

Item Name:	The Phone Plan
Item Type:	Stand Alone
Subject and/or Course:	Mathematics 9-12, Algebra I, Algebra II
Common Core Standards:	<p>Mathematical Practices</p> <ul style="list-style-type: none"> • CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them • CCSS.Math.Practice.MP4 Model with mathematics • CCSS.Math.Practice.MP5 Use appropriate tools strategically • CCSS.Math.Practice.MP6 Attend to precision <p>Mathematics High School Algebra</p> <ul style="list-style-type: none"> • HS.A.SSE Seeing Structure in Expressions • HS.A.CED Create Equations • HS.A.REI Reasoning with Equations and Inequalities <p>Mathematics High School Functions</p> <ul style="list-style-type: none"> • HS.F.IF Interpreting Functions • HS.F.BF Building Functions • HS.F.LE Linear, Quadratic, and Exponential Functions
Developer/Source:	Ohio Performance Assessment Pilot Project
Item Features:	<p>Administration: Stand Alone</p> <p>Length of time for response: 1-2 class periods</p> <p>Method of scoring: Point Scoring (0-12 points)</p> <p>Opportunity for student collaboration: Limited</p> <p>Opportunity for teacher feedback and revision: Limited</p>

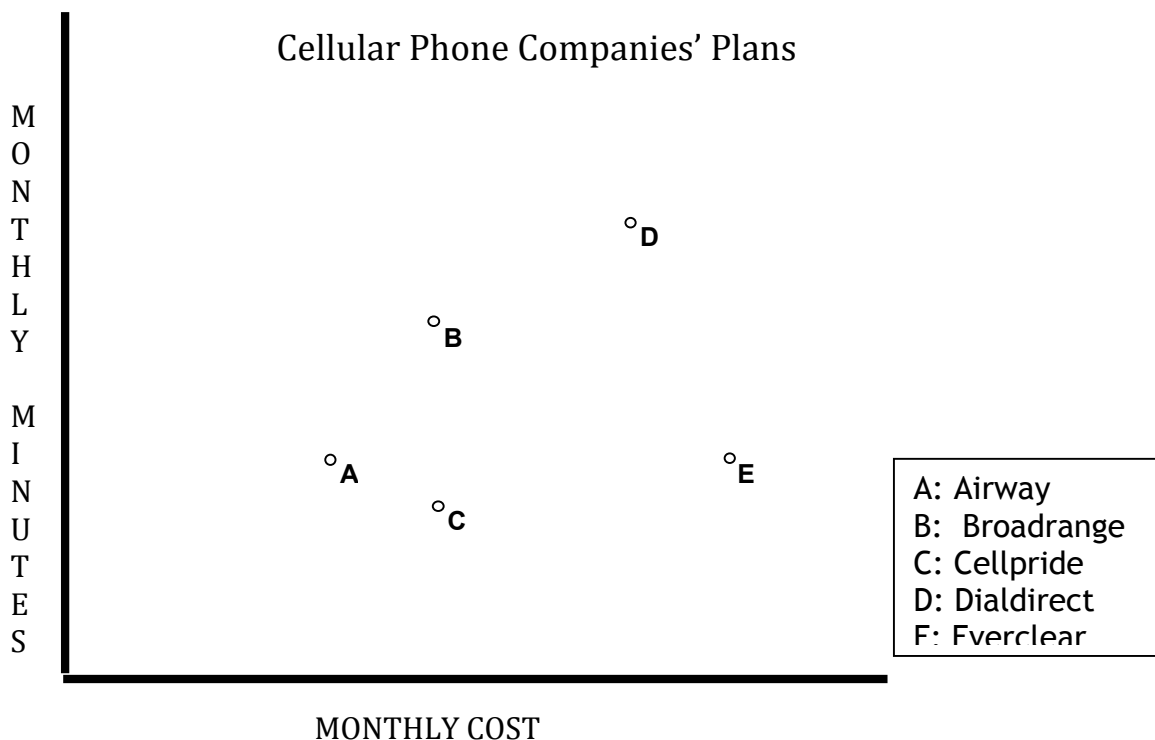
Collection of performance assessment items compiled by



The Phone Plan

Performance Assessment Task

You want to purchase a cell phone. There are five phone companies and each has a different plan that comes with the phone. The plans include monthly minutes and costs. A consumer magazine has a graph that shows how the plans compare to one another.



