

Name: _____

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Chapter 4 Review

For each type of question, the achievement level is indicated. Showing work is an important strategy in communicating your knowledge and ideas so please be thorough.

Identify and order irrational numbers.

Tell whether each number is rational or irrational.

For those that are irrational, estimate the value of the radical to **one decimal place, without a calculator**.

For those that are rational, evaluate the radical **without a calculator**. You may use your sheet of perfect numbers (from Section 4.1)

Emerging	Developing	Proficient
1. $\sqrt{81}$	2. $\sqrt[5]{100}$	3. $\sqrt[4]{2000}$
4. $\sqrt{169}$	5. $\sqrt[3]{64}$	6. $\sqrt[3]{1738}$
7. $\sqrt{150}$	8. $\sqrt[4]{16}$	9. $\sqrt[5]{1864}$
10. $\sqrt{125}$	11. $\sqrt[3]{81}$	12. $\sqrt[3]{100}$
13. $\sqrt{121}$	14. $\sqrt[3]{216}$	15. $\sqrt[4]{1296}$
16. $\sqrt{49}$	17. $\sqrt[4]{75}$	18. $\sqrt[7]{128}$
19. $\sqrt{200}$	20. $\sqrt[4]{81}$	21. $\sqrt[5]{248832}$

Developing	
State the index and the radicand of each radical.	
1. $\sqrt[3]{64}$	2. $\sqrt[4]{20000}$
3. $\sqrt[4]{16}$	4. $\sqrt{1738}$
5. $\sqrt[3]{216}$	6. $\sqrt[5]{1864}$
7. $\sqrt[4]{81}$	8. $\sqrt[3]{10000}$

Proficient/Extending
Use a number line to order these numbers from least to greatest, without a calculator .
1. $\sqrt{25}, \sqrt[3]{30}, \sqrt[3]{-8}, \sqrt[4]{20}, \sqrt{\frac{144}{9}}$
2. $\sqrt[5]{-243}, \sqrt{4}, \sqrt[3]{\frac{27}{216}}, \sqrt{12}, \sqrt[3]{6}$

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Express an entire radical as a mixed radical and vice versa.
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Developing	Proficient	Extending
Write each radical in simplest form, without a calculator .		
1. $\sqrt{125}$	2. $\sqrt[3]{216}$	3. $\sqrt{216k^3}$
4. $\sqrt{512}$	5. $\sqrt[4]{405}$	6. $\sqrt[3]{-96xy^4}$
7. $\sqrt{80}$	8. $\sqrt[3]{-100}$	9. $\sqrt[4]{48m^5n^4}$
10. $\sqrt{147}$	11. $\sqrt[3]{80}$	12. $\sqrt[5]{a^7b^{10}c^2d^{12}}$

Developing	Proficient	Extending
Write each mixed radical as an entire radical, without a calculator .		
1. $2\sqrt{3}$	2. $-2\sqrt[3]{8}$	3. $12\sqrt{k^3}$
4. $3\sqrt{5}$	5. $5\sqrt[4]{2}$	6. $-xy^3\sqrt{9xy^4}$
7. $6\sqrt{3}$	8. $6\sqrt[3]{10}$	9. $-3m^4\sqrt{4mn^4}$
10. $4\sqrt{2}$	11. $-8\sqrt[3]{8}$	12. $a^2d^3\sqrt[5]{a^3b^5c^2}$

Extending
Simplify the radical. $\sqrt[n]{3 \cdot 2^n \cdot x^{2n} \cdot y^{n+3}}$
Write the mixed radical as a mixed radical. $2ab^2 \cdot \sqrt[n]{5ab^2}$

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Understanding and evaluating expressions using fractional exponents.
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Developing	Proficient	Extending
Write each power as a radical in simplest form, without a calculator .		
1. $20^{1/2}$	2. $18^{2/3}$	3. $(12x^3y^2)^{1/2}$
4. $18^{1/3}$	5. $32^{4/3}$	6. $(18a^2b^5)^{2/3}$
7. $12^{1/2}$	8. $50^{3/2}$	9. $(32m^2n^8)^{3/4}$
10. $32^{1/2}$	11. $125^{2/3}$	12. $(8x^{n+2}y^{n+1})^{2/n}$
13. $15^{1/3}$	14. $27^{5/3}$	15. $(64p^5q^9)^{4/3}$

Proficient	Extending
Write each power as a radical in two different ways .	Write each power as a radical in two different ways , then write in simplest form without a calculator .
1. $26^{2/5}$	2. $20^{2/3}$
3. $19^{3/4}$	4. $25^{2/3}$
5. $6^{5/2}$	6. $(9n^4)^{3/2}$
7. $40^{2/3}$	8. $(40a^3b^4)^{2/3}$
9. $3^{5/4}$	10. $(72p^3q)^{5/2}$
11. $25^{2/3}$	

