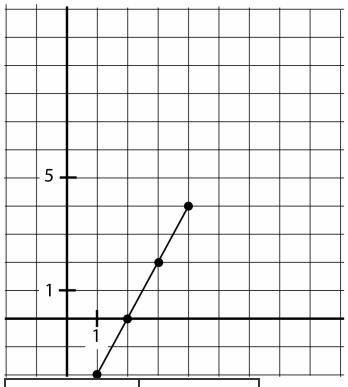
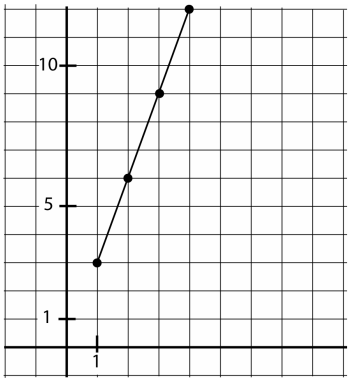
Understanding slope Solutions NAME:

This worksheet will work on some preliminary information we need to understand linear functions.
For each table below, use the graph paper directly below to plot the points.

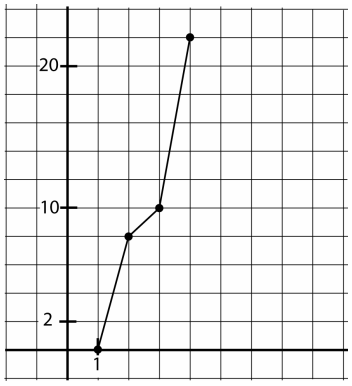
| *x* | *y* |
|---|---|
| 1 | -2 |
| 2 | 0 |
| 3 | 2 |
| 4 | 4 |



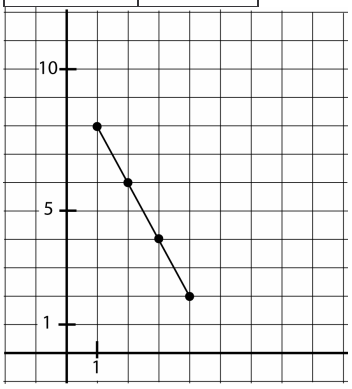

| *x* | *y* |
|---|---|
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |
| 4 | 12 |




| *x* | *y* |
|---|---|
| 1 | 0 |
| 2 | 8 |
| 3 | 10 |
| 4 | 22 |




| *x* | *y* |
|---|---|
| 1 | 8 |
| 2 | 6 |
| 3 | 4 |
| 4 | 2 |




Which ones form a straight line? What about the numbers in the table could help you determine if the graph will be a straight line? In other words, what was true of the points that formed a straight line that was not true about the points that did not form a straight line?

*The lower left graph is the only one that is not a straight line. The others had constant differences in the y values. This constant difference is what makes the graph a straight line. We'll look more at this idea on the next page.*

We see that points whose *y* values increase each time by a constant value (as *x* increases by 1) will form a straight line. This is the whole idea of slope. For every increase of one unit in *x*, there is some constant increase in *y*. Let's investigate these relationships more. For each table, complete the third row by figuring how much you add or subtract to get from one *y* value to the next. The first table is done for you.

| ***x*** | ***y*** | ***Difference in y value from last*** |
|---|---|---|
| 1 | -2 | -- |
| 2 | 0 | +2 |
| 3 | 2 | +2 |
| 4 | 4 | +2 |

*To get from -2 to 0, you add 2.*
*To get from 0 to 2, you add 2.*
*To get from 2 to 4, you add 2.*

*If we were to subtract going from one value to the next, we would write the difference as negative.*

| ***x*** | ***y*** | ***Difference in y value from last*** |
|---|---|---|
| 1 | 3 | -- |
| 2 | 6 | *+3* |
| 3 | 9 | *+3* |
| 4 | 12 | *+3* |

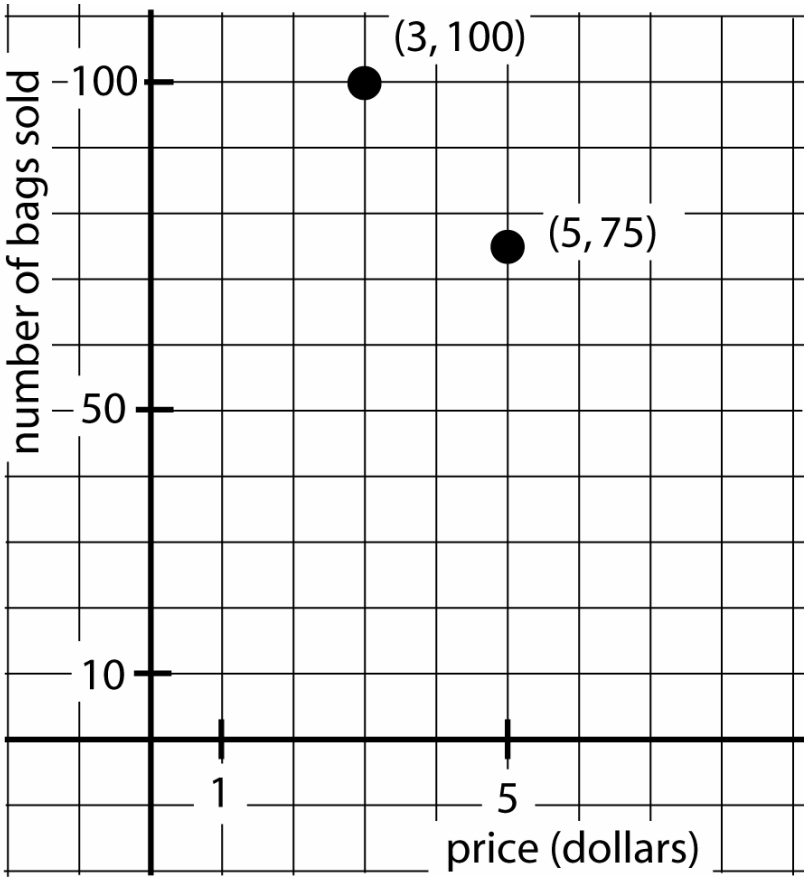
| ***x*** | ***y*** | ***Difference in y value from last*** |
|---|---|---|
| 1 | 0 | -- |
| 2 | 8 | *+8* |
| 3 | 10 | *+2* |
| 4 | 22 | *+12* |

*This one did not graph as a straight line. Notice how the y values do not maintain a constant difference for each increase of one unit in the x values. Consequently, its graph will not be a straight line.*

| ***x*** | ***y*** | ***Difference in y value from last*** |
|---|---|---|
| 1 | 8 | -- |
| 2 | 6 | *-2* |
| 3 | 4 | *-2* |
| 4 | 2 | *-2* |

Again, notice how the points that formed straight lines had consistently increasing *y* values. This is not the case with the third relationship, which is not a straight line.

Michael is selling bags of apples. If he sells the bags at $3 each, he can sell 100 bags. If he raises his price to $5 per bag, he will only sell 75 bags. Write this related information in ordered pair form (price, number of bags sold) and then plot the two points on the graph below.




Now find the slope between these two points. (Be careful to take note of the scale of the graph.) What meaning can we give to the slope? In other words, for every one dollar increase in price, how many less bags should he expect to sell?

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{100 - 75}{3 - 5} = \frac{25}{-2} = -12.5$$

*We can think of this as* $-12.5/1$ *. This helps us see that the slope, which is the ratio of change in the y values (number of bags sold) to the change in the x values (price), tells us that for every one dollar increase in price, he can expect to sell 12.5 less bags of apples.*