Outcome 2A Review Worksheet

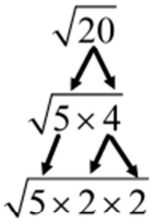
Outcome #2A Students will demonstrate understanding of irrational numbers by determining if a number is an irrational number, ordering rational numbers, and knowing where they may be used.

Beginning	Approaching	Proficient	Mastery
I need help/I am inconsistent	I am consistently able to change an entire radical to a mixed radical and mixed radical to an entire radical for simple numbers. I am consistently able to order real numbers including rational and irrational.	I am able to change all radical numbers from mixed to entire and vice versa. I am able to consistently determine and justify if a number is irrational in radical form (by simplifying)	I will be able to answers questions involving irrational numbers and explain why they are used in the question. I am able to perform error analysis.

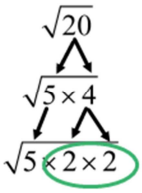
Level 2

Example 1 Write $\sqrt{20}$ as a mixed radical in simplest form

One strategy (if you know another feel free to use it!)
Break it down to its prime factors



Because it is a square root, look to see if you have any pairs of identical numbers. If you do, then group them, if not then you cannot simplify.



The pair is the perfect square part of the number. This number goes out in front of the radical sign, but only ONE of the 2's – why??? Because you are taking the square root! 2 x 2 = 4 and the square root of 4 is 2. The leftovers (ungrouped numbers) remain inside the radical.

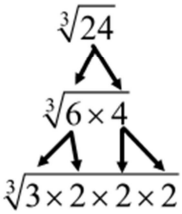
The answer is $2\sqrt{5}$

1. Write as a mixed radical in simplest form.

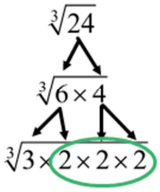
a) $\sqrt{45}$ b) $\sqrt{75}$ c) $\sqrt{12}$

Example 2 Write $\sqrt[3]{24}$ as a mixed radical in simplest form

One strategy (if you know another feel free to use it!)
Break it down to its prime factors



Because it is a cube root, look to see if you have any groups of 3 identical numbers. If you do, then group them, if not then you cannot simplify.



The group is the perfect cube part of the number. This number goes out in front of the radical sign, but only ONE of the 2's – why??? Because you are taking the cube root! 2 x 2 x 2 = 8 and the cube root of 8 is 2. The leftovers (ungrouped numbers) remain inside the radical.

The answer is $2\sqrt[3]{3}$. Notice the cube root symbol remains!!!!

2. Write as a mixed radical in simplest form

a) $\sqrt[3]{88}$ b) $\sqrt[3]{54}$ c) $\sqrt[3]{40}$

Example 3 Write as an entire radical

a) $3\sqrt{5}$
Because this is a square root, the 3
Goes in the radical twice
$\sqrt{3\times3\times5}$
$\sqrt{45}$

b) $2\sqrt[3]{5}$
Because this is a cube root, the 2
Goes in the radical 3 times
$\sqrt[3]{2\times2\times2\times5}$
$\sqrt[3]{40}$
Notice the cube root symbol
Remains!,

3. Write as an entire radical.

a) $3\sqrt{7}$ b) $7\sqrt[3]{5}$

c) $7\sqrt{2}$ d) $5\sqrt[3]{2}$

Example 4 Order the following numbers from least to greatest: $\sqrt{18}, -\sqrt[3]{24}, -\sqrt{16}, \sqrt[4]{22}$

You can use your calculator to determine the decimal value of each.
$\sqrt{18} = 4.2426$ … Use the $\sqrt{\ }$ button on your calculator to get this.
$-\sqrt[3]{24} = -2.884$ …. Use the $\sqrt[3]{\ }$ button on your calculator to get this
$-\sqrt{16}$ = -4 Use the $\sqrt{\ }$ button on your calculator to get this.
$\sqrt[4]{22} = 2.1657$ … Use the $\sqrt[x]{y}$ button on your calculator to get this.

We can now order these. The negatives are the smallest, -4 is smaller than -2.884 so the order from least to greatest is: $-\sqrt{16}, -\sqrt[3]{24}, \sqrt[4]{22}, \sqrt{18}$

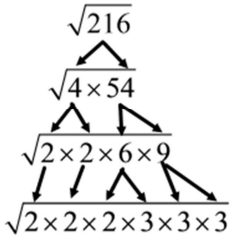
4. Order the following numbers from least to greatest.

