

**TO BE DONE IN COMMENT SHEETS**

IX - Mathematics



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MATHEMATICS—IX

**SHORT ANSWER-II TYPE PROBLEMS**

7. Evaluate:  $\frac{\sqrt[3]{2} \cdot 4^{3/2}}{128^{1/3}}$  [CBSE 2012]

8. Simplify:  $\frac{(25)^{\frac{1}{5}} \times (343)^{\frac{1}{7}}}{16^4 \times 8^3 \times 7^5}$  [CBSE 2012]

9. Simplify:

(i)  $4\sqrt{20} + \frac{1}{2}\sqrt{245} - \sqrt{405}$  [CBSE 2012] (ii)  $3\sqrt[3]{40} - 4\sqrt[3]{320} - \sqrt[3]{5}$  [CBSE 2012]

10. Rationalise the denominators in each of the following and hence evaluate by taking  $\sqrt{2} = 1.414$ ,  $\sqrt{3} = 1.732$  and  $\sqrt{5} = 2.236$ , upto three places of decimal.

(i)  $\frac{\sqrt{10} - \sqrt{5}}{2}$  (ii)  $\frac{\sqrt{2}}{2 + \sqrt{2}}$  (iii)  $\frac{1}{\sqrt{3} + \sqrt{2}}$  [NCERT (EP)]

11. Simplify by rationalising the denominator of  $\frac{4\sqrt{3} + 5\sqrt{2}}{\sqrt{48} + \sqrt{18}}$ . [CBSE 2010]

12. Find the values of  $a$  and  $b$ , if

(i)  $\frac{5 - 2\sqrt{3}}{7 - 4\sqrt{3}} = a - b\sqrt{3}$ , find  $a$  and  $b$ . [CBSE 2012]

(ii)  $\frac{5 + \sqrt{6}}{5 - \sqrt{6}} = a + b\sqrt{6}$ , find  $a$  and  $b$ . [CBSE 2012]

13. Determine on the number line, the points which represent  $\sqrt{5}$  and  $\sqrt{6}$ .

14. Simplify:

(i)  $\frac{3\sqrt{2}}{\sqrt{6} - \sqrt{3}} - \frac{4\sqrt{3}}{\sqrt{6} + \sqrt{3}}$  (ii)  $\frac{5 + \sqrt{3}}{7 - 4\sqrt{3}} - \frac{5 - \sqrt{3}}{7 + 4\sqrt{3}}$  [CBSE 2012]

**LONG ANSWER TYPE PROBLEMS**

15. If  $a = 5 + 2\sqrt{6}$  and  $b = \frac{1}{a}$ , then what will be the value of  $a^3 + b^3$ ? [CBSE 2012]

16. If  $a = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$  and  $b = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ , find the value of  $a^2 + b^2 - 5ab$ . [CBSE 2011]

17. If  $\sqrt{2} = 1.414$ ,  $\sqrt{3} = 1.732$ , then find the value of  $\frac{4}{3\sqrt{3} - 2\sqrt{2}} + \frac{3}{3\sqrt{3} + 2\sqrt{2}}$ . [NCERT (EP), CBSE 2010]

18. Show that: (i)  $\frac{1}{1 + x^{b-a} + x^{c-a}} + \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{a-c} + x^{b-c}} = 1$

(ii)  $\left(\frac{x^a}{x^b}\right)^{a^2 + ab + b^2} \cdot \left(\frac{x^b}{x^c}\right)^{b^2 + bc + c^2} \cdot \left(\frac{x^c}{x^a}\right)^{c^2 + ca + a^2} = 1$  [CBSE 2011, 12]

19. Evaluate :

$$(i) \frac{\left(\frac{9}{4}\right)^{-\frac{3}{2}} \times \left(\frac{125}{27}\right)^{-\frac{2}{3}} \times \left(\frac{3}{5}\right)^{-2}}{(\sqrt{2})^4} \quad [\text{CBSE 2012}] \quad (ii) \left(\frac{64}{125}\right)^{-\frac{2}{3}} + \frac{1}{\left(\frac{256}{625}\right)^{\frac{1}{4}}} + \frac{\sqrt{25}}{\sqrt[3]{64}} \quad [\text{CBSE 2012}]$$

$$(iii) \frac{1}{(216)^{\frac{2}{3}}} + \frac{1}{(256)^{\frac{3}{4}}} + \frac{1}{(243)^{\frac{1}{5}}}$$

$$20. \text{ If } a = \frac{2-\sqrt{5}}{2+\sqrt{5}} \text{ and } b = \frac{2+\sqrt{5}}{2-\sqrt{5}}, \text{ then find } (a+b)^3 \quad [\text{CBSE 2012}]$$

$$21. \text{ Rationalise the denominator of the following: } \frac{1}{\sqrt{3}-\sqrt{2}+1}$$

