8 TABLE DESIGN

Once you've determined that a table should be used to communicate your message and have chosen the type of table that will work best, you should refine your design so that it can be quickly and accurately read and understood.

We use tables regularly to communicate lists of quantitative information. They've been around since the 2nd century common era (CE) and have become commonplace since the advent of spreadsheet software in the 1970s. When used properly and designed well, they're fantastic, but they often fall far short of their potential. Fortunately, the design practices required to optimize their effectiveness are simple and easy to learn.

Structural Components of Tables

The components that we combine to construct tables and graphs fall into two categories:

- Information components
- Support components

Each component, whether its role is to express information directly or to play a supporting role by arranging or highlighting information, must be thoughtfully designed to do its job effectively. When these components are designed well, the result is clear, accurate, and efficient communication.

Data Components

Tables encode information as text (i.e., words and numbers). They include both categorical items and quantitative values. Tables generally work best when they also contain additional text that is used to complement categorical items and quantitative values in various ways. In Chapter 7, *General Design for Graphical Communication*, we noted that additional text can do the following:

- Label
- Introduce
- Explain
- Reinforce
- Highlight
- Sequence
- Recommend
- Inquire

Apart from these complementary roles, the most common uses of text in tables are as titles and headers. Headers are used to label columns of data (column headers) and rows of data (row or group headers).

In total, then, tables actually consist of three types of information:

- Categorical labels
- Quantitative values
- Complementary text

Support Components

Support components are the non-data ink objects that highlight or organize the data. The following visual objects and attributes can function as support components:

- White space and page breaks
- Rules and grids
- Fill color

WHITE SPACE AND PAGE BREAKS

The defining structural characteristic of tables is the arrangement of information into columns and rows. The primary visual means that we can use to impose this structure is *white space*.

White space is used to group data objects that belong together by separating them from others. It is the visual mechanism that underlies the Gestalt principle of proximity. White space is not the most visually powerful means of grouping objects (e.g., the Gestalt principle of enclosure is more powerful), but its subtlety and lack of ink make it especially useful. Properly used, white space clearly organizes data objects into groups without drawing attention to itself. Any design method that works effectively without drawing attention away from the information is invaluable.

Technically, the term "white space" is a bit of a misnomer in that the space it defines is only white if the color of the background is white. The alternate term "blank space" is technically more accurate, but we'll stick with the conventional term to keep things simple.

Page breaks are a logical extension of white space. They can be used to group data by starting each new group on a separate page or screen. Once again, the underlying principle is proximity. Page breaks should not be used to unnecessarily separate information that ought to be seen together, however. For example, a page break would not be useful to separate groups of information that are meant to be compared.

RULES AND GRIDS

Rules and grids are variations on the same theme. Both use lines to delineate or highlight data. Grids are combinations of horizontal and vertical lines that intersect to form a matrix of rectangles around data. Rules are lines that run either only horizontally or only vertically and therefore don't intersect. Grids work on the Gestalt principle of enclosure, and rules work primarily on the principle of connection even though they do not actually touch the data that they tie together.

FILL COLOR

2-D areas containing information in a table can be filled with different color intensities, such as shades of gray, or different hues to group areas of the table together or highlight them as important. Both use the Gestalt principles of similarity and enclosure to define an area within a table (e.g., one or more columns and/or rows) and make the area stand out.

The surface on which all data and support components reside is the background. It provides a clear surface that allows information, as well as the support components that arrange and highlight the information, to stand out for easy and efficient reading.

Visual Attributes of Components

All components of tables (data and support) exhibit visual attributes. Design involves not only choosing the components that are used to construct the table and display the information, but also determining the visual attributes of each. Throughout the rest of this chapter, we'll explore the best choices for specific situations.

Table Terminology

It is helpful, when discussing table design, to begin with a standard set of terms for the parts of a table. *Figure 8.1* shows the terms that we'll use throughout this chapter. Let's clarify terms that might be new or ambiguous. In the context of tables that contain quantitative information, the term *body* generally refers exclusively to the rectangular area that contains the quantitative values. Only the area that is shaded in light gray constitutes the body of the sample table in *Figure 8.1*. Defining body in this manner highlights the centrality of the quantitative information, reinforcing the fact that the primary message is in the numbers.

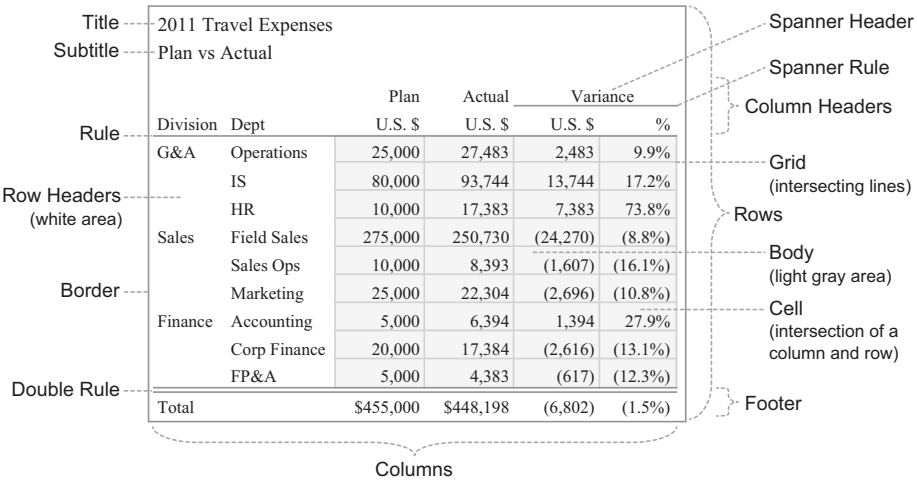

FIGURE 8.1 This diagram labels the parts of a table.

This figure is meant to label a table's components, not to illustrate best practices.

Rows that summarize information from preceding rows are called *footers*. These can be used to summarize the entire table, as in the diagram above, or to summarize a subset of rows, in which case they are called *group footers*. The two left-most columns in the table above contain categorical items. When categorical items appear as labels to the left of the quantitative values associated with them—a common arrangement—they serve as labels for the rows and are therefore called *row headers*. When labels appear above the column of data associated with them, they are *column headers*. When a column header spans multiple columns, it is called a *spanner header*. When a rule is used to underscore a spanner header and does so by spanning each of the columns to which the header applies, it is called a *spanner rule*.

Table Design Best Practices

In this section we'll dig into the details of table design. We'll cover several topics, grouped into five categories:

- Delineating columns and rows
  - White space
  - Rules and grids
  - Fill color
- Arranging data
  - Columns or rows
  - Groups and breaks
  - Column sequence
  - Data sequence
- Formatting text
  - Orientation
  - Alignment
  - Number and date format
  - Number and date precision
  - Fonts
  - Emphasis and color
- Summarizing values
  - Column and row summaries
  - Group summary values
  - Headers versus footers
- Page information
  - Repeating column headers
  - Repeating row headers

Delineating Columns and Rows

The table design process involves several decisions regarding the layout of columns and rows to provide a structure that is easy and efficient to read and understand. Readers should be able to quickly scan through the content to find what they need and perhaps make localized comparisons of related numbers.

WHITE SPACE

White space is the preferred means for arranging data into columns and rows. The subtle use of blank space to group data into columns and rows is the least visible means available. It does its job without calling attention to itself.

The ability of white space to effectively delineate columns and rows is only limited when the overall space available for the table is so restricted that white space alone can't keep the columns or rows sufficiently distinct. If two rows of data are too close together, our eyes are not able to easily track across one without confusing it with the other. The same is true, but to a lesser extent, with columns.

As rows grow wider across, you need more white space between them to enable your readers' eyes to track across them without difficulty. When faced with wide rows, you have two potential means to address them using white space alone: 1) Decrease the horizontal white space between the columns to clarify the continuity of the rows, or 2) increase the vertical white space between the rows. Obviously, you can only decrease the horizontal white space between the columns so much before you reach the point where the columns are no longer clearly distinct. You can then add more white space between the rows, but too much can result in too little data on the page or screen. To preserve data density, you sometimes need to add a visual component other than white space (e.g., rules) to separate the rows. The balance between white space and overall data density is upset when the vertical white space between the rows exceeds the vertical space used by the rows of data themselves. Let me illustrate. When I created *Figure 8.2* using Excel, I selected a 10-point font (i.e., one that is 10 points high) and a row height of 12 points, resulting in 2 points of vertical white space between the rows (i.e., 20% of the height of the data). Given a full 12 months of data spread horizontally across the page, it is somewhat difficult to track across the rows with this spacing.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	83,626	91,499	92,476	92,716	92,519	98,503
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	77,773	85,094	86,002	86,226	86,043	91,608
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	80,106	87,647	88,582	88,813	88,624	94,356
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	74,498	81,511	82,382	82,596	82,420	87,751
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	76,733	83,957	84,853	85,074	84,893	90,384
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	79,035	86,475	87,399	87,626	87,440	93,095
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	81,406	89,070	90,021	90,255	90,063	95,888

FIGURE 8.2 This example shows rows of data without enough white space between them, which makes horizontal tracking difficult.

