Graphing is an important skill in mathematics. It gives us the ability to visualize the numerical concepts we are discussing and to develop pictures which makes the concepts easier to comprehend. The primary format of graphing used in algebra is called the Cartesian graphing system. It consists of two axes, which divides the graph into four regions called quadrants:

![Graph of the Cartesian Plane](image)

Often we will need to graph objects which only have values that are positive or zero. In this case we only need to graph the first quadrant.

![Graph of the First Quadrant](image)

The purpose for pointing this out is to build the understanding that whether we use all four quadrants or just one (or maybe two) quadrant(s), all of the techniques are the same.

When graphing, one valuable tool is the t-chart. The t-chart is a simple method to list points directly below the variable in a t format. For example, if you are going to use straight line depreciation (linear depreciation) for a new wheat combine just purchased for a farm, you would have a point with time = 0
and value = $350,000. Given a life span of about 8 years and an estimated salvage value of $30,000, your second point would be time = 8 and value = $30,000. Thus a \( t \)-chart would look like

\[
\begin{array}{c|c}
  t & v \\
  0 & $350,000 \\
  8 & $30,000 \\
\end{array}
\]

With the \( t \)-chart, we can graph the two points and connect them with a line since we are using straight line depreciation giving the following graph:

![Graph showing straight line depreciation](image)

Finally we can create a numerical equation to represent the graph. The vertical intercept is fairly easy to find since we have the point \((0, \$350,000)\). Next we need to find the slope:

\[
m = \frac{30,000 - 350,000}{8 - 0} = -\frac{320,000}{8} = -40,000
\]

Thus we have the following linear equation:

\[v = -40,000t + 350,000\]

Often in business, this equation will be written as

\[v = 350,000 - 40,000t\]

Hopefully, this can still be recognized as a line, even though it is no longer written in the typical mathematical slope intercept form.

In this case, the slope represents rate of change and furthermore, it gives the value that can be depreciated each year using the straight line depreciation methods of $40,000.

To complete the discussion of the problem, please notice that we have only graphed the years \([0, 8]\). This is the domain implied by the problem. Since the combine was not owned prior to year zero, it would be meaningless to graph any negative time. Once the combine reaches salvage value there is no additional depreciation on the combine. Thus, this provides an upper bound to the problem.
Another example of a problem used in business which relates to lines is used in manufacturing. Consider manufacturing chairs \((C)\) and tables \((T)\). In the first week, you manufacture only 80 chairs and in the same amount of time in the second week, you manufacture only 60 tables. Let chairs be represented on the horizontal axis and tables be represented on the vertical axis. Fill in the t-chart and graph the points.

Since manufacturing of chairs and tables must be greater than or equal to zero, it will only be necessary to graph the first quadrant. (Note in filling in the t-chart, realize that we are comparing the number of chairs manufactured in a week to the number of tables manufactured in a week. Hence, you should be able to find two points in this paragraph. If you need assistance, ask your instructor.)

Write the equation of the line based on this problem.

\[ \text{Rewrite the equation of the line in what is called standard form: } Ax + By = C. \text{ Make sure all coefficients are integers.} \]

If your work has been completed correctly, your last equation should be \(3C + 4T = 240\). This answer is very interesting as the coefficients represent time as follows:

- The 3 as a coefficient for chairs represents that it takes 3 hours to produce one chair.
- The 4 as a coefficient for tables represents that it takes 4 hours to produce one table
- The resulting answer of 240 gives the total number of man-hours spent in a week.
Using the equation we just created; consider that it is also desirable to create four chairs for every table. We would then have a second equation:

\[ C = 4T \]

Use the two equations to determine the number of 5 piece table and chair sets that this manufacturing firm can create each week. (Note: This equation seems backwards, why is it not?)

For the following problems, create the t-chart, graph (in the first quadrant only), determine the equation which represents straight line depreciation and state the amount that can be written off each year to depreciation.

1) A florist company purchases a $20,000 van to make deliveries. It has a life expectancy of 7 years and a salvage value of $1200.
2) A company purchases a $1200 computer. It has a life expectancy of 4 years and a salvage value $15.
3) A construction company purchases a crane for $800,000. It has a life expectancy of 15 years and a salvage value of $25,000.

For the following problems:

- Use the first sentence to create the t-chart, graph (in the first quadrant only), determine the equation which represents the relationship between tables and chairs.
- Use the second sentence to create a second equation relating table and chairs
- Use both equations to determine the number of table and chairs the furniture company should manufacture.

4) The company can create 70 tables in a week or 200 chairs in a week. They desire to make 4 chairs for every table.
5) The company can create 120 tables in a week or 400 chairs in a week. They desire to make 6 chairs for every table.
6) The company can create 200 tables in a week or 600 chairs in a week. They desire to make 6 chairs for every table.
7) The company can create 1000 tables in a week or 2000 chairs. They desire to make 8 chairs for every table.