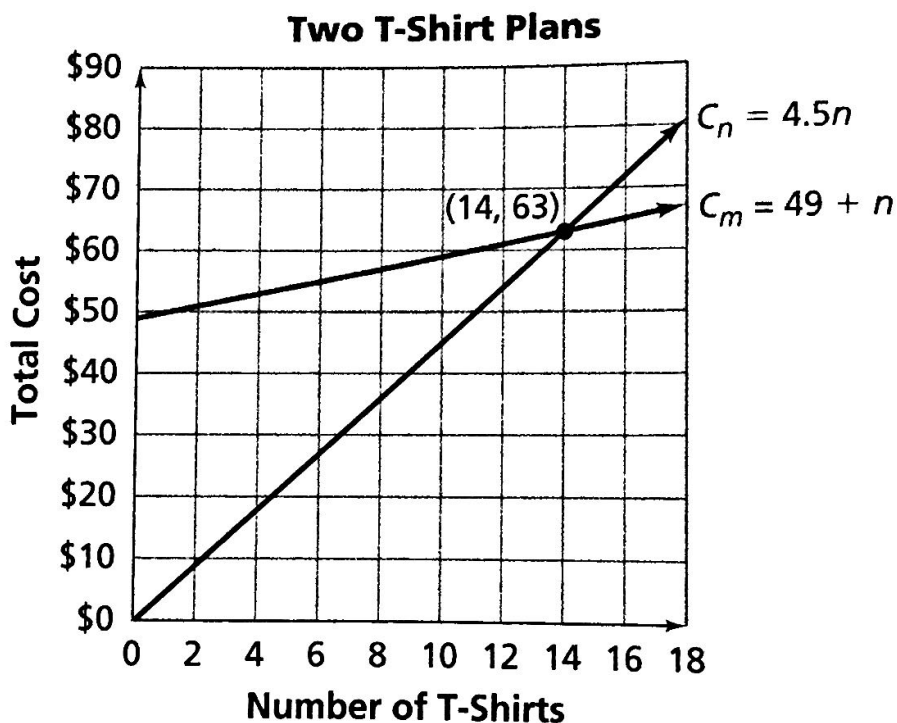


3.5 Finding the Point of Intersection

Equations and Inequalities



In Problem 2.3, you used graphs and tables to find when the costs of two different plans for buying T-shirts were equal. The graphs of the two cost plans are shown below. C_n represents the costs of the No-Shrink Tee. C_m represents the costs of the Mighty Tee. The **point of intersection** of the two lines tells us when the costs for the two T-shirt plans are equal.



- What information do the coordinates of the point of intersection of the two lines give you about this situation?
- Show how you could use the two equations to find the coordinates of the point of intersection of the two lines. That is, for what number of T-shirts n is $C_m = C_n$?
- For what number(s) of T-shirts is plan C_m less than plan C_n ? That is, when is $C_m < C_n$?

Statements like $C_m = C_n$ are called equality statements or equations. You learned how to solve these equations symbolically in this Investigation.

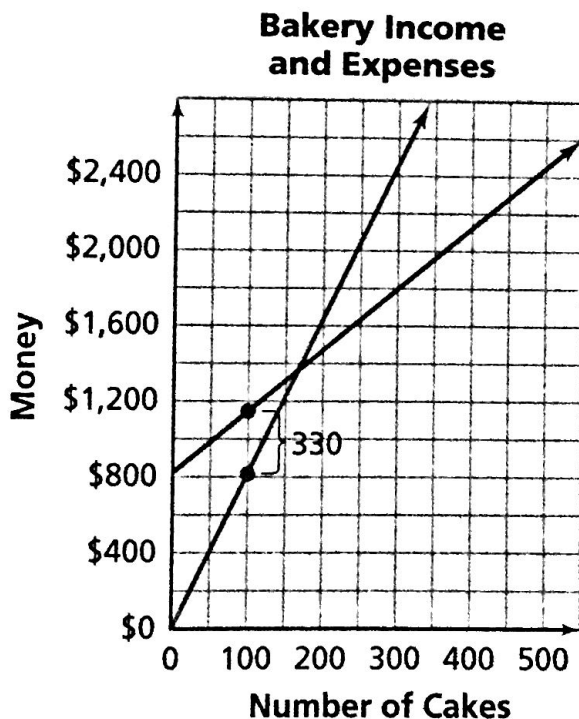
Statements like $C_m < C_n$, $x < 5$, and $x > -5$ are called **inequality statements** or inequalities.

In this Problem, you will answer questions about points of intersection and about when the cost of one plan is less than or greater than that of another plan.

Problem 3.5

At Fabulous Fabian's Bakery, the expenses E to make n cakes per month is given by the equation $E = 825 + 3.25n$. The income I for selling n cakes is given by the equation $I = 8.20n$.

- A**
1. In the equations for I and E , what information do the y -intercepts give you?
 2. What do the coefficients of n represent?
- B** Fabian sells 100 cakes in January.
1. What are his expenses and his income?
 2. What is his profit? Describe how you found your answer.
 3. Kevin drew the graph below. Explain how he could use his graph to determine Fabian's profit.



- C**
1. Write an equation that represents the profit, P , for selling n cakes. Describe how you can use this equation to find the profit.
 2. Fabian uses the equation $P = 4.95n - 825$ to predict the profit. Does this equation make sense? Explain.

continued on the next page >

Problem 3.5 continued

D The *break-even* point is when expenses equal income ($E = I$). Fabian thinks that this information is useful.

1. Write an equation to find the number of cakes n needed to break even. How many cakes does Fabian need to make in order to break even?
2. Describe how you could use a table or graph to find the break-even point.

- E**
1. How many cakes can Fabian make if he wants his expenses to be less than \$2,400 a month?
 2. How many cakes can he make if he wants to his income to be greater than \$2,400 a month?
 3. Fabian's sister Mariah wrote the following inequality statements to answer parts (1) and (2) above.

$$825 + 3.25n < 2,400 \quad \text{and} \quad 8.20n > 2,400$$

Do these statements make sense? Why?

4. For each of the following inequalities
 - find the number of cakes Fabian needs to make in a month.
 - record the solution on a graph.
 - explain how you found your answers.
 - a. $E < 1,475$
 - b. $I > 1,640$
 - c. $P > 800$