

Topic: Rationalizing the denominator

Question: Simplify the expression, making sure to rationalize the denominator.

$$2\sqrt{\frac{3}{5}} - 5\sqrt{\frac{5}{3}} + \sqrt{135}$$

Answer choices:

A $\frac{26\sqrt{15}}{15}$

B $-\frac{26\sqrt{15}}{15}$

C $\frac{3\sqrt{15}}{5}$

D $\frac{7\sqrt{5}}{15}$



Solution: A

We know that when we take the square root of a fraction, we can take the square roots of the numerator and denominator separately.

$$2\sqrt{\frac{3}{5}} - 5\sqrt{\frac{5}{3}} + \sqrt{135}$$

$$2\frac{\sqrt{3}}{\sqrt{5}} - 5\frac{\sqrt{5}}{\sqrt{3}} + \sqrt{135}$$

Now we'll factor the 135 (under the radical sign in the last term) as $9 \cdot 15$, which will ultimately help us to simplify things because 9 is a perfect square.

$$2\frac{\sqrt{3}}{\sqrt{5}} - 5\frac{\sqrt{5}}{\sqrt{3}} + \sqrt{9 \cdot 15}$$

$$2\frac{\sqrt{3}}{\sqrt{5}} - 5\frac{\sqrt{5}}{\sqrt{3}} + \sqrt{9}\sqrt{15}$$

$$\frac{2\sqrt{3}}{\sqrt{5}} - \frac{5\sqrt{5}}{\sqrt{3}} + 3\sqrt{15}$$

We can divide the $3\sqrt{15}$ in the last term by 1, which won't change its value.

$$\frac{2\sqrt{3}}{\sqrt{5}} - \frac{5\sqrt{5}}{\sqrt{3}} + \frac{3\sqrt{15}}{1}$$



Now we need to find a common denominator so that we can combine the fractions. We can use the product of the three denominators ($\sqrt{5}$, $\sqrt{3}$, and 1) as our common denominator:

$$\sqrt{5} \cdot \sqrt{3} \cdot 1$$

$$\sqrt{15}$$

We'll multiply the numerator and denominator of each fraction by whatever gets us $\sqrt{15}$ in the denominator.

$$\frac{2\sqrt{3}}{\sqrt{5}} \left(\frac{\sqrt{3}}{\sqrt{3}} \right) - \frac{5\sqrt{5}}{\sqrt{3}} \left(\frac{\sqrt{5}}{\sqrt{5}} \right) + \frac{3\sqrt{15}}{1} \left(\frac{\sqrt{15}}{\sqrt{15}} \right)$$

$$\frac{2\sqrt{3}\sqrt{3}}{\sqrt{5}\sqrt{3}} - \frac{5\sqrt{5}\sqrt{5}}{\sqrt{3}\sqrt{5}} + \frac{3\sqrt{15}\sqrt{15}}{1\sqrt{15}}$$

$$\frac{2 \cdot 3}{\sqrt{15}} - \frac{5 \cdot 5}{\sqrt{15}} + \frac{3 \cdot 15}{\sqrt{15}}$$

$$\frac{6}{\sqrt{15}} - \frac{25}{\sqrt{15}} + \frac{45}{\sqrt{15}}$$

$$\frac{26}{\sqrt{15}}$$

Now we need to rationalize the denominator.

$$\frac{26}{\sqrt{15}} \left(\frac{\sqrt{15}}{\sqrt{15}} \right)$$



$$\frac{26\sqrt{15}}{15}$$



Topic: Rationalizing the denominator

Question: Simplify the expression, making sure to rationalize the denominator.

$$2\sqrt{\frac{3}{5}} - 6\sqrt{\frac{5}{3}}$$

Answer choices:

A $\sqrt{15} - \sqrt{3}$

B $\sqrt{\frac{15}{5}} - \sqrt{\frac{30}{3}}$

C $\frac{-8\sqrt{15}}{5}$

D $\frac{8\sqrt{15}}{5}$



Solution: C

When we take the square root of a fraction, we can take the square roots of the numerator and denominator separately.

$$2\sqrt{\frac{3}{5}} - 6\sqrt{\frac{5}{3}}$$

$$2\frac{\sqrt{3}}{\sqrt{5}} - 6\frac{\sqrt{5}}{\sqrt{3}}$$

$$\frac{2\sqrt{3}}{\sqrt{5}} - \frac{6\sqrt{5}}{\sqrt{3}}$$

Now we need to find a common denominator. Since we have only two terms, we can do this by multiplying the numerator and denominator of each fraction by the denominator of the other fraction.

$$\frac{2\sqrt{3}}{\sqrt{5}} \cdot \frac{\sqrt{3}}{\sqrt{3}} - \frac{6\sqrt{5}}{\sqrt{3}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\frac{2\sqrt{3}\sqrt{3}}{\sqrt{5}\sqrt{3}} - \frac{6\sqrt{5}\sqrt{5}}{\sqrt{3}\sqrt{5}}$$

$$\frac{2 \cdot 3}{\sqrt{15}} - \frac{6 \cdot 5}{\sqrt{15}}$$

$$\frac{6}{\sqrt{15}} - \frac{30}{\sqrt{15}}$$



$$\frac{-24}{\sqrt{15}}$$

Now we need to rationalize the denominator.

$$\frac{-24}{\sqrt{15}} \cdot \frac{\sqrt{15}}{\sqrt{15}}$$

All that remains is to reduce the fraction $-24/15$ to lowest terms.

$$\frac{-8\sqrt{15}}{5}$$



Topic: Rationalizing the denominator

Question: Simplify the expression, making sure to rationalize the denominator.

$$\frac{9}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

Answer choices:

A $\frac{9\sqrt{2}}{2}$

B $\frac{9\sqrt{2}}{4}$

C $\frac{9}{2}$

D 9



Solution: A

We can multiply the numerators and denominators separately.

$$\frac{9}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{9\sqrt{2}}{\sqrt{2}\sqrt{2}}$$

$\sqrt{2}$ multiplied by itself is just 2, so we get

$$\frac{9\sqrt{2}}{2}$$

There are no remaining radicals in the denominator, so there's no need to do anything further to rationalize it.

