cm}^2\ \text{mol}^{-1}$

28. Answer (A, B, C)

In D, Benzoin is formed which does not give positive iodoform test



29. Answer (A)

ΔS_{y-z} is negative

Heat is absorbed in $Z \rightarrow X$

30. Answer (A, C)

In (B)y > x due to –M of NO_2

In (D)y > x due to more S character in bond represented by x

31. Answer (13)

$$NH_2COONH_4(s) \rightleftharpoons N_2(g)+3H_2(g)+CO(g)+\frac{1}{2}O_2(g)$$

-		P_0	$3P_0$	P_0	$\frac{P_0}{2}$

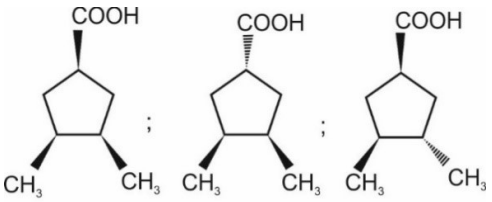
$$\frac{11P_0}{2}=11 \Rightarrow P_0 = 2$$

$$\therefore K_p = \frac{3^3}{2^{1/2}}(P_0)^{5.5} = 3^3\times2^5$$

x = 3, y = 5

32. Answer (04)

Products formed are



(d + l)pair

33. Answer (06)

An → nA

a_0

$(a_0 - x)$ (nx)

Given $a_0 - x = nx$

$\Rightarrow a_0 = (n + 1)x$

And $\frac{a_0 - x}{a_0} = \frac{6}{7}$

$\Rightarrow 7a_0 - 7x = 6a_0$

$\Rightarrow a_0 = 7x$

$\therefore (n + 1) = 7$

$\Rightarrow n = 6$

34. Answer (14)

(i) $MgCO_3$ (ii) $Al_2Si_2O_5(OH)_4$

(iii) $FeWO_4$ (iv) $CuCO_3.Cu(OH)_2$

(v) Na_3AlF_6 (vi) $MgSO_4.7H_2O$

(vii) $MgCO_3.CaCO_3$ (viii) $FeCr_2O_4$

x = 4 (iii, v, vii, viii)

y = 7 (all except v)

z = 3 (i, vi, vii)

35. Answer (11)

$$Na_2S_2O_3 + Cl_2 \longrightarrow \underset{(X)}{NaHSO_4} + Cl^-$$

$$Na_2S_2O_3 + I_2 \longrightarrow \underset{(Y)}{Na_2S_4O_6} + I^-$$

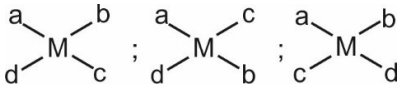
X = 6, Y = 2.5

$\therefore$ X + 2Y = 6 + 5 = 11

36. Answer (03)

The given complex is a square planar complex [M(abcd)]

Geometrical isomers are



PART – III : MATHEMATICS

37. Answer (C)

For $0 < x < 1 \Rightarrow \sin x < x \Rightarrow \frac{\sin x}{\sqrt{x}} < \sqrt{x}$

$$\Rightarrow \int_0^1 \frac{\sin x}{\sqrt{x}} < \int_0^1 \sqrt{x}\, dx$$

38. Answer (D)

$\frac{dy}{dx} = -\frac{1}{2}\cot^3 t$

Let $Q(\sec^2\theta, \cot\theta)$

$\because$ Slope PQ = Slope of tangent at P

$$\Rightarrow \frac{\cot\theta - 1}{\sec^2\theta} = -\frac{1}{2}$$

$$\Rightarrow \frac{(1 - \tan\theta)}{(\tan^2\theta - 1)\tan\theta} = -\frac{1}{2}$$

