

ROOTS AND RADICALS - EXERCISES

① Evaluate:

a) $\sqrt{36}$ b) $\sqrt{81}$ c) $-\sqrt{25}$ d) $\sqrt[3]{27}$ e) $\sqrt[3]{81}$

f) $\sqrt[3]{-64}$ g) $\sqrt{225}$ h) $-\sqrt{169}$ i) $-\sqrt[3]{125}$ j) $\sqrt{16x^2}$

② Evaluate with a calculator

a) $\sqrt{3}$ b) $-\sqrt{5}$ c) $4\sqrt{7}$ d) $3+\sqrt{11}$ e) $6(\sqrt{5}-3)$ f) $2\sqrt{7}+4\sqrt{13}$

③ Simplify:

a) $\sqrt{2}\sqrt{50}$ b) $\sqrt{12}$ c) $\sqrt{7}\sqrt{14}$ d) $\sqrt{80}$ e) $2\sqrt{6} \cdot 3\sqrt{3}$ f) $\sqrt{108}$

g) $\sqrt{5}\sqrt{3}\sqrt{30}$ h) $\sqrt{810}$ i) $\sqrt[3]{54}$ j) $(-4\sqrt{3})^2$ k) $(\sqrt[3]{1000})^2$ l) $\sqrt{18x^4}$

④ Simplify:

a) $\frac{\sqrt{48}}{\sqrt{3}}$ b) $\sqrt{\frac{25}{9}}$ c) $\frac{\sqrt{24}}{\sqrt{3}}$ d) $\sqrt{\frac{54}{49}}$ e) $\frac{\sqrt{112}}{\sqrt{7}}$ f) $\sqrt[3]{\frac{64}{27}}$

g) $\frac{5\sqrt{32}}{4\sqrt{2}}$ h) $\frac{3}{2} \cdot \frac{\sqrt[3]{16}}{\sqrt[3]{54}}$ i) $\sqrt{2} \cdot \sqrt{\frac{8}{25}}$ j) $\sqrt{\frac{5}{2}} \cdot \sqrt{\frac{125}{8}}$

k) $\sqrt{\frac{5}{16} + \frac{1}{4}}$ l) $\frac{\sqrt{16a^3x}}{\sqrt{2ax}}$

⑤ Simplify:

a) $2\sqrt{3} + 5\sqrt{3}$ b) $9\sqrt{2} - 4\sqrt{2}$ c) $10\sqrt{2} - 5\sqrt{8}$ d) $4\sqrt{27} - 7\sqrt{3}$

e) $\sqrt{45} + \sqrt{20}$ f) $3\sqrt{75} - 2\sqrt{12}$ g) $\sqrt{5}\sqrt{15} + \sqrt{48}$ h) $5\sqrt[3]{16} - 2\sqrt[3]{54}$

i) $\sqrt{27} + 2\sqrt{3} - \sqrt{75}$ j) $5\sqrt{7} - 3\sqrt{28} + 6\sqrt{63}$ k) $\sqrt{20} + \sqrt{45} + \sqrt{80}$

l) $3\sqrt{11} - \sqrt{44} + \sqrt{99}$ m) $4\sqrt{12} - \sqrt{27} + 2\sqrt{48}$ n) $2\sqrt{63} - 3\sqrt{28} + 4\sqrt{20}$

o) $\sqrt{200} - 12\sqrt{8} + \sqrt{450}$ p) $2\sqrt{20} - 3\sqrt{45} + \sqrt{180}$ q) $2\sqrt{125} - 4\sqrt{45} - 6\sqrt{20}$

r) $\sqrt{108} - \sqrt{243} + \sqrt{75}$ s) $\sqrt{24} - \sqrt{150} - \sqrt{54}$ t) $\sqrt{8x^2} - x\sqrt{18} + \sqrt{50x^2}$

ROOTS AND RADICALS - EXERCISES

6) Simplify:

