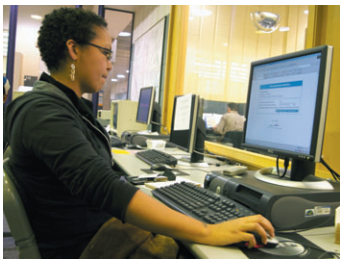
3.2 Exploring Linear Relations

YOU WILL NEED

- grid paper



GOAL

Identify direct and partial variations.

EXPLORE the Math

Rana's Computer Repair Service charges $45/h. Bill's Computer Repair Service charges a flat fee of $25 plus $18/h. Each company charges for parts of hours.

? How are the plans alike and how are they different?

A. Make a table of values that shows solutions for each company's cost for 0, 1, 2, and 3 hours of service.

B. Graph the relation between cost and hours of service for each company.
How are the graphs alike and how are they different?

C. Use an equation to describe the cost in terms of hours of service, for each company.
How are the equations alike and how are they different?

D. Identify the ***y*-intercept** of each relation. What does it mean in each case?

E. How are the hourly rate and initial value connected to the table of values, graph, and equation for each relation?

F. Identify each relation as a **direct variation** or a **partial variation**. Justify your answer.

y-intercept
the value of the dependent variable when the independent variable is zero; sometimes called the initial value

direct variation
a relation in which one variable is a multiple of the other

partial variation
a relation in which one variable is a multiple of the other plus a constant amount

linear relation
a relation in which the graph forms a straight line

Reflecting

G. Why might you have predicted that each graph would be a **linear relation**?

H. If the service time triples, Rana's charge will triple but Bill's won't. Why is that so?

I. How are direct and partial variations alike and how are they different? Refer to graphs, tables, and equations.

In Summary

Key Idea

- You can determine whether a linear relation is a partial or a direct variation by examining its table of values, its graph, or its equation.

Direct Variation	Partial Variation
(0, 0) is an ordered pair in the table of values.	(0, 0) is not an ordered pair in the table of values.
The initial value is 0, so the graph passes through (0, 0).	The initial value is some number, b, so the graph passes through (0, b).
The equation looks like $y = mx$.	The equation looks like $y = mx + b$.

Need to Know

- A solution to a linear relation is an ordered pair that appears in the table of values, lies on the line representing the linear relation, or makes a true statement in the equation of the relation.
- An initial value has a corresponding x-value of zero.

FURTHER Your Understanding

1. Identify each relation as a direct or a partial variation. Support your answer using a table, a graph, and form of the equation.

a) $y = 2x$ **c)** $y = 1 - x$ **e)** $y = -\frac{1}{2}x$

b) $y = 2x + 3$ **d)** $y = 0.25x - 3.5$ **f)** $y = -\frac{2}{3}x + \frac{1}{6}$

2. A small rocket is launched from a hill 1500 m above sea level. It rises at 35 m/s.

a) Write an equation for the relation between the height of the rocket and time.

b) Use a table of values to graph this relation.

c) Identify this relation as a direct or a partial variation. Explain.

3. Students can choose from two different cafeteria milk plans.
Plan A: Pay \$0.75 per glass of milk
Plan B: Pay \$10, plus \$0.25 per glass of milk

a) Write an equation for each plan.

b) Determine the cost of 20 glasses for each plan.

c) Determine the cost of 30 glasses for each plan.

d) Which plan would you choose? Why?

e) Identify each plan as a direct or a partial variation.

f) How does the type of variation affect the cost?