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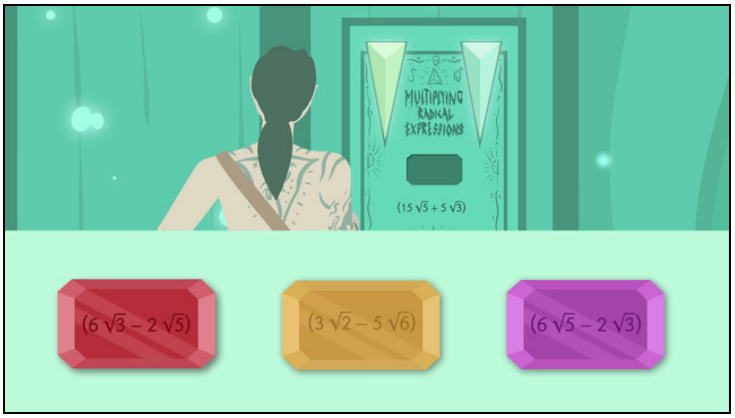
Multiplying Radical Expressions



1. **Decide which expressions can be simplified.**
2. **Explain how to multiply** $(15\sqrt{5}+5\sqrt{3})(6\sqrt{3}-2\sqrt{5})$
3. **Calculate** $(15\sqrt{5}+5\sqrt{3})(6\sqrt{5}-2\sqrt{3})$.
4. **Identify the steps of multiplication.**
5. **Calculate the product.**
6. **Find the errors in the calculation.**

\+ **with lots of tips, answer keys, and detailed answer explanations for all of the problems.**

Decide which expressions can be simplified.

Choose the expressions to be simplified.

- [ ] A $15\sqrt{5}(3\sqrt{2})$
- [ ] B $5\sqrt{3}(5\sqrt{6})$
- [ ] C $45\sqrt{10}-75\sqrt{30}$
- [ ] D $25\sqrt{18}$
- [ ] E $15\sqrt{6}-75\sqrt{2}$

Hints for solving these problems

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Decide which expressions can be simplified.

Hint #1

You can only combine like terms.

For example, $5\sqrt{3}+6\sqrt{3}=11\sqrt{3}$, but you can't combine $5\sqrt{3}+6\sqrt{5}$.

Hint #2

For example:

$$\begin{aligned} 2\sqrt{5}(5\sqrt{3}) &= 2\times 5\times \sqrt{5}\times \sqrt{3} \\ &= 10\times \sqrt{5\times 3} \\ &= 10\times \sqrt{15} \end{aligned}$$

Hint #3

There are just three terms which can be simplified.

Answers and detailed answer explanations for these problems

1 of 6

Decide which expressions can be simplified.

Answer key: A, B, D

Combining like terms means that you only can add or subtract terms with the same variable and exponent:

- $a+a=2a$
- $a^2+a^2=2a^2$

But $a+a^2$ can't be simplified any further, for instance.

Let's have a look at the following example:

$(15\sqrt{5}+5\sqrt{3})(3\sqrt{2}-5\sqrt{6})$.

First we use the FOIL method:

- **F** multiply the first $15\sqrt{5}(3\sqrt{2})$
- **O** multiply the outer $-15\sqrt{5}(5\sqrt{6})$
- **I** multiply the inner $5\sqrt{3}(3\sqrt{2})$
- **L** multiply the last $-5\sqrt{3}(5\sqrt{6})$

Adding all of these resulting terms together, we get:

$$(15\sqrt{5}+5\sqrt{3})(3\sqrt{2}-5\sqrt{6})=15\sqrt{5}(3\sqrt{2})-15\sqrt{5}(5\sqrt{6})+5\sqrt{3}(3\sqrt{2})-5\sqrt{3}(5\sqrt{6}).$$

The radicals can be multiplied by multiplying the terms under the square roots:

- $\sqrt{5}(\sqrt{2})=\sqrt{10}$
- $\sqrt{5}(\sqrt{6})=\sqrt{30}$
- $\sqrt{3}(\sqrt{2})=\sqrt{6}$
- $\sqrt{3}(\sqrt{6})=\sqrt{18}$

So we get $(15\sqrt{5}+5\sqrt{3})(3\sqrt{2}-5\sqrt{6})=45\sqrt{10}-75\sqrt{30}+15\sqrt{6}-25\sqrt{18}$.

We are still able to simplify $\sqrt{18}=\sqrt{9\times 2}=\sqrt{9}\times\sqrt{2}=3\sqrt{2}$ further.

This together with the expression above gives us:

$$(15\sqrt{5}+5\sqrt{3})(3\sqrt{2}-5\sqrt{6})=45\sqrt{10}-75\sqrt{30}+15\sqrt{6}-75\sqrt{2}$$

And that's it! We have simplified the expression as much as we can.