# QB365 Question Bank Software Study Materials

## Algebra Important 2 Marks Questions With Answers (Book Back and Creative)

10th Standard

**Maths**

Total Marks : 60

**2 Marks**

30 x 2 = 60

1) Reduce the rational expressions to its lowest form

$\frac{x-3}{x^2-9}$

**Answer :** $\frac{x-3}{x^2-9}=\frac{x-3}{(x+3)(x-3)}=\frac{1}{x+3}$

2) Find the excluded values, if any of the following expressions.

$\frac{y}{y^2-25}$

**Answer :** $\frac{y}{y^2-25}=\frac{y}{(y+5)(y-5)}$ is undefined when (y+5)(y-5)=0 that is y=-5,5.

∴ The excluded values are -5,5.

3) Multiply $\frac{x^3}{9y^2}$ by $\frac{27y}{x^5}$

**Answer :** $\frac{x^3}{9y^2}\times\frac{27y}{x^5}=\frac{3}{x^2y}$

4) Solve $2m^2 + 19m + 30 = 0$

**Answer :** $2m^2 + 19m + 30 = 2m^2 + 4m + 15m + 30 = 2m(m + 2) + 15(m + 2)$

= (m + 2)(2m + 15)

Now, equating the factors to zero we get,

(m + 2)(2m + 15) = 0

m + 2 gives, m = -2 or 2m + 15 = 0 we get, m = $\frac{-15}{2}$

Therefore the roots are -2, $\frac{-15}{2}$

Some equations which are not quadratic can be solved by reducing them to quadratic equations by suitable substitutions. Such examples are illustrated below.

5) Solve the following quadratic equations by factorization method

$4x^2 - 7x - 2 = 0$

**Answer :** $4x^2 - 7x - 2 = 0$

$4x^2 - 8x + x - 2 = 0$

4x(x - 2) + 1(x - 2) = 0

(x - 2)(4x + 1) = 0

x - 2 = 10

x = 2 or 4x + 1 = 0

x = 2 , x = $-\frac{1}{4}$

6) Find the values of 'k', for which the quadratic equation $kx^2 - (8k + 4)x + 81 = 0$ has real and equal roots?

**Answer :** $kx^2 - (8k + 4) + 81 = 0$

Since the equation has real and equal roots, Δ = 0

That is, $b^2 - 4ac = 0$

Here, a = k, b = -(8k + 4), c = 81

That is, $[-(8k + 4)]^2 - 4(k)(81) = 0$

$64k^2 + 64k + 16 - 324k = 0$

$64k^2 - 260k + 16 = 0$

dividing by 4 we get $16k^2 - 65k + 4 = 0$

(16k - 1)(k - 4) = 0 then, k = $\frac{1}{16}$ or k = 4

7) Find the value(s) of 'k' for which the roots of the following equations are real and equal.

$(5k - 6)x^2 + 2kx + 1 = 0$

**Answer :** $(5k - 6)x^2 + 2kx + 1 = 0$

a b c

$\Delta = b^2 - 4ac$

$= (2k)^2 - 4(5k-6)(1)$

$\Rightarrow 4k^2 - 20k + 24 = 0$

$\Rightarrow k^2 - 5k + 6 = 0$

$\Rightarrow (k-3)(k-2) = 0$

$k = 3, 2$

(Since the roots are real and equal)

8) If α, β are the roots of the equation $3x^2 + 7x - 2 = 0$, find the values of

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

**Answer :** $3x^2 + 7x - 2 = 0$ here, a = 3, b = 7, c = -2

since, α, β are the roots of the equation

$\alpha + \beta = \frac{-b}{a} = \frac{-7}{3}$, $\alpha\beta = \frac{c}{a} = \frac{-2}{3}$

$\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2+\beta^2}{\alpha\beta} = \frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{\left(\frac{-7}{3}\right)^2 - 2\left(\frac{-2}{3}\right)}{\frac{-2}{3}} = \frac{-61}{6}$

9) If one root of the equation $2y^2 - ay + 64 = 0$ is twice the other then find the values of a.

