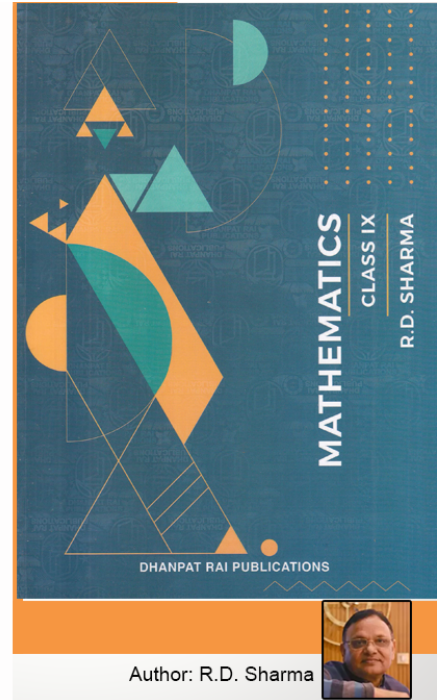


Class 9 - Chapter 3 Rationalisation



RD Sharma Solutions for Class 9 Maths Chapter 3–Rationalisation

Class 9: Maths Chapter 3 solutions. Complete Class 9 Maths Chapter 3 Notes.

RD Sharma Solutions for Class 9 Maths Chapter 3–Rationalisation

RD Sharma 9th Maths Chapter 3, Class 9 Maths Chapter 3 solutions

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Exercise 3.1**Question 1: Simplify each of the following:**

(i) $\sqrt[3]{4} \times \sqrt[3]{16}$

(ii) $\frac{\sqrt[4]{1250}}{\sqrt[4]{2}}$

Solution:**(i)**

Using: $\sqrt[n]{a} \times \sqrt[n]{b} = \sqrt[n]{a \times b}$

$$= \sqrt[3]{4 \times 16}$$

$$= \sqrt[3]{64}$$

$$= \sqrt[3]{4^3}$$

$$= (4^3)^{\frac{1}{3}}$$

$$= 4$$

(ii)

$$\text{(Note: } \frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}} \text{)}$$

$$= \sqrt[4]{\frac{1250}{2}}$$

$$= \sqrt[4]{\frac{2 \times 625}{2}}$$

$$= \sqrt[4]{625}$$

$$= \sqrt[4]{5^4}$$

$$= 5(4 \times \frac{1}{4})$$

$$= 5$$

Question 2: Simplify the following expressions:

(i) $(4 + \sqrt{7})(3 + \sqrt{2})$

(ii) $(3 + \sqrt{3})(5 - \sqrt{2})$

(iii) $(\sqrt{5} - 2)(\sqrt{3} - \sqrt{5})$

Solution:

(i) $(4 + \sqrt{7})(3 + \sqrt{2})$

$$= 12 + 4\sqrt{2} + 3\sqrt{7} + \sqrt{14}$$

(ii) $(3 + \sqrt{3})(5 - \sqrt{2})$

$$= 15 - 3\sqrt{2} + 5\sqrt{3} - \sqrt{6}$$

(iii) $(\sqrt{5} - 2)(\sqrt{3} - \sqrt{5})$

$$= \sqrt{15} - \sqrt{25} - 2\sqrt{3} + 2\sqrt{5}$$

$$= \sqrt{15} - 5 - 2\sqrt{3} + 2\sqrt{5}$$

Question 3: Simplify the following expressions:

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(i) $(11 + \sqrt{11})(11 - \sqrt{11})$

(ii) $(5 + \sqrt{7})(5 - \sqrt{7})$

(iii) $(\sqrt{8} - \sqrt{2})(\sqrt{8} + \sqrt{2})$

(iv) $(3 + \sqrt{3})(3 - \sqrt{3})$

(v) $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$

Solution:

Using Identity: $(a - b)(a + b) = a^2 - b^2$

(i) $(11 + \sqrt{11})(11 - \sqrt{11})$

$$= 11^2 - (\sqrt{11})^2$$

$$= 121 - 11$$

$$= 110$$

(ii) $(5 + \sqrt{7})(5 - \sqrt{7})$

$$= (5^2 - (\sqrt{7})^2)$$

$$= 25 - 7 = 18$$

(iii) $(\sqrt{8} - \sqrt{2})(\sqrt{8} + \sqrt{2})$

$$= (\sqrt{8})^2 - (\sqrt{2})^2$$

$$= 8 - 2$$

$$= 6$$

(iv) $(3 + \sqrt{3})(3 - \sqrt{3})$

$$= (3)^2 - (\sqrt{3})^2$$

$$= 9 - 3$$

$$= 6$$

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$$(v) (\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$$

$$=(\sqrt{5})^2 - (\sqrt{2})^2$$

$$= 5 - 2$$

$$= 3$$

Question 4: Simplify the following expressions:

(i) $(\sqrt{3} + \sqrt{7})^2$

(ii) $(\sqrt{5} - \sqrt{3})^2$

(iii) $(2\sqrt{5} + 3\sqrt{2})^2$

Solution:

Using identities: $(a - b)^2 = a^2 + b^2 - 2ab$ and $(a + b)^2 = a^2 + b^2 + 2ab$

(i) $(\sqrt{3} + \sqrt{7})^2$

$$= (\sqrt{3})^2 + (\sqrt{7})^2 + 2(\sqrt{3})(\sqrt{7})$$

$$= 3 + 7 + 2\sqrt{21}$$

$$= 10 + 2\sqrt{21}$$

(ii) $(\sqrt{5} - \sqrt{3})^2$

$$= (\sqrt{5})^2 + (\sqrt{3})^2 - 2(\sqrt{5})(\sqrt{3})$$

$$= 5 + 3 - 2\sqrt{15}$$

$$= 8 - 2\sqrt{15}$$

(iii) $(2\sqrt{5} + 3\sqrt{2})^2$

$$= (2\sqrt{5})^2 + (3\sqrt{2})^2 + 2(2\sqrt{5})(3\sqrt{2})$$

$$= 20 + 18 + 12\sqrt{10}$$

$$= 38 + 12\sqrt{10}$$

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Exercise 3.2

Question 1: Rationalise the denominators of each of the following (i – vii):

(i) $\frac{3}{\sqrt{5}}$ (ii) $\frac{3}{2\sqrt{5}}$ (iii) $\frac{1}{\sqrt{12}}$ (iv) $\frac{\sqrt{2}}{\sqrt{5}}$

(v) $\frac{(\sqrt{3} + 1)}{\sqrt{2}}$ (vi) $\frac{(\sqrt{2} + \sqrt{5})}{\sqrt{3}}$ (vii) $3\sqrt{2}/\sqrt{5}$

Solution:

(i) Multiply both numerator and denominator to with same number to rationalise the denominator.

$$\begin{aligned} &= \frac{3 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} \\ &= \frac{3 \times \sqrt{5}}{5} \end{aligned}$$

$$= 3\sqrt{5}/5$$

(ii) Multiply both numerator and denominator to with same number to rationalise the denominator.

$$\begin{aligned} \frac{3}{2\sqrt{5}} &= \frac{3 \times \sqrt{5}}{2 \times \sqrt{5} \times \sqrt{5}} \\ &= \frac{3\sqrt{5}}{2 \times 5} = \frac{3\sqrt{5}}{10} = \frac{3}{10} \sqrt{5} \end{aligned}$$

(iii) Multiply both numerator and denominator to with same number to rationalise the denominator.

(iv) Multiply both numerator and denominator to with same number to rationalise the denominator.

$$\frac{\sqrt{2}}{\sqrt{5}} = \frac{\sqrt{2} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{\sqrt{10}}{5} = \frac{1}{5} \sqrt{10}$$

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(v) Multiply both numerator and denominator to with same number to rationalise the denominator.

$$\frac{\sqrt{3}+1}{\sqrt{2}} = \frac{(\sqrt{3}+1)\sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{6}+\sqrt{2}}{2}$$

(vi) Multiply both numerator and denominator to with same number to rationalise the denominator.

$$\begin{aligned}\frac{\sqrt{2}+\sqrt{5}}{\sqrt{3}} &= \frac{(\sqrt{2}+\sqrt{5}) \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} \\ &= \frac{\sqrt{6}+\sqrt{15}}{3}\end{aligned}$$