In the next example below, the same information is displayed with white space between the rows equal to the height of the rows.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	83,626	91,499	92,476	92,716	92,519	98,503
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	77,773	85,094	86,002	86,226	86,043	91,608
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	80,106	87,647	88,582	88,813	88,624	94,356
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	74,498	81,511	82,382	82,596	82,420	87,751
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	76,733	83,957	84,853	85,074	84,893	90,384
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	79,035	86,475	87,399	87,626	87,440	93,095
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	81,406	89,070	90,021	90,255	90,063	95,888

This is the practical limit: a one-to-one ratio of data height to white space height. Notice that your eyes track across these rows with little difficulty. In fact, even a little less white space between the rows would still work effectively.

FIGURE 8.3 This example shows rows of data with enough white space between them so that horizontal tracking is made easy.

In the next example, I've exceeded the practical limits of vertical white space, with white space that equals 150% of the height of the data. In this case you certainly don't have any difficulty tracking across the rows, but too much space is wasted, reducing data density to an unacceptable degree.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	83,626	91,499	92,476	92,716	92,519	98,503
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	77,773	85,094	86,002	86,226	86,043	91,608
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	80,106	87,647	88,582	88,813	88,624	94,356
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	74,498	81,511	82,382	82,596	82,420	87,751
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	76,733	83,957	84,853	85,074	84,893	90,384
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	79,035	86,475	87,399	87,626	87,440	93,095
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	81,406	89,070	90,021	90,255	90,063	95,888

FIGURE 8.4 This example shows rows of data with white space between them that exceeds the practical limit of a 1:1 ratio of text height to white space height.

White space can be intentionally manipulated to direct your readers' eyes to predominantly scan either across rows or down columns. If you wish to lead your readers to scan down columns, rather than across rows, make the white space between the columns greater than the white space between the rows. To direct readers to scan predominantly across rows, simply do the opposite.

If you don't have enough overall space on the page or screen to use white space alone to delineate the rows or columns, it's time to move on to another method.

RULES AND GRIDS

Rules and grids can be used to 1) delineate columns and rows, 2) group sections of data, and 3) highlight sections of data. Of these, the delineation of columns and rows is the least effective use of rules and grids though this use is unfortunately quite common. The problem with rules and grids is that they excessively fragment the data and introduce clutter. As you scan across rows or down columns of data that are broken up by lines, the lines distract your eyes, promoting a strong perception of individual cells through the Gestalt principle of enclosure rather than a seamless flow of information. Examples make this argument better than words. The following examples start with strong grids and gradually decrease the use of grids and rules to a minimum. Judge for yourself which table is easiest to read.

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	83,733	75,520	79,137	85,377	83,627	74,826
Total	447,913	403,976	423,323	456,705	447,346	400,264

FIGURE 8.5 This table uses a thick grid to delineate columns and rows and to enclose the entire table.

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	86,245	77,785	81,511	87,938	86,136	77,071
Total	450,425	406,241	425,697	459,266	449,854	402,508

FIGURE 8.6 In contrast to the table in *Figure 8.5*, thin horizontal rules now delineate rows in the body of the table.

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	83,733	75,520	79,137	85,377	83,627	74,826
Total	447,913	403,976	423,323	456,705	447,346	400,264

FIGURE 8.7 In contrast to the table in *Figure 8.6*, all vertical rules have now been thinned.

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	86,245	77,785	81,511	87,938	86,136	77,071
Total	450,425	406,241	425,697	459,266	449,854	402,508

FIGURE 8.8 In contrast to the table in *Figures 8.7*, all of the rules have now been lightened.

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	83,733	75,520	79,137	85,377	83,627	74,826
Total	447,913	403,976	423,323	456,705	447,346	400,264

FIGURE 8.9 In contrast to the table in *Figures 8.8*, all vertical rules have now been removed, along with the border around the entire table.

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	83,733	75,520	79,137	85,377	83,627	74,826
Total	447,913	403,976	423,323	456,705	447,346	400,264

FIGURE 8.10 In contrast to the table in *Figure 8.9*, only the rule beneath the headers and the rule above the footer row of totals now remain, and even these have been further thinned and lightened.

I think you will agree that the last of these tables is the easiest to read. It has entirely abandoned the use of grids to delineate rows and columns, and rules have only been used to separate the headers and footers from the body of the table. Nothing more is needed. Anything more would reduce the table's effectiveness.

Even using rules to form a boundary around the entire table is a waste of ink except when you must place other objects (such as additional tables, graphs, or text) on the page or screen close to the table, When you can't surround the table with sufficient white space, a light boundary around the table may be useful to separate it from the objects around it, enabling the reader to focus on it without distraction from surrounding content.

Despite the uselessness of grids and the limited usefulness of rules to delineate columns and rows in tables, grids and rules are sometimes useful for grouping or highlighting sections of data. Consider the following example, in which a column of totals has been included at the right, and additional white space has been used to group the totals as distinct from the other columns.

Product	Jan	Feb	Mar	Apr	May	Jun	Total
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	541,305
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	503,414
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	518,516
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	534,072
Product 05	83,733	75,520	79,137	85,377	83,627	74,826	482,220
Total	447,913	403,976	423,323	456,705	447,346	400,264	2,579,526

FIGURE 8.11 This example uses white space to make one column, in this case the column of totals at the right, stand out as different from the other columns.

Although using extra white space to highlight the Total column is effective, you could also use a light rule to set this column apart if space is limited:

Product	Jan	Feb	Mar	Apr	May	Jun	Total
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	541,305
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	503,414
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	518,516
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	534,072
Product 05	83,733	75,520	79,137	85,377	83,627	74,826	482,220
Total	447,913	403,976	423,323	456,705	447,346	400,264	2,579,526

FIGURE 8.12 This example uses a vertical rule to distinguish one column from the others, in this case the column of totals at the right.

Rather than the vertical rule above, we could have used four rules to form a border around the entire Total column. This would work, but it is a good practice to use the minimum ink necessary to do the job. In the following example, the objective is to highlight the March column as particularly important, which cannot be done with vertical rules alone, so the combination of vertical and horizontal rules has been used to form a border around it.

Product	Jan	Feb	Mar	Apr	May	Jun	Total
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	541,305
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	503,414
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	518,516
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	534,072
Product 05	83,733	75,520	79,137	85,377	83,627	74,826	482,220
Total	447,913	403,976	423,323	456,705	447,346	400,264	2,579,526

FIGURE 8.13 This example uses a border to highlight a particular set of data.

When you use rules, be sure to subdue them visually in relation to the data by keeping the lines thin and light. I've found that shades of gray often work best and can be relied on to remain subtle in comparison to data rendered in black, even when the table is photocopied in black and white. However, if a section of the table needs to shout, then thicker, darker lines would be appropriate.

FILL COLOR

When white space alone can't be used effectively to delineate columns and rows in tables, fill colors usually work better than grids and rules. When subtly designed, fill colors are less distracting to the eye as it scans across them. They are limited, however, to one direction; they can delineate columns or rows but not both simultaneously. Here's an example of how a light shade of gray on alternating rows aids the eye in scanning across long rows of data.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	83,626	91,499	92,476	92,716	92,519	98,503
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	77,773	85,094	86,002	86,226	86,043	91,608
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	80,106	87,647	88,582	88,813	88,624	94,356
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	74,498	81,511	82,382	82,596	82,420	87,751
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	76,733	83,957	84,853	85,074	84,893	90,384
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	79,035	86,475	87,399	87,626	87,440	93,095
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	81,406	89,070	90,021	90,255	90,063	95,888

FIGURE 8.14 This example uses a light gray fill color to assist horizontal scanning.

Using fill color behind every other row or every few rows in this manner to assist the eyes in scanning across rows is sometimes called *zebra striping*. As you can see, it doesn't take much. This shade of gray is very light yet visible enough to assist our eyes in scanning across a single row without confusing it with the rows above or below. The shading is light enough that vertical scanning down a column is not significantly disrupted. Notice in the next example that when background fill colors are too dark, they suffer from three problems: 1) the text is harder to read because of insufficient contrast between the background color and the text; 2) it looks like every other row has been highlighted, which is not intended; and 3) scanning down a column of numbers is complicated by the alternating light and dark background colors.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	83,626	91,499	92,476	92,716	92,519	98,503
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	77,773	85,094	86,002	86,226	86,043	91,608
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	80,106	87,647	88,582	88,813	88,624	94,356
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	74,498	81,511	82,382	82,596	82,420	87,751
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	76,733	83,957	84,853	85,074	84,893	90,384
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	79,035	86,475	87,399	87,626	87,440	93,095
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	81,406	89,070	90,021	90,255	90,063	95,888

FIGURE 8.15 The background fill colors in this example are too dark.

Fill colors can also be used to group and highlight sections of data. In the example below, the intention is to simply delineate the headers and footers as distinct from the rest, not to highlight them as more important:

Product	Jan	Feb	Mar	Apr	May	Jun	Total
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	541,305
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	503,414
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	518,516
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	534,072
Product 05	83,733	75,520	79,137	85,377	83,627	74,826	482,220
Total	447,913	403,976	423,323	456,705	447,346	400,264	2,579,526

FIGURE 8.16 This example uses a fill color to group particular data.