**Answer :** Let one of the root $\propto = 2\beta$

$\propto + \beta = 2\beta + \beta = 3\beta$

Given

$2y^2 - ay + 64 = 0$

$y^2 = \frac{a}{2}y + 32 = 0$

$\Rightarrow y^2 - \left(\frac{a}{2}\right)y + 32 = 0$

Sum of the roots $\propto + \beta = \frac{a}{6}$

i.e $3\beta = \frac{a}{2} \Rightarrow \beta = \frac{a}{6}$

$\propto\beta = \propto \times \frac{a}{6}$

$\Rightarrow 2\beta \times \beta = 2\left(\frac{a}{6}\right)\left(\frac{a}{6}\right)$

$a^2 = 576$

$a = 24, -24$

10) If one root of the equation $3x^2 + kx + 81 = 0$ (having real roots) is the square of the other then find k.

**Answer :** $3x^2 + kx + 81 = 0$

Let the roots be ∝ and ∝2

$\propto + \propto 2 = \frac{-k}{3}$ ....(1)

$\propto + \propto 2 = \frac{81}{3}$

$\Rightarrow k^3 = 27$

$\Rightarrow k^3 = 3$...(3)

$3 + 32 = \frac{-k}{3}$

$\Rightarrow (3 + 9)3 = -k$

$\Rightarrow k = -36.$

11) Construct a 3 x 3 matrix whose elements are $a_{ij} = i^2j^2$

**Answer :** The general 3 x 3 matrix is given by $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}$ $a_{ij} = i^2j^2$

$a_{11} = 1^2 \times 1^2 = 1 \times 1 = 1$; $a_{12} = 1^2 \times 2^2 = 1 \times 4 = 4$; $a_{13} = 1^2 \times 3^2 = 1 \times 9 = 9$

$a_{21} = 2^2 \times 1^2 = 2 \times 1 = 2$; $a_{22} = 2^2 \times 2^2 = 4 \times 4 = 16$; $a_{23} = 2^2 \times 3^2 = 4 \times 9 = 36$

$a_{31} = 3^2 \times 1^2 = 3 \times 1 = 3$; $a_{32} = 3^2 \times 2^2 = 9 \times 4 = 36$; $a_{33} = 3^2 \times 3^2 = 9 \times 9 = 81$

Hence the required matrix is $A = \begin{pmatrix} 1 & 4 & 9 \\ 4 & 16 & 36 \\ 9 & 36 & 81 \end{pmatrix}$

12) If A = $\begin{bmatrix} 1 & 3 & -2 \\ 5 & -4 & 6 \\ -3 & 2 & 9 \end{bmatrix}$, B = $\begin{bmatrix} 1 & 8 \\ 3 & 4 \\ 9 & 6 \end{bmatrix}$, find A + B.

**Answer :** It is not possible to add A and B because they have different orders.

13) Find the value of a, b, c, d, from the following matrix equation.

$$\begin{bmatrix} d & 8 \\ 3b & a \end{bmatrix} + \begin{bmatrix} 3 & a \\ -2 & -4 \end{bmatrix} = \begin{bmatrix} 2 & 2a \\ b & 4c \end{bmatrix} + \begin{bmatrix} 0 & 1 \\ -5 & 0 \end{bmatrix}$$

**Answer :** First, we add the two matrices on both left, right hand sides to get

$$\begin{bmatrix} d+3 & 8+a \\ 3b-2 & a-4 \end{bmatrix} = \begin{bmatrix} 2 & 2a+1 \\ b-5 & 4c \end{bmatrix}$$

Equating the corresponding elements of the two matrices, we have

d + 3 = 2 gives d = –1

8 + a = 2a + 1 gives a = 7

3b - 2 = b - 5 gives b = $\frac{-3}{2}$

Substituting a = 7 in a - 4 = 4c gives c = $\frac{3}{4}$

Therefore, a = 7, b = $\frac{-3}{2}$, c = $\frac{3}{4}$, d = -1.

14) If A = $\begin{bmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{bmatrix}$, B = $\begin{bmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{bmatrix}$ then verify that

A + B = B + A

**Answer :** L.H.S=A+B= $\begin{bmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{bmatrix}$ + $\begin{bmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{bmatrix}$

$= \begin{bmatrix} 6 & 16 \\ 6 & 7 \\ 9 & -3 \end{bmatrix}$ ...(1)

R.H.S=B+A = $\begin{bmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{bmatrix}$ + $\begin{bmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{bmatrix}$

$= \begin{bmatrix} 6 & 16 \\ 6 & 7 \\ 9 & -3 \end{bmatrix}$ ...(2)

(1)+(2) ⇒ L.H.S=R.H.S. Hence verified.

