NARAYANA EDUCATIONAL INSTITUTIONS

QUADRATIC EQUATION AND EXPRESSION

MATHEMATICS-A

1. If $\frac{a}{b}+\frac{b}{c}+\frac{c}{d}+\frac{d}{a}=6$ and $\frac{a}{c}+\frac{b}{d}+\frac{c}{a}+\frac{d}{b}=8,$ then the value of $\frac{a}{b}+\frac{c}{d}$ is/are

1) 4 2) 3 3) 1/4 4) 1/2

2. If p and q be two positive numbers such that p + q = 2 and $p^4+q^4=272$ then p & q are the roots of the equation

1) $x^2-2x+8=0$ 2) $x^2-2x+16=0$ 3) $x^2-2x+2=0$ 4) $x^2-2x+36=0$

3. Let $\alpha,\beta(\alpha>\beta)$ be the roots of the equation $x^2-x-4=0$. If $P_n=\alpha^n-\beta^n, n\in N$, then

$\frac{P_{15}P_{16}-P_{14}P_{16}-P_{15}^2+P_{14}P_{15}}{P_{13}P_{14}}$

1) 13 2) 14 3) 15 4) 16

4. If $\alpha\neq\beta$ and $\alpha^2=5\alpha-3,\beta^2=5\beta-3$ find the equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$

1) $3x^2-19x+3=0$ 2) $3x^2-19x-3=0$ 3) $3x^2+19x-3=0$ 4) $3x^2+19x+3=0$

5. If the roots of equation $3x^2+5x+1=0$ are $(\sec\theta_1-\tan\theta_1)$ and $(\operatorname{cosec}\theta_2-\cot\theta_2)$ then find the equation whose roots are $(\sec\theta_1+\tan\theta_1)$ and $(\operatorname{cosec}\theta_2+\cot\theta_2)$

1) $3x^2-5x+1=0$ 2) $3x^2+5x-1=0$ 3) $x^2-5x+3=0$ 4) $x^2+5x+3=0$

6. If a, b, c are in A.P. and one root of the equation $ax^2+bx+c=0$ is 2 then find the other root

1) $\frac{5}{2}$ 2) $\frac{-5}{2}$ 3) $\frac{-5}{4}$ 4) $\frac{5}{4}$

7. Find a quadratic equation whose product of the roots $x_1\,\&\,x_2$ is equal to 4 and satisfy the relation $\frac{x_1}{x_1-1}+\frac{x_2}{x_2-1}=2$

1) $x^2-2x+4=0$ 2) $x^2-3x+4=0$ 3) $x^2-2x-4=0$ 4) $x^2-3x-4=0$

8. Let $\alpha,\beta\in R$ if α^2,β^2 are the roots of the quadratic equation $x^2-px+1=0$ and $\alpha^2\beta$ are the roots of quadratic equation $x^2-px+8=0$ then find α,β

1) $\alpha=\frac{1}{2},\beta=4$ 2) $\alpha=4,\beta=\frac{-1}{2}$ 3) $\alpha=4,\beta=\frac{1}{2}$ 4) $\alpha=\frac{1}{2},\beta=-4$

9. If α and β are the roots of equation $ax^2+bx+c=0$ then find the roots of the equation $ax^2-bx(x-1)+c(x-1)^2=0$ in terms of α and β

1) $\frac{\alpha}{1-\alpha},\frac{\beta}{1-\beta}$ 2) $\frac{1-\alpha}{\alpha},\frac{1-\beta}{\beta}$ 3) $\frac{\alpha}{1+\alpha},\frac{\beta}{1+\beta}$ 4) $\frac{1+\alpha}{\alpha},\frac{1+\beta}{\beta}$

10. If $ax^2+bx+c=0$ and $bx^2+cx+a=0$ have a common root and a, b, c are root zero real numbers then find the value of $\frac{a^3+b^3+c^3}{abc}$

1)2 2) 3 3) 4 4) 1

11. If equation $x^2+ax+12=0, x^2+bx+15=0$ and $x^2+(a+b)x+36=0$ have a common positive root then find the value of a and b.
1) $a=7, b=8$ 2) $a=-7, b=8$ 3) $a=-7, b=-8$ 4) $a=7, b=-8$