(a) $\sqrt{5}\sqrt{5}$ (b) $(-3\sqrt{7})^2$ (c) $\sqrt{7}(3-\sqrt{7})$ (d) $\sqrt{2}(3\sqrt{2}+2\sqrt{8})$

(e) $\sqrt{3}(2\sqrt{6}-3\sqrt{3})$ (f) $(5+\sqrt{7})(5-\sqrt{7})$ (g) $(\sqrt{5}-4)(\sqrt{5}+4)$

(h) $(3+\sqrt{6})(2-\sqrt{6})$ (i) $(3\sqrt{5}-4\sqrt{2})(2\sqrt{5}+3\sqrt{2})$ (j) $(4\sqrt{2}+3\sqrt{5})(4\sqrt{2}-3\sqrt{5})$

(k) $(5\sqrt{2}-2\sqrt{11})(5\sqrt{2}+2\sqrt{11})$ (l) $(1+\sqrt{2})^2$ (m) $(\sqrt{5}-2\sqrt{6})^2$

(n) $(\sqrt{2}+\sqrt{3}-\sqrt{5})(\sqrt{2}+\sqrt{3}+\sqrt{5})$ (o) $(\sqrt{a+x}-\sqrt{a})(\sqrt{a+x}+\sqrt{a})$

7) Rationalize the denominator and simplify:

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{2}{\sqrt{5}}$ (c) $\frac{6}{\sqrt{10}}$ (d) $\frac{15}{\sqrt{5}}$ (e) $\frac{9}{2\sqrt{18}}$ (f) $\frac{-4}{3\sqrt{12}}$

(g) $\frac{1-\sqrt{3}}{\sqrt{3}}$ (h) $\frac{9}{\sqrt{3}x}$ (i) $\frac{\sqrt{3x-3y}}{\sqrt{5x-5y}}$ (j) $\frac{3}{1+\sqrt{2}}$ (k) $\frac{8}{\sqrt{5}-3}$

(l) $\frac{\sqrt{2}+\sqrt{3}}{\sqrt{3}-\sqrt{2}}$ (m) $\frac{14\sqrt{2}}{2+\sqrt{2}}$ (n) $\frac{\sqrt{12}}{\sqrt{3}+1}$ (o) $\frac{7}{2\sqrt{2}+1}$ (p) $\frac{7+\sqrt{3}}{2-\sqrt{3}}$

(q) $\frac{26}{5-2\sqrt{3}}$ (r) $\frac{3\sqrt{2}-\sqrt{3}}{2\sqrt{2}+\sqrt{3}}$ (s) $\frac{\sqrt{8}-6}{\sqrt{8}+6}$ (t) $\frac{25\sqrt{3}-4\sqrt{2}}{7\sqrt{3}-5\sqrt{2}}$

(u) $\frac{(3+\sqrt{5})(\sqrt{5}-2)}{5-\sqrt{5}}$ (v) $\frac{\sqrt{x}}{\sqrt{x}+\sqrt{y}}$ (w) $\frac{2x-\sqrt{xy}}{2\sqrt{xy}-y}$ (x) $\frac{1}{\sqrt{x+1}-1}$

8) Simplify:

(a) $4^{3/2}$ (b) $27^{2/3}$ (c) $-25^{3/2}$ (d) $(-8)^{5/3}$ (e) $16^{-1/4}$ (f) $(\frac{49}{16})^{3/2}$

(g) $(\frac{9}{25})^{-1/2}$ (h) $2^{1/2} \cdot 2^{3/2}$ (i) $(-3)^{5/3} \cdot (-3)^{4/3}$ (j) $\frac{5^{1/2}}{5^{3/2}}$

(k) $\frac{6^{1/5} \cdot 6^{3/5}}{6^{-1/5}}$ (l) $3^{5/2} - \sqrt{48}$ (m) $(8x^3y^6)^{1/3}$ (n) $\frac{(4x)^{3/2} y^{5/2}}{(xy)^{1/2}}$

(o) $(\frac{27x^{-3}}{64y^{-3}})^{-1/3}$ (p) $(4^5)^{-3/5} - [(-8)^6]^{-1/3}$

ROOTS AND RADICALS - EXERCISES

① Simplify:

(a) $2\sqrt{32} - 4\sqrt{\frac{1}{2}}$ (b) $6\sqrt{\frac{1}{6}} - \sqrt{\frac{2}{3}}$ (c) $\frac{1}{2}\sqrt{\frac{4}{3}} - \frac{2}{3}\sqrt{\frac{3}{4}} + 2\sqrt{\frac{1}{12}}$

(d) $\sqrt{\frac{x}{2}} + \frac{\sqrt{2x}}{2} - 8\sqrt{\frac{x}{8}}$ (e) $\sqrt{9x^2 - 18x + 9}$ (f) $\frac{2\sqrt{5} + 15}{\sqrt{5} - 1} \cdot \frac{\sqrt{5} - 2}{3 + \sqrt{5}}$

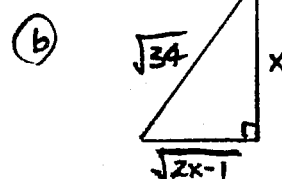
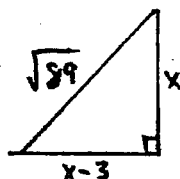
(g) $\frac{3 + \sqrt{6}}{5\sqrt{3} - 2\sqrt{12} - \sqrt{32} + \sqrt{50}}$ (h) $\sqrt{\frac{3}{x}} \left(1 + \frac{3}{x}\right) \frac{2x^{3/2}}{\sqrt{3}}$

(10) Evaluate $x^2 - 2x + 5$ if $x = 1 + \sqrt{2}$.

(11) Is $x = \frac{-2 + \sqrt{10}}{3}$ a solution of $3x^2 + 4x - 2 = 0$?

(12) Solve for x : $2(x - 5) = x\sqrt{3} - 3$.

(13) Find x in each triangle: (a)



(14) Find the distance between the points:

(a) $(2, 1)$ and $(6, 4)$ (b) $(-1, -1)$ and $(2, 3)$ (c) $(-3, 7)$ and $(0, -5)$

(d) $(2, -3)$ and $(3, 1)$ (e) $(-3, -2)$ and $(-1, 4)$ (f) $(-4, 3)$ and $(2, 2)$

(g) $(-1, -1)$ and $(-2, -2)$ (h) $(-\sqrt{2}, 4)$ and $(0, 0)$

(15) Show that $(-3, 2)$ is equidistant from $(-4, -2)$ and $(1, 1)$.

(16) Use the distance formula to show that:

(a) $(-3, -7)$, $(-1, 1)$ and $(2, 5)$ are co-linear.

(b) $(-3, 7)$, $(-6, -2)$ and $(3, 5)$ are the vertices of a right-angle triangle.

(c) the rectangle formed by $(-3, 1)$, $(1, 6)$, $(6, 2)$ and $(2, -3)$ is a square.

(17) Find the area of the right-angle triangle with the vertices $(1, 1)$, $(-3, 2)$ and $(-4, -2)$.

ROOTS AND RADICALS - EXERCISES (ANSWERS)