(vii) Multiply both numerator and denominator to with same number to rationalise the denominator.

$$\begin{aligned}\frac{3\sqrt{2}}{\sqrt{5}} &= \frac{3\sqrt{2} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{3 \times \sqrt{10}}{5} \\ &= \frac{3}{5} \sqrt{10}\end{aligned}$$

Question 2: Find the value to three places of decimals of each of the following. It is given that

$$\sqrt{2} = 1.414, \sqrt{3} = 1.732, \sqrt{5} = 2.236 \text{ and } \sqrt{10} = 3.162$$

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(i) $\frac{2}{\sqrt{3}}$

(ii) $\frac{3}{\sqrt{10}}$

(iii) $\frac{\sqrt{5}+1}{\sqrt{2}}$

(iv) $\frac{\sqrt{10}+\sqrt{15}}{\sqrt{2}}$

(v) $\frac{2+\sqrt{3}}{3}$

(vi) $\frac{\sqrt{2}-1}{\sqrt{5}}$

Solution:

$$(i) \frac{2}{\sqrt{3}} = \frac{2 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$
$$= \frac{2\sqrt{3}}{3} = \frac{2 \times 1.732}{3} = \frac{3.464}{3} = 1.154$$

$$(ii) \frac{3}{\sqrt{10}} = \frac{3 \times \sqrt{10}}{\sqrt{10} \times \sqrt{10}} = \frac{3\sqrt{10}}{10}$$
$$= \frac{3(3.162)}{10} = \frac{9.486}{10} = 0.9486$$

$$(v) \frac{2 + \sqrt{3}}{3} = \frac{2 + 1.732}{3} = \frac{3.732}{3} = 1.244$$

$$(vi) \frac{\sqrt{2} - 1}{\sqrt{5}} = \frac{(\sqrt{2} - 1) \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$$
$$= \frac{\sqrt{10} - \sqrt{5}}{5} = \frac{3.162 - 2.236}{5}$$
$$= \frac{0.926}{5} = 0.185$$

Question 3: Express each one of the following with rational denominator:

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$$\begin{array}{lll} \text{(i)} \frac{1}{3+\sqrt{2}} & \text{(ii)} \frac{1}{\sqrt{6}-\sqrt{5}} & \text{(iii)} \frac{16}{\sqrt{41}-5} \\ \text{(iv)} \frac{30}{5\sqrt{3}-3\sqrt{5}} & \text{(v)} \frac{1}{2\sqrt{5}-\sqrt{3}} & \text{(vi)} \frac{\sqrt{3}+1}{2\sqrt{2}-\sqrt{3}} \\ \text{(vii)} \frac{6-4\sqrt{2}}{6+4\sqrt{2}} & \text{(viii)} \frac{3\sqrt{2}+1}{2\sqrt{5}-3} & \text{(ix)} \frac{b^2}{\sqrt{a^2+b^2}+a} \end{array}$$

Solution:

Using identity: $(a + b)(a - b) = a^2 - b^2$

(i) Multiply and divide given number by $3-\sqrt{2}$

$$\begin{aligned} & \frac{1}{3+\sqrt{2}} \\ &= \frac{3-\sqrt{2}}{(3+\sqrt{2})(3-\sqrt{2})} \\ &= \frac{3-\sqrt{2}}{9-2} \\ &= \frac{3-\sqrt{2}}{7} \end{aligned}$$

(ii) Multiply and divide given number by $\sqrt{6} + \sqrt{5}$

$$\begin{aligned} & \frac{1}{\sqrt{6}-\sqrt{5}} \\ &= \frac{\sqrt{6}+\sqrt{5}}{(\sqrt{6}-\sqrt{5})(\sqrt{6}+\sqrt{5})} \\ &= \frac{\sqrt{6}+\sqrt{5}}{6-5} \\ &= \sqrt{6}+\sqrt{5} \end{aligned}$$

(iii) Multiply and divide given number by $\sqrt{41} + 5$

$$\begin{aligned} & \frac{16}{\sqrt{41}-5} \\ &= \frac{16 \times (\sqrt{41}+5)}{(\sqrt{41}-5)(\sqrt{41}+5)} \\ &= \frac{16\sqrt{41}+80}{41-25} \\ &= \frac{16\sqrt{41}+80}{16} \\ &= \frac{16(\sqrt{41}+5)}{16} \\ &= \sqrt{41} + 5 \end{aligned}$$

