Surds

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Things you need to learn to do

- Simplify surds.
- Rationalize denominator/numerator.

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In mathematics which of the following $3\sqrt{2}$ or $\sqrt{18}$ is simpler depends on the context.

In mathematics which of the following $3\sqrt{2}$ or $\sqrt{18}$ is simpler depends on the context. You need to be able to change from one form to the other quickly.

If we have an expression like $3\sqrt{2}$ and we want to move the 3 under the square root sign we simply make sure to adjust its power. For example:

•
$$3\sqrt{2} = \sqrt{3^2 \times 2} = \sqrt{18}$$

If we have an expression like $3\sqrt{2}$ and we want to move the 3 under the square root sign we simply make sure to adjust its power. For example:

•
$$3\sqrt{2} = \sqrt{3^2 \times 2} = \sqrt{18}$$
,

•
$$3\sqrt[3]{2} = \sqrt[3]{3^3 \times 2} = \sqrt[3]{54}$$
,

If we have an expression like $3\sqrt{2}$ and we want to move the 3 under the square root sign we simply make sure to adjust its power. For example:

- $3\sqrt{2} = \sqrt{3^2 \times 2} = \sqrt{18}$,
- $3\sqrt[3]{2} = \sqrt[3]{3^3 \times 2} = \sqrt[3]{54}$,
- $3\sqrt[4]{2} = \sqrt[4]{3^4 \times 2} = \sqrt[4]{162}$,

If we have an expression like $3\sqrt{2}$ and we want to move the 3 under the square root sign we simply make sure to adjust its power. For example:

• $3\sqrt{2} = \sqrt{3^2 \times 2} = \sqrt{18}$, • $3\sqrt[3]{2} = \sqrt[3]{3^3 \times 2} = \sqrt[3]{54}$, • $3\sqrt[4]{2} = \sqrt[4]{3^4 \times 2} = \sqrt[4]{162}$, • $3\sqrt[5]{2} = \sqrt[5]{3^5 \times 2} = \sqrt[5]{486}$.

Some practice:

•
$$2\sqrt{3} =$$

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Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} =$

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} =$

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,
• $4\sqrt{3} =$

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,
• $4\sqrt{3} = \sqrt{4^2 \times 3} = \sqrt{48}$,

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,
• $4\sqrt{3} = \sqrt{4^2 \times 3} = \sqrt{48}$,
• $3\sqrt{3} =$

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,
• $4\sqrt{3} = \sqrt{4^2 \times 3} = \sqrt{48}$,
• $3\sqrt{3} = \sqrt{3^2 \times 3} = \sqrt{27}$,

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,
• $4\sqrt{3} = \sqrt{4^2 \times 3} = \sqrt{48}$,
• $3\sqrt{3} = \sqrt{3^2 \times 3} = \sqrt{27}$,
• $5\sqrt{2} =$

Some practice:

•
$$2\sqrt{3} = \sqrt{2^2 \times 3} = \sqrt{12}$$
,
• $4\sqrt{2} = \sqrt{4^2 \times 2} = \sqrt{32}$,
• $3\sqrt{5} = \sqrt{3^2 \times 5} = \sqrt{45}$,
• $4\sqrt{3} = \sqrt{4^2 \times 3} = \sqrt{48}$,
• $3\sqrt{3} = \sqrt{3^2 \times 3} = \sqrt{27}$,
• $5\sqrt{2} = \sqrt{5^2 \times 2} = \sqrt{50}$.

Some more practice:

•
$$2\sqrt[3]{3} =$$

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} =$

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} =$

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$,

Some more practice:

• $2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$, • $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$, • $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$, • $2\sqrt[4]{2} =$

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$,
• $2\sqrt[4]{2} = \sqrt[4]{2^4 \times 2} = \sqrt[4]{32}$,

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$,
• $2\sqrt[4]{2} = \sqrt[4]{2^4 \times 2} = \sqrt[4]{32}$,
• $2\sqrt[5]{5} =$

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$,
• $2\sqrt[4]{2} = \sqrt[4]{2^4 \times 2} = \sqrt[4]{32}$,
• $2\sqrt[5]{5} = \sqrt[5]{2^5 \times 5} = \sqrt[5]{160}$,

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$,
• $2\sqrt[4]{2} = \sqrt[4]{2^4 \times 2} = \sqrt[4]{32}$,
• $2\sqrt[5]{5} = \sqrt[5]{2^5 \times 5} = \sqrt[5]{160}$,
• $3\sqrt[5]{3} =$

Some more practice:

•
$$2\sqrt[3]{3} = \sqrt[3]{2^3 \times 3} = \sqrt[3]{24}$$
,
• $4\sqrt[3]{2} = \sqrt[3]{4^3 \times 2} = \sqrt[3]{128}$,
• $3\sqrt[4]{5} = \sqrt[4]{3^4 \times 5} = \sqrt[4]{405}$,
• $2\sqrt[4]{2} = \sqrt[4]{2^4 \times 2} = \sqrt[4]{32}$,
• $2\sqrt[5]{5} = \sqrt[5]{2^5 \times 5} = \sqrt[5]{160}$,
• $3\sqrt[5]{3} = \sqrt[5]{3^5 \times 3} = \sqrt[5]{729}$.