15) Find the order of the product matrix AB if

| | (i) | (ii) | (iii) | (iv) | (v) |
|---|---|---|---|---|---|
| Orders of A | 3 x 3 | 4 x 3 | 4 x 2 | 4 x 5 | 1 x 1 |
| Orders of B | 3 x 3 | 3 x 2 | 2 x 2 | 5 x 1 | 1 x 3 |

**Answer :** (i) Order of A= 3 x 3, order of B = 3 x 3

Order of AB = 3 x 3

(ii) Order of A = 4 x 3,Order of B = 3 x 2

Order of AB = 4 x 2

(iii) Order of A = 4 x 2, Order of B = 2 x 2

Order of AB = 4 x 2

(iv) Order of A = 4 x 5, Order of B = 5 x 1

Order of AB = 4 x 1

(v) Order of A = 1 x 1, Order of B = 1 x 3

Order of AB = 1 x 3

16) Write down the quadratic equation in general form for which sum and product of the roots are given below.

$-\frac{7}{2}, \frac{5}{2}$

**Answer :** $x^2 - \left(-\frac{7}{2}\right)x + \frac{5}{2} = 0$ gives $2x^2 + 7x + 5 = 0$

17) Determine the quadratic equations, whose sum and product of roots are

$\frac{5}{3}$, 4

**Answer :** Sum of the roots $= \frac{5}{3}$

Product of the roots = 4

General form of the Quadratic equation is $x^2$ - (sum of the roots)x + product of the roots = 0

$\Rightarrow x^2 - \frac{5}{3}x + 4 = 0$

Simplifying $3x^2 - 5x + 12 = 0$

18) Find the sum and product of the roots for each of the following quadratic equations

$x^2 + 3x = 0$

**Answer :** $x^2 + 3x = 0$

Comparing with $ax^2 + bx + c = 0$

a = 1,b = 3, c = 0

Sum of the roots $-\frac{b}{a} = -\frac{3}{1} = -3$

Products of the roots $\frac{c}{a} = \frac{0}{1} = 0$

19) If α and β are the roots of $x^2 + 7x + 10 = 0$ find the values of

$\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$

**Answer :** $x^2 + 7x + 10$ here, a = -1, b = 7, c =10

if α and β are roots of the equation then,

$\alpha + \beta = \frac{-b}{a} = \frac{-7}{1} = -7$; $\alpha\beta = \frac{c}{a} = \frac{10}{1} = 10$

$\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3+\beta^3}{\alpha\beta} = \frac{(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)}{\alpha\beta}$

$= \frac{(-343)-3(10\times(-7))}{10} = \frac{-343+210}{10} = \frac{-133}{10}$

20) Write each of the following expression in terms of α + β and αβ.

$\frac{1}{\alpha^2\beta} + \frac{1}{\beta^2\alpha}$

**Answer :** $\frac{1}{\alpha^2\beta} + \frac{1}{\beta^2\alpha} = \frac{\beta+\alpha}{\alpha^2\beta^2}$

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

21) Write each of the following expression in terms of α + β and αβ.

$\frac{\alpha+3}{\beta} + \frac{\beta+3}{\alpha}$

**Answer :** $\frac{\alpha+3}{\beta} + \frac{\beta+3}{\alpha} = \frac{\alpha^2+3\alpha+\beta^2+3\beta}{\alpha\beta}$

$= \frac{\alpha^2+\beta^2+3(\alpha+\beta)}{\alpha\beta}$

$= \frac{(\alpha+\beta)^2-2\alpha\beta+3(\alpha+\beta)}{\alpha\beta}$

22) The roots of the equation $x^2 + 6x - 4 = 0$ are α, β. Find the quadratic equation whose roots are

$\frac{2}{\alpha}$ and $\frac{2}{\beta}$

**Answer :** If the roots are given, the quadratic equation is $X^2$ - (sum of the roots) x + product the roots =0. For the given equation.

