

This chapter introduces Microsoft Excel, a powerful spreadsheet application used to store numeric data and perform calculations.

## 8.1 What is a Spreadsheet?

spreadsheet application  
workbook  
worksheet

A *spreadsheet* is data displayed in rows and columns. The term comes from the field of accounting where business activities were tracked on large sheets of paper that spread out to form a “spreadsheet.” A *spreadsheet application*, such as Microsoft Excel, is used to electronically store data. In Excel, spreadsheet files are called *workbooks*, and each workbook contains three *worksheets*, also called sheets.

Worksheets are used to present data in an organized format:

	A	B	C	D	E	F
1	<b>Name</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>	<b>Student Average</b>
2		1/7/2003	2/9/2003	3/1/2003	4/1/2003	
3						
4	Jones, D.	85	73	88	95	85.3
5	Neave, C.	92	88	85	91	89.0
6	Garcia, E.	72	63	67	72	68.5
7	McCallister, T.	87	92	85	93	89.3
8	Smith, L.	94	91	93	84	90.5
9	Bell, M.	70	74	80	83	76.8

### Spreadsheet Uses

Spreadsheets are widely used by businesses for payroll and inventory and by individuals for personal budgets and calculating education costs.

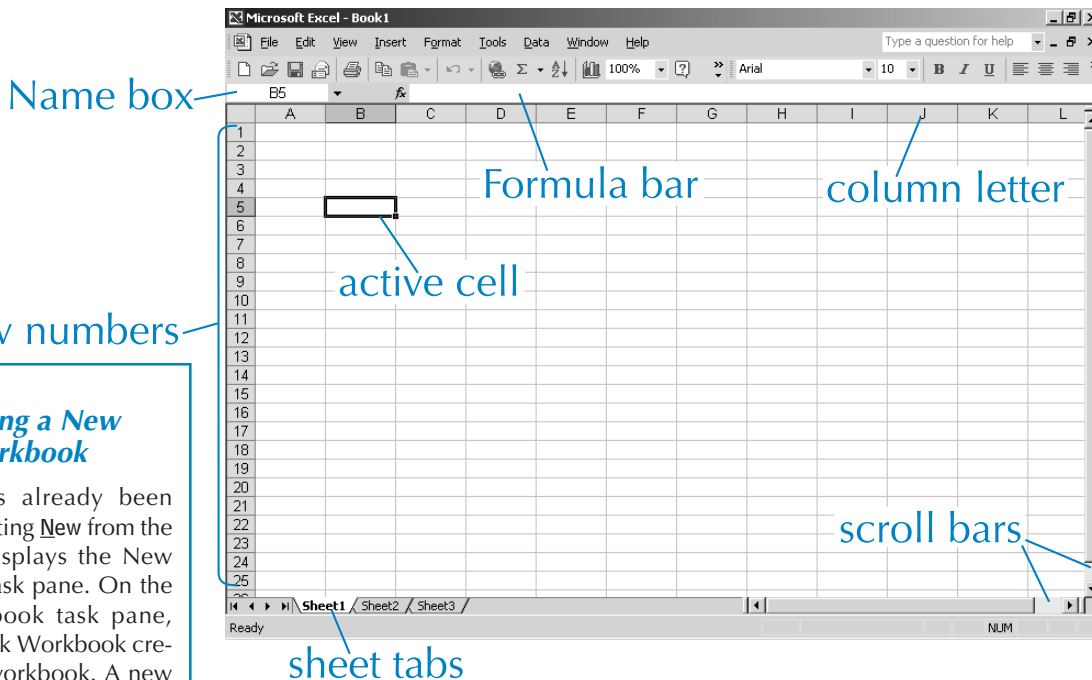
The name Jones, D., the test grades 85, 73, 88, 95, and the average 85.3 form a row. Rows 4 through 9 store the name, test grades, and average for six students. The title Test 1, date 1/7/2003, and test grades from 85 to 70 form a column. Columns B through E each store a title, date, and all of the grades for a single test.

Benefits of using a spreadsheet application include the ability to easily perform calculations on data and to automatically recalculate values when changes are made to the data. For example, the spreadsheet above is set up to calculate student averages. If a test grade is changed, the corresponding average will automatically recalculate.


## 8.2 Creating a New Excel Workbook



Selecting New Office Document from the Start menu on the Windows Taskbar displays the New Office Document dialog box. Clicking the Blank Workbook icon and then selecting OK starts Excel and creates a new, empty workbook. The first worksheet in the workbook is displayed:



### Creating a New Workbook

If Excel has already been started, selecting **New** from the **File** menu displays the New Workbook task pane. On the New Workbook task pane, clicking Blank Workbook creates a new workbook. A new workbook can also be created by selecting the New button  on the toolbar.