12. The sum of the non real roots of $(x^2+x-2)(x^2+x-3)=12$ is
1) 0 2) 1 3) – 1 4) 2

13. The number of irrational roots of the equation $\frac{4x}{x^2+x+3}+\frac{5x}{x^2-5x+3}=-\frac{3}{2}$ is
1) 4 2) 0 3) 1 4) 2

14. If $x^2+ax-3x-(a+2)=0$ has real and district roots, then the minimum value of $\frac{a^2+1}{a^2+2}$
1) 1 2) 0 3) $\frac{1}{2}$ 4) $\frac{1}{4}$

15. α,β are the roots of $ax^2+bx+c=0$ and α^2,β^2 are the roots of $a^2x^2+b^2x+c^2=0$ then a, b, c are in is
1) G.P. 2) H.P 3) A.P. 4) None

16. Solve for x $\left(5+2\sqrt{6}\right)^{x^2-3}+\left(5-2\sqrt{6}\right)^{x^2-3}=10$
1) ± 3 2) $\sqrt{2}$ 3) $-\sqrt{2}$ 4) ± 2

17. Find the value of 'm' for which exactly one root of the equation $x^2-2mx+m^2-1=0$ lies in the interval (-2,4)
1) $[-3,-1)\cup(3,5]$ 2) $(-3,-1)\cup(3,5)$ 3) $(-3,-1]\cup[3,5)$ 4) $[-3,-1]\cup[3,5]$

18. Let α,β be the roots of the equation $x^2-x+p=0$ and γ,δ be the roots of the equation $x^2-4x+q=0$. If $\alpha,\beta,\gamma,\delta$ are in G.P. the integral value of (p, q) respectively are
1) (-2, - 32) 2) (-2, 3) 3) (– 6, 3) 4) (-6,32)

19. If a, b, c are real and $a \neq b$ the root of the equation $2(a-b)x^2-11(a+b+c)x-3(a-b)=0$ are
1) Real and equal 2) real and unequal 3) Purely imaginary 4) None

20. If for all real values of a one root of the equation $x^2-3x+f(a)=0$ is double the other f(x) is equal to
1) 2x 2) x^2 3) $2x^2$ 4) $2\sqrt{x}$

21. If the roots of the quadratic equation $(4p-p^2-5)x^2-(2p-x)x+3p=0$ lies on either sider of unity then number of integral value of p is
1) 1 2) 2 3) 3 4) 4

22. If $b_1b_2=2(c_1+c_2)$ then at least one of the equation $x^2+b_1x+c_1=0$ and $x^2+b_2x+c_2=0$ has
1) Imaginary roots 2) Real roots 3) Purely imaginary root 4) None

23. If α,β are the roots of $x^2-px+q=0$ and α',β' are the roots of $x^2-p'x+q'=0$ then the value of $(\alpha-\alpha')^2+(\beta-\alpha')^2+(\alpha-\beta')^2+(\beta-\beta')^2$ is
1) $2\left[p^2-2q+p'^2-2q'-pp'\right]$ 2) $2\left[p^2-2q-p'^2-2q'+qq'\right]$
3) $2\left[p^2-2q-p'^2-2q'+pp'\right]$ 4) $2\left[p^2-2q-p'^2-2q'-qq'\right]$

24. If the equation $x^2-3px+2q=0$ and $x^2-3ax+2b=0$ have a common root and the other roots of the second equation is the reciprocal of the other roots of the first then $(2q-2b)^2$
1) $36pa(q-b)^2$ 2) $18pa(q-b)^2$ 3) $36pq(p-q)^2$ 4) $18pq(p-a)^2$

25. The number of real solution of $|x|+2\sqrt{5-4x-x^2}=16$
1) 6 2) 1 3) 0 4) 4

26. If roots of $x^2-(a-3)x+a=0$ are such that at least one of them is greater than 2 then

1) $a\in[7,9]$ 2) $a\in[7,\infty]$ 3) $a\in[9,\infty]$ 4) $a\in[7,9]$

27. Let $n\in Z$ and ΔABC be a right triangle with right angle at C if sinA and sinB are the roots of the quadratic equation $(5n+8)x^2-(7n-20)x+120=0$. Then find the value of n

1) 56 2) 55 3) 66 4) 67

28. If α and β are the roots of the equation $375x^2-25x-2=0$ then $\underset{n\to\infty}{\text{lt}}\sum_{r=1}^{n}\alpha^{\gamma}+\underset{n\to\infty}{\text{lt}}\sum_{r=1}^{n}\beta^{\gamma}$ is equal to