Of course if we want to go in the opposite direction (as is often the case) we do the exact opposite.

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•
$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$$
,

Of course if we want to go in the opposite direction (as is often the case) we do the exact opposite.

•
$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$$
,
• $\sqrt{72} = \sqrt{36 \times 2} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$,

Of course if we want to go in the opposite direction (as is often the case) we do the exact opposite.

•
$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$$
,
• $\sqrt{72} = \sqrt{36 \times 2} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$,
• $\sqrt[3]{16} = \sqrt[3]{8 \times 2} = \sqrt[3]{8} \times \sqrt[3]{2} = 2\sqrt[3]{2}$,

Of course if we want to go in the opposite direction (as is often the case) we do the exact opposite.

•
$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$$
,
• $\sqrt{72} = \sqrt{36 \times 2} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$,
• $\sqrt[3]{16} = \sqrt[3]{8 \times 2} = \sqrt[3]{8} \times \sqrt[3]{2} = 2\sqrt[3]{2}$,
• $\sqrt[3]{108} = \sqrt[3]{27 \times 4} = \sqrt[3]{27} \times \sqrt[3]{4} = 3\sqrt[3]{4}$.

Of course if we want to go in the opposite direction (as is often the case) we do the exact opposite.

•
$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$$
,
• $\sqrt{72} = \sqrt{36 \times 2} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$,
• $\sqrt[3]{16} = \sqrt[3]{8 \times 2} = \sqrt[3]{8} \times \sqrt[3]{2} = 2\sqrt[3]{2}$,
• $\sqrt[3]{108} = \sqrt[3]{27 \times 4} = \sqrt[3]{27} \times \sqrt[3]{4} = 3\sqrt[3]{4}$.

The point is that if we are dealing with square roots $\sqrt{}$ we want to express the number as a product of a square number (4,9,16,25,...) times something,

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Of course if we want to go in the opposite direction (as is often the case) we do the exact opposite.

•
$$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$$
,
• $\sqrt{72} = \sqrt{36 \times 2} = \sqrt{36} \times \sqrt{2} = 6\sqrt{2}$,
• $\sqrt[3]{16} = \sqrt[3]{8 \times 2} = \sqrt[3]{8} \times \sqrt[3]{2} = 2\sqrt[3]{2}$,
• $\sqrt[3]{108} = \sqrt[3]{27 \times 4} = \sqrt[3]{27} \times \sqrt[3]{4} = 3\sqrt[3]{4}$.

The point is that if we are dealing with square roots $\sqrt{}$ we want to express the number as a product of a square number (4,9,16,25,...) times something, if we're dealing with a cube root $\sqrt[3]{}$ we want a cube number (8,27,64,125,...) times something, etc.

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Practice:

•
$$\sqrt{32} =$$

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Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$

Practice:

• $\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$, • $\sqrt{162} =$

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Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$
,
• $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$,

Practice:

• $\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$, • $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$, • $\sqrt{147} =$

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Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$
,
• $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$,
• $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$,

Practice:

• $\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$, • $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$, • $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$, • $\sqrt{63} =$

Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$
,
• $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$,
• $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$,
• $\sqrt{63} = \sqrt{9 \times 7} = 3\sqrt{7}$,

Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$
,
• $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$,
• $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$,
• $\sqrt{63} = \sqrt{9 \times 7} = 3\sqrt{7}$,
• $\sqrt{80} =$

Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$
,
• $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$,
• $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$,
• $\sqrt{63} = \sqrt{9 \times 7} = 3\sqrt{7}$,
• $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$,

Practice:

• $\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$, • $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$, • $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$, • $\sqrt{63} = \sqrt{9 \times 7} = 3\sqrt{7}$, • $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$, • $\sqrt{125} =$

Practice:

•
$$\sqrt{32} = \sqrt{16 \times 2} = 4\sqrt{2}$$
,
• $\sqrt{162} = \sqrt{81 \times 2} = 9\sqrt{2}$,
• $\sqrt{147} = \sqrt{49 \times 3} = 7\sqrt{3}$,
• $\sqrt{63} = \sqrt{9 \times 7} = 3\sqrt{7}$,
• $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$,
• $\sqrt{125} = \sqrt{25 \times 5} = 5\sqrt{5}$.

