

Repeating Decimals

In Lesson 1-1, you learned how to write a terminating decimal as a fraction. You use algebra to write a repeating decimal as a fraction.

EXAMPLE Writing a Repeating Decimal as a Fraction

In a recent survey, $0.\overline{45}$ of those asked chose blue as their favorite color. Write $0.\overline{45}$ as a fraction in simplest form.

Step 1 Represent the given decimal with a variable.

$$n = 0.\overline{45}$$

Step 2 Multiply by 10^d , where d = the number of digits that repeat.

In this case, multiply by 10^2 or 100. Since 2 digits repeat in $0.\overline{45}$.

$$100n = 45.\overline{45}$$

Step 3 Subtract to eliminate the repeating part.

$$100n = 45.454545 \dots$$

$$- n = - 0.454545 \dots \quad \leftarrow \text{Use the Subtraction Property of Equality.}$$

$$99n = 45.000000 \dots \quad \leftarrow \text{Simplify.}$$

$$99n = 45$$

Step 4 Solve the new equation.

$$\frac{99n}{99} = \frac{45}{99} \quad \leftarrow \text{Divide each side by 99.}$$


$$n = \frac{45}{99} = \frac{5}{11} \quad \leftarrow \text{Simplify using the GCF, 9.}$$

The repeating decimal $0.\overline{45}$ equals $\frac{5}{11}$.

Exercises

Write each repeating decimal as a fraction in simplest form.

1. $0.\overline{5}$ 2. $0.\overline{7}$ 3. $0.\overline{24}$ 4. $0.\overline{15}$ 5. $0.\overline{135}$ 6. $0.\overline{282}$

7.  **Writing in Math** Explain why a repeating decimal is a rational number. Justify your answer with an example.