Because I didn't want to suggest that the names of the months or the totals are more important than the other data, I've used a light fill color.

In the example below, fill color has been used to highlight two cells of data:

Product	Jan	Feb	Mar	Apr	May	Jun	Total
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	541,305
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	503,414
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	518,516
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	534,072
Product 05	83,733	75,520	79,137	85,377	83,627	74,826	482,220
Total	447,913	403,976	423,323	456,705	447,346	400,264	2,579,526

FIGURE 8.17 This example uses fill color in the background to highlight particular data.

When your purpose is to highlight, the fill color should be more noticeable. Don't go overboard, though, unless you want your readers to ignore everything else.

Arranging Data

Our focus in this section is on how we can best arrange information in a table to tell its story. Should the categorical items be displayed vertically in a column or horizontally across a row? Should information be separated into subgroups with breaks in between? Should the information be sorted in a particular order?

COLUMNS OR ROWS

Categorical items can be freely arranged across columns and down rows. Some arrangements work better than others, however. When you begin to construct a table, you have already identified one or more categories that are required to communicate your message. You must now arrange the sets of categorical items across the columns or down the rows to best tell the story. How do you determine what goes where? What questions should you ask yourself about the information to make that determination? Take a minute right now to put yourself in this position, using a real or hypothetical data set. Focus on what you need to know about each category to decide whether its items should be arranged across the columns or down the rows.

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Here are the questions that I ask myself about each category:

- How many items does it contain?
- What is the maximum number of characters in any one of its items?
- Will the items display a time-series relationship or a ranking relationship?

If the answer to the question "How many items does it contain?" is "only a few," then you have the option of arranging them in a row in separate columns. If there are more than a few, you have no choice but to arrange them in a single column because of the limited width of a standard page or screen. For instance, because there are only four sales regions in the following table, they can be arranged along a row, one per column.

	Regions			
Product	North	East	South	West
Product 01	94	152	174	87
Product 02	122	198	226	113
Product 03	101	164	188	94
Product 04	142	230	263	131
Product 05	132	214	244	122
Product 06	174	282	323	161
Product 07	401	648	742	371
Product 08	281	454	519	260
Product 09	112	182	208	104
Product 10	584	944	1,081	540
Product 11	543	878	1,005	502
Product 12	163	263	301	151
Product 13	489	790	904	452
Product 14	327	529	606	303
Product 15	295	476	545	273
Total	3,960	6,403	7,330	3,665

FIGURE 8.18 This is an example of arranging categorical items, in this case sales regions, as separate columns.

If you had 15 sales regions in addition to 15 products, however, you probably wouldn't have enough space to display either in separate columns, so you might need to display both sets of categorical items down the rows with one column for products and another for regions, perhaps as follows:

Region	Product	Units Sold
Region 01	Product 01	152
	Product 02	198
	Product 03	164
	Product 04	230
	Product 05	214
	Product 06	282
	Product 07	648
	Product 08	454
	Product 09	182
	Product 10	944
	Product 11	878
	Product 12	263
	Product 13	790
	Product 14	529
	Product 15	476
Region 02	Product 01	443
	Product 02	133
	Product 03	399

FIGURE 8.19 This is an example of arranging all items in a particular category in a single column, because each set has too many items to arrange across multiple columns.

If you compare the last two examples, you might notice that by arranging both sets of categorical items side by side down the rows (*Figure 8.19*) rather than with one set down the rows and the other across the columns (*Figure 8.18*), you are forced to give up something that could be seen more readily in the bidirectional arrangement of the data. Can you see it? With the unidirectional arrangement of the data in *Figure 8.19*, you can easily compare the sales of different products within a given region, but it is more difficult to compare the sales of a product in different regions because those values aren't close together. With the bidirectional arrangement in *Figure 8.18*, the sales for the various regions are close to one another, making comparisons easier. This is worth noting. Bidirectional tables arrange more of the quantitative values closer together than unidirectional tables, offering a distinct advantage when comparisons need to be made. For this reason, you should almost always arrange the categorical items bidirec-

tionally when you can fit one or more sets of categorical items across multiple columns.

The next question to consider is "What is the maximum number of characters in any one of the items?" If some of the items contain a large number of characters, this tells you that if you arrange them across the columns, the columns will have to be wide. Even if you have a small number of items, you may not have the horizontal space required to arrange them in wide columns. If you arrange the items down the rows in a single column, however, you only need one wide column, which saves considerable horizontal space.

Next, you should ask the question, "Will the categorical items display either a time-series or a ranking relationship?" Why does it matter? Some sequential relationships (both time and rankings have a proper sequence) are more easily understood when they are arranged in a particular way, either horizontally from left to right or vertically from top to bottom. If your table contains time-series data (years, quarters, months, etc.), what would usually work best, a left-to-right or top-to-bottom arrangement? It is more natural to think of time as moving from left to right, rather than down from top to bottom. For this reason, whenever space permits, time-series items should be arranged across the columns, as in the following example.

	2010				2011	
Region	Q1	Q2	Q3	Q4	Q1	Q2
North	393	473	539	639	439	538
East	326	393	447	530	364	447
South	401	483	550	652	448	549
West	538	647	737	874	601	736
Total	1,658	1,996	2,274	2,696	1,852	2,270

FIGURE 8.20 This example shows the preferred arrangement of time-series data across the columns from left to right.

A vertical arrangement would not work as well, illustrated below.

		Region				
Year	Qtr	North	East	South	West	Total
2010	1	393	326	401	538	1,658
	2	473	393	483	647	1,996
	3	539	447	550	737	2,273
	4	639	530	652	874	2,695
2011	1	439	364	448	601	1,852
	2	538	447	549	736	2,270

FIGURE 8.21 This example shows an awkward arrangement of time-series data.

When you display a ranking relationship, such as your top 10 products, it works best to arrange the items vertically, from top to bottom, as in the following example.

Rank	Product	Sales (U.S. $)
1	Product J	1,939,993
2	Product E	1,784,794
3	Product G	1,642,010
4	Product A	1,510,649
5	Product D	1,389,797
6	Product C	1,278,614
7	Product B	1,176,324
8	Product H	1,082,219
9	Product F	995,641
10	Product I	915,990

FIGURE 8.22 This example shows a vertical arrangement of ranked data.

Even if you had room to arrange the 10 products horizontally across the columns, you generally wouldn't want to because rankings look more natural when arranged from top to bottom.

GROUPS AND BREAKS

It is often appropriate, and perhaps even necessary, to break sets of data into smaller groups. Sometimes we do so to direct our readers to examine particular groups of data in isolation from the rest. Sometimes we do so because smaller chunks of data are easier to handle. Sometimes we are forced to break data into groups simply because we can't fit everything horizontally across the page or screen. Sometimes we create group breaks so we can display summary values for them, such as sums and averages.

Whenever you break the data into smaller chunks and arrange them vertically, do so logically, based on categories. For instance, you could start a new group of information for each year or one for each department in your organization. You might need to break the data into even smaller chunks, basing the groups on a combination of categories, such as country and sales region, as illustrated in the following example.

Country: USA Region: North

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	83,626	91,499	92,476	92,716	92,519	98,503
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	77,773	85,094	86,002	86,226	86,043	91,608
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	80,106	87,647	88,582	88,813	88,624	94,356
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	74,498	81,511	82,382	82,596	82,420	87,751
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	76,733	83,957	84,853	85,074	84,893	90,384
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	79,035	86,475	87,399	87,626	87,440	93,095
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	81,406	89,070	90,021	90,255	90,063	95,888
Total	$884,886	$798,085	$836,307	$902,255	$883,765	$790,751	$797,953	$873,070	$882,391	$884,688	$882,805	$939,903

Country: USA Region: East

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	84,759	92,738	93,728	93,972	93,772	99,837
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	78,826	86,246	87,167	87,394	87,208	92,848
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	81,191	88,834	89,782	90,016	89,824	95,634

FIGURE 8.23 This example shows a grouping of data based on a combination of categories, in this case country and region.

Notice that if you want to sum sales by region, it would be awkward to incorporate them into the table without breaking the data into regional groups with group footers. Notice also that the group headers (e.g., Country: USA, Region: North) interrupt vertical scanning of the information. This isn't a problem in this case because the interruption reinforces the fact that a new group has begun and causes readers to briefly focus on the header information.

Whatever your reason for breaking the data into groups, keep in mind the following design practices:

- Use vertical white space between the groups but only enough to make the break noticeable. Excessive white space does nothing but spread the data farther apart and reduce the amount of information on the page or screen, which is rarely useful.
- Repeat the column headers at the beginning of each new group. This will help your readers keep track of the content in each column.
- Don't vary the structure of the table from group to group. For instance, each group should contain the same columns, in the same order, with the same widths; otherwise, your readers will be forced to relearn the structure at the beginning of each new group.
- When you group data based on multiple categories (e.g., country and region), position the group headers on the same row, in order, from left to right, unless there isn't enough horizontal space to do so. This arrangement saves vertical space and clearly represents the hierarchical relationship between the categorical sets. *Figure 8.23*, on the previous page illustrates this arrangement.
- When you want your readers to examine each group of data in isolation from the rest, start each group on a new page.

