4.4b Comparing Rates

EXAMPLE 1 Comparing Proportional Relationships
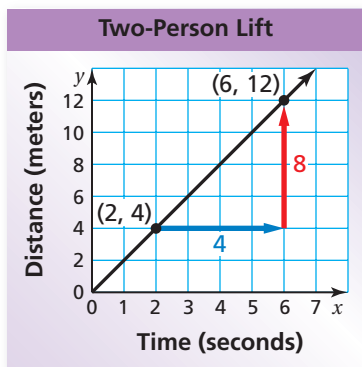
Two-Person Lift

The distance y (in meters) traveled by a four-person ski lift in x seconds is represented by the equation $y = 2.5x$. The graph shows the distance traveled by a two-person ski lift.

a. Which ski lift is faster?

Four-Person Lift

The equation is written in slope-intercept form.

$$y = 2.5x$$

The slope is 2.5.

The four-person lift travels 2.5 meters per second.

Two-Person Lift

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$= \frac{8}{4}$$

$$= 2$$

The two-person lift travels 2 meters per second.

∴ So, the four-person lift is faster than the two-person lift.

b. Graph the equation that represents the four-person lift in the same coordinate plane as the two-person lift. Compare the steepness of the graphs. What does this mean in the context of the problem?

∴ The graph that represents the four-person lift is steeper than the graph that represents the two-person lift. So, the four-person lift is faster.

Ski Lift
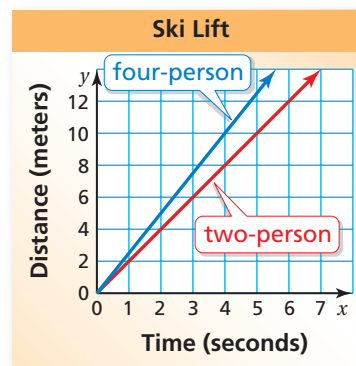
Practice

1. BIOLOGY Toenails grow about 13 millimeters per year. The table shows fingernail growth.

Weeks	1	2	3	4
Fingernail Growth (millimeters)	0.7	1.4	2.1	2.8

a. Do fingernails or toenails grow faster?

b. Graph equations that represent the growth rates of toenails and fingernails in the same coordinate plane. Compare the steepness of the graphs. What does this mean in the context of the problem?

EXAMPLE **2** **Comparing Functions**

The earnings y (in dollars) of a nighttime employee working x hours is represented by the function $y = 7.5x + 30$. The table shows the earnings of a daytime employee.

	+1	+1	+1	

Time (hours)	1	2	3	4
Earnings (dollars)	12.50	25.00	37.50	50.00

+12.50   +12.50   +12.50

a. Which employee has a higher hourly wage?

Nighttime Employee

$y = 7.5x + 30$

The slope is 7.5.

The nighttime employee earns $7.50 per hour.

Daytime Employee

$$\frac{\text{change in earnings}}{\text{change in time}} = \frac{\$12.50}{1\ \text{hour}}$$

The daytime employee earns $12.50 per hour.

∴ So, the daytime employee has a higher hourly wage.

b. Write a function that relates the daytime employee's earnings to the number of hours worked. Graph the functions that represent the earnings of the two employees in the same coordinate plane. Interpret the graphs.

Use a verbal model to write a function that represents the earnings of the daytime employee.

Employee Earnings

nighttime

daytime

$$\text{Earnings} = \frac{\text{Hourly}}{\text{wage}} \cdot \frac{\text{Hours}}{\text{worked}}$$

$$y = 12.5x$$

∴ The graph shows that the daytime employee has a higher hourly wage, but does not earn more money than the nighttime employee until each person has worked more than 6 hours.

Practice

2. EMPLOYMENT Manager A earns $15 per hour and receives a $50 bonus. The graph shows the earnings of Manager B.

a. Which manager has a higher hourly wage?

b. After how many hours does Manager B earn more money than Manager A?

Earnings of Manager B

(3, 75)