Some Numbers are Rational

$$0.4\overline{85}$$

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I want to turn this repeating decimal into a fraction. I can see this decimal number has a two-digit repeating pattern.

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$$x = 0.4\overline{85}$$

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First I'll set x equal to this number.

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$$100x = 48.5\overline{85}$$

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Since the repeating pattern is 2 digits long, I'm going to multiply by 100 and write out a few more digits so I can still see the pattern.

Some Numbers are Rational

$$100x = 48.5\overline{85}$$
$$-x \quad -0.485\overline{85}$$

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Now I'll subtract the value of the decimal from each side. By lining the subtraction up vertically, it's easier to see what the left side will equal.

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$$99x = 48.1$$
$$990x = 481$$

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If I multiply each side by 10, I can re-write my equation without any decimal numbers.

Some Numbers are Rational

$$x = \frac{481}{990}$$

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Dividing each side by 990, I now know

$$0.4\overline{85} = \frac{481}{990}$$