$x^2 - 6x - 4 = 0$

$\propto+\beta=-6$

$\propto\beta=-4$

$\frac{2}{\alpha} \times \frac{2}{\beta} = \frac{2\beta+2\alpha}{\alpha\beta} = \frac{2(-6)}{-4}$

$= \frac{-12}{-4} = 3$

$\frac{2}{\alpha} \times \frac{2}{\beta} = \frac{4}{\alpha\beta} = \frac{4}{-4} = -1$

∴ The required equation is $x^2 - 3x - 1 = 0$

23) If A = $\begin{bmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{bmatrix}$, B = $\begin{bmatrix} 5 & 7 \\ 3 & 3 \\ 1 & 0 \end{bmatrix}$ then verify that

A + (-A) = (-A) + A = 0

**Answer :** A + (-A) = (-A) + A = 0

L.H.S = A+(-A)

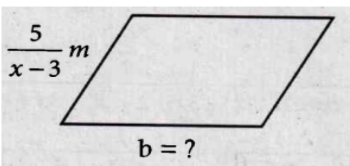
$$= \begin{bmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{bmatrix} + \begin{bmatrix} -1 & -9 \\ -3 & -4 \\ -8 & 3 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad ...(1)$$

R.H.S = (-A)+A

$$= \begin{bmatrix} -1 & -9 \\ -3 & -4 \\ -8 & 3 \end{bmatrix} + \begin{bmatrix} 1 & 9 \\ 3 & 4 \\ 8 & -3 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \quad ...(2)$$

(1) = (2) ⇒ L.H.S.= R.H.S. Hence verified.

24) Find the base of the given parallelogram whose perimeter is $= \frac{4x^2+10x-50}{(x-3)(x+5)}$




**Answer :** $Perimeter = \frac{4x^2+10x-50}{(x-3)(x+5)}$

$2(l+b) = \frac{4x^2+10x-50}{(x-3)(x+5)}$

$2\left(\frac{5}{x-3} + b\right) = \frac{2(2x-5)(x+5)}{(x-3)(x+5)}$

$b = \frac{2x-5}{x-3} - \frac{5}{x-3}$

$= \frac{2x-5-5}{x-3} = \frac{2x-10}{x-3}$

25) Find the element ln the second row and third column of the matrix $\begin{bmatrix} 1 & -2 & 3 \\ 2 & 1 & 5 \end{bmatrix}$

**Answer :** $a_{23}$ = 25

26) Find the values of k for which the following equation has equal roots.

(k - 12)r + 2(k - 12)x + 2 = 0

**Answer :** $\frac{(k-12)}{a}x^2 + \frac{2(k-12)}{b}x + \frac{2}{c} = 0$

$D^2 = b^2 - 4ac = (2(k - 12))^2 - 4(k - 12)(2)$

= 4(k - 12)[(k - 12) - 2]

= 4(k-12)(k- 14)

The given equation will have equal roots, if D = 0

⇒ 4(k-12)(k-14) 0

k - 12 = 0 or k - 14 0

k 12, 14

27) Simplify : $\frac{x^2+3x}{x^2-4x-21}$

**Answer :** $\frac{x^2+3x}{x^2-4x-21} = \frac{x(x+3)}{(x-7)(x+3)}$

$= \frac{x}{x-7}$

28) Find the Quadratic equation whose sum and product of the roots are (i) - 12,32 (ii) 2a, $a^2$-$b^2$.

**Answer :** (i) Sum = -12,

Product = 32.

Quadratic equation:

$x^2$ - (Sum of Roots) x + Product of Roots = 0

$x^2 + 12x + 32 = 0$

(ii) Sum of the roots '2a'

Product of the roots '$a^2 - b^2$'

Quadratic equation:

$x^2$ - (Sum of Roots) x + Product of Roots = 0

$x^2 - 2ax + a^2 - b^2 = 0$

29) Fiid the transpose of $A = \begin{bmatrix} 0 & 0 \\ 3 & 8 \\ 8 & 7 \end{bmatrix}$

**Answer :** $A = \begin{bmatrix} 0 & 0 \\ 3 & 8 \\ 8 & 7 \end{bmatrix}$

$\therefore A^T = \begin{bmatrix} 0 & 3 & 8 \\ 0 & 8 & 7 \end{bmatrix}$

30) If $\begin{bmatrix} x-y & 2y \\ 2y+z & x+y \end{bmatrix} = \begin{bmatrix} 1 & 4 \\ 9 & 5 \end{bmatrix}$, then find the value of $\mathbf{x}+\mathbf{y}+\mathbf{z}$

**Answer :** Since the matrices are equal,

Let us equate the cbrresponding elements.

Now,x - y = 1, 2y = 4

2y + z = 9, x + y = 5

2y - 4, x + y = 5 2y + z = 9

y = 2 x + 2 = 5 2(2) + z = 9

X = 3 z = 9 - 4 = 5

∴ x + y + z = 3 + 2 + 5 = 10