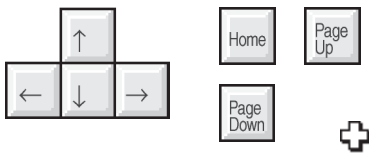
### The Formula Bar

If the Formula bar is not displayed, select **Formula Bar** from the **View** menu.

### Cell Reference vs. Cell Contents

Each cell is identified by its cell reference, such as A3 or C2, and each cell can contain data, such as the number 5 or the text Total. This system is similar to mailboxes at the post office where each box (or cell) has a name and can store information. Be careful not to confuse the cell reference with the data it stores.

- **Letters** at the top of the worksheet identify individual **columns**. In Excel columns are lettered from A to Z and then AA to IV for a total of 256 columns. In the worksheet above, only columns A through L are displayed.
- **Numbers** down the left side of the worksheet identify individual **rows**. In Excel, rows are numbered from 1 to 65,536. In the worksheet above, only rows 1 through 25 are displayed.
- **Scroll bars** are used to display rows and columns that are not currently visible in the worksheet.
- A **cell** is the intersection of a row and column. Each cell can store a single item of data.
- A **cell reference** is the column letter and row number that identify a single cell. For example, B5 is the cell reference of the selected cell in the worksheet above.
- The selected cell is called the **active cell** and is displayed with a bold outline. In the worksheet above, cell B5 is the active cell. The column letter and row number corresponding to the active cell are blue. Data can only be entered into an active cell.
- The **Name box** displays the cell reference of the active cell, which is B5 in the worksheet above.
- The **Formula bar** displays the contents of the active cell.
- The **sheet tabs** are used to display the three worksheets in the workbook.



### Scrolling

The active cell does not change when the scroll bars are used. If the active cell is not displayed after scrolling, pressing **Ctrl+Backspace** scrolls back to the active cell.

### The Go To Command

Selecting **Go To** from the **Edit** menu displays a dialog box with options that allow you to make a specific cell active quickly.

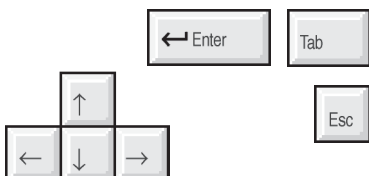
### Date Interpretation

If a date is entered with a two-digit year, Excel interprets years 00 through 29 as the years 2000 through 2029 and interprets years 30 through 99 as the years 1930 through 1999.

Note that if a cell is formatted to display the date with a two-digit year, the Formula bar still displays the four-digit year.

### AutoComplete

As data is typed into a cell, if the data matches the first few characters in a cell above, Excel fills in the remaining characters. This feature is called AutoComplete. Pressing **Enter** accepts the entry, or continuing to type replaces the AutoComplete entry.



## 8.3 The Active Cell

When the pointer is moved onto the worksheet, it changes from an arrow shape to a plus sign (⊕). Clicking a cell makes it the active cell.

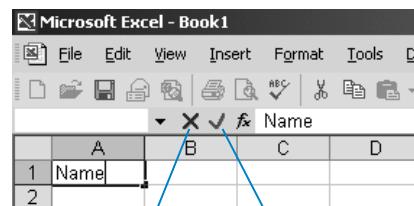
The keyboard can also be used to change the active cell. Pressing an arrow key makes the next cell in that direction the active cell. Pressing the **Home** key changes the active cell to the first cell in the row. Pressing **Ctrl+Home** changes the active cell to cell A1. Pressing the **Page Up** or **Page Down** key changes the active cell to a cell one screen up or down, respectively.

## 8.4 Entering Data into a Worksheet

Worksheets can store three types of data: labels, values, and times/dates. *Labels* are text and cannot be used in calculations. *Values* are numeric and can be used in calculations. *Times/dates* are either a time, such as 12:10 PM, or a date, such as 6/4/2003. A time/date entry may be used in some calculations. In the worksheet in Section 6.1, student names and titles (such as Jones, D. and Test 1) are labels, test grades (such as 85) are values, and a date (such as 1/7/2003) is a time/date. Labels are left aligned and values and times/dates are right aligned in worksheet cells:

	A	B	C	D
1	Inventory	9/8/2003	1:30 PM	789
2				

Data is entered into a cell by selecting that cell and then typing the data. As data is typed, it appears in the cell and on the Formula bar, and the **Cancel** and **Enter** buttons are activated:



Cancel button    Enter button

Clicking the *Enter button* (☑) enters the data and leaves the active cell in its current position. Clicking the *Cancel button* (☒) cancels data entry and restores the original contents of the cell. The keyboard can also be used to perform similar actions:

- Pressing the **Enter** key enters the data and then selects the next cell in the column.
- Pressing the **Tab** key enters the data and then selects the next cell in the row.
- Pressing an arrow key enters the data and then selects the next cell in the direction of the arrow key.
- Pressing the **Esc** key cancels data entry and restores the original contents of the cell.

### efficient data entry



An efficient method