22. Simplify the following by rationalising the denominators:

$$\frac{2}{\sqrt{5}+\sqrt{3}} + \frac{1}{\sqrt{2}+\sqrt{3}} - \frac{3}{\sqrt{5}+\sqrt{2}} \quad [\text{CBSE 2010}]$$



14. Find the values of  $a$  and  $b$  so that the polynomial  $f(x) = x^3 + ax^2 + bx - 42$  is exactly divisible by  $x^2 - x - 6$ .
15. Find  $h$  and  $k$  so that the polynomial  $f(x) = x^3 - hx^2 - 13x + k$  has  $(n - 1)$  and  $(x + 3)$  factors.
16. Let  $f(x) = 6x^4 + 11x^3 + 13x^2 - 3x + 27$  and  $g(x) = 3x + 4$ .  
Find the quotient,  $q(x)$  and the remainder,  $r(x)$  when  $f(x)$  is divided by  $g(x)$ . Also, check the remainder obtained by using remainder theorem.
17. Verify whether  $\pm 1, \pm 3$  are the zero of the polynomial,  $f(x) = x^4 + 4x^3 + 2x^2 - 4x - 3$ .
18. Without actual division, how will you show that  $(x + 4)$  is a factor of the polynomial,  $f(x) = x^4 + 2x^3 - 7x^2 + 2x - 8$ . Justify your answer and state the theorem you have used.
19. Show, without actual division, that  $(x - 2)$  and  $(x - 4)$  are the factors of the polynomial,  $f(x) = x^4 - 6x^3 + 12x^2 - 24x + 32$ .
20. Using suitable identities:  
(i) Evaluate:  $(x - 2y)(x + 2y)(x^2 + 4y^2)$   
(ii) Simplify:  $(3x - 2y + z)^2 - (3x + 2y - z)^2$   
(iii) Simplify:  $(3x + 4)^3 - (3x - 4)^3$   
(iv) Evaluate:  $\left(\frac{x}{2} + 2y\right)\left(\frac{x^2}{4} - xy + 4y^2\right)$ . [NCERT (EP)]  
(v) Evaluate:  $(x^2 - 1)(x^4 + x^2 + 1)$ . [NCERT (EP)]
21. If  $a + b + c = 9$  and  $ab + bc + ca = 26$ , find the value of  $a^3 + b^3 + c^3 - 3abc$ .
22. If  $a + 1 = -2b$ , show that  $1 + a^3 + 8b^3 = 6ab$ .
23. Factorise:  
(i)  $64x^6 - y^6$  (ii)  $3x^6 - 81y^6$   
(iii)  $18x^3 - 50xy^2$  (iv)  $x^8 - 256$
24. (i) If  $a, b, c$  are all non-zero and  $a + b + c = 0$ , prove that  $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = 3$ . [NCERT (EP)]  
(ii) If  $a^3 + b^3 + c^3 = 3abc$  and  $a + b + c = 0$ , show that  $\frac{(b+c)^2}{3bc} + \frac{(c+a)^2}{3ac} + \frac{(a+b)^2}{3ab} = 1$ .

## LONG ANSWER TYPE PROBLEMS

25. Simplify:  $\frac{(4x^2 - 9y^2)^3 + (9y^2 - 16z^2)^3 + (16z^2 - 4x^2) \times 2}{(2x - 3y)^3 + (3y - 4z)^3 + (4z - 2x)^3}$  [CBSE 2010]
26. Factorise:  
(i)  $f(x) = x^3 + 2x^2 - x - 2$  (ii)  $f(x) = x^4 + x^3 - 7x^2 - x + 6$  (iii)  $x^3 + 13x^2 + 32x + 20$  [CBSE 2012]
27. Factorise:  $(a^2 - 2a)^2 - 23(a^2 - 2a) + 120$  [CBSE (Sample Paper) 2010]
28. Factorise:  $(x^{12} - y^{12})$  [CBSE (Sample Paper) 2010]
29. Prove that:  
 $(p+q)^3(p-q)^3(p^2+q^2)^3 + (q+r)^3(q^2+r^2)^3(q-r)^3 + (r+p)^3(r^2+p^2)^3(r-p)^3$   
 $= 3(p^4 - q^4)(q^4 - r^4)(r^4 - p^4)$
30. The polynomial,  $f(x) = x^4 - 2x^3 + 3x^2 - ax + b$  when divided by  $(x - 1)$  and  $(x + 1)$ , leaves the remainders 5 and 19 respectively. Find the values of  $a$  and  $b$ . Hence, find the remainder when  $f(x)$  is divided  $(x - 2)$ .
31. If the polynomials  $(2x^3 + ax^2 + 3x - 5)$  and  $(x^3 + x^2 - 2x + a)$  leave the same remainder when divided by  $(x - 2)$ , find the value of  $a$ . Also, find the remainder in each case.
32. Without actual division, prove that  $3x^3 - 8x^2 + 3x + 2$  is exactly divisible by  $x^2 - 3x + 2$ . [CBSE 2012]