More practice:

•
$$\sqrt[3]{32} =$$

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More practice:

•
$$\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$$
,

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More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$,
- $\sqrt[3]{81} =$

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More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$,
- $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$,

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More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$,
- $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$,
- $\sqrt[3]{250} =$

More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$,
- $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$,
- $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$,

More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$,
- $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$,
- $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$,
- $\sqrt[3]{56} =$

More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$,
- $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$,
- $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$,
- $\sqrt[3]{56} = \sqrt[3]{8 \times 7} = 2\sqrt[3]{7}$,

More practice:

• $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$, • $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$, • $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$, • $\sqrt[3]{56} = \sqrt[3]{8 \times 7} = 2\sqrt[3]{7}$, • $\sqrt[4]{162} =$

More practice:

• $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$, • $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$, • $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$, • $\sqrt[3]{56} = \sqrt[3]{8 \times 7} = 2\sqrt[3]{7}$, • $\sqrt[4]{162} = \sqrt[4]{81 \times 2} = 3\sqrt[4]{2}$,

More practice:

- $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$, • $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$, • $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$, • $\sqrt[3]{56} = \sqrt[3]{8 \times 7} = 2\sqrt[3]{7}$, • $\sqrt[4]{162} = \sqrt[4]{81 \times 2} = 3\sqrt[4]{2}$,
- √⁴√80 =

More practice:

• $\sqrt[3]{32} = \sqrt[3]{8 \times 4} = 2\sqrt[3]{4}$, • $\sqrt[3]{81} = \sqrt[3]{27 \times 3} = 3\sqrt[3]{3}$, • $\sqrt[3]{250} = \sqrt[3]{125 \times 2} = 5\sqrt[3]{2}$, • $\sqrt[3]{56} = \sqrt[3]{8 \times 7} = 2\sqrt[3]{7}$, • $\sqrt[4]{162} = \sqrt[4]{81 \times 2} = 3\sqrt[4]{2}$, • $\sqrt[4]{80} = \sqrt[4]{16 \times 2} = 2\sqrt[4]{5}$.

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Sometimes we may want to have a rational number in a denominator/numerator.

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Sometimes we may want to have a rational number in a denominator/numerator. We start with a number like $\frac{5}{\sqrt{2}}$ and we don't want the irrational number in the denominator.

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Sometimes we may want to have a rational number in a denominator/numerator. We start with a number like $\frac{5}{\sqrt{2}}$ and we don't want the irrational number in the denominator. The trick here is to multiply this number by 1 (we can't multiply by anything else as it would change the number), but 1 written in the form $\frac{\sqrt{2}}{\sqrt{2}}$:

Sometimes we may want to have a rational number in a denominator/numerator. We start with a number like $\frac{5}{\sqrt{2}}$ and we don't want the irrational number in the denominator. The trick here is to multiply this number by 1 (we can't multiply by anything else as it would change the number), but 1 written in the form $\frac{\sqrt{2}}{\sqrt{2}}$:

$$\frac{5}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{5 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{5\sqrt{2}}{2}$$

Sometimes we may want to have a rational number in a denominator/numerator. We start with a number like $\frac{5}{\sqrt{2}}$ and we don't want the irrational number in the denominator. The trick here is to multiply this number by 1 (we can't multiply by anything else as it would change the number), but 1 written in the form $\frac{\sqrt{2}}{\sqrt{2}}$: $5 \sqrt{2} - 5 \times \sqrt{2} - 5\sqrt{2}$

$$\overline{\sqrt{2}} \times \overline{\sqrt{2}} = \overline{\sqrt{2} \times \sqrt{2}} = \overline{2}$$

And we no longer have an irrational number in the denominator.

Examples:

•
$$\frac{4}{\sqrt{3}} =$$

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Examples:

•
$$\frac{4}{\sqrt{3}} = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} =$$

Examples:

•
$$\frac{4}{\sqrt{3}} = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$$
,

Examples:

•
$$\frac{4}{\sqrt{3}} = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$$
,
• $\frac{2}{\sqrt{5}} =$

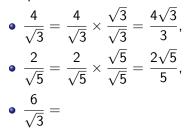
Examples:

•
$$\frac{4}{\sqrt{3}} = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$$
,
• $\frac{2}{\sqrt{5}} = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} =$

Examples:

•
$$\frac{4}{\sqrt{3}} = \frac{4}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$$
,
• $\frac{2}{\sqrt{5}} = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$,