These design practices are not arbitrary. Each of them is effective because it corresponds to the way that visual perception works.

COLUMN SEQUENCE

The primary considerations when you are determining the best order in which to arrange the columns of a table are the following:

- Each set of categorical items that is arranged down the rows of a single column should be placed to the left of the quantitative values that are associated with it.
- If there is a hierarchical relationship between categories (e.g., between product families and products), they should be sequenced from left to right to reflect that order.
- Quantitative values that are derived from another set of quantitative values using a calculation should generally be placed in a column just to the right of the column from which they were derived.

Let's look at an example of this last design practice before continuing the list.

Product	Units Sold	Actual Revenue	% of Total	Fcst Revenue	% of Fcst
Product A	938	187,600	47%	175,000	107%
Product B	1,093	114,765	28%	130,000	88%
Product C	3,882	62,112	15%	50,000	124%
Product D	873	36,666	9%	40,000	92%
Product E	72	2,088	1%	50,000	4%
Total	6,858	$403,231	100%	$445,000	91%

FIGURE 8.24 This example shows columns of quantitative values that are derived (i.e., calculated) from a source column and are therefore placed to the right of the source column.

In this example, even though the % of Total column is somewhat ambiguous because it doesn't clarify what the percentages are based on, most readers would still assume that it is the percentage of revenue for each product compared to the total revenue for all products. They would do so because this column is to the right of the Actual Revenue column. Even if its header were clearer (e.g., % of Total Actual Revenue), confusion would result if it were placed to the right of the Units Sold column or the Fcst Revenue column.

Now, back to our list of design practices.

- Columns containing sets of quantitative values that you want your readers to easily compare should be placed as close to one another as possible.

In the following example, last year's revenue has intentionally been placed next to this year's revenue to encourage comparisons between them.

Product	Units Sold	Last Year's Revenue	This Year's Revenue	Fcst Revenue	Planned Revenue
Product A	938	159,497	187,600	175,000	160,000
Product B	1,093	123,007	114,765	130,000	125,000
Product C	3,882	45,384	62,112	53,000	50,000
Product D	873	41,003	36,666	38,000	40,000
Product E	72	2,485	2,088	4,000	5,000
Total	6,858	$371,376	$403,231	$400,000	$380,000

FIGURE 8.25 This example places particular columns next to one another to encourage comparisons.

There is one more design practice that deserves a place on the list, but I want you to work on your own a little for this one. Imagine that you are designing a table that will display units sold for a set of five products (i.e., products A through E) and a set of four sales channels (i.e., Direct, Reseller, Distributor, and Original Equipment Manufacturer [OEM]). You will have three columns: one for units sold, one for products, and one for sales channels. If you want to help your readers easily compare sales through the various channels for each product, in what order would you place the columns?

To achieve this objective, you would place the sales channel column to the right of the product column. Here's an example of how it might look, with an additional column of percentages thrown in to enhance the comparisons.

Product	Channel	Units Sold	% of Total
Product A	Direct	8,384	26.5%
	Reseller	7,384	23.4%
	Distributor	10,838	34.3%
	OEM	4,993	15.8%
Product B	Direct	5,939	23.5%
	Reseller	7,366	29.1%
	Distributor	8,364	33.0%
	OEM	3,645	14.4%

FIGURE 8.26 This example arranges columns containing categories in a particular sequence to support comparisons that are important to the message.

Here's a statement of this design practice:

- To enable easy comparisons between individual items in a particular category, either arrange them across multiple columns if space allows, or in a single column to the right of the other columns of categorical data.

That's quite a mouthful, but I hope the example we worked through helps you make sense of it. In the example, because you wanted to help your readers make comparisons among sales through the various channels for individual products, the channel column had to go to the right of the product column. Placing the product column to the right of the channel column would not have served this purpose.

DATA SEQUENCE

The common term for sequencing data in a table is *sorting*. Numbers and dates both have a natural order that is meaningful. When you need to sequence numbers, their quantitative order, either ascending or descending, is the only useful way to sequence them. The same is true regarding the chronological order of dates and times. Other data, such as the names of things (e.g., products, customers, and countries) and other types of identifiers (e.g., purchase order numbers) have a conventional order based on alphabetical sequence, which is useful for look-up purposes but isn't meaningful otherwise. Alphabetical order is useful in tables for items that have no natural order, such as the names of your customers because this arrangement makes it easy for your readers to find any customers that they're looking for by scanning alphabetically through the list.

However, when a set of categorical items has a natural order, sorting them in alphabetical order would be unnatural and confusing. For instance, if your company does business in five countries—the United States, England, France, Australia, and Germany—and 80% of your business is done is the United States, and the percentage of business conducted in the other countries declines in the order in which they are listed above, to list them alphabetically in tables would make no sense. The point is simple: if items have a natural order that is meaningful, sort them in that order. This will not only create a sequence that makes sense but will also place near one another those items that your readers will often want to compare.

Formatting Text

In this section we'll focus on aspects of text formatting that play a role in table design. By text, I'm referring to all alphanumeric characters, including numbers and dates.

ORIENTATION

As speakers of English, we are accustomed to reading language from left to right, arranged horizontally. Any other orientation is more difficult to read, as a quick scan of the following should confirm.

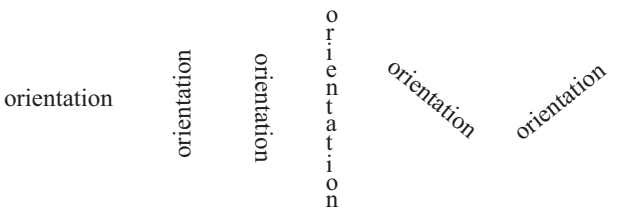

FIGURE 8.27 This figure illustrates various ways in which text can be oriented.

There is rarely a valid reason to sacrifice the legibility of text in a table by orienting it in any way other than horizontally from left to right. As we'll see in the next chapter, an alternate orientation is sometimes required in graphs, but this is seldom the case in tables.

ALIGNMENT

The most effective alignment of text is primarily a matter of convention rather than the mechanics of visual perception, but this convention is powerful, so ignoring it will lead to inefficiency, frustration, and confusion. The best practices of alignment can be summarized as follows:

- Numbers that represent quantitative values, as opposed to those that are merely identifiers (e.g., customer numbers), should always be aligned to the right.
- Text that expresses neither numbers nor dates works best when aligned to the left.
- How dates are aligned doesn't matter, but it's important to format them in a way that keeps the number of digits in each part of the date (i.e., month, day, and year) consistent.

Aligning numbers to the left or center makes them difficult to compare, as illustrated in the following example:

Sales	Sales	Sales
93,883.39	93,883.39	93,883.39
5,693,762.32	5,693,762.32	5,693,762.32
483.84	483.84	483.84
674,663.39	674,663.39	674,663.39
548.93	548.93	548.93
3,847.33	3,847.33	3,847.33
$6,467,189.20	$6,467,189.20	$6,467,189.20

FIGURE 8.28 These examples show the difficulty created when numbers are not aligned to the right.

This preference holds true for all units of measure, including money and percentages. You might be concerned that this preference for aligning numbers to the right would not hold true if the values in a particular column contained decimal digits of varying number, in which case the decimal points would not be aligned. It is best in such cases is to align both the decimal point and the final digit to the right. This can be accomplished by expressing each value using the same number of decimal digits, even when they are zeroes, as in the table on the right in the following example. Notice how the ragged right edge that's

created by an inconsistent number of decimal digits gives the table on the left a sloppy appearance and makes comparisons more difficult.

Rate		Rate
3.5%		3.500%
12.675%		12.675%
5.%		5.000%
13.25%		13.250%
2.75%		2.750%
13.125%		13.125%
8.383%		8.383%

FIGURE 8.29 This example compares the right alignment of numbers to the decimal point with an inconsistent number of decimal digits on the left and a consistent number on the right, which works best.

Text that expresses neither numbers nor dates works best when aligned to the left because we read from left to right. This includes numbers that are used as identifiers, rather than quantitative values, as is the case with customer numbers, for example. Here are examples of various text alignments:

Product Code	Product Name		Product Code	Product Name		Product Code	Product Name
A1838	2-Door Sport		A1838	2-Door Sport		A1838	2-Door Sport
A89	4-Door Sport		A89	4-Door Sport		A89	4-Door Sport
J98488	2-Door Luxury		J98488	2-Door Luxury		J98488	2-Door Luxury
J3883	4-Door Luxury		J3883	4-Door Luxury		J3883	4-Door Luxury
K9288	2-Door Truck		K9288	2-Door Truck		K9288	2-Door Truck
K38733	4-Door Truck		K38733	4-Door Truck		K38733	4-Door Truck

FIGURE 8.30 These examples show various text alignments, including the preferable left alignment highlighted in gray.

