



#CRESTInnovator



CREST Mathematics Olympiad (CMO) Worksheet for

Class 9



**Topic
Number System**



@crestolympiads



info@crestolympiads.com



+91-98182-94134

Worksheet on Number System

1. Which of the following compares of the surds $A = \sqrt{7} + \sqrt{6}$ and $B = \sqrt{5} + \sqrt{8}$?

- a. $A < B$
- b. $A > B$
- c. $A = B$
- d. $A^2 = B^2 + 2$

2. Simplify: $(4 + \sqrt{7})(7 + \sqrt{10})$

- a. $28 + 4\sqrt{10} + 6\sqrt{7} + 2\sqrt{70}$
- b. $28 + 4\sqrt{10} + 7\sqrt{7} + 2\sqrt{70}$
- c. $28 + 4\sqrt{10} + 6\sqrt{7} + \sqrt{70}$
- d. $28 + 4\sqrt{10} + 7\sqrt{7} + \sqrt{70}$

3. Rationalise the numerator of the following expression:

$$\frac{6 - \sqrt{7 + x}}{x - 11}$$

a.

$$\frac{29 - x}{6x + 2x\sqrt{7 + x} - 66 - 11\sqrt{7 + x}}$$

b.

$$\frac{29 - x}{6x + 2x\sqrt{7 + x} - 66 - 13\sqrt{7 + x}}$$

c.

$$\frac{29 - x}{6x + x\sqrt{7 + x} - 66 - 11\sqrt{7 + x}}$$

d.

$$\frac{29 - x}{6x + 4x\sqrt{7 + x} - 66 - 11\sqrt{7 + x}}$$

4. Simplify the following by the method of rationalising:

$$\frac{4\sqrt{3} + 3\sqrt{4}}{3\sqrt{2} - 2\sqrt{3}}$$

- a. $2 + 3\sqrt{2} + 2\sqrt{6} + \sqrt{12}$
- b. $2 - 3\sqrt{2} + 2\sqrt{6} + \sqrt{12}$
- c. $2 + 3\sqrt{2} - 2\sqrt{6} + \sqrt{12}$
- d. $2 + 3\sqrt{2} + 2\sqrt{6} - \sqrt{12}$

5. What is the value of x in the following equation?

$$\frac{x}{\sqrt{3} + \sqrt{4} + \sqrt{9} + \sqrt{12}} = \frac{\sqrt{3} - \sqrt{4} - \sqrt{9} + \sqrt{12}}{k}$$

- a. $2/k$
- b. $3/k$
- c. $4/k$
- d. $5/k$

1. b - A > B



Explanation: By squaring both the surds we get,

$$A^2 = (\sqrt{7} + \sqrt{6})^2 = 7 + 6 + 2\sqrt{42} = 13 + 2\sqrt{42} \dots\dots\dots(1)$$

$$B^2 = (\sqrt{5} + \sqrt{8})^2 = 5 + 8 + 2\sqrt{40} = 13 + 2\sqrt{40} \dots\dots\dots(2)$$

Also, $\sqrt{42} > \sqrt{40}$

Comparing equation (1) and (2),

$$\Rightarrow 13 + 2\sqrt{42} > 13 + 2\sqrt{40}$$

$$\Rightarrow A^2 > B^2$$

$$\therefore A > B$$

2. d - $28 + 4\sqrt{10} + 7\sqrt{7} + \sqrt{70}$

Explanation: Using the identity,

$$(\sqrt{p} + \sqrt{q})(\sqrt{r} + \sqrt{s}) = \sqrt{pr} + \sqrt{ps} + \sqrt{qr} + \sqrt{qs}$$
$$(4 + \sqrt{7})(7 + \sqrt{10}) = 28 + 4\sqrt{10} + 7\sqrt{7} + \sqrt{70}$$

3. C -

$$\frac{29 - x}{6x + x\sqrt{7+x} - 66 - 11\sqrt{7+x}}$$

Explanation:

Rationalizing factor of $6 - \sqrt{7+x}$ is $6 + \sqrt{7+x}$



$$\begin{aligned}\frac{6 - \sqrt{7+x}}{x - 11} &= \frac{6 - \sqrt{7+x}}{x - 11} \times \frac{6 + \sqrt{7+x}}{6 + \sqrt{7+x}} \\ &= \frac{6 \times 6 + 6(\sqrt{7+x}) - 6(\sqrt{7+x}) - (\sqrt{7+x})(\sqrt{7+x})}{(x - 11)(6 + \sqrt{7+x})}\end{aligned}$$

