

**Dr. Virendra Swarup Education Centre, Avadhपुरi**

**Subject: Mathematics**

**Summer Holiday Assignment (2024-25)**

**Class- IX**

- Q1)** If  $a+b\sqrt{6} = \frac{7+2\sqrt{6}}{5+\sqrt{6}} - \frac{7-2\sqrt{6}}{5-\sqrt{6}}$ , find the values of a & b. Ans:  $a=0, b=\frac{6}{19}$
- Q2)** If  $x=12+6\sqrt{3}$ , then find the value of  $\sqrt{x} + \frac{6}{\sqrt{x}}$  Ans: 6
- Q3)** Simplify:  $\frac{\sqrt{6}}{\sqrt{3}+\sqrt{2}} + \frac{\sqrt{6}}{\sqrt{2}+1} - \frac{2\sqrt{6}}{\sqrt{3}+1}$  Ans: 0
- Q4)** Factorise the following: -
- a)  $4a^2-x^2+2xy-y^2$  Ans:  $(2a+x-y)(2a-x+y)$
  - b)  $a^2+b^2+2ab-c^2-d^2+2cd$  Ans:  $(a+b+c-d)(a+b-c+d)$
  - c)  $4x^4+y^4$  Ans:  $(2x^2+y^2+2xy)(2x^2+y^2-2xy)$
  - d)  $x^4+5x^2+9$  Ans:  $(x^2+x+3)(x^2-x+3)$
  - e)  $x^4-7x^2y^2+y^4$  Ans:  $(x^2+y^2+3xy)(x^2+y^2-3xy)$
- Q5)** Without actually calculating the cube, find the value of: -  
 $(18)^3 + (-10)^3 + (-8)^3$  Ans: 4320
- Q6)** Find the coefficient of x and constant term in  
 $(x+2)(x-6)(x+4)$  Ans:  $x=-28$ , constant term = - 48
- Q7)** Expand:  $-(2x+3y)^3 - (2x-3y)^3$  Ans:  $72x^2y+54y^3$
- Q8)** If  $3x=2y-4$ , find the value of  $27x^3 - 8y^3+72xy$ . Ans: -64
- Q9)** Solve for x:
- a)  $4-x-5x^2=0$  Ans:  $x = \frac{4}{5}, -1$
  - b)  $8x^2-27x+9=0$  Ans:  $x=3, \frac{3}{8}$
  - c)  $4x^2+12x+5=0$  Ans:  $x = \frac{-5}{2}, \frac{-1}{2}$
- Q10)** Factorise the following: -
- a)  $8x^2+14x+5$  Ans:  $(4x+5)(2x+1)$
  - b)  $x^4+18x^2+80$  Ans:  $(x^2+10)(x^2+8)$
  - c)  $4\sqrt{5}x^2-23x+3\sqrt{5}$  Ans:  $(x-\sqrt{5})(4\sqrt{5}x-3)$
- Q11)** Simplify the following: -
- a) Write  $8^{2x+3}$  in the form of  $2^y$  and express the relation between x and y.
  - b)  $\frac{5a^3b^2 \times 3(a^2b^6)}{15a^2b}$  Ans:  $a^5b^7$
  - c) If a and b are whole numbers such that  $a^b = 121$ , find the value of  $(a-1)^{b+1}$  Ans: 1000
  - d)  $1 - \{1+(x^2-1)^{-1}\}^{-1}$  Ans:  $\frac{1}{x^2}$
  - e) If  $2^x=3^y=108^z$ , find the relation between x, y, z Ans:  $\frac{2}{x} + \frac{3}{y} = \frac{1}{z}$
- Q12)** If  $a^x \cdot b^y = \sqrt[3]{a^5} \cdot \sqrt[3]{b^{-2}}$ , where  $a \neq b$  and a, b are positive prime numbers, then find the value of x and y. Ans:  $x=\frac{5}{3}$  and  $y=-\frac{2}{3}$

**Q13)** Solve:  $3^{2x+2} - 10 \cdot 3^x + 1 = 0$

Ans  $x=0$  or  $x=-2$

**Q14)** Factorise the following:

a)  $(x - 3y)^2 - 2x + 6y - 24$

Ans:  $(x-3y-6)(x-3y+4)$

b)  $x^2 + \frac{7}{2}x + 3$

Ans:  $\frac{1}{2}(x + 2)(2x + 3)$

**Q15)** If  $x = \sqrt{2} + 1$ , find the values of:

i)  $x + \frac{1}{x}$     Ans:  $2\sqrt{2}$

ii)  $x^2 + \frac{1}{x^2}$     Ans: 6

iii)  $x^3 + \frac{1}{x^3}$     Ans:  $10\sqrt{2}$

**Q16)** If  $3x^2 - 4x - 3 = 0$ , find the values of:

i)  $x - \frac{1}{x}$     Ans:  $\frac{4}{3}$

ii)  $x + \frac{1}{x}$     Ans:  $\pm \frac{2\sqrt{13}}{3}$

iii)  $x^2 + \frac{1}{x^2}$     Ans:  $\frac{34}{9}$

**Q17)** Simplify:  $\frac{1}{\sqrt{2}+1} + \frac{1}{\sqrt{3}+\sqrt{2}} + \frac{1}{\sqrt{4}+\sqrt{3}}$

Ans: 1

**Q18)** If  $\frac{2a}{3b} = \frac{3b}{4c}$ , show that  $(2a-3b+4c)(2a+3b+4c) = 4a^2+9b^2+16c^2$

**Q19)** If the sum of two numbers is 8 and the sum of their squares is 40, find the product of two numbers

Ans: 12

**Q20)** If the number y is 6 less than the number x and the sum of the squares of these two numbers is 68, find the product of two numbers.