Don't be tempted by the aesthetic appeal of centered text in the columns of tables. The ragged left edge of the text makes scanning less efficient than the consistent leading edge of left-aligned text. I find that one exception to the practice of left alignment works well for columns of text, however: when the text entries in a column each consist of the same number of characters and the column header consists of several more characters than the text entries. Here are two examples using columns with single character text entries, which display left and center alignment:

Cust Code	Preferred?		Cust Code	Preferred?
193847394	Y		193847394	Y
109388484	N		109388484	N
187466463	N		187466463	N
174563553	N		174563553	N
175357736	Y		175357736	Y
167374565	Y		167374565	Y

FIGURE 8.31 Theses examples show left- versus center-aligned text for columns with lengthy headers and single-character text entries.

Centering rather than left aligning such text entries does not produce a ragged left edge, so reading is not impaired. Centering also has the advantage of adding more white space to the left of the text entries, thus distinguishing them more clearly from data in adjacent columns.

There is no strict convention for the alignment of dates. People differ in their preferences for left, right, and center alignment, and, in truth, it doesn't matter. What does matter, however, is that each part of the date is composed of a consistent number of digits (e.g., 01/02/11 rather than 1/2/11 or 01/02/2011

rather than 1/2/11). When the number of digits is consistent, the parts of the dates in a column are always aligned for easy comparison. The following example illustrates some of the alternatives, with my preferences highlighted in gray.

Left	Left	Center	Center	Right	Right
12/17/02	12/17/02	12/17/02	12/17/02	12/17/02	12/17/02
1/2/03	01/02/03	1/2/03	01/02/03	1/2/03	01/02/03
1/17/03	01/17/03	1/17/03	01/17/03	1/17/03	01/17/03
2/9/03	02/09/03	2/9/03	02/09/03	2/9/03	02/09/03
10/29/03	10/29/03	10/29/03	10/29/03	10/29/03	10/29/03
12/1/03	12/01/03	12/1/03	12/01/03	12/1/03	12/01/03
1/1/03	01/01/03	1/1/03	01/01/03	1/1/03	01/01/03

FIGURE 8.32 These examples show left, center, and right alignment of dates, using two different date formats.

When we use a consistent number of digits in each date, each part of the date (month, day, and year) is aligned as well, making comparisons of a specific component (e.g., year) easy and efficient.

You may have noticed that in each of the examples above, the headers are aligned with the associated data. If entries in the column are left aligned, the column header is left aligned as well, and so on. This is intentional. This practice clearly establishes at the top of each column the nature of its alignment and it creates a clear association between the column's header and information in the body of that column. The only exception that is sometimes useful involves spanner headers. When a header is used to label multiple columns, centering it across those columns often helps to clarify the fact that it refers to all of those columns rather than just a single column. This is illustrated by the centering of the header Region in the following example:

		Region				
Year	Qtr	North	East	South	West	Total
2010	1	393	326	401	538	1,658
	2	473	393	483	647	1,996
	3	539	447	550	737	2,273
	4	639	530	652	874	2,695
2011	1	439	364	448	601	1,852
	2	538	447	549	736	2,270

FIGURE 8.33 This example shows a spanner header as an exception to the normal rules of alignment.

NUMBER AND DATE FORMAT

The format that works best for displaying numbers and dates is the one that exhibits the following characteristics:

- Includes no unnecessary information (e.g., excessive levels of precision, which we'll examine in the next section)
- Expresses information using the format that is most familiar to your readers
- Most consistently aligns information from row to row for efficient scanning

Rather than list and comment on all possible variations of number and date formats, I'll highlight only those formatting practices that communicate effectively.

Here's a list of the useful practices for formatting numbers in tables:

- Place a comma (or a space for European readers) to the left of every three whole-number digits (e.g., 1,393,033 rather than 1393033).
- Truncate the display of whole numbers by sets of three digits to the nearest thousand, million, billion, etc., whenever numeric precision can be reduced without the loss of meaningful information, and declare that you've done so in the title or header (e.g., "U.S. dollars in thousands").
- Use either parentheses or a negative sign to display negative numbers (e.g., (8,395.37) or -8,395.37), but if you use parentheses, keep the numbers that are enclosed in them right aligned with the positive numbers.

The first three practices in this list are each firmly rooted in what you now know about visual perception. The commas break the numbers up into smaller chunks that can be stored more easily in working memory. They also make it easy for the reader to determine the difference between numbers such as 10000000 and 1000000 at a glance (i.e., 10,000,000 and 1,000,000) without having to count the digits. Truncating whole numbers to remove everything below 1,000, or everything below 1,000,000, or etc., reduces the amount of information that must be read, which makes the process of reading more efficient, and reduces the amount of horizontal space required by the column. Aligning the right-most digits of positive and negative numbers, even when the negative numbers are enclosed in parentheses, keeps the numbers aligned for easy scanning down the column. Look at the difference between the two formats below:

83,743	83,743
2,339,844	2,339,844
(67,909)	(67,909)
60,036	60,036
376,003	376,003
3,974,773	3,974,773
(576,533)	(576,533)
937,764	937,764
343	343

FIGURE 8.34 This example shows two alignment techniques for negative numbers that are enclosed within parentheses, with the preferred method highlighted in gray.

Readers' eyes would be forced to jump back and forth slightly from row to row when scanning the values in the right-hand column in the example above.

Now, here's a list of useful practices for formatting dates in tables:

- Express months either as a two-digit number (e.g., 02 rather than 2 for February) or a three-character word (e.g., Feb rather than February).
- Express days using two digits (e.g., 01 rather than 1 for the first day of the month).
- Use a format that excludes portions of the date that provide more precision than necessary.

The first two practices relate to the advantages of alignment for efficient visual perception, which we covered earlier. The last relates entirely to the level of precision that is appropriate, which we'll cover next.

If your readers are distributed internationally, keep in mind that conventional

date formats differ in various parts of the world. The difference that is most prone to create confusion is that in the United States we usually list the month first, then the day, but it is common in Europe to list the day first, then the month. This isn't confusing when you express months as words rather than numbers (e.g., Dec rather than 12), but when months are expressed as numbers using a format like 01-12-11, the positions of the month and day are ambiguous. When this is the case, be sure to clarify the positions of the month and day portions of the date in your header, using a method like the following:

Order Date (mm/dd/yy)
12/17/02
01/02/03
01/17/03

FIGURE 8.35 This example includes information in the column header to clarify the date format.

NUMBER AND DATE PRECISION

The precision of a number or a date is the degree of detail that it expresses. The number 12.825 represents a quantitative precision of three decimal digits while the number 12 only displays precision to the nearest whole number. The date December 15, 2003 represents precision to the day level while the date 2003 only displays year-level precision. Selecting the appropriate level of precision for numbers and dates in tables boils down to a single design practice:

> The level of precision should not exceed the level needed to serve your communication objectives and the needs of your readers.

If the purpose of the table is to support the reconciliation of financial accounts, you had better display precision down to the penny (i.e., two decimal digits). If, however, you are presenting a multi-year comparison of sales revenue to the executives of a multi-billion dollar corporation, precision to the nearest million dollars may be appropriate. Forcing them to read six more digits of precision (or eight more digits if you include cents) would waste their time. If you express numbers with less precision than is available, you should always be careful to clearly state this in the title or header (e.g., Rounded to the nearest million dollars).

We are faced with choices regarding numeric precision whenever we produce new numbers as a result of calculations. When you divide 100 by 49 using spreadsheet software, you will likely get a result like 2.040816327. For most purposes, precision to the level of nine decimals digits is excessive. Here are examples of the excessive levels of precision you would typically get using spreadsheet software to divide numbers into 100.

```
100 /  15 = 6.666666667
100 /  20 = 5.000000000
100 /  42 = 2.380952381
100 /  49 = 2.040816327
100 /  50 = 2.000000000
100 /  55 = 1.818181818
100 /  60 = 1.666666667
100 / 175 = 0.571428571
```

FIGURE 8.36 This example shows a level of precision that exceeds what is needed for most purposes.

It is probably obvious that you would rarely need nine digits of decimal precision, but how many digits do you need? The answer depends on the message you're trying to communicate. For many purposes, rounding to the nearest whole number works fine. Here are three sample levels of precision for the list of numbers in the example above.

	Decimal Digits	
0	1	2
7	6.7	6.67
5	5.0	5.00
2	2.4	2.38
2	2.0	2.04
2	2.0	2.00
2	1.8	1.82
2	1.7	1.67
1	0.6	0.57

FIGURE 8.37 These examples show three different levels of precision for the same set of values.

It isn't likely that more than a single decimal digit of precision would be significant in this case. In the example below, revenue is displayed as whole dollars per region along with each region's percentage contribution to the whole. The percentages have been repeated in four separate columns to illustrate different levels of precision.

Region	Revenue	% of Total	% of Total	% of Total	% of Total
Americas	636,663,663	40%	39.8%	39.82%	39.816%
Europe	443,874,773	28%	27.8%	27.76%	27.759%
Asia	399,393,993	25%	25.0%	24.98%	24.978%
Australia	99,838,333	6%	6.2%	6.24%	6.244%
Middle East	10,399,383	1%	0.7%	0.65%	0.650%
Africa	7,939,949	1%	0.5%	0.50%	0.497%

FIGURE 8.38 This example shows four different levels of precision for the display of the same set of percentage values.

