Factor the following.

$$x^7 - x^3$$

$x^3(x^4 - 1)$

$x^3(x^2 + 1)(x^2 - 1)$

$x^3(x^2 + 1)(x + 1)(x - 1)$

Factor the following.

$$4x^2 - 1$$

$= (2x + 1)(2x - 1)$

Factor the following.

$$6x^2 - 7x - 20$$

$ac = -120$ $\quad 8 \quad -15$

$b = -7$

$= 6x^2 + 8x - 15x - 20$

$= 2x(3x + 4) - 5(3x + 4) \Rightarrow (3x + 4)(2x - 5)$

2. $m^2 - 7m - 18$

$= (m - 9)(m + 2)$

Chapter 4 – Roots and Powers: Skills Summary

1. Skill: Determine whether a number is rational or irrational.

Strategy: 1. Write the number in decimal form.

4. Repeating and terminating decimals are rational, non-repeating, non-terminating decimals are irrational.

Example: Put the following numbers on a Real Numbers Diagram:

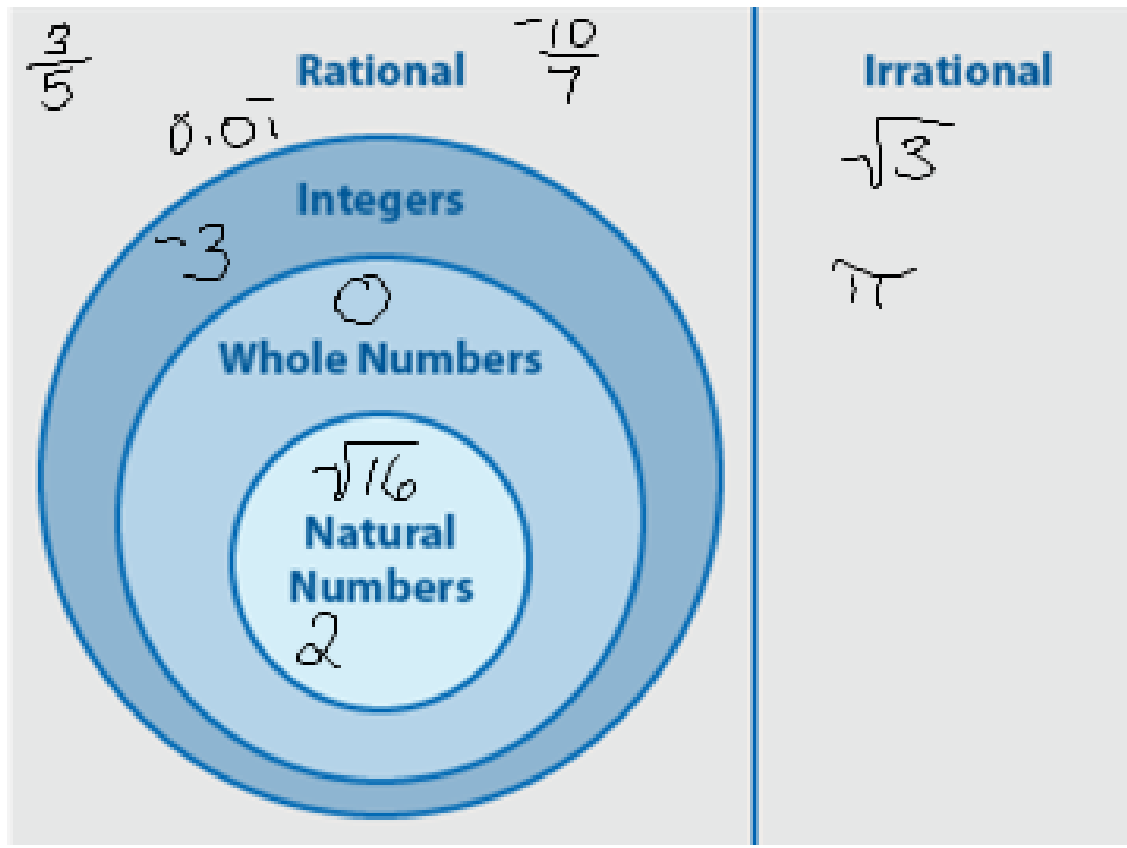
$2, 0, -3, \sqrt{3}, \sqrt{16}, \pi, \frac{3}{5}, \frac{-10}{7}, 0.0\overline{1}$

Nat # → counting not including 0

whole # → counting # including 0

Integers → (+/−) counting

Rational → predictable



2. Skill: Simplify radicals

Strategy: To simplify a square root:

1. Write the radicand as a product of its greatest perfect square factor and another number.
2. Take the square root of the perfect square factor. A similar procedure applies for cube roots and higher roots.

Example: Simplify each radical:

$$\sqrt{200} = \sqrt{2 \cdot 100}$$
$$= \sqrt{2 \cdot 4 \cdot 25}$$
$$= \sqrt{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5}$$
$$= 2 \cdot 5 \sqrt{2}$$
$$= 10\sqrt{2}$$

$$\sqrt[3]{200} = \sqrt[3]{2 \cdot 2 \cdot 2 \cdot 5 \cdot 5}$$
$$= 2\sqrt[3]{25}$$

3. Skill: Writing mixed radicals as entire radicals

Strategy: 1. Write the coefficient as a square root of its square (or cube root of its cube, etc.)

2. Use the multiplication property of radicals to combine the radical.

All under radical symbol

Example: Write as an entire radical: $4\sqrt{3}$

$= \sqrt{4 \cdot 4 \cdot 3}$

$= \sqrt{48}$

4. Skill: Evaluate powers without using a calculator.

Strategy: 1) Powers with negative exponents – rewrite as a power with a positive exponent (reciprocal base)

2) Powers with fractional exponents – rewrite as a radical (numerator – power / denominator – root)

power

index (root)

neg means flip the BASE

Example: a) $125^{\frac{2}{3}}$

$= \left(\sqrt[3]{125}\right)^2$

$= (5)^2$

$= 25$

b) $64^{-\frac{2}{3}}$

$= \left(\frac{1}{64}\right)^{2/3}$

$= \left(\sqrt[3]{\frac{1}{64}}\right)^2$

$= \left(\frac{1}{4}\right)^2$

$= \frac{1}{16}$

5. Skill: Apply the exponent laws to simplify expressions

Strategy: 1. Remove brackets by applying the exponent laws

2. Write the simplest expression using positive exponents.

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Product of powers:	$a^m \cdot a^n = a^{m+n}$
Quotient of powers:	$a^m \div a^n = a^{m-n}, a \neq 0$
Power of a power:	$(a^m)^n = a^{mn}$
Power of a product:	$(ab)^m = a^m b^m$
Power of a quotient:	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

Example: $\left(\frac{(xy^2)^3}{x^5y}\right)^{-4} = \left(\frac{x^3y^6}{x^5y}\right)^{-4}$

$= \left(x^{-2}y^5\right)^{-4}$

$= x^8y^{-20}$

$\boxed{= \frac{x^8}{y^{20}}}$

$x^8 \, \frac{1}{y^{20}}$

$$\frac{16x^2}{2x^{-3}}$$

$$= 8x^5$$

$2-(-3) = 5$

subtract a negative is <u>addition</u>