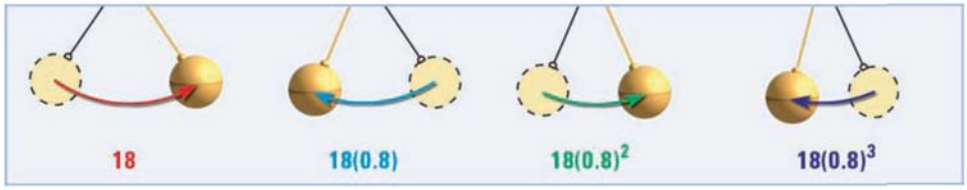
EXAMPLE 4 Use an infinite series as a model

PENDULUMS A pendulum that is released to swing freely travels 18 inches on the first swing. On each successive swing, the pendulum travels 80% of the distance of the previous swing. What is the total distance the pendulum swings?



Solution

The total distance traveled by the pendulum is:

$$d = 18 + 18(0.8) + 18(0.8)^2 + 18(0.8)^3 + \cdots$$

$= \frac{a_1}{1 - r}$ Write formula for sum.

$= \frac{18}{1 - 0.8}$ Substitute 18 for a_1 and 0.8 for r.

$= 90$ Simplify.

▶ The pendulum travels a total distance of 90 inches, or 7.5 feet.

EXAMPLE 5 Write a repeating decimal as a fraction

Write 0.242424. . . as a fraction in lowest terms.

$$0.242424\ldots = 24(0.01) + 24(0.01)^2 + 24(0.01)^3 + \cdots$$

$= \frac{a_1}{1 - r}$ Write formula for sum.

$= \frac{24(0.01)}{1 - 0.01}$ Substitute 24(0.01) for a_1 and 0.01 for r.

$= \frac{0.24}{0.99}$ Simplify.

$= \frac{24}{99}$ Write as a quotient of integers.

$= \frac{8}{33}$ Reduce fraction to lowest terms.

▶ The repeating decimal 0.242424. . . is $\frac{8}{33}$ as a fraction.

GUIDED PRACTICE for Examples 4 and 5

5. WHAT IF? In Example 4, suppose the pendulum travels 10 inches on its first swing. What is the total distance the pendulum swings?

Write the repeating decimal as a fraction in lowest terms.

6. 0.555. . . **7.** 0.727272. . . **8.** 0.131313. . .