In this example, if you needed to display both a part-to-whole and a ranking relationship between the six regions using only percentages (i.e., excluding the actual revenue dollars), which level of precision should you select for the % of Total column?

• • • • • • •

Whole percentages (i.e., no decimal digits) would not differentiate the relative contributions or rank of the Middle East and Africa regions, and two decimal digits would provide more detail than necessary, so one decimal digit would probably work best.

Appropriate date precision is simpler to determine than numeric precision. Generally, you just need to decide whether your message requires precision to the level of year, quarter, month, week, or day. Once you determine which to use, select a date format that displays nothing below that level. Forcing your readers to read entire dates (e.g., 11/27/2011) when all they need to know is the year (e.g., 2011) not only slows them down, but also uses up more horizontal space, which is often in short supply.

FONT

There are hundreds of available fonts. A thorough knowledge of typography involves years of study and practice. Fortunately, we don't need to be experts in typography when designing tables. The best practices regarding font selection for tables have three primary goals:

- The font should be as legible as possible.
- The same font should be used throughout.
- Each numeric digit (0-9) should be equal in width.

Because our design goal is effective communication, fonts should be easy to read. Extravagant font choices intended to spice up the appearance of a table will reduce communication efficiency. This is seldom, if ever, an advantage in quantitative tables.

Fonts are generally classified into two primary types: 1) *serif* and 2) *sans-serif*. A serif is an embellishment, such as a line or curve, located at the end of a letterform.

Fonts that are most legible tend to have a clean and simple design. Although serifs are embellishments, a font with serifs can still have a clean and simple appearance. In fact, many experts have argued that serif fonts are more legible because the serif creates a greater distinction between the individual characters. Whether this is true or not isn't entirely clear, even after a comprehensive review of the research. Serif and sans-serif fonts both work fine in print as long as you select one that is highly legible. Sans-serif fonts have a slight advantage in legibility when information is displayed on a computer screen, however. Despite improvements in screen resolution, the resolution of print on paper is still higher. The lesser resolution of a screen cannot produce perfectly clean and clear serifs because they are tiny. The figure below shows examples of some of the most legible serif and sans-serif fonts as well as some that are not so legible.

Fine Legibility		Poor Legibility	
Serif	Sans-Serif	Serif	Sans-Serif
Times New Roman	Arial	Academy Engraved	Poplar Std Black
Palatino	Verdana	Script	SYNCHRO LET
Georgia	Helvetica	Playbill	SILOM

FIGURE 8.39 These are examples of serif and sans-serif fonts with fine and poor legibility.

This list of legible fonts is not comprehensive by any means. It gives just a few examples of good ones that are readily available to most computer users. The best typefaces for text assign different widths to characters based on character shape. When characters have equal widths regardless of shape, which was standard on typefaces created for typewriters such as `Courier, text is harder to read`. Numbers, however, should have equal widths; otherwise, they will not line up properly in tables, as you can see by trying to compare the numbers in the right-hand table on the following page.

Arial

Region	Revenue
Americas	639,453,661
Europe	413,874,773
Asia	199,393,992
Australia	67,802,333
Middle East	10,349,381
Africa	7,011,159

Big Caslon Medium

Region	Revenue
Americas	639,453,661
Europe	413,874,773
Asia	199,393,992
Australia	67,802,333
Middle East	10,349,381
Africa	7,011,159

FIGURE 8.40 The best typefaces for tables vary the width of text characters but keep numbers equal in width.

Using the same font throughout a table is usually the best practice. There is almost always a better way to group or highlight particular content than using a different font. The use of emphasis (e.g., boldfacing) is one strategy that is almost always preferable to mixing fonts.

EMPHASIS AND COLOR

Text may be grouped or highlighted by using emphasis and color. Emphasis, in this context, refers to boldfacing or italicizing the text. Boldfacing makes text heavier (the lines that form characters are slightly thicker than for regular text) and italics make text stand out through a contrast in orientation, specifically by slanting the characters at an angle. Don't overdo the use of italics, however, because it is slightly harder to read than regular text. Color and emphasis can both be used effectively to group and highlight data.

Summarizing Values

Tables provide an ideal means to combine detail and summary values, simultaneously displaying high- and low-level perspectives. Values can be aggregated across an entire row or down an entire column. In Chapter 2, *Simple Statistics to Get You Started*, we examined several numbers that can be used to aggregate data, such as sums and averages. Aggregates give your readers an overview in a single glance. If readers wish, they can then dig into the detailed values. This is a powerful path to understanding, moving from general to specific, macroscopic to microscopic, summary to detail. Aggregates that are most useful in tables include:

- Measures of sum (i.e., the simple addition of a set of values)
- Measures of average (primarily means and medians)
- Measures of occurrence (i.e., a count of the number of instances of a thing or event)
- Measures of distribution (primarily the minimum and maximum values to represent the range and occasionally the standard deviation)

COLUMN AND ROW SUMMARIES

Most aggregates that appear in tables are used to summarize the values down an entire column or across an entire row. A value that aggregates an entire column of values is a *column summary*, which generally appears in a separate row beneath the last row of detailed values. A value that aggregates an entire row of values is a *row summary*, which generally appears in a separate column to the right of the last column of detailed values. The following example includes both:

Product	Jan	Feb	Mar	Apr	May	Jun	**Total**
Product 01	93,993	84,773	88,833	95,838	93,874	83,994	**$541,305**
Product 02	87,413	78,839	82,615	89,129	87,303	78,114	**$503,414**
Product 03	90,036	81,204	85,093	91,803	89,922	80,458	**$518,516**
Product 04	92,737	83,640	87,646	94,557	92,620	82,872	**$534,072**
Product 05	86,245	77,785	81,511	87,938	86,136	77,071	**$496,687**
Product 06	88,833	80,119	83,956	90,576	88,720	79,383	**$511,587**
Product 07	82,614	74,511	78,079	84,236	82,510	73,826	**$475,776**
Product 08	85,093	76,746	80,421	86,763	84,985	76,041	**$490,049**
Product 09	87,646	79,048	82,834	89,366	87,535	78,322	**$504,751**
Product 10	90,275	81,420	85,319	92,047	90,161	80,672	**$519,893**
Total	**$884,886**	**$798,085**	**$836,307**	**$902,255**	**$883,765**	**$790,751**	**$5,096,049**

FIGURE 8.41 This is an example of a table that includes both column and row summaries.

The column and row summaries in this example have been boldfaced simply to make them stand out in the example, not to suggest that you should always highlight summary values.

Column and row summaries frequently convey critical information. Whenever you design a table, ask yourself whether column and/or row summaries would be meaningful and useful even if they weren't specifically requested. If the answer is "yes" or even "maybe," and there is space, include them. Because they are located at the edges of the table, readers can easily ignore them if they wish.

GROUP SUMMARIES

Group summaries are similar to column and row summaries, differing only in that they aggregate meaningful subsets of values rather than the entire set of values throughout a column or row. When you group and break rows of data into subsets based on one or more categories (e.g., sales regions), it is easy to include summary values for each of those groups, as illustrated below:

Region: North

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458
Product 04	92,737	83,640	87,646	94,557	92,620	82,872
Product 05	86,245	77,785	81,511	87,938	86,136	77,071
Product 06	88,833	80,119	83,956	90,576	88,720	79,383
Product 07	82,614	74,511	78,079	84,236	82,510	73,826
Product 08	85,093	76,746	80,421	86,763	84,985	76,041
Product 09	87,646	79,048	82,834	89,366	87,535	78,322
Product 10	90,275	81,420	85,319	92,047	90,161	80,672
Total	**$884,886**	**$798,085**	**$836,307**	**$902,255**	**$883,765**	**$790,751**

Region: East

Product	Jan	Feb	Mar	Apr	May	Jun
Product 01	93,993	84,773	88,833	95,838	93,874	83,994
Product 02	87,413	78,839	82,615	89,129	87,303	78,114
Product 03	90,036	81,204	85,093	91,803	89,922	80,458

FIGURE 8.42 This is an example of group summaries, in this case per region.

Summaries of individual values across multiple columns in a single row are placed in a column of their own, generally to the right of the values they summarize. Here's a typical example:

Product	Jan	Feb	Mar	Q1 Total	Apr	May	Jun	Q2 Total
Product 01	93,993	84,773	88,833	267,599	95,838	93,874	83,994	273,706
Product 02	87,413	78,839	82,615	248,867	89,129	87,303	78,114	254,547
Product 03	90,036	81,204	85,093	256,333	91,803	89,922	80,458	262,183
Product 04	92,737	83,640	87,646	264,023	94,557	92,620	82,872	270,048
Product 05	86,245	77,785	81,511	245,541	87,938	86,136	77,071	251,145
Product 06	88,833	80,119	83,956	252,908	90,576	88,720	79,383	258,679
Product 07	82,614	74,511	78,079	235,204	84,236	82,510	73,826	240,572
Product 08	85,093	76,746	80,421	242,260	86,763	84,985	76,041	247,789
Product 09	87,646	79,048	82,834	249,528	89,366	87,535	78,322	255,223
Product 10	90,275	81,420	85,319	257,014	92,047	90,161	80,672	262,879
Total	$884,886	$798,085	$836,307	$2,519,278	$902,255	$883,765	$790,751	$2,576,771

FIGURE 8.43 This is an example of group column summaries, in this case summing revenue by quarter.