$\Rightarrow \tan^2\theta + \tan\theta = 2$

$\Rightarrow \tan\theta = -2$

Point Q is $\left(5, -\frac{1}{2}\right)$

So, $PQ = \frac{3\sqrt{5}}{2}$

39. Answer (C)

$\because \alpha + \beta + \gamma = 1,\ \alpha\beta + \alpha\gamma + \beta\gamma = 0$

and $\alpha x.\ \beta y = -4$

$\therefore$ Let $y = \alpha + \beta^2 + \gamma^2$

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

$= \alpha(1 - \alpha)^2 - \frac{2\beta\gamma}{\alpha}$

$\therefore y = x + (1 - x)^2 + \frac{8}{x}$

$\therefore x = \frac{y}{y - 1}$

Thus equation is $y^3 - 3y^2 - y + 19 = 0$ or

$x^3 - 3x^2 - x + 19 = 0$

40. Answer (C)

Let $x = r\cos\theta$ and $y = r\sin\theta$

so, $r^2\sin\theta.\cos\theta.\cos2\theta = 1$

$$r^2 = \frac{4}{\sin 4\theta}$$

$$\because \left(x^2 + y^2\right)_{\min} = r^2_{\min} = 4$$

41. Answer (A, B, C, D)

$$f_n(x) = \sum_{r=1}^{n} \frac{\sin^2 x}{\sin(r+1)x.\sin rx}$$

$$= \sin x \sum_{r=1}^{n} \frac{\sin\left((r+1)r - rx\right)}{\sin(r+1)x.\sin rx}$$

$$\sin x \sum_{r=1}^{n} \left[\cot rx - \cot(r+1)x\right] = \sin x\left[\cot x - \cot(n+1)x\right]$$

$$= \frac{\sin nx}{\sin(n+1)x}$$

$$g_n(x) = \prod_{r=1}^{n} \frac{\sin rx}{\sin(r+1)x} = \frac{\sin x}{\sin(n+1)x}$$

$$I_n = \int_0^{\pi} \frac{\sin nx}{\sin x} dx$$

$$\because I_n - I_{n-2} = \int_0^{\pi} \frac{\sin nx - \sin(n-2)}{\sin x} dx = 0$$

So, $I_0 = I_2 = I_4 = I_6 = ... = I_{2m} = 0$

and $I_1 = I_3 = I_5 = ... = I_{2m-1} = \pi$

So, $\sum_{k=1}^{100} I_k = 50\pi$

42. Answer (A, C)

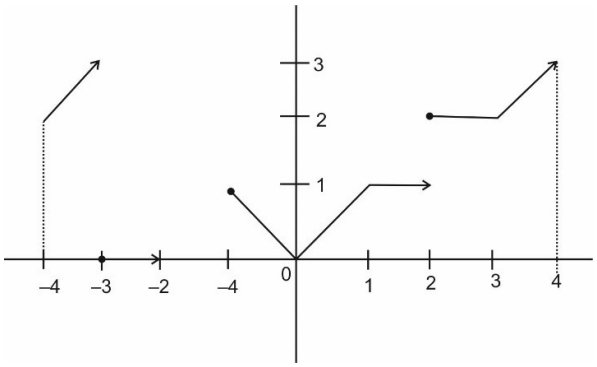
$1 + 3 + 5 \ldots + (2k - 1) = k^2$

$$\therefore \left(\frac{p+1}{2}\right)^2 + \left(\frac{q+1}{2}\right)^2 = \left(\frac{r+1}{2}\right)^2$$

$$\therefore (p+1)^2 + (q+1)^2 = (r+1)^2 \quad p+1 > 7$$

$\Rightarrow (p + 1, q + 1, r + 1)$ Pythagorean triplet

43. Answer (A, B)



$f(x)$ is discontinuous at $x = -3, -2, -1, 2, 4$

$f(x)$ is non differentiable at $x = -3, -2, -1, 0, 1, 2, 3$

Range of $f(x)$ is $[0, 1] \cup [2,3)$

44. Answer (A, C, D)

$$\lim_{x\to 0}\left[\left|\cos\sqrt{2 + 2\cos x 3[x]}\right|\right]$$

$$\lim_{x\to 0}\left[\left|\cos\left(\left|2\cos[x]\right|\right)\right|\right] = 0$$

Other cases can also be simplified like this

45. Answer (A, B, C)

(A) These curves are symmetric to each other w.r.t the line y = x. so if there is only one point of intersection of curve, then