$\sqrt{23}, \ -\sqrt[3]{21}, -\sqrt{9} \quad \sqrt[4]{20}$.

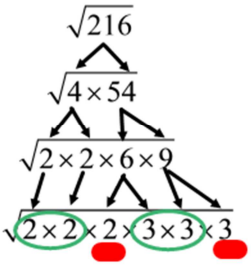
<u>Level 3</u>

Example 5 Write $\sqrt{216}$ as a mixed radical in simplest form.

One strategy (if you know another feel free to use it!)
Break it down to its prime factors



Because it is a square root, look to see if you have any pairs of identical numbers. If you do, then group them, if not then you cannot simplify



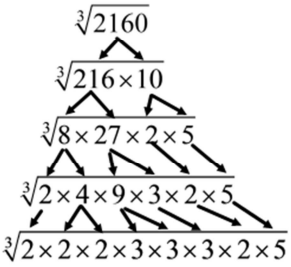
The pairs are the perfect square part of the number. These number go out in front of the radical sign, but only ONE of each pair – why??? Because you are taking the square root! The leftovers (ungrouped numbers) remain inside the radical and are multiplied together if there is more than 1.

You will get: $2 \times 3\sqrt{2 \times 3}$. So the answer is $6\sqrt{6}$

5. Write as a mixed radical in simplest form.

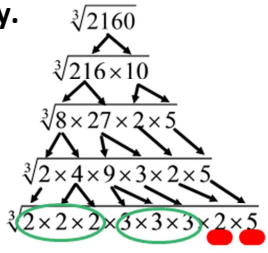
a) $\sqrt{900}$ b) $\sqrt{540}$ c) $\sqrt{1350}$

Example 6 Write $\sqrt[3]{2160}$ as a mixed radical is simplest form



One strategy (if you know another feel free to use it!)
Break it down to its prime factors

Because it is a cube root, look to see if you have any groups of 3 identical numbers. If you do, then group them, if not then you cannot simplify.



The groups are the perfect cube parts of the number. These numbers go out in front of the radical sign, but only ONE of each group – why??? Because you are taking the cube root! The leftovers (ungrouped numbers) remain inside the radical and are multiplied together if there is more than one.

You get $2 \times 3\sqrt[3]{2 \times 5}$. The answer is $6\sqrt[3]{10}$

6. Write the following as mixed radicals in simplest form

a) $\sqrt[3]{96}$ b) $\sqrt[3]{1296}$ c) $\sqrt[3]{576}$

Example 7 Write as an entire radical

a) $3\sqrt[4]{2}$

Because this is a fourth root, the 3
Goes in the radical four times

$\sqrt[4]{3 \times 3 \times 3 \times 3 \times 2}$

$\sqrt[4]{162}$

Notice the fourth root symbol
Remains!

b) $6\sqrt[5]{3}$

Because this is a fifth root, the 6
Goes in the radical 5 times

$\sqrt[5]{6 \times 6 \times 6 \times 6 \times 6 \times 3}$

$\sqrt[5]{23328}$

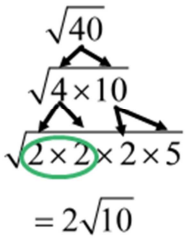
Notice the fifth root symbol
Remains!

7. Write as an entire radical.

a) $6\sqrt[3]{15}$ b) $8\sqrt[5]{3}$

Example 8 Determine if $\sqrt{40}$ is rational or irrational.

Strategy 1: Determine if this can be written as a mixed radical (which would make it irrational) or if it is a perfect square (which would make it rational)



Since this is a mixed radical it is irrational as all mixed radicals are irrational.

Strategy 2: Find the decimal value of $\sqrt{40}$. If it terminates or repeats, it is rational; if it does not terminate or repeat it is irrational.

$\sqrt{40} = 6.32455532$ … therefore it is irrational since it does not terminate or repeat.

8. Determine if each of the following are rational or irrational. Justify your answer.

a) $\sqrt{720}$ b) $\sqrt{81}$ c) $\sqrt{210}$

Level 4

The rubric states: I will be able to answers questions involving irrational numbers and explain why they are used in the question. I am able to perform error analysis.

Look through your practice assignments to practice these types of questions.