1. Which is the least expensive plan? _____.
2. Do any two plans provide the same amount of monthly minutes?
Explain your answer.
3. Which plan is the best buy - providing you more minutes for a smaller price? Explain how you determined your answer.

The Phone Plan

Performance Assessment Task

Dialdirect wants to determine how best to price their monthly plan to maximize their revenue. They surveyed a group of potential customers from three cities. Below is data from the survey.

Cities Surveyed	Cost Per Month	Potential Customers Willing To Buy Plan (in thousands)
Cleveland	\$48.00	10
Columbus	\$16.00	20
Cincinnati	\$32.00	15

4. Write an equation that shows the relationship between the cost per month and potential customers willing to buy the plan.

5. Write a revenue equation in terms of the monthly cost and demand for customers.

6. What is the maximum revenue that can be earned? _____

7. To obtain the maximum revenue, how much should Dialdirect charge? Show how you figured it out.

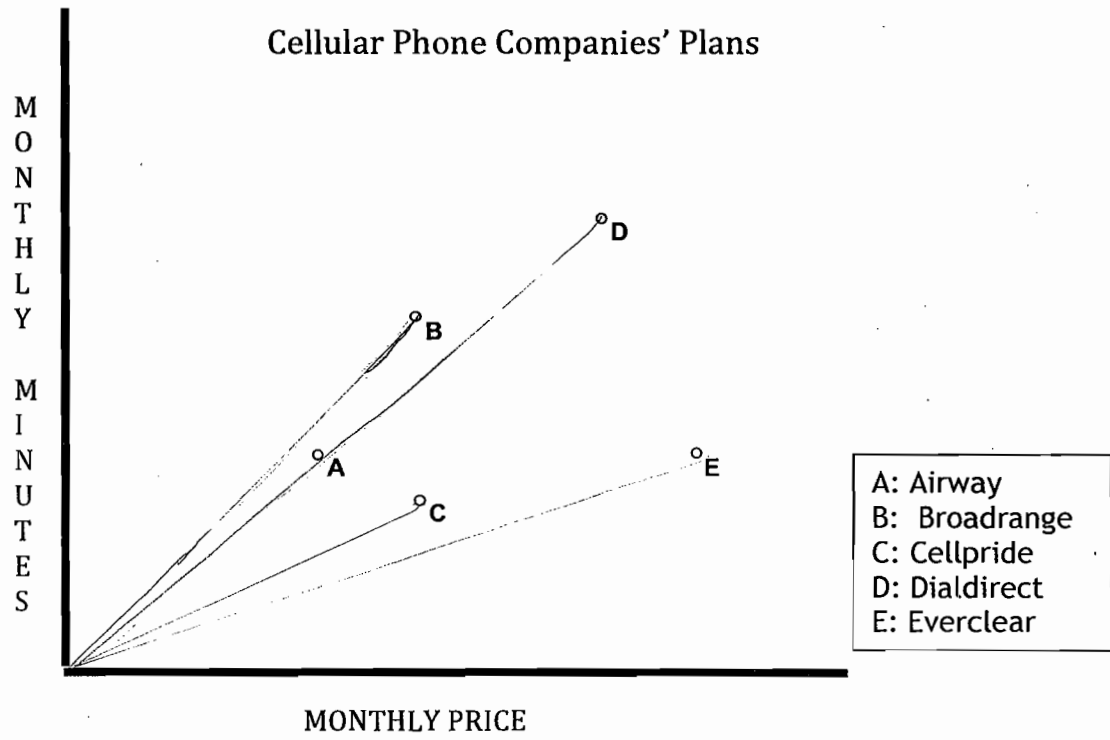
SVMI Performance Assessment Rubric

The Phone Plan	Rubric	
<p>The core elements of performance required by this task are:</p> <ul style="list-style-type: none"> • Interpret a situation involving rates using a scatterplot • Determine an equation of a line. • Find a revenue equation • Determine the maximum revenue that can be generated <p>Based on these, credit for specific aspects of performance should be assigned as follows</p>	points	section points
1. Gives correct answers: A: Airway	1	1
2. Gives correct answer: A: Airway and E: Everclear Gives correct explanation such as: A horizontal line that intersects the same two points indicates the same monthly minutes. Points A and E are two points that lie on a horizontal line	1 1	 2
3. Gives correct answers: B: Broadrange Gives correct explanation such as: The best buy may be found using the line drawn through the origin and the point. The line with the greatest slope indicates the best rate of monthly minutes to cost. The point B line through the origin has the greatest slope.	1 1	 2
4. Gives a correct equation such as: Let c: cost per month and p: potential customers, so $p = -5/16 \cdot c + 25$ <i>Partial Credit:</i> Correct slope $-5/16 = \Delta p / \Delta c$	 2 (1)	 2
5. Gives a correct equation such as: Revenue = $c(-5/16 c + 25)$ or Revenue = $-5/16 c^2 + 25c$	 2	 2
6. Gives correct answers: \$500	1	1