$y = 4(x - \lambda)$ & $y = x$ has $\Rightarrow x^2 = 4(x - \lambda)$

$\Rightarrow x^2 - 4x + 4\lambda$

D = 0

$\Rightarrow 16 = 16\lambda \Rightarrow \lambda = 1$

And when $\lambda = 1$, then

$x^2 = 4(x - \lambda)$

$\Rightarrow x^2 = 4(x - 1)$

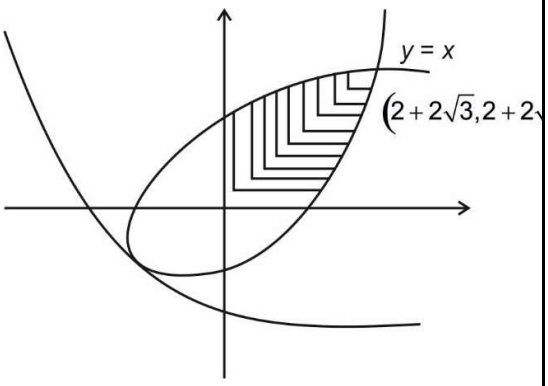
$\Rightarrow x^2 = x^2 - 4x + 4 = 0$

$\Rightarrow (x - 2)^2 = 0$

$\Rightarrow x = 2$

So for $\lambda = 1$, these two curves has only one point of intersection and co-ordinates of that point is (2,2)

(B) Area bounded between the curves $y^2 = 4(x + 2)$ & $x^2 = 4(y + 2)$ in the first quadrant is



Shade d area is the required are.

Required area = $y^2 = 4(x+4)$ & $x^2 = 4(y+4)$

and co-ordinates of those points are (–4, 0) & (0, –4) $\left(2+2\sqrt{5},1+2\sqrt{5}\right)$ & $\left(2-2\sqrt{5},2-2\sqrt{5}\right)$

$$2\int_0^{2+2\sqrt{3}}\left(2\sqrt{x+2}-x\right)dx$$

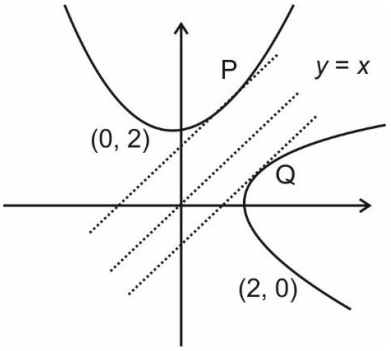
$$=2\left[\frac{4}{3}(x+2)^{\frac{3}{2}}-\frac{x^2}{2}\right]_0^{2+2\sqrt{3}}$$

$$=\left[\frac{8}{3}(x+2)^{\frac{3}{2}}-x^2\right]_0^{2+2\sqrt{3}}$$

$$=\frac{8}{3}\left(4+2\sqrt{3}\right)^{\frac{3}{2}}-\left(2+2\sqrt{3}\right)^2-\left\{\frac{8}{3}(2)^{\frac{3}{2}}\right\}$$

$$=\frac{8}{3}\left(4+3\sqrt{3}\right)-\frac{8}{3}\times 2\sqrt{2}$$

(C)Area of circle which touches both these parabola $y^2 = 4(x-2)$ & $x^2 = 4(y-2)$ is



Let the equation of tangent to parabola $y^2 = 4(x-2)$ is $y = x + \lambda$

$$\Rightarrow (x+\lambda)^2 = 4(x-2)$$

$$\Rightarrow x^2+\lambda^2+2\lambda x-4x+8=0$$

$$\Rightarrow x^2+(2\lambda-4)x+\left(\lambda^2+8\right)=0$$

D = 0

$$(2\lambda-4)^2 = 4(\lambda+8)$$

$$\Rightarrow 4\lambda^2+16-16\lambda = 4\lambda^2+32$$

$$\Rightarrow \lambda = -1$$

$\Rightarrow y = x - 1$ is equation of tangent

Distance between $y = x$ & $y = x$ is radius of circle

$$r=\frac{|-1|}{\sqrt{1^2+1^2}}=\frac{1}{\sqrt{2}}$$

Area of circle = $\pi r^2 = \frac{\pi}{2}$units^2

(D) Four points are common to parabolas

46. Answer (A, C, D)

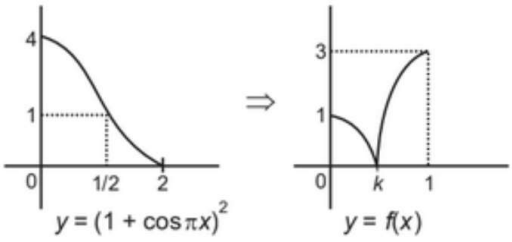
$$\alpha\sqrt{P\left(\frac{A}{B}\right)}+\beta\sqrt{P\left(\frac{\overline{A}}{B}\right)}\le\sqrt{\alpha^2+\beta^2}\sqrt{P\left(\frac{A}{B}\right)+P\left(\frac{\overline{A}}{B}\right)}$$

$$\Rightarrow \frac{2}{3}\le\sqrt{\alpha^2+\beta^2}\Rightarrow\alpha^2+\beta^2\ge\frac{4}{9}$$

