

Choosing a Cell Phone Plan–Verizon

Investigating Linear Equations



When am I ever going to use this? ”
Using the concepts in this worksheet, you will be able to determine which cell phone plan is the best value.

In 2008, Verizon offered the following cell phone plans to consumers. (Source: www.verizon.com)

| Verizon: Nationwide Basic | | |
|---------------------------|-------------|--------------------------|
| Monthly Anytime Minutes | Monthly Fee | Charge for Extra Minutes |
| 450 minutes | \$39.99 | \$0.45 per minute |
| 900 minutes | \$59.99 | \$0.40 per minute |
| 1350 minutes | \$79.99 | \$0.30 per minute |

1. If a customer expects to use 500 minutes per month, which plan is the best value?
2. A cell phone plan consists of a fixed cost (the monthly fee) and a variable cost (charge for extra minutes). Find a linear function that gives the total cost of each plan when x extra minutes are used.
3. Using the cost functions from (2) above, determine the cost of using 600 total minutes and 1000 total minutes with each plan. Then determine which plan is the best deal for each level.

4. The number of minutes a person uses each month often varies. Suppose that a Verizon customer uses the total number of minutes shown below.

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 423 | 441 | 404 | 387 | 417 | 628 | 448 | 402 | 356 | 402 | 436 | 639 |

Which plan would cost the consumer the least amount money over the year?

5. At what number of extra minutes does the annual cost of the 900 Plan become less expensive than the 450 Plan?

6. Which plan would you recommend to a consumer who expects to use between 400 and 600 minutes each month? Explain your reasoning.

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1. If a customer expects to use 500 minutes per month, which plan is the best value?

$$450 \text{ Plan: } \$39.99 + (50 \text{ extra minutes})(\$0.45 \text{ per minute}) = \$62.49$$

$$900 \text{ Plan: } \$59.99$$

For this customer, the 900 minute plan costs less than the 450 minute plan.

2. A cell phone plan consists of a fixed cost (the monthly fee) and a variable cost (charge for extra minutes). Find a linear function that gives the total cost of each plan when x extra minutes are used.

$$\text{Total Cost} = \text{Fixed Cost} + \text{Variable Cost}$$

$$= \text{Monthly Fee} + (\text{Cost per Extra Minute})(\text{Extra Minute})$$

$$= \text{Monthly Fee} + (\text{Cost per Extra Minute})(x)$$

$$450 \text{ Plan: } C = 39.99 + 0.45x$$

$$900 \text{ Plan: } C = 59.99 + 0.40x$$

$$1350 \text{ Plan: } C = 79.99 + 0.30x$$

3. Using the cost functions from (2) above, determine the cost of using 600 total minutes and 1000 total minutes with each plan. Then determine which plan is the best deal for each level.

For the 450 Plan, 600 minutes requires 150 minutes more than the included minutes and 1000 minutes requires 550 minutes more than the included minutes. For the 900 Plan, 0 and 100 extra minutes are needed, respectively. For the 1350 Plan, no extra minutes are needed.

| Plan | 600 minutes | 1000 minutes |
|------|------------------------------------|------------------------------------|
| 450 | $C = 39.99 + 0.45(150) = \107.49 | $C = 39.99 + 0.45(550) = \287.49 |
| 900 | $C = 59.99 + 0.40(0) = \$59.99$ * | $C = 59.99 + 0.40(100) = \99.99 |
| 1350 | $C = 79.99 + 0.30(0) = \$79.99$ | $C = 39.99 + 0.30(0) = \$79.99$ * |

4. The number of minutes a person uses each month often varies. Suppose that a Verizon customer uses the total number of minutes shown below.

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 423 | 441 | 404 | 387 | 417 | 628 | 448 | 402 | 356 | 402 | 436 | 639 |

Which plan would cost the consumer the least amount money over the year?

This consumer used less than 450 minutes a month every month except June and December. In June, they used 178 extra minutes and in December they used 189 extra minutes. In total, they used 367 extra minutes throughout the year. The basic fee for the 450 Plan is \$39.99 per month so their annual cost is

$$\begin{aligned}
 \text{Annual Cost} &= (\text{Monthly fee})(\text{months}) + (\text{cost per minute})(\text{extra minutes}) \\
 &= (39.99)(12) + (0.45)(367) \\
 &= 479.88 + 165.15 \\
 &= 645.03
 \end{aligned}$$

The annual cost for the 450 Plan is \$645.03.

The 900 Plan costs \$59.99 per month for all 12 months for a total cost of \$719.88. Even though the consumer had to pay extra during June and December, the 450 Plan was still less expensive than the 900 Plan.

5. At what number of extra minutes does the annual cost of the 900 Plan become less expensive than the 450 Plan?

The annual cost of the 450 Plan if no extra minutes are used is $(39.99)(12) = \$479.88$. Extra minutes are \$0.45 each. The annual cost of the 900 Plan if no extra minutes are used is $(59.99)(12) = \$719.88$. We need to solve the following equation.

$$\begin{aligned}
 \text{450 Plan Cost} &= \text{Lowest Cost for 900 Plan} \\
 479.88 + 0.45x &= 719.88 \\
 0.45x &= 240 \\
 x &\approx 533
 \end{aligned}$$

As long as the total number of extra minutes per year remains at 533 minutes or below, the 450 Plan is the least expensive of the two plans.

6. Which plan would you recommend to a consumer who expects to use between 400 and 600 minutes each month? Explain your reasoning.

If the consumer uses 450 minutes or less each month, the 450 Plan is clearly the better plan. In (5) above, we saw that after 533 extra minutes annually (average of 44 minutes monthly), the 900 Plan becomes the better value. In other words, if the consumer consistently uses more than 494 minutes monthly, the 900 Plan is the better deal. If the consumer is on the 450 Plan and talks 600 minutes each month, their annual cost is \$1289.88! In contrast, the 900 Plan annual cost is \$719.88. We choose to play it safe and pick the 900 Plan.

| | | | | | | |
|------------------------|---|-------------------------------|--|---|---------------------|-------|
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| | | Number and Operations | | X | Problem Solving | |
| | X | Algebra | | X | Reasoning and Proof | |
| | | Geometry | | X | Communication | |
| | | Measurement | | | Connections | |
| | X | Data Analysis and Probability | | | Representations | |
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