Name _____ Date _____ Period _____

Lesson 10-4

Reinforce Understanding

Math is Ingenuity

I can use ratios and models to explain how the Penny Farthing and gear-driven bicycles were ingenious solutions to a real problem.

Worked model

A later bicycle design uses a chain: the pedal gear has 48 teeth, and the largest rear gear has 32 teeth.

1. For each rotation of the 48-tooth pedal gear, the wheel gear also turns 48 teeth.
2. The 32-tooth gear needs to turn 32 teeth to make one full rotation, so I find the equivalent ratio: 48 ÷ 32 = 1.5.
3. The rear wheel makes 1.5 rotations for each pedal rotation — this gear makes it easier to pedal at slower speeds or go uphill.

Practice

Complete each exercise. Show the reasoning that supports your answer.

1. On the Penny Farthing, what is the ratio of pedal rotations to front-wheel rotations?

Circle the letter of the best answer. Show how you know.

A. 1 to 1
B. 1 to 2
C. 1 to 4
D. 2 to 1

Show your work

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2. How far does the Penny Farthing travel with each pedal rotation?

Circle the letter of the best answer. Show how you know.

A. The height of the rider
B. The length of the perimeter of the front wheel
C. The length of the pedal
D. It does not move a fixed distance

Show your work

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3. Why was the front wheel of the Penny Farthing so large?

Circle the letter of the best answer. Show how you know.

A. So the bicycle is easier to stop
B. So the rider sits closer to the ground
C. So the bicycle travels a greater distance with one pedal rotation
D. So the rear wheel spins faster

Show your work