When intermingling group summary columns with detail columns, take extra care to make a clear distinction between the two. You certainly don't have to make them as distinct as I have using gray background fills in the example above (and you shouldn't do this unless you want them to stand out as more important than the detail columns), but you should make sure that your readers notice that the summaries and details are different. In the example below, where no visual distinction is made between the detail and summary columns, readers might mistakenly perceive the summaries as just another column of monthly values:

Product	Jan	Feb	Mar	Q1 Mo Avg	Apr	May	Jun	Q2 Mo Avg
Product 01	93,993	84,773	88,833	89,200	95,838	93,874	83,994	91,235
Product 02	87,413	78,839	82,615	82,956	89,129	87,303	78,114	84,849
Product 03	90,036	81,204	85,093	85,444	91,803	89,922	80,458	87,394
Product 04	92,737	83,640	87,646	88,008	94,557	92,620	82,872	90,016
Product 05	86,245	77,785	81,511	81,847	87,938	86,136	77,071	83,715
Product 06	88,833	80,119	83,956	84,303	90,576	88,720	79,383	86,226
Product 07	82,614	74,511	78,079	78,401	84,236	82,510	73,826	80,191
Product 08	85,093	76,746	80,421	80,753	86,763	84,985	76,041	82,596
Product 09	87,646	79,048	82,834	83,176	89,366	87,535	78,322	85,074
Product 10	90,275	81,420	85,319	85,671	92,047	90,161	80,672	87,626
Total	$884,886	$798,085	$836,307	$839,759	$902,255	$883,765	$790,751	$858,924

FIGURE 8.44 This is an example of group column summaries that are not visually distinct from the columns that contain detailed data.

This tendency to confuse summary columns with detail columns becomes more pronounced as the reader's eyes move farther down the table, away from the top where the only clue to the column's identity is in the headers. You can create the minimum necessary visual distinction through the use of any one of the available visual attributes that we've already examined, including something as simple as extra white space separating the summary columns from the detail columns. Just be careful to keep the distinction subtle unless the summary columns deserve greater attention than the detail columns.

HEADERS VERSUS FOOTERS

Values that summarize rows don't necessarily have to appear below the rows that they summarize. Although it is common practice to place them in table or group footers, there is, at times, an advantage to placing them above the rows that they summarize. When might it be beneficial to place summary values before the information that they summarize rather than after it? Take a moment

to imagine tables that you commonly use to see whether you can think of circumstances when the placement of summary values in headers would offer an advantage to your readers.

• • • • • • •

When the summary values are more important to your message or to your readers than the details, and placing them below the details would make them harder and less efficient to find, it often makes sense to place them near the group headers even though this is less conventional. Here are two examples of how this can be arranged:

Region: North	**$1,568,586**	**$1,414,719**	**$1,482,474**	**$1,599,376**	**$1,566,600**	**$1,401,719**
Salesperson	Jan	Feb	Mar	Apr	May	Jun
Abrams, S	93,993	84,773	88,833	95,838	93,874	83,994
Benson, J	87,413	78,839	82,615	89,129	87,303	78,114
James, R	86,245	77,785	81,511	87,938	86,136	77,071
Wilson, O	86,704	78,199	81,944	88,406	86,594	77,481
Yao, J	89,305	80,545	84,403	91,058	89,192	79,805

FIGURE 8.45 This illustrates the placement of column summary values in a header, in this case in the same row as a group subdivision (i.e., the north region).

Region: North

Total	**$1,568,586**	**$1,414,719**	**$1,482,474**	**$1,599,376**	**$1,566,600**	**$1,401,719**
Salesperson	Jan	Feb	Mar	Apr	May	Jun
Abrams, S	93,993	84,773	88,833	95,838	93,874	83,994
Benson, J	87,413	78,839	82,615	89,129	87,303	78,114
James, R	86,245	77,785	81,511	87,938	86,136	77,071
Wilson, O	86,704	78,199	81,944	88,406	86,594	77,481
Yao, J	89,305	80,545	84,403	91,058	89,192	79,805

FIGURE 8.46 This is an example of placing column summary values in a header, in this case in their own row beneath the group value because there isn't enough room to place them on the same row as the group label.

This same practice works just as well with grand totals. You might earn your readers' gratitude if you eliminate the hassle of having to flip to the last page of the report to get the big picture that they need most. If you're concerned that they'll be thrown off by not finding summary values where they conventionally appear, after the details, you may put the summaries there as well. Summary values are generally so useful that the little loss of space used to place them in both the headers and the footers is a small price to pay for the advantage of greater availability.

Page Information

Because of working memory constraints, effective table design requires that certain information be repeated on each new page. Otherwise, your readers may lose track of information that's needed to interpret the table as they move from page to page. Two types of information should be repeated:

- Column headers
- Row headers

REPEATING COLUMN HEADERS

When tables extend down multiple pages, columns are no longer labeled after the first page unless you repeat the column headers on each. The space required to repeat the column headers is insignificant compared to the benefit of improved ease of use.

REPEATING ROW HEADERS

I've found that in actual practice, even those of us who are careful to repeat column headers on each page seldom think to repeat the row headers as well, yet the problem is the same. In the example below, state names (Alabama, Arkansas, etc.) appear in the State column.

State	Order Date	Sales Volume	Sales Revenue
Alabama	05/01/03	432	215,568
	05/02/03	534	266,466
	05/03/03	466	232,534
	05/04/03	354	176,646
	05/05/03	456	227,544
	05/08/03	553	275,947
	05/09/03	465	232,035
	05/12/03	589	293,911
	05/15/03	501	249,999
	05/16/03	556	277,444
	05/17/03	623	310,877
	05/19/03	563	280,937
	05/22/03	675	336,825
	05/23/03	702	350,298
	05/24/03	658	328,342
	05/26/03	798	398,202
	05/29/03	801	399,699
	05/30/03	735	366,765
	05/31/03	802	400,198
Arkansas	05/01/03	201	100,299
	05/02/03	247	123,253
	05/03/03	245	122,255
	05/04/03	277	138,223
	05/05/03	203	101,297

FIGURE 8.47 This example shows a typical table that groups data, in this case by state.

Because all the rows pertaining to each state are grouped together, it isn't necessary to repeat the name of the state on each row. In fact, to do so would be inefficient, causing readers to scan, on each new row, information that they already know. Also, the infrequent presence of text in the state column alerts readers through an obvious visual cue when information for a new state has begun. However, if information for the state of Alabama continues for five pages, by the time that you reached the third page, you might have forgotten which state you were examining, especially if your attention was pulled away, even briefly. You would see something like the next example:

State	Order Date	Sales Volume	Sales Revenue
	05/04/03	354	176,646
	05/05/03	456	227,544
	05/06/03	556	277,444
	05/07/03	598	298,402
	05/08/03	553	275,947
	05/09/03	465	232,035
	05/10/03	434	216,566
	05/11/03	676	337,324
	05/12/03	589	293,911
	05/13/03	688	343,312
	05/14/03	701	349,799
	05/15/03	501	249,999
	05/16/03	556	277,444
	05/17/03	623	310,877
	05/18/03	456	227,544
	05/19/03	563	280,937
	05/20/03	367	183,133
	05/21/03	356	177,644

FIGURE 8.48 This is an example of a page that lacks useful row headers.

Get the picture? Repeating the current row header at the beginning of each new page costs you nothing but benefits your readers a great deal.

Summary at a Glance

Topic	Practices
Delineating Columns and Rows	• Use white space alone whenever space allows. • When you can't use white space, use subtle fill colors. • When you can't use fill color, use subtle rules. • Avoid grids altogether.

Arranging Data	• Columns or rows
	  ◦ Arrange a set of categorical subdivisions across separate columns if they are few in number, and the maximum number of characters in those subdivisions is not too large.
	  ◦ Arrange times-series subdivisions horizontally across separate columns.
	  ◦ Arrange ranked subdivisions vertically down the rows.
	• Groups and breaks
	  ◦ Use just enough vertical white space between groups to make breaks noticeable.
	  ◦ Repeat column headers at the beginning of each new group.
	  ◦ Keep table structure consistent from group to group.
	  ◦ When groups should be examined independently, start each on a new page.
	• Column sequence
	  ◦ Place sets of categorical subdivisions that are arranged down the rows of a single column to the left of the quantitative values associated with them.