1) $\frac{1}{12}$ 2) $\frac{1}{13}$ 3) $\frac{1}{15}$ 4) $\frac{1}{14}$

29. Let P(x) be a quadratic polynomial such that $P(0)=1$. If P(x) leaves remainder 4 when divided by x – 1 and it leaves remainder 6 when divided by x + 1 then

1) $P(2)=11$ 2) $P(2)=19$ 3) $P(-2)=19$ 4) $P(-2)=11$

30. If the quadratic equation $4^{\sec^2\alpha}x^2+2x+\left(\beta^2-\beta+\frac{1}{2}\right)=0$ has real roots then the value of

$\cos^2\alpha+\cos^{-1}\beta=$

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{3}+1$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{2}-1$

MATHEMATICS-A

1-10	1	2	4	1	4	3	1	2	3	2
11-20	3	3	4	3	1	4	2	1	2	3
21-30	2	2	1	3	3	3	3	1	3	2

SOLUTIONS

01. Let $\frac{a}{b}=x,\frac{b}{c}=y,\frac{c}{d}=z,\frac{d}{a}=w$

i.e., $x+y+z+w=6$ and $xy+yz+zw+wx=8$

$(x+z)+(y+w)=6 \quad \to(1)$ and $(x+z)(y+w)=8\to(2)$

So from (1) and (2)

$(x+z)$and $(y+w)$ are roots of the equation $t^2-6t+8=0$

$t=2,4\Rightarrow\frac{a}{b}+\frac{c}{d}=2\ (\text{or})4$

02. $x^2+(p+q)x+pq=0$

$p+q=2\Rightarrow(p+q)^2=4$

$p^2+q^2+2pq=4$

$(p^2+q^2)^2=(4-2pq)^2$

$p^4+q^4+2p^2q^2=16+4p^2q^2=16pq$

Let $pq=x$

$272+2x^2=17+4x^2-16x$

$2x^2-16x-256=0$

$x^2 8x-128=0$
$x^2-16x+8x-128=0$
$x(x-16)+8(x-16)=0$
$(x-16)(x+8)=0$
$x=-8$ (not positive)

$x=16$, (since p,q are positive)
$pq=16, p+q=2$
$x^2-2x+16=0$

03. $\dfrac{P_{15}P_{16}-P_{14}P_{16}-P_{15}^2+P_{14}P_{15}}{P_{13}P_{14}}$

$\dfrac{(P_{16}-P_{15})(P_{15}-P_{14})}{P_{13}P_{14}}$.....(1)

$\boxed{P_n=\alpha^n-\beta^n}$ $P_n-P_{n-1}=(\alpha^n-\beta^n)-(\alpha^{n-1}-\beta^{n-5})$
$=\alpha^{n-1}(\alpha^2-\alpha)-\beta^{n-2}(\beta^2-\beta)$
$=4(\alpha^{n-2}-\beta^{n-2})$
$P_n-P_{n-1}=4P_{n-2}$
$P_{16}-P_{15}=4P_{14}$
$P_{15}-P_{14}=4P_{13}$
From 1 $\dfrac{4P_{14}4P_{13}}{P_{13}.P_{14}}=16$

04. we have $\alpha^2=5\alpha-3$ and $\beta^2=5\beta-3$
Hence α,β are roots of $x^2=5x-3$
$x^2-5x+3=0$
$\alpha+\beta=5, \alpha\beta=3$
$\text{Sum}=\dfrac{\alpha}{\beta}+\dfrac{\beta}{\alpha}=\dfrac{\alpha^2+\beta^2}{\alpha\beta}=\dfrac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}=\dfrac{25-6}{3}=\dfrac{19}{3}$
Product $=\dfrac{\alpha}{\beta}.\dfrac{\beta}{\alpha}=1$
So the required equation is
$x^2-(\text{sum})x+\text{product}=0$
$x^2-\dfrac{19}{3}x+1=0$
$3x^2-19x+3=0$

05. Let $\sec\theta_1+\tan\theta_1=\alpha$, then $\sec\theta_1+\tan\theta_1=\dfrac{1}{\beta}$

and $\operatorname{cosec}\theta_2-\cot\theta_2=\beta$ then $\operatorname{cosec}\theta_2+\cot\theta_2=\dfrac{1}{\beta}$

Hence, we have to find the equation having roots $\dfrac{1}{\alpha}$ and $\dfrac{1}{\beta}$

Replacing x by $\dfrac{1}{x}$ in the given equation we get required equation

$$3\left(\frac{1}{x}\right)^2+5\left(\frac{1}{x}\right)+1=0$$

$$x^2+5x+3=0$$

06. Given equation $ax^2+bx+c=0$

$x=2\ \ 4a+2b+c=0$

a,b,c are in A.P.