(iv) Multiply and divide given number by $5\sqrt{3} + 3\sqrt{5}$

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$$\begin{aligned} & \frac{30}{5\sqrt{3}-3\sqrt{5}} \\ &= \frac{30 \times (5\sqrt{3}+3\sqrt{5})}{(5\sqrt{3}-3\sqrt{5})(5\sqrt{3}+3\sqrt{5})} \\ &= \frac{30 \times (5\sqrt{3}+3\sqrt{5})}{75-45} \\ &= \frac{30 \times (5\sqrt{3}+3\sqrt{5})}{30} \\ &= 5\sqrt{3} + 3\sqrt{5} \end{aligned}$$

(v) Multiply and divide given number by $2\sqrt{5} + \sqrt{3}$

$$\begin{aligned} & \frac{1}{2\sqrt{5}-\sqrt{3}} \\ &= \frac{2\sqrt{5}+\sqrt{3}}{(2\sqrt{5}-\sqrt{3})(2\sqrt{5}+\sqrt{3})} \\ &= \frac{2\sqrt{5}+\sqrt{3}}{20-3} \\ &= \frac{2\sqrt{5}+\sqrt{3}}{17} \end{aligned}$$

(vi) Multiply and divide given number by $2\sqrt{2} + \sqrt{3}$

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$$\begin{aligned} & \frac{\sqrt{3}+1}{2\sqrt{2}-\sqrt{3}} \\ &= \frac{(\sqrt{3}+1)(2\sqrt{2}+\sqrt{3})}{(2\sqrt{2}+\sqrt{3})(2\sqrt{2}-\sqrt{3})} \\ &= \frac{(2\sqrt{6}+3+2\sqrt{2}+\sqrt{3})}{8-3} \\ &= \frac{(2\sqrt{6}+3+2\sqrt{2}+\sqrt{3})}{5} \end{aligned}$$

(vii) Multiply and divide given number by $6 - 4\sqrt{2}$

$$\begin{aligned} & \frac{6-4\sqrt{2}}{6+4\sqrt{2}} \\ &= \frac{(6-4\sqrt{2})(6-4\sqrt{2})}{(6+4\sqrt{2})(6-4\sqrt{2})} \\ &= \frac{(6-4\sqrt{2})^2}{36-32} \\ &= \frac{36-48\sqrt{2}+32}{4} \\ &= \frac{68-48\sqrt{2}}{4} \\ &= \frac{4(17-12\sqrt{2})}{4} \\ &= 17 - 12\sqrt{2} \end{aligned}$$

(viii) Multiply and divide given number by $2\sqrt{5} + 3$

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$$\begin{aligned} & \frac{3\sqrt{2}+1}{2\sqrt{5}-3} \\ &= \frac{(3\sqrt{2}+1) \times (2\sqrt{5}+3)}{(2\sqrt{5}-3)(2\sqrt{5}+3)} \\ &= \frac{6\sqrt{10}+9\sqrt{2}+2\sqrt{5}+3}{(20-9)} \\ &= \frac{6\sqrt{10}+9\sqrt{2}+2\sqrt{5}+3}{11} \end{aligned}$$

(ix) Multiply and divide given number by $\sqrt{(a^2+b^2)} - a$

$$\begin{aligned} & \frac{b^2}{\sqrt{(a^2+b^2)}+a} \\ &= \frac{b^2(\sqrt{(a^2+b^2)}-a)}{(\sqrt{(a^2+b^2)}+a)(\sqrt{(a^2+b^2)}-a)} \\ &= \frac{b^2(\sqrt{(a^2+b^2)}-a)}{(a^2+b^2)-a^2} \\ &= \frac{b^2(\sqrt{(a^2+b^2)}-a)}{b^2} \end{aligned}$$

Question 4: Rationales the denominator and simplify:

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$$(i) \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$$

$$(ii) \frac{5+2\sqrt{3}}{7+4\sqrt{3}}$$

$$(iii) \frac{1+\sqrt{2}}{3-2\sqrt{2}}$$

$$(iv) \frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}}$$

$$(v) \frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$$

$$(vi) \frac{2\sqrt{3}-\sqrt{5}}{2\sqrt{2}+3\sqrt{3}}$$

Solution:[Use identities: $(a + b)(a - b) = a^2 - b^2$; $(a + b)^2 = (a^2 + 2ab + b^2)$ and $(a - b)^2 = (a^2 - 2ab + b^2)$]

(i) Multiply both numerator and denominator by $\sqrt{3}-\sqrt{2}$ to rationalise the denominator.

$$\begin{aligned} & \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \\ &= \frac{(\sqrt{3}-\sqrt{2})(\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})} \\ &= \frac{(\sqrt{3}-\sqrt{2})^2}{3-2} \\ &= \frac{3-2\sqrt{3}\sqrt{2}+2}{1} \\ &= 5 - 2\sqrt{6} \end{aligned}$$

(ii) Multiply both numerator and denominator by $7-4\sqrt{3}$ to rationalise the denominator.

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$$\begin{aligned} & \frac{5+2\sqrt{3}}{7+4\sqrt{3}} \\ &= \frac{(5+2\sqrt{3})(7-4\sqrt{3})}{(7+4\sqrt{3})(7-4\sqrt{3})} \\ &= \frac{(5+2\sqrt{3})(7-4\sqrt{3})}{49-48} \\ &= 35 - 20\sqrt{3} + 14\sqrt{3} - 24 \\ &= 11 - 6\sqrt{3} \end{aligned}$$

(iii) Multiply both numerator and denominator by $3+2\sqrt{2}$ to rationalise the denominator.

$$\begin{aligned} & \frac{1+\sqrt{2}}{3-2\sqrt{2}} \\ &= \frac{(1+\sqrt{2})(3+2\sqrt{2})}{(3-2\sqrt{2})(3+2\sqrt{2})} \\ &= \frac{(1+\sqrt{2})(3+2\sqrt{2})}{9-8} \\ &= 3 + 2\sqrt{2} + 3\sqrt{2} + 4 \\ &= 7 + 5\sqrt{2} \end{aligned}$$

(iv) Multiply both numerator and denominator by $3\sqrt{5}+2\sqrt{6}$ to rationalise the denominator.

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$$\begin{aligned} & \frac{2\sqrt{6}-\sqrt{5}}{3\sqrt{5}-2\sqrt{6}} \\ &= \frac{(2\sqrt{6}-\sqrt{5})(3\sqrt{5}+2\sqrt{6})}{(3\sqrt{5}-2\sqrt{6})(3\sqrt{5}+2\sqrt{6})} \\ &= \frac{(2\sqrt{6}-\sqrt{5})(3\sqrt{5}+2\sqrt{6})}{45-24} \\ &= \frac{(2\sqrt{6}-\sqrt{5})(3\sqrt{5}+2\sqrt{6})}{21} \\ &= \frac{6\sqrt{30}+24-15-2\sqrt{30}}{21} \\ &= \frac{4\sqrt{30}+9}{21} \end{aligned}$$

(v) Multiply both numerator and denominator by $\sqrt{48}-\sqrt{18}$ to rationalise the denominator.

$$\begin{aligned} & \frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}} \\ &= \frac{(4\sqrt{3}+5\sqrt{2})(\sqrt{48}-\sqrt{18})}{(\sqrt{48}+\sqrt{18})(\sqrt{48}-\sqrt{18})} \\ &= \frac{(4\sqrt{3}+5\sqrt{2})(\sqrt{48}-\sqrt{18})}{48-18} \\ &= \frac{48-12\sqrt{6}+20\sqrt{6}-30}{30} \\ &= \frac{18+8\sqrt{6}}{30} \\ &= \frac{9+4\sqrt{6}}{15} \end{aligned}$$

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(vi) Multiply both numerator and denominator by $2\sqrt{2} - 3\sqrt{3}$ to rationalise the denominator.

$$\begin{aligned} & \frac{2\sqrt{3}-\sqrt{5}}{2\sqrt{2}+3\sqrt{3}} \\ &= \frac{(2\sqrt{3}-\sqrt{5})(2\sqrt{2}-3\sqrt{3})}{(2\sqrt{2}+3\sqrt{3})(2\sqrt{2}-3\sqrt{3})} \\ &= \frac{(2\sqrt{3}-\sqrt{5})(2\sqrt{2}-3\sqrt{3})}{8-27} \\ &= \frac{(4\sqrt{6}-2\sqrt{10})-18+3\sqrt{15}}{-19} \\ &= \frac{(18-4\sqrt{6}+2\sqrt{10}-3\sqrt{15})}{19} \end{aligned}$$

Exercise VSAQs

Question 1: Write the value of $(2 + \sqrt{3})(2 - \sqrt{3})$.