- (1) (a) 6 (b) 9 (c) -5 (d) 3 (e) 3 (f) -4 (g) 15 (h) -13 (i) -5 (j) $4x$
 (2) (a) 1.732 (b) -2.236 (c) 10.583 (d) 6.317 (e) -4.584 (f) 19.714
 (3) (a) 10 (b) $2\sqrt{3}$ (c) $7\sqrt{2}$ (d) $4\sqrt{5}$ (e) $18\sqrt{2}$ (f) $6\sqrt{3}$ (g) $15\sqrt{2}$ (h) $9\sqrt{10}$
 (i) $3\sqrt{2}$ (j) 48 (k) 100 (l) $3x^2\sqrt{2}$
 (4) (a) 4 (b) $\frac{5}{3}$ (c) $2\sqrt{2}$ (d) $\frac{3\sqrt{6}}{7}$ (e) 4 (f) $\frac{4}{3}$ (g) 5 (h) 1 (i) $\frac{4}{5}$
 (j) $\frac{25}{4}$ (k) $\frac{3}{4}$ (l) $2a\sqrt{2}$
 (5) (a) $7\sqrt{3}$ (b) $5\sqrt{2}$ (c) 0 (d) $5\sqrt{3}$ (e) $5\sqrt{5}$ (f) $11\sqrt{3}$ (g) $9\sqrt{3}$ (h) $4\sqrt{2}$ (i) 0 (j) $17\sqrt{7}$
 (k) $9\sqrt{5}$ (l) $4\sqrt{11}$ (m) $13\sqrt{3}$ (n) $8\sqrt{5}$ (o) $\sqrt{2}$ (p) $\sqrt{5}$ (q) $-14\sqrt{5}$ (r) $2\sqrt{3}$ (s) $-6\sqrt{6}$ (t) $4x\sqrt{2}$
 (6) (a) 5 (b) 63 (c) $3\sqrt{7}-7$ (d) 14 (e) $6\sqrt{2}-9$ (f) 18 (g) -11 (h) $-\sqrt{6}$ (i) $6+\sqrt{10}$ (j) -13
 (k) 6 (l) $3+2\sqrt{2}$ (m) $29-4\sqrt{30}$ (n) $2\sqrt{6}$ (o) x
 (7) (a) $\frac{\sqrt{3}}{3}$ (b) $\frac{2\sqrt{5}}{5}$ (c) $\frac{3\sqrt{10}}{5}$ (d) $3\sqrt{5}$ (e) $\frac{3\sqrt{2}}{4}$ (f) $-\frac{2\sqrt{3}}{9}$ (g) $\frac{\sqrt{3}-3}{3}$ (h) $\frac{3\sqrt{3}x}{x}$ (i) $\frac{\sqrt{15}}{5}$
 (j) $3\sqrt{2}-3$ (k) $-2\sqrt{5}-6$ (l) $5+2\sqrt{6}$ (m) $\frac{\sqrt{2}}{2}$ (n) $3-\sqrt{3}$ (o) $2\sqrt{2}-1$ (p) $17+9\sqrt{3}$
 (q) $10+4\sqrt{3}$ (r) $3-\sqrt{6}$ (s) $\frac{6\sqrt{2}-11}{7}$ (t) $5+\sqrt{6}$ (u) $\frac{\sqrt{5}}{5}$ (v) $\frac{x-\sqrt{xy}}{x-y}$ (w) $\frac{\sqrt{xy}}{y}$ (x) $\frac{\sqrt{x+1}+1}{x}$
 (8) (a) 8 (b) 9 (c) -125 (d) -32 (e) $\frac{1}{2}$ (f) $\frac{343}{64}$ (g) $\frac{5}{3}$ (h) 4 (i) -27 (j) $\frac{1}{5}$ (k) 6
 (l) $5\sqrt{3}$ (m) $2xy^2$ (n) $8xy^2$ (o) $\frac{4x}{3y}$ (p) 0
 (9) (a) $6\sqrt{2}$ (b) $\frac{2\sqrt{6}}{3}$ (c) $\sqrt{3}$ (d) $-\sqrt{2}x$ (e) $3(x-1)$ (f) $\frac{\sqrt{5}}{2}$ (g) $\sqrt{3}$ (h) $2x+6$
 (10) 6 (11) 405 (12) $14+7\sqrt{3}$ (13) (a) 8 (b) 5
 (14) (a) 5 (b) 5 (c) $3\sqrt{17}$ (d) $\sqrt{17}$ (e) $2\sqrt{10}$ (f) $\sqrt{37}$ (g) $\sqrt{2}$ (h) $3\sqrt{2}$
 (15) $\sqrt{17} = \sqrt{17}$
 (16) (a) $15 = \sqrt{5+10}$ (b) $(\sqrt{130})^2 = (\sqrt{40})^2 + (\sqrt{90})^2$ (c) sides are $\sqrt{41}$ each.
 (17) $8.5m^2$