$2b=a+c$

$4a+a+c+c=0$

$5a+2c=0$

$$\boxed{\frac{c}{a}=\frac{-5}{2}}$$

Let α be the after root

Product of roots $2.\alpha=\frac{c}{a}$

$$2.\alpha=\frac{-5}{2}$$

$$\alpha=\frac{-5}{4}$$

07. $\frac{x_1}{x_1-1}+\frac{x_2}{x_2-1}=2$

Since $x_1x_2=4$

$$x_2=\frac{4}{x_1}$$

$$\frac{x_1}{x_1-1}+\frac{4/x_1}{4/x_1-1}=2$$

$$\frac{x_1}{x_1-1}+\frac{4}{4-x_1}=2$$

$$4x_1-x_1^2+4x_1-4=2(x_1-1)(4-x_1)$$

$$8x_1-x_1^2+4=8x_1-2x_1^2-8+2x_1$$

$$x_1^2-2x_1+4=0$$

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

08. $x^2-px+1=0,\to\alpha,\beta^2$ are roots

product of roots $\alpha,\beta^2=1.....(1)$

and $x^2-qx+8=0\to\alpha^2\beta=8-----(2)$

$(1)\times(2)\ (\alpha\beta^2)(\alpha^2\beta)=1\times8$

$\alpha^3\beta^3=2^3\Rightarrow\alpha\beta=2$

From (1) $\alpha\beta^2=1$

$$\alpha\beta.\beta=1\Rightarrow\left(\beta=\frac{1}{2}\right)$$

From (2) $\alpha^2.\beta=8$

$\alpha.\alpha\beta=8\Rightarrow\alpha=4$

Sum of roots $\alpha^2+\beta^2=p$

$$4+\frac{1}{4}=P \Rightarrow P=\frac{17}{4}$$

$$q=\alpha^2+\beta=16+\frac{1}{2}\ q=\frac{33}{2}$$

09. $ax^2-bx(x-1)+c(x-1)^2=0$

$$\frac{ax^2}{(x-1)^2}-\frac{bx}{x-1}+c=0$$

Now α is a root of $ax^2+bx+c=0$

Then let $\alpha=\frac{x}{1-x}, x=\frac{\alpha}{\alpha+1}$

Hence the roots of $\frac{\alpha}{1+\alpha}, \frac{\beta}{1+\beta}$

10. Given equation $ax^2+bx+c=0,\ bx^2+cx+a=0$ have a common root

$$(c_1a_2-c_2a_1)^2=(a_1b_2-a_2b_1)(b_1c_2-b_2c_1)$$

$$(cb-a^2)=(ac-b^2)(ba-c^2)$$

$$c^2b^2+a^4-2a^2bc=a^2bc-ac^3-ab^3+b^2c^2$$

$$a^3+b^3+c^3=3abc$$

$$\frac{a^3+b^3+c^3}{abc}=3$$

11. $x^2+ax+12=0\ -----(1)$

$$x^2+bx+15=0-----(2)$$

$$x^2+(a+b)x+36=0----(3)$$

$$(1)+(2)\ 2x^2+(a+b)x+27=0$$

Now subtract $x^2-9=0$

$x=\pm 3$

Let common positive root is 3

$a+12+3a=0 \Rightarrow a=-7$

$9+3b+15=0, b=-8$

12. Put $x^2+x=y$

$$(y-2)(y-3)=12$$

$$y^2-5y-6=0$$

$$(y-6)(y+1)=0$$

When $y=6$, we get $x^2+x-6=0$

$(x+3)(x-2)=0, x=-3, 2$

When y = -1, we get $x^2+x+1=0$

ω, ω^2 are roots non real roots

Sum $\omega+\omega^2=-1$

13. $\dfrac{4}{x+1+\frac{3}{x}}+\dfrac{5}{x-5+\frac{3}{x}}=-\dfrac{3}{2}$

Put $x+\frac{3}{x}=y$

$$\frac{4}{y+1}+\frac{5}{y-5}=\frac{-3}{2}$$

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