Topic	Practices
Arranging Data *(continued)*	• Place sets of categorical subdivisions that have a hierarchical relationship from left to right to reflect that hierarchy. • Place quantitative values that were calculated from another set of quantitative values just to the right of the column from which they were derived. • Place columns containing data that should be compared close together. • Value sequence • Whenever categorical subdivisions have a meaningful order, sort them in that order.
Formatting Text	• Orientation • Avoid text orientations other than horizontal, left to right. • Alignment • Align numbers to the right, keeping the decimal points aligned as well. • Align dates however you wish, but maintain a consistent number of characters or digits for each part of the date. • Align all other text to the left. • Center non-numeric items if they all have the same number of characters, and the number of characters in the header is significantly greater. • Number formatting • Place a comma to the left of every three whole-number digits. • Truncate the display of whole numbers by sets of three digits whenever numeric precision can be reduced to the nearest thousand, million, billion, etc. • When negative numbers are enclosed in parentheses, keep the negative numbers themselves right aligned with the positive numbers. • Date Formatting • Express months either as a two-digit number or a three-character word. • Express days as two digits. • Express years consistently as either two or four digits. • Number and date precision • Do not exceed the required level of precision. • Font • Select a font that is legible, and use the same font throughout the table. • Emphasis and color • Boldface, italicize, or change the color of fonts when useful to group or highlight.
Summarizing Values	• Make columns containing group summaries visually distinct from detail columns. • Consider placing summaries in the group header if the information extends down multiple pages.
Giving Page Information	• Repeat column headers at the top of each page. • Repeat current row headers at the top of each page.

PRACTICE IN TABLE DESIGN

Nothing helps learning take root like practice. You will strengthen your developing expertise in table design by working through a few real-world scenarios.

Exercise #1

The following table has been prepared for a regional sales manager for the purpose of tracking the quarter-to-date performance of her sales representatives, including their relative performance. Given this purpose, take a look at the table, and follow the instructions below.

Quarter-to-Date Sales Rep Performance Summary
Quarter 2, 2011 as of March 15, 2011

Sales Rep	Quota	Variance to Quota	% of Quota	Forecast	Actual Bookings
Albright, Gary	200,000	-16,062	92	205,000	183,938
Brown, Sheryll	150,000	84,983	157	260,000	234,983
Cartwright, Bonnie	100,000	-56,125	44	50,000	43,875
Caruthers, Michael	300,000	-25,125	92	324,000	274,875
Garibaldi, John	250,000	143,774	158	410,000	393,774
Girard, Jean	75,000	-48,117	36	50,000	26,883
Jone, Suzanne	140,000	-5,204	96	149,000	134,796
Larson, Terri	350,000	238,388	168	600,000	588,388
LeShan, George	200,000	-75,126	62	132,000	124,874
Levensen, Bernard	175,000	-9,267	95	193,000	165,733
Mulligan, Robert	225,000	34,383	115	275,000	259,383
Tetracelli, Sheila	50,000	-1,263	97	50,000	48,737
Woytisek, Gillian	190,000	-3,648	98	210,000	186,352

List each of the problems that you see in the design of this table:

Suggest a solution to each of these problems:

Exercise #2

The following table is used by mortgage brokers to look up the mortgage rates offered by several lenders. Brokers use this when they need to know the current rates offered by a particular lender for all of its loan programs. Given this purpose, take a look at the table, and follow the instructions below.

Mortgage Loan Rates
Effective September 1, 2011

Loan Type	Term	Points	Lender	Rate
Adjustable	15	0	ABC Mortgage	6.0%
Adjustable	15	0	BCD Mortgage	6.0%
Adjustable	15	0	CDE Mortgage	6.0%
Fixed	15	0	ABC Mortgage	6.25%
Fixed	15	0	BCD Mortgage	6.75%
Fixed	15	0	CDE Mortgage	7.0%
Adjustable	30	.5	ABC Mortgage	6.125%
Adjustable	30	.5	BCD Mortgage	6.25%
Adjustable	30	.5	CDE Mortgage	6.5%
Fixed	30	.5	ABC Mortgage	6.5%
Fixed	30	.5	BCD Mortgage	7.0%
Fixed	30	.5	CDE Mortgage	7.25%
Adjustable	15	1	ABC Mortgage	5.675%
Adjustable	15	1	BCD Mortgage	5.675%
Adjustable	15	1	CDE Mortgage	5.75%
Fixed	30	1	ABC Mortgage	6.5%
Fixed	30	1	BCD Mortgage	6.5%
Fixed	30	1	CDE Mortgage	7.0%
Adjustable	15	1	ABC Mortgage	5.675%
Adjustable	15	1	BCD Mortgage	5.675%

List each of the problems that you see in the design of this table:

Suggest a solution to each of these problems:

Exercise #3

The following table is used by the manager of the marketing department to examine the previous year's expenses in total and by quarter for each type of expense. What you see below is the top portion of a page that is several pages into the table. The marketing manager finds this table frustrating. Can you help him out? Take a few minutes to respond to the instructions below:

2011 Marketing Department Expenses

Quarter	Transaction Date	Expense Type	Expense
	9/28/2011	Software	3837.05
	9/28/2011	Computer Hardware	10873.34
	9/29/2011	Travel	2939.95
	9/30/2011	Supplies	27.53
Qtr 4	10/1/2011	Supplies	17.37
	10/1/2011	Postage	23.83
	10/3/2011	Computer Hardware	3948.85
	10/3/2011	Software	535.98
	10/3/2011	Furniture	739.37
	10/3/2011	Travel	28.83
	10/4/2011	Entertainment	173.91
	10/15/2011	Travel	33.57
	10/16/2011	Membership Fees	395.93
	10/16/2011	Conference Registration	2195.00

List each of the problems that you see in the design of this table:

Suggest a solution to each of these problems:

Exercise #4

It's now time to shift your focus closer to home. Select three tables that are used at your place of work. Make sure that at least one of them is a table that you created. For each of the tables, respond to the following instructions:

Table #1

List each of the problems that you see in the design of this table:

Suggest a solution to each of these problems:

Table #2

List each of the problems that you see in the design of this table:

Suggest a solution to each of these problems:

Table #3

List each of the problems that you see in the design of this table:

Suggest a solution to each of these problems:

Exercise #5

This exercise asks you to design a table from scratch to achieve a specific set of communication objectives. You may construct the table using any relevant software that is available to you, such as spreadsheet software. Imagine that you are a business analyst who was asked to assess the sales performance of your company's full line of 10 products during the preceding 12 months. During the course of your analysis, you discovered that the top two products account for more than 89% of total revenue and 95% of total profit. You believe it would be beneficial to either discontinue or sell off some of the worst-performing products. To make the case, you've decided to design a table that clearly communicates your findings. The table below provides the raw data that your findings were based on, which you can expand through calculations and arrange however you choose to construct your table. Dollars have been rounded to and expressed in thousands:

Product	Units Sold	Ext Cost (000s)	Ext Revenue (000s)
A	136	$3	$7
B	119	$59	$132
C	2,938	$7	$40
D	8	$54	$92
E	4,873	$387	$402
F	25,750	$760	$1,957
G	1,837	$395	$602
H	3	$15	$20
I	13,973	$3,298	$9,266
J	93	$2	$2

Once you've completed your table, take a few minutes to describe its design in the space below, including your rationale for each design feature:

Exercise #6

You support the Vice President of Sales. She has asked for a report that she can use during presentations, which she'll be making separately to each of the six sales regions during a two-week tour of field operations. She won't display the report during these presentations. She just wants something that she can refer to when questions arise about the following areas of performance in the current quarter in each of the regions (Western U.S., Central U.S., Eastern U.S., Canada, Europe, and Asia):

- Sales revenue
- Average revenue per salesperson
- Regional percent of total revenue
- Revenue by product type (shirts, pants, dresses, skirts, and coats)
- Average order size
- Expenses

She must be prepared to answer questions about the individual performance of regions and their comparative performance as well. Design a new table for the Vice President using the following data:

Region	Number of Salespeople	Number of Orders	Expenses	Product	Revenue (U.S. $)
Western U.S.	36	4,599	11,944,850	Shirts	4,537,397
				Pants	6,738,453
				Dresses	8,503,942
				Skirts	10,376,432
				Coats	12,503,954
Central U.S.	15	2,942	3,920,940	Shirts	2,938,434
				Pants	4,682,776
				Dresses	6,039,461
				Skirts	8,239,484
				Coats	4,239,443
Eastern U.S.	24	4,112	7,135,251	Shirts	3,839,221
				Pants	5,123,044
				Dresses	7,270,982
				Skirts	9,103,845
				Coats	8,640,293
Canada	52	5,447	17,534,716	Shirts	5,988,343
				Pants	7,028,474
				Dresses	9,253,400
				Skirts	11,364,033
				Coats	17,938,444
Europe	90	7,553	40,988,486	Shirts	8,102,943
				Pants	10,384,302
				Dresses	12,982,833
				Skirts	14,135,203
				Coats	30,299,323
Asia	22	3,047	6,360,875	Shirts	2,384,332
				Pants	2,543,343
				Dresses	5,944,832
				Skirts	1,938,843
				Coats	1,323,928

You can find answers to the exercises in Appendix G, *Answers to Practice in Table Design*.