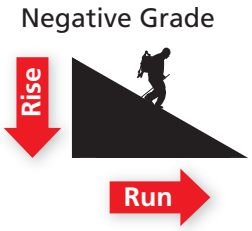
10.4 Outdoor Sports

- Use mathematics to analyze hiking and mountain climbing.
- Use mathematics to analyze kayaking and sailing.
- Use mathematics to analyze bicycling and cross-country skiing.



$$\text{Grade} = \frac{\text{Rise}}{\text{Run}}$$

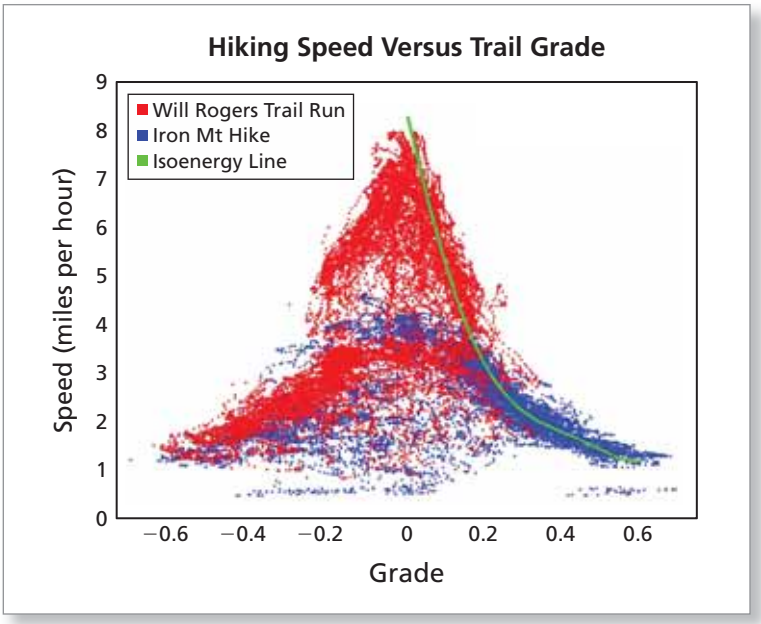
The American Hiking Society works "toward ensuring that hiking trails and natural places are cherished and preserved" for all generations.

Hiking and Mountain Climbing

Hiking is an outdoor sport, often done on trails created by the National Forest Service or by a state agency. There are thousands of trails in the United States, such as Glacier Gorge Trail in Estes Park, Colorado, and the Appalachian Trail in the Eastern United States.

EXAMPLE 1 Comparing Grade and Speed

The scatter plot shown was created by a hiker in California. The hiker used a GPS to compare the grade of the trail with his speed. Describe the scatter plot. What does the green line represent?



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SOLUTION

As a general observation, you can see that the hiker was traveling faster on level ground. As the grade changed to uphill or downhill, the hiker's speed decreased. In the Internet post about this experiment, the hiker called the green line his "isoenergy line" because he figured he was exerting the same amount of energy at every point on the line. For instance, walking at 2 miles per hour at a grade of 0.4 uses the same energy as running at 5 miles per hour at a grade of 0.1.

Checkpoint

Help at Math.andYOU.com

The suggestion for a casual hiking pace on a trail is 1 hour to walk 1.8 miles with a change in elevation of 0.2 mile. The suggestion for a fast hiking pace is 30 minutes. How do these speeds compare to the scatter plot shown in Example 1?