$$8y-40+10y+10=-3\left(y^2-4y-5\right)$$

$$3y^2+6y-45=0 \qquad x+\frac{3}{x}=3$$

$$y^2+2y-15=0 \qquad x^2+3=3x$$

$$(y+5)(y-3)=0 \qquad x^2-3x+3=0$$

$$y=-5,3 \qquad x=\frac{3\pm\sqrt{3}i}{2}$$

$$x^2+5x+3=0 \qquad \text{Imaginary roots}$$

$$x=\frac{-5\pm\sqrt{13}}{2}$$

Two irrationals roots

14. $b^2-4ac>0$

$$(a-3)^2+4(1)(a+2)>0$$

$$a^2-6a+9+4a+8>0$$

$a \in R$

$$\frac{a^2+1}{a^2+2}=1-\frac{1}{a^2+2}\geq\frac{1}{2}$$

15. $\alpha+\beta=\frac{-b}{a},\ \alpha\beta=\frac{c}{a}$

α^2,β^2 are roots of $a^2x^2+b^2x+c^2=0$

$$\alpha^2+\beta^2=\frac{-b^2}{a^2},\alpha^2\beta^2=\frac{c^2}{a^2}.$$

$$(\alpha+\beta)^2-2\alpha\beta=\frac{-b^2}{a^2}$$

$$\frac{2b^2}{a^2}=\frac{2c}{a}$$

$b^2=ac$

a,b,c are in G.P.

16. $\left(5+2\sqrt{6}\right)\left(5-2\sqrt{6}\right)=1$

$$\left(5-2\sqrt{6}\right)=\frac{1}{\left(5+2\sqrt{6}\right)}$$

$$\left(5+2\sqrt{6}\right)^{x^2-3}+\left(\frac{1}{5-2\sqrt{6}}\right)^{x^2-3}=10$$

Put $\left(5+2\sqrt{6}\right)^{x^2-3}=k$

$$k+\frac{1}{k}=10$$

$$k^2-10k+1=0$$

$k = 10 \pm \frac{4\sqrt{6}}{2} = 5 \pm 2\sqrt{6}$

$\left(5+2\sqrt{6}\right)^{x^2-3}\left(5+2\sqrt{6}\right) = \left(5+2\sqrt{6}\right)^{\pm 1}$

$x^2 = 3 = \pm 1$

$x^2 = 4, x^2 = 2$

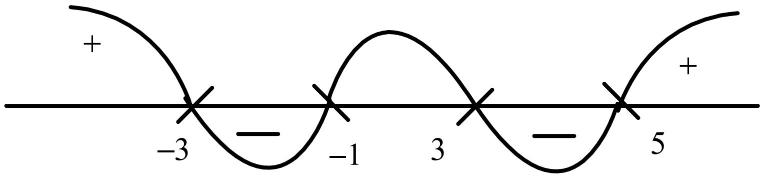
$x = \pm 2, x = \pm\sqrt{2}$

17. Let $f(x) = x^2 - 2mx + m^2 - 1$ are exactly one root of $f(x) = 0$ lies in $(-2,4)$ we can take D > 0 and $f(-2)f(4) < 0$

(I) $\Delta > 0\ (-2m)^2 - 4\left(m^2 - 1\right) > 0 \Rightarrow 4 > 0$

$m \in R.....(1)$

(II) $f(-2)f(4) = 0$



$\left(4+4m+m^2-1\right)\left(16-8m+m^2-1\right) < 0$

$\left(m^2+4m+3\right)\left(m^2-8m+15\right) < 0$

$(m+1)(m+3)(m-3)(m-5) < 0$

$m \in (-3,-1) \cup (3,5)......(2)$

From (1) and (2) $m \in (-3,-1) \cup (3,5)$

18. Let r be the common root of the G.P. then $\beta = ar, \gamma = ar^2, \delta = ar^3$

$\alpha + \beta = a + ar = 1$

$a(1+r) = 1....(1)$

$\alpha\beta = p \Rightarrow a, ar = p$

$a^2 r = p.....(2)$

$\gamma + \delta = ar^2 + ar^3 = 4$

$ar^2(1+r) = 4$

$rq = q$

$a^2 r^5 = q$

$\frac{ar^2(1+r)}{a(1+r)} = \frac{4}{1}, r^2 = 4$

$r = \pm 2$

If we take $r = 2$ then a is not integer

If we take $r = -2$ in equation (1)

