

Indices - 3

1. Evaluate each root without using a calculator:

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|--------------------|--------------------|----------------------|---------------------|
| (a) $\sqrt[3]{25}$ | (b) $\sqrt[3]{64}$ | (c) $\sqrt[3]{9}$ | (d) $\sqrt[3]{100}$ |
| (e) $\sqrt[3]{8}$ | (f) $\sqrt[3]{27}$ | (g) $\sqrt[3]{1000}$ | (h) $\sqrt[3]{64}$ |
| (i) $\sqrt[4]{16}$ | (j) $\sqrt[4]{81}$ | (k) $\sqrt[3]{125}$ | (l) $\sqrt[5]{32}$ |

2. Evaluate using the rule $a^{\frac{m}{n}} = \sqrt[n]{a^m}$:

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|------------------------|------------------------|--------------------------|------------------------|------------------------|------------------------|
| (a) $16^{\frac{1}{2}}$ | (b) $25^{\frac{1}{2}}$ | (c) $81^{\frac{1}{2}}$ | (d) $9^{\frac{1}{2}}$ | (e) $8^{\frac{1}{3}}$ | (f) $27^{\frac{1}{3}}$ |
| (g) $64^{\frac{1}{3}}$ | (h) $16^{\frac{1}{4}}$ | (i) $9^{\frac{3}{2}}$ | (j) $16^{\frac{3}{2}}$ | (k) $25^{\frac{3}{2}}$ | (l) $4^{\frac{3}{2}}$ |
| (m) $8^{\frac{2}{3}}$ | (n) $27^{\frac{2}{3}}$ | (o) $1000^{\frac{2}{3}}$ | (p) $64^{\frac{2}{3}}$ | (q) $16^{\frac{3}{4}}$ | (r) $81^{\frac{3}{4}}$ |

3. Use the rule $a^m \times a^n = a^{m+n}$ to simplify each expression.

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|--|---|--|---|
| (a) $a^{\frac{3}{2}} \times a^{\frac{1}{2}}$ | (b) $y^{\frac{2}{3}} \times y^{\frac{1}{3}}$ | (c) $w^{\frac{1}{2}} \times w^{\frac{5}{2}}$ | (d) $m^{\frac{1}{4}} \times m^{\frac{3}{4}}$ |
| (e) $p^{\frac{4}{3}} \times p^{\frac{2}{3}}$ | (f) $k^{\frac{5}{2}} \times k^{\frac{3}{2}}$ | (g) $a^{\frac{7}{2}} \times a^{\frac{1}{2}}$ | (h) $y^{\frac{5}{3}} \times y^{\frac{1}{3}}$ |
| (i) $t^{\frac{1}{2}} \times t^{\frac{1}{2}}$ | (j) $u^{-\frac{1}{2}} \times u^{\frac{5}{2}}$ | (k) $v^{\frac{7}{3}} \times v^{\frac{3}{3}}$ | (l) $b^{\frac{2}{3}} \times b^{-\frac{2}{3}}$ |

4. Use the rule $a^m \div a^n = a^{m-n}$ to simplify each expression.

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|--|--|---|---|
| (a) $x^{\frac{4}{3}} \div x^{\frac{1}{3}}$ | (b) $y^{\frac{5}{2}} \div y^{\frac{1}{2}}$ | (c) $a^{\frac{3}{2}} \div a^{\frac{1}{2}}$ | (d) $m^{\frac{7}{3}} \div m^{\frac{1}{3}}$ |
| (e) $t^{\frac{5}{4}} \div t^{\frac{1}{4}}$ | (f) $x^{\frac{9}{2}} \div x^{\frac{3}{2}}$ | (g) $y^{\frac{3}{2}} \div y^{-\frac{1}{2}}$ | (h) $a^{\frac{2}{3}} \div a^{-\frac{1}{3}}$ |

ANSWERS

2. (a) 4 (b) 5 (c) 9 (d) 3 (e) 2 (f) 3
(g) 4 (h) 2 (i) 27 (j) 64 (k) 125 (l) 8
(m) 4 (n) 9 (o) 100 (p) 16 (q) 8 (r) 27
3. (a) a^2 (b) y (c) w^3 (d) m (e) p^2 (f) k^4
(g) a^4 (h) y^2 (i) t (j) u^2 (k) v^2 (l) 1
4. (a) x (b) y^2 (c) a (d) m^2 (e) t (f) x^3
(g) y^2 (h) a