Solution:

$$\begin{aligned} & (2 + \sqrt{3})(2 - \sqrt{3}) \\ &= (2)^2 - (\sqrt{3})^2 \text{ [Using identity : } (a + b)(a - b) = a^2 - b^2 \text{]} \\ &= 4 - 3 \\ &= 1 \end{aligned}$$

Question 2: Write the reciprocal of $5 + \sqrt{2}$.

Solution:

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Reciprocal of $5 + \sqrt{2} = \frac{1}{5 + \sqrt{2}}$

Rationalisation of fraction

Multiply and divide given fraction by $5 - \sqrt{2}$

$$\begin{aligned} &= \frac{5 - \sqrt{2}}{(5 + \sqrt{2})(5 - \sqrt{2})} \\ &= \frac{5 - \sqrt{2}}{(5)^2 - (\sqrt{2})^2} \\ &= \frac{5 - \sqrt{2}}{25 - 2} \\ &= \frac{5 - \sqrt{2}}{23} \end{aligned}$$

Question 3: Write the rationalisation factor of $7 - 3\sqrt{5}$.

Solution:

Rationalisation factor of $7 - 3\sqrt{5}$ is $7 + 3\sqrt{5}$

Question 4: If

$$\frac{\sqrt{3} - 1}{\sqrt{3} + 1} = x + y\sqrt{3}$$

Find the values of x and y.

Solution:[Using identities : $(a + b)(a - b) = a^2 - b^2$ and $(a - b)^2 = a^2 + b^2 - 2ab$]

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Rationalising Denominator

$$\begin{aligned}\frac{\sqrt{3}-1}{\sqrt{3}+1} &= \frac{(\sqrt{3}-1)}{(\sqrt{3}+1)} \times \frac{(\sqrt{3}-1)}{(\sqrt{3}-1)} = \frac{(\sqrt{3}-1)^2}{(\sqrt{3})^2-(1)^2} \\ &= \frac{3+1-2\sqrt{3}}{3-1} = \frac{4-2\sqrt{3}}{2} = 2 - \sqrt{3}\end{aligned}$$

Now,

$$2 - \sqrt{3} = x + y\sqrt{3}$$

On comparing,

$$x = 2, y = -1$$

Question 5: If $x = \sqrt{2} - 1$, then write the value of $1/x$.

Solution:

$$x = \sqrt{2} - 1$$

$$\text{or } 1/x = 1/(\sqrt{2} - 1)$$

Rationalising denominator, we have

$$= 1/(\sqrt{2} - 1) \times (\sqrt{2} + 1)/(\sqrt{2} + 1)$$

$$= (\sqrt{2} + 1)/(2-1)$$

$$= \sqrt{2} + 1$$

Question 6: Simplify

$$\sqrt{3 + 2\sqrt{2}}$$

Solution:

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$$\begin{aligned} & \sqrt{3+2\sqrt{2}} \\ &= \sqrt{2+1+2\sqrt{2}} \\ &= \sqrt{(\sqrt{2})^2 + (1)^2 + 2 \times \sqrt{2} \times 1} \\ &= \sqrt{(\sqrt{2}+1)^2} = \sqrt{2} + 1 \end{aligned}$$

[Because: $(a + b)^2 = a^2 + b^2 + 2ab$]

Question 7: Simplify

$$\sqrt{3 - 2\sqrt{2}}$$

Solution:

$$\begin{aligned} & \sqrt{3 - 2\sqrt{2}} \\ &= \sqrt{2+1-2\sqrt{2}} \\ &= \sqrt{(\sqrt{2})^2 + (1)^2 - 2 \times \sqrt{2} \times 1} \\ &= \sqrt{(\sqrt{2}-1)^2} = \sqrt{2} - 1 \end{aligned}$$

[Because: $(a - b)^2 = a^2 + b^2 - 2ab$]

Question 8: If $a = \sqrt{2} + 1$, then find the value of $a - 1/a$.