47. Answer (A, B, D)

$f(x) = |(1 + \cos\{\pi x\})^2 - 3|$

$\because$ $f(x)$ is periodic with period 1, then we draw the graph of $f(x)$ is [0, 1) only



$f(x) = 2$

$\Rightarrow (1 + \cos\pi x)^2 = 1$

$\Rightarrow \cos\pi x = 0$

$$\Rightarrow x=\frac{1}{2},\frac{3}{2},\frac{5}{2}$$

48. Answer (A, C)

In ellipse and hyperbola are orthogonal if they are confocal

$ae_{ellipse} = ae_{hyperbola}$

Let ellipse be $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ and hyperbola be $\frac{x^2}{l^2}-\frac{y^2}{m^2}=1$ then $a^2 - b^2 = l^2 + m^2$

49. Answer (43)

$$\ln\left(\frac{a}{b}\right)=\lim_{n\to\alpha}\frac{1}{n}\log\left(\frac{3n_{Cn}}{2n_{Cn}}\right)$$

$$\lim_{n\to\alpha}\frac{1}{n}\log\left[\frac{(2n+1)(2n+2)....(2n+n)}{(n+1)(n+2)...(n+n)}\right]$$

$$\lim_{n\to\alpha}\frac{1}{n}\left[\sum_{r=1}^{n}\ln\left(2+\frac{r}{n}\right)-\sum_{r=1}^{n}\ln\left(1+\frac{r}{n}\right)\right]$$

$$\int_0^1\ln(2+x)dx-\int_0^1\ln(1+x)dx=\ln\left(\frac{27}{16}\right)$$

50. Answer (05)

$$\therefore (z+iz_2)^3=2+11i$$

$$\Rightarrow \left(z_1^2+z_2^2\right)^{3/2}=\sqrt{125}$$

$$\Rightarrow \left(z_1^2+z_2^2\right)^{3/2}=5^{3/2}$$

$$\therefore z_1^2+z_2^2=5$$

51. Answer (03)

$$\because \frac{1}{r}=\frac{1}{h_1}+\frac{1}{h_2}+\frac{1}{h_3}=\frac{1}{2}+\frac{1}{2}+\frac{1}{3}$$

$$\Rightarrow r=\frac{3}{4}$$

Also $\Delta=\frac{1}{2}a\times 2=\frac{1}{2}b\times 2=\frac{1}{2}c\times 3$

$\Rightarrow a = b = \Delta$ and $c = \frac{2\Delta}{3}$

$$\Delta=\sqrt{S(S-a)(S-b)(S-c)}=\sqrt{\frac{4\Delta}{3}.\frac{\Delta}{3}.\frac{\Delta}{3}.\frac{2\Delta}{3}}$$

$$\Rightarrow \Delta=\frac{2\sqrt{2}}{3^2}\Delta^2\Rightarrow\Delta=\frac{9}{2\sqrt{2}}$$

52. Answer (50)

We can distribute elements of first set into groups containing (2, 2, 1) or (1, 1, 3) elements.

$$N={}^5C_3.\underline{|3}\left[\frac{\underline{|5}}{\underline{|2}\underline{|2}\underline{|1}\underline{|2}}+\frac{\underline{|5}}{\underline{|1}\underline{|1}\underline{|3}\underline{|2}}\right]$$

$N = 10 \times 6 \times (15 + 10)$

53. Answer (02)

$$g(x)=\lim_{n\to\infty}\left(\frac{x}{2^n}+10+\frac{10}{2}+\frac{10}{2^2}+...\right)=20$$

$$\int_{10}^{18}\frac{dx}{1+x^a}<\frac{1}{2}\Rightarrow a_{min}=2$$

54. Answer (02)

$$\frac{x^2+2-\sqrt{x^4+4}}{x}=\frac{4x}{x^2+2+\sqrt{x^4+4}}$$

$$=\frac{4}{x+\frac{2}{x}+\sqrt{x^2+\frac{4}{x^2}}}$$

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