We get $a = -1$

From (2) $a^2 r = p$

$(-1)^2(2) = p$

$p = -2$

From (3) $a^2 r^5 = q$

$$(-1)^2(2)^5 = q$$
$$q = -32$$
$$(p, q) = (-2, -32)$$

19. We have Δ

$$2(a-b)x^2 - 11(a+b+c)x - 3(a-b) = 0$$
$$\Delta = (-11(a+b+c))^2 - 4(2)(a-b)(3(a-b))$$
$$121(a+b+c)^2 + 24(a-b)^2 > 0$$

Roots are real & unequal

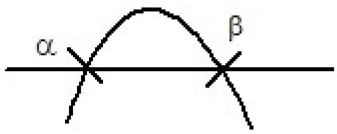
20. Let α be the one of $x^2 - 3ax + f(a) = 0$

$$\alpha + 2\alpha = 3a \Rightarrow 3\alpha = 3a$$
$$\alpha = \omega$$
$$\alpha.2\alpha = f(a)$$
$$f(a) = 2\alpha^2,$$
$$= 2a^2$$
$$f(x) = 2x^2$$

21. Since the coefficient of $x^2 = 4p - p^2 - 5 < 0$

Let graph is open down word according to the question must lies between the roots f(1) > 0

$$4p - p^2 - 5 - 2p + 13p > 0$$



$$-p^2 + 5p - 4 > 0$$
$$p^2 - 5p + 4 < 0$$
$$(p-1)(p-4) < 0$$
$$1 < p < 4$$

Integral value of p

p=2,3

Number of integral value of p is 2

22. Let D_1 & D_2 be discriminant of $x^2 + b_1x + c_1 = 0$ and $x^2 + b_2x + c_2 = 0$ respectively then

$$D_1 + D_2 = b_1^2 - 4c_1 + b_2^2 - 4c_2$$
$$= b_1^2 + b_2^2 - 2b_1b_2$$
$$\boxed{b_1b_2 = 2(c_1 - c_2)}$$
$$= (b_1 - b_2)^2 \geq 0$$
$$D_1 \geq 0 \text{ (or) } D_2 \geq 0 \text{ (or) } D_1 \text{ and } D_2$$

Both are positive hence at least one root of its equation has real roots.

23. α, β are roots of $x^2 - px + q = 0$

$$\alpha + \beta = p, \alpha\beta = q$$

$\alpha'\beta'$ are roots of $x^2p'x + q' = 0$

$$\alpha' + \beta' = p', \alpha'\beta' = q'$$

Now $(\alpha - \alpha)^2 + (\beta - \alpha')^2 + (\alpha - \beta')^2 + (\beta - \beta')^2$

$$2\left(\alpha^2+\beta^2\right)+2\left(\alpha'^2+\beta'^2\right)-2\alpha'(\alpha+\beta)-2\beta'(\alpha+\beta)$$
$$=2\left[(\alpha+\beta)^2-2\alpha\beta+(\alpha'+\beta')^2-2\alpha'\beta'-(\alpha+\beta)(\alpha'+\beta')\right]$$
$$=2\left[p^2-2q+p'^2-2q'-pp'\right]$$

24. According to the equation α,β are the root of $x^2-3px+2q=0$ and $\alpha,\dfrac{1}{\beta}$

$$\alpha+\beta=3p,\alpha\beta=2q$$
$$\alpha+\frac{1}{\beta}=3a,\frac{\alpha}{\beta}=2b$$
$$(2q-2b)^2=\left(\alpha\beta-\frac{\alpha}{\beta}\right)^2=\alpha^2\left(\beta-\frac{1}{\beta}\right)^2$$
$$=\frac{\alpha}{\beta}.\alpha\beta(\alpha+\beta)-\left(\alpha+\frac{1}{\beta}\right)^2$$
$$=(2b)(2q)(3p-3a)^2$$
$$=36bq(p-a)^2$$

25. $2\sqrt{5-4x-x^2}=16-|x|$

$$4\left(5-4x-x^2\right)=256-32|x|+x^2$$
$$5x^2+32|x|+16|x|+236=0$$
$$5x^2-16x+236=0 \text{ when } x\ge 0$$
and $5x^2+48x+236=0$ when $x<0$