7. Gives correct answers: \$40 per month Shows a correct method such as: Graphing the parabola determined by Revenue = $-5/16 c^2 + 25c$ and determining the vertex point (40, \$500)	1 1	 2
Total Points		12

The Phone Plan

Performance Assessment Task

You want to purchase a cell phone. There are five phone companies and each has a different plan that comes with the phone. The plans include monthly minutes and price. A consumer magazine has a graph that shows how the plans compare to one another.



- Which is the least expensive plan? Airway (A)
- Do any two plans provide the same amount of monthly minutes? Explain your answer. Plan Airway (A) and Plan Everclear (E) provide the same amount of minutes because they are on the same horizontal line. In other words, their y value on the scale is equal.
- Which plan is the best buy - providing you more minutes for a smaller price? Explain how you determined your answer. Plan Broadrange (B) is the best buy. This is determined by the fact that point b. has the steepest slope. In such a scenario, the steeper slope has a higher y value and lower x value. The plan therefore provides the most minutes at the lowest cost.

The Phone Plan

Performance Assessment Task

Dialdirect wants to determine how best to price their monthly plan to maximize their revenue. They conduct three surveys of potential customers. Below are data from the surveys.

Surveys	Price Per Month x	Potential Customers Willing To Buy Plan y (in thousands)
Survey 1	\$48.00	10
Survey 2	\$16.00	20
Survey 3	\$32.00	15

4. Write an equation that shows the relationship between the price per month and potential customers willing to buy the plan.

$q = mp + b$ slope = $-\frac{5}{16}$ $Q = -\frac{5}{16}p + 25$
 $10 = -\frac{5}{16}(48) + b$ $10 = -15 + b$ $25 = b$

5. Write a revenue equation in terms of the monthly price and demand for customers.

$R = pq$ $R = (-\frac{5}{16}p + 25)(p)$
 $R = -\frac{5}{16}p^2 + 25p$

6. What is the maximum revenue that can be earned? \$500.00 maximize

7. To obtain the maximum revenue, how much should Dialdirect charge? Show how you figured it out.

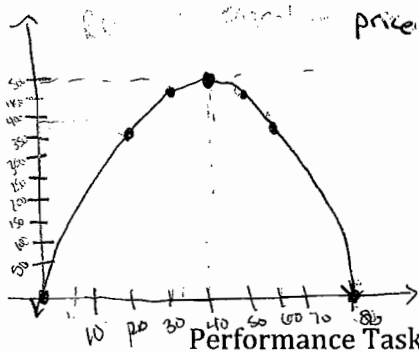
Dialdirect should charge \$40.

$y = \frac{-b}{2a}$

$y = \frac{-25}{2(-\frac{5}{16})}$

$y = \$40$

The price that maximizes the revenue can be determined by finding the vertex of the parabola of the revenue equation. The x value of the vertex can be found by using $(\frac{-b}{2a})$. This produces a result of 40.



x	y
0	0
16	20
32	40
40	50
48	40
80	0

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