Using $[(a - b)(a + b) = a^2 - b^2]$

$$\begin{aligned}&= \frac{36 - (7+x)}{6x + x\sqrt{7+x} - 66 - 11\sqrt{7+x}} \\ &= \frac{29 - x}{6x + x\sqrt{7+x} - 66 - 11\sqrt{7+x}}\end{aligned}$$

4. a - 2 + 3√2 + 2√6 + √12

Rationalising factor of $3\sqrt{2} - 2\sqrt{3}$ is $3\sqrt{2} + 2\sqrt{3}$.



$$\begin{aligned}&\frac{4\sqrt{3} + 3\sqrt{4}}{3\sqrt{2} - 2\sqrt{3}} \quad \frac{4\sqrt{3} + 3\sqrt{4}}{3\sqrt{2} - 2\sqrt{3}} \quad \frac{3\sqrt{2} + 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}} \\ &= \frac{4\sqrt{3}(3\sqrt{2} + 2\sqrt{3}) + 3\sqrt{4}(3\sqrt{2} + 2\sqrt{3})}{(3\sqrt{2})^2 - (2\sqrt{3})^2} \\ &= \frac{12\sqrt{6} + 8 \times 3 + 9\sqrt{8} + 6\sqrt{12}}{(9 \times 2) - (2 \times 3)^2} \\ &= \frac{12\sqrt{6} + 24 + 9\sqrt{8} + 6\sqrt{12}}{18 - 12} \\ &= \frac{3[4\sqrt{6} + 4 + 3\sqrt{8} + 2\sqrt{12}]}{6} \\ &= \frac{4\sqrt{6} + 4 + 3 \times 2\sqrt{2} + 2\sqrt{12}}{2} \\ &= 2\sqrt{6} + 2 + 3\sqrt{2} + \sqrt{12} \\ &= 2 + 3\sqrt{2} + 2\sqrt{6} + \sqrt{12}\end{aligned}$$

5. $a - 2/k$

Explanation: By cross-multiplying both sides, we get:

$$xk = [\sqrt{3} + \sqrt{12} + \sqrt{4} + \sqrt{9}] \times [\sqrt{3} + \sqrt{12} - \sqrt{4} - \sqrt{9}]$$

$$xk = [(\sqrt{3} + \sqrt{12}) + (\sqrt{4} + \sqrt{9})] \times [(\sqrt{3} + \sqrt{12}) - (\sqrt{4} + \sqrt{9})]$$

Using the formula, $(a + b) \times (a - b) = a^2 - b^2$, we get:

$$xk = [(\sqrt{3} + \sqrt{12})^2 - (\sqrt{4} + \sqrt{9})^2]$$

$$xk = (3 + 12 + 2\sqrt{36}) - (4 + 9 + 2\sqrt{36})$$

$$xk = 15 + 2\sqrt{36} - 13 - 2\sqrt{36}$$

$$xk = 2$$

$$\therefore x = 2/k$$

More Questions Coming Soon – Keep Learning!

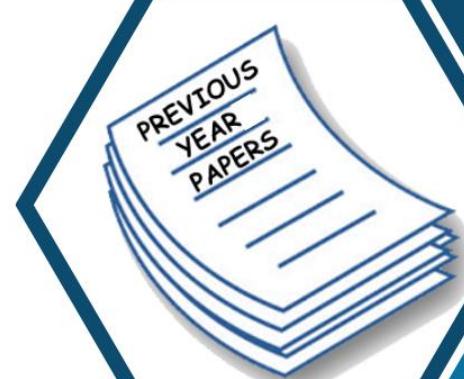


Difference between Ordinary & Extra-Ordinary is that “Little Extra”

Discover Our Ultimate Prep Kits!

Buy Previous Years Papers

1. Login at www.crestolympiads.com/login
2. Go to Dashboard -> Additional Practice -> Buy



Buy Physical & Digital Workbooks at

<https://www.crestolympiads.com/olympiad-books>



Buy Additional Practice

1. Login at www.crestolympiads.com/login
2. After login, go to Dashboard -> Additional Practice -> Buy