In both cases equation has non real roots

26. $x^2-(a-3)x+a=0$

$$\Delta=(a-3)^2-4a\ ;=a^2-10a+9=(a-1)(a-9)$$

Case (i): Both roots are greater then 2

$$D\ge 0,f(2)>0,-\frac{\beta}{2A}>2$$
$$(a-1)(a-9)\ge 0$$
$$4-(a-3)2+a>0,\ \frac{a-3}{2}>2$$
$$(a-1)(a-9)\ge 0,\ a<10,\ a>7$$
$$a\in(-\alpha,1]\cup[9,\infty)$$
$$a\in[9,10].....(1)$$

Case (ii) One root is greater than 2 and the other root is less than (or) equal to 2

$$f(2)\le 0$$

(1) and (2) $a\in[9,10)\cup[10,\infty)$ $a\in[9,\infty)$

$$4-(a-3)2+a\le 0$$
$$a\ge 10.....(2)$$

27. We have $\sin A+\sin B=\dfrac{7n-20}{5n+8}....(1)$

$$\sin A.\sin B=\frac{120}{5n+8}....(2)$$

$$\sin^2 A+\sin^2 B=1$$

$$(\sin A+\sin B)^2=2\sin A\sin B=1$$

$$x^2-65n-66=0$$

$$(n-66)(n+1)=0$$

$$n=66$$

28. $\alpha+\alpha^2+\alpha^3.....\infty+\beta+\beta^2+\beta^3.....\infty$

$$\frac{\alpha}{1-\alpha}+\frac{\beta}{1-\beta}$$

$$=\frac{\alpha-\alpha\beta+\beta-\alpha\beta}{(1-\alpha)(1-\beta)}$$

$$=\frac{\alpha+\beta-2\alpha\beta}{1-\beta-\alpha+\alpha\beta}$$

$$=\frac{25}{375}-2\left(\frac{-2}{375}\right)$$

$$1-\left(\frac{25}{375}\right)+\left(\frac{-2}{375}\right)$$

$$=\frac{1}{12}$$

29. $P(x)=ax^2+bx+c$

$$P(x)=a(0)^2+b(0)+c=1$$

$$c=1$$

$$p(x)=ax^2+bx+1$$

$$p(x)=(x-1)g(x)+4$$

$$p(x)-4=(x-1)g(x)$$

$$p(x)-4=ax^2+bx=3=(a-1)g(x)$$

Put x = 1

$$a(1)^2+b(1)-3=3(1-1)g(x)$$

$$a+b-3=0$$

$$a+b=3.....(1)$$

$$P(x)=(x+1)h(x)+6$$

$$P(x)-6=(x+1)h(x)$$

$$ax^2+bx+1-6=ax^2+bx-5=(x+1)h(x)$$

$$a(-1)^2+b(-1)-5=(-1+1)b(x)$$

$$a-b-5=0$$

$$a-b=5.....(2)$$

$$\frac{a+b=3}{2a-8}$$

$$a=4, b=-1$$

$$p(x)=ax^2+bx+c$$

$= 4x^2 - x + 1$

$p(-2) = 4(-2)^2 - (-2) + 1$

$16 + 2 + 1 = 19$

$p(-2) = 19$

30. $4^{\sec^2} x^2 + 2x + \left(\beta^2 - \beta + \frac{1}{2}\right) = 0$

Real roots $\Delta \geq 0$

$4 - 4.4^{\sec^2\alpha}\left(\beta^2 - \beta + \frac{1}{2}\right) \geq 0$

$\Rightarrow 4^{\sec^2\alpha}\left(\beta^2 - \beta + \frac{1}{2}\right) \geq 1$

$\Rightarrow 4^{\sec^2\alpha}\left(\beta^2 - \beta + \frac{1}{2}\right) \leq 1$

$4^{\sec^2\alpha} \geq 4, \beta^2 - \beta + \frac{1}{2} = \left(\beta + \frac{1}{2}\right)^2 + \frac{1}{4} \geq \frac{1}{4}$

The equation satisfy only when $4^{\sec^2\alpha} = 4, \beta^2 - \beta + \frac{1}{2} = \frac{1}{4}$

$\sec^2\alpha = 1, \left(\beta - \frac{1}{2}\right)^2 = 0$

$\cos^2\alpha = 1, \beta = \frac{1}{2}$

$\cos^2\alpha + \cos^{-1}\beta = 1 + \cos^{-1}\frac{1}{2} = \frac{\pi}{3} + 1$

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