Solution:

Given: $a = \sqrt{2} + 1$

$$1/a = 1/(\sqrt{2} + 1)$$

$$= 1/(\sqrt{2} + 1) \times (\sqrt{2} - 1)/(\sqrt{2} - 1)$$

$$= (\sqrt{2} - 1)/((\sqrt{2})^2 - (1)^2)$$

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$$= (\sqrt{2} - 1)/1$$

$$= \sqrt{2} - 1$$

Now,

$$a - 1/a = (\sqrt{2} + 1) - (\sqrt{2} - 1)$$

$$= 2$$

Question 9: If $x = 2 + \sqrt{3}$, find the value of $x + 1/x$.

Solution:

Given: $x = 2 + \sqrt{3}$

$$1/x = 1/(2 + \sqrt{3})$$

$$= 1/(2 + \sqrt{3}) \times (2 - \sqrt{3})/(2 - \sqrt{3})$$

$$= (2 - \sqrt{3}) / ((2)^2 - (\sqrt{3})^2)$$

$$= (2 - \sqrt{3}) / (4 - 3)$$

$$= (2 - \sqrt{3})$$

Now,

$$x + 1/x = (2 + \sqrt{3}) + (2 - \sqrt{3})$$

$$= 4$$

Question 10: Write the rationalisation factor of $\sqrt{5} - 2$.

Solution:

Rationalisation factor of $\sqrt{5} - 2$ is $\sqrt{5} + 2$

Question 11: If $x = 3 + 2\sqrt{2}$, then find the value of $\sqrt{x} - 1/\sqrt{x}$.

Solution:

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$$x = 3 + 2\sqrt{2}$$

$$\begin{aligned}\frac{1}{x} &= \frac{1}{3+2\sqrt{2}} = \frac{(3-2\sqrt{2})}{(3+2\sqrt{2})(3-2\sqrt{2})} \\ &= \frac{3-2\sqrt{2}}{(3)^2 - (2\sqrt{2})^2} = \frac{3-2\sqrt{2}}{9-8} = \frac{3-2\sqrt{2}}{1}\end{aligned}$$

$$x + \frac{1}{x} = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} = 6$$

$$\begin{aligned}\text{Now, } \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 &= x + \frac{1}{x} - 2 \\ &= 6 - 2 = 4 = (2)^2\end{aligned}$$

$$\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) = 2$$



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- Chapter 2–Exponents of Real Numbers
- Chapter 3–Rationalisation
- Chapter 4–Algebraic Identities
- Chapter 5–Factorization of Algebraic Expressions
- Chapter 6–Factorization Of Polynomials
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- Chapter 20–Surface Area and Volume of A Right Circular Cone
- Chapter 21–Surface Area And Volume Of Sphere
- Chapter 22–Tabular Representation of Statistical Data
- Chapter 23–Graphical Representation of Statistical Data
- Chapter 24–Measure of Central Tendency
- Chapter 25–Probability

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About RD Sharma

RD Sharma isn't the kind of author you'd bump into at lit fests. But his bestselling books have helped many CBSE students lose their dread of maths. Sunday Times profiles the tutor turned internet star

He dreams of algorithms that would give most people nightmares. And, spends every waking hour thinking of ways to explain concepts like 'series solution of linear differential equations'. Meet Dr Ravi Dutt Sharma — mathematics teacher and author of 25 reference books — whose name evokes as much awe as the subject he teaches. And though students have used his thick tomes for the last 31 years to ace the dreaded maths exam, it's only recently that a spoof video turned the tutor into a YouTube star.

R D Sharma had a good laugh but said he shared little with his on-screen persona except for the love for maths. "I like to spend all my time thinking and writing about maths problems. I find it relaxing," he says. When he is not writing books explaining mathematical concepts for classes 6 to 12 and engineering students, Sharma is busy dispensing his duty as vice-principal and head of department of science and humanities at Delhi government's Guru Nanak Dev Institute of Technology.

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