Ans: 16

**Q21)** If  $a+b+c=4$ ,  $ab+bc+ca=5$  and  $abc=2$ , find the value of  $a^3 + b^3 + c^3$  Ans:10

### CASE STUDY

Q1) Two classmates Akshat and Anil simplified two different expressions during the revision hour and explained to each other their simplifications.

Akshat explains simplification of  $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$  by rationalising the denominator and Anil explains simplification of  $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$  by using the identity  $(a+b)(a-b)$ . Answer the following questions:

**a) What is the conjugate of  $(\sqrt{5} + \sqrt{3})$**

i)  $(\sqrt{5} + \sqrt{3})$

ii)  $(\sqrt{5} - \sqrt{3})$

iii)  $(\sqrt{5} \times \sqrt{3})$

iv)  $\frac{\sqrt{5}}{\sqrt{3}}$

**b) By rationalising the denominator of  $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$  Akshat got the answer as:**

i)  $\frac{\sqrt{2}}{\sqrt{5}-\sqrt{3}}$

ii)  $\frac{\sqrt{10-6}}{2}$

iii)  $(\sqrt{5} - \sqrt{3})$

v) None of these.

**c) Addition of two irrational numbers is equal to .....**

i) Rational

ii) Irrational

iii) Both a and b

iv) None of the above.

**Q2)** In class IX the Mathematics teacher asked the students about polynomials which have variable x and y. Then out of these polynomials, following are represented by  $p(x) = 4x^2 - 2x + 2$  at  $x=2$ ,  $q(y) = y^2 - 2y + 1$  at  $y=1$ ,  $r(t) = t^2 + 6t + 8$  at  $t=2$ . The students solved these equations to get best appreciation from the teacher's side

and to enhance their practice for half-yearly and yearly exams.  
Analyse the above information and answer the following questions.

**a) Calculate the value of polynomial  $p(x) = 4x^2 - 2x + 2$  at  $x=2$ .**

- i) 35
- ii) 14
- iii) 15
- iv) 12

**b) Calculate the roots of given equation  $q(y) = y^2 - 2y + 1$ .**

- i) 3,1
- ii) 2,1
- iii) 1,1
- iv) None of these

**c) How many zeros are there in linear polynomial?**

- i) 2
- ii) 1
- iii) 0
- iv) 4

### Q3) Laws of Indices

- $a^m \times a^n = a^{m+n}$
- $a^m/a^n = a^{m-n}$
- $a^0 = 1$
- $a^{-m} = 1/a^m$
- $a^m \times b^m = (a \times b)^m$
- $(a^m)^n = a^{mn}$
- $a^{1/2} = \sqrt{a}$

Based on the given rules, answer the following questions.

**i) If  $x \geq 0$ , then the value of  $\sqrt{x\sqrt{x\sqrt{x}}}$  is**

- a)  $x\sqrt{x}$
- b)  $x^4\sqrt{x}$
- c)  $\sqrt[8]{x}$
- d)  $\sqrt[8]{x^7}$

**ii) The value of  $\left(\frac{x^q}{x^r}\right)^{\frac{1}{qr}} \times \left(\frac{x^r}{x^p}\right)^{\frac{1}{rp}} \times \left(\frac{x^p}{x^q}\right)^{\frac{1}{pq}}$  is**

- a) 0
- b) 1
- c)  $x^{pq+qr+rp}$
- d) None of these

**iii) The value of  $\frac{4}{216^{\frac{-2}{3}}} - \frac{1}{256^{\frac{-3}{4}}}$  is**

- a) 144
- b) 64
- c) 80
- d) 36

### **Assertion and Reason**

- (i) Both assertion (A) and reason (R) are true, and reason (R) is the correct explanation of assertion (A).
- (ii) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
- (iii) Assertion (A) is true but reason (R) is false.
- (iv) Assertion (A) is false but reason (R) is true.

**Q1)** Assertion:  $\sqrt{2}$  is an irrational number.

Reason: It cannot be written in the form of  $\frac{p}{q}$ .

**Q2)** Assertion: A quadratic equation in the form of variable x is an equation of the form  $ax^2+bx+c=0$ , where a, b, c are real numbers,  $a \neq 0$ .

Reason:  $2x^2+x-300=0$  is a quadratic equation.