1.2 Rewriting Radicals

Standard:
N.RN.2

Old! Real Number System $\mathbb{R}$

Sum of:
- rational and rational gets rational.
- rational and irrational gets irrational.

Product of:
- rational and rational gets rational.
- rational and irrational gets irrational.

[Examples] Identify Rational or Irrational.

① π – Rational ② 5 – Rational ③ e – Irrational

④ $\sqrt{7}$ – Irrational ⑤ $\frac{1}{2}$ – Rational ⑥ $\sqrt{36}$ – Rational

new-A Simplifying Radicals

We know how to simplify rational number radicals like:

① $\sqrt{36} = 6$ ② $\sqrt{4} = 2$ ③ $\sqrt{81} = 9$ ④ $\sqrt{25} = 5$

What about simplifying irrational number radicals like $\sqrt{20}$?

- In order for us to simplify this radical, we need to use the perfect square list.

Perfect Square List	
1	36
4	49
9	64
16	81
25	100
	⋮

Let's consider $\sqrt{20}$. Reduce the radical to its simplest terms.

$$\sqrt{20}$$
$$= \sqrt{4} \cdot \sqrt{5}$$ — use a perfect square to "break up" radical
$$= 2\sqrt{5}$$ — the perfect square in the radical will turn into an integer.

Perfect Square List

1
4
9
16
25
36
49
64
81
100
⋮

[Examples] Simplify Radicals

① $\sqrt{200}$
$= \sqrt{100} \cdot \sqrt{2}$
$= 10\sqrt{2}$

② $3\sqrt{96}$
$= 3 \cdot \sqrt{16} \cdot \sqrt{6}$
$= 3 \cdot 4 \cdot \sqrt{6}$
$= 12\sqrt{6}$

New - B Rewriting N^{th} Roots & Radical Exponents

Parts of a Radical: $\sqrt[\text{root}]{\text{radicand}}$

(Examples)

$\sqrt{2}$, $\sqrt[3]{2}$, $\sqrt[4]{2}$, $\sqrt[5]{2}$, ...

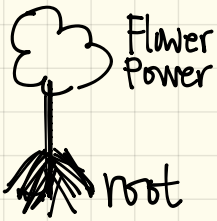
- $\sqrt{2}$: Square root (no number where the root is means square root)
- $\sqrt[3]{2}$: Cubic root
- $\sqrt[4]{2}$: fourth root
- $\sqrt[5]{2}$: fifth root

Rewriting Radicals to Rational Exponents

$\sqrt[\text{root}]{\text{radical}^{\text{power}}} = \text{radicand}^{\frac{\text{power}}{\text{root}}}$

"Power over root"

"Power is on top, Roots are on the ground".



[Examples] Rewrite into radical form.

① $10^{\frac{1}{3}} = \sqrt[3]{(10)^1}$

② $50^{\frac{2}{9}} = \sqrt[9]{(50)^2}$

③ $7^{\frac{4}{5}} = \sqrt[5]{(7)^4}$

④ $25^{\frac{1}{2}} = \sqrt{25} = 5$

[Examples] Rewrite into exponent form.

⑤ $\sqrt{(7)^3} = 7^{\frac{3}{2}}$

⑥ $\sqrt[3]{(4)^7} = 4^{\frac{7}{3}}$

⑦ $\sqrt[4]{(10)^3} = 10^{\frac{3}{4}}$