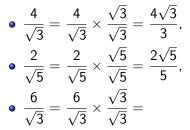
Examples:



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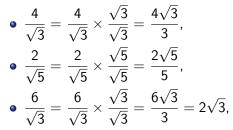
Examples:



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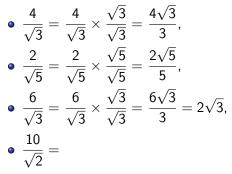
Examples:



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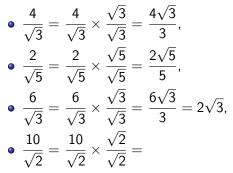
Examples:



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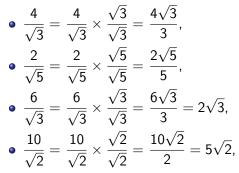
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Examples:



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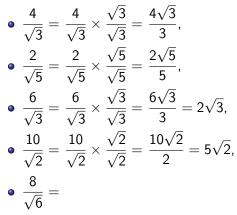
Examples:



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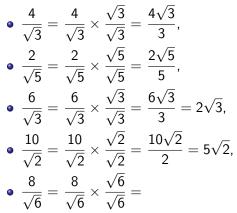
Examples:



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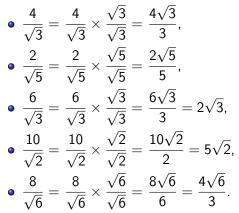
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Examples:



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$$\frac{1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{\sqrt{3}+1}{(\sqrt{3}-1)(\sqrt{3}+1)} = \frac{\sqrt{3}+1}{3-1} = \frac{\sqrt{3}+1}{2}$$

Examples:

•
$$\frac{2}{\sqrt{2}-1} =$$

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$$\frac{2}{\sqrt{2}-1} = \frac{2}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1} =$$

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Tomasz Lechowski

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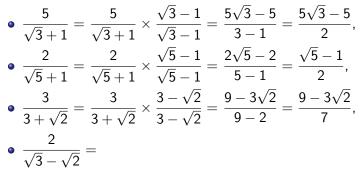
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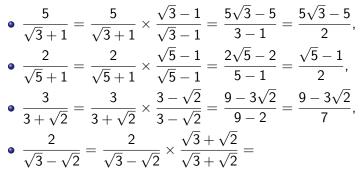
•
$$\frac{5}{\sqrt{3}+1} = \frac{5}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{5\sqrt{3}-5}{3-1} = \frac{5\sqrt{3}-5}{2},$$

• $\frac{2}{\sqrt{5}+1} = \frac{2}{\sqrt{5}+1} \times \frac{\sqrt{5}-1}{\sqrt{5}-1} = \frac{2\sqrt{5}-2}{5-1} = \frac{\sqrt{5}-1}{2},$
• $\frac{3}{3+\sqrt{2}} = \frac{3}{3+\sqrt{2}} \times \frac{3-\sqrt{2}}{3-\sqrt{2}} = \frac{9-3\sqrt{2}}{9-2} = \frac{9-3\sqrt{2}}{7},$

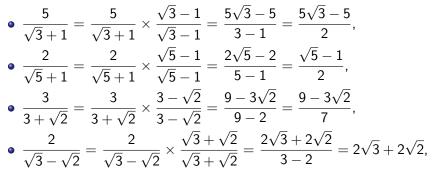
More examples:



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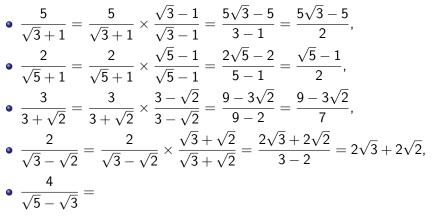


More examples:



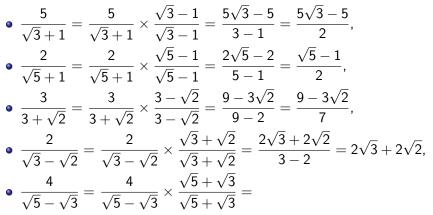
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More examples:

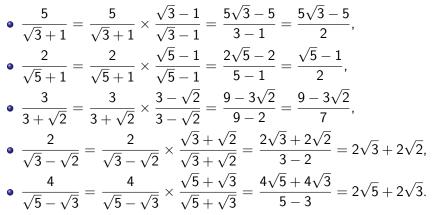


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More examples:



More examples:



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The short test at the beginning of the next class will consist simplifying expressions with roots and rationalizing the denominator.

Tomasz Lechowski	

If you have any questions or doubts email me at T.J.Lechowski@gmail.com

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