Extending
Arrange these numbers in order from least to greatest, without using a calculator .
1. $\sqrt[3]{9}, 9^{3/2}, 9, (\sqrt[5]{9})^4, 9^{1/2}$

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Chapter 4 Review

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Understanding and evaluating expressions using negative exponents.
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Developing	Proficient
Evaluate each power without using a calculator .	
1. $\left(\frac{2}{3}\right)^{-4}$	2. 0.5^{-2}
3. $\left(\frac{1}{10}\right)^{-2}$	4. $\left(\frac{1}{4}\right)^{-1/2}$
5. $\left(\frac{5}{2}\right)^{-3}$	6. $(-1000)^{-2/3}$
7. $\left(\frac{6}{2}\right)^{-4}$	8. $(-0.008)^{-4/3}$

Proficient	Extending
Simplify without using a calculator . Your answers should contain only positive exponents.	
1. $0.5x^{-2}$	2. $3xy\left(\frac{x^2}{y^2}\right)^{-1/2}$
3. $\left(\frac{a^2}{9}\right)^{-1/2}$	4. $\frac{(9a^3b^6)^{-1/2}}{(3a^3b^6)^{-2}}$
5. $(-8000q^6)^{-2/3}$	
6. $(-0.027m^3)^{-4/3}$	

Extending

Suppose you want \$5000 in three years. The interest rate for a savings account is 2.9% compounded annually. The money, P dollars, you must invest now is given by the formula

$$P = 5000(1.029)^{-3}$$

How much must you invest now to have \$5000 in three years?

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Use exponent laws to simplify expressions using fractional and negative exponents.

Proficient	Extending
Simplify without using a calculator . Your answers should contain only positive exponents.	
1. $2m^2 \cdot 2m^3$ 3. $m^4 \cdot 2m^{-3}$ 5. $\frac{a^3}{a^5} \cdot a^{-2}$ 7. $4n^4 \cdot 2n^{-3}$ 9. $\frac{2x^4y^{-4}z^{-3}}{3x^2y^{-3}z^4}$ 11. $2x^3y^{-3} \cdot 2x^{-1}y^3$ 13. $2y^{5/2} \cdot 3y^{-3}$ 15. $4v^3 \cdot v^{-1/3}u^{-2}$ 17. $4a^3b^2 \cdot 3a^{-4}b^{-3}$ 19. $\frac{2y^3 \cdot 3xy^3}{3x^2y^4}$ 21. $4r^{-3} \cdot 2r^2$ 23. $\frac{3m^{-4}}{m^3}$ 25. $2k^4 \cdot 4k$	2. $(x^{-2}x^{-3})^4$ 4. $(n^3)^{-1/3} \cdot 2n^{-1}$ 6. $x^2y^{-4} \cdot (xy)^2$ 8. $(2x^4y^{-3})^{-1}$ 10. $\frac{(16a^2b^6)^{-1/2}}{2ab^3}$ 12. $\left(\frac{x^2y}{y^{-2}}\right)^{-2}$ 14. $ba^4 \cdot (2b^6a^4)^{-3/2}$ 16. $\frac{(2x^{-3}z^2)^3}{x^3y^4z^2 \cdot x^{-4}z^3}$ 18. $\frac{(16pm^{-1})^{-1/4} \cdot 2m^{-1}p^3}{2pq^2}$ 20. $(m \cdot m^{-2} \cdot n^{5/3})^2$ 22. $\left(\frac{x^{1/2}y^{-2}}{x^2y^{1/2}}\right)^4$ 24. $\frac{(x^3y^2)^{3/2}}{(x^{-1}y^{-2/3})^{1/4}}$ 26. $\frac{(x^{-1/2}y^2)^{-5/4}}{x^2y^{1/2}}$

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Extending

Write 3 different expressions for each result.

1. $x^{3/2}$ is the product of two powers with rational exponents.
2. $x^{3/2}$ is the quotient of two powers with rational exponents.
3. $x^{3/2}$ is the result of raising a power with a rational exponent to a rational exponent.
4. $z^{-3/4}$ is the product of two powers with rational exponents.
5. $z^{-3/4}$ is the quotient of two powers with rational exponents.
6. $z^{-3/4}$ is the result of raising a power with a rational exponent to a rational exponent.

Extending

Scientists use the formula

$$d = 0.099m^{9/10}$$

to calculate the volume of water, d litres, that a mammal with mass m kilograms should drink in one day. Calculate how much water a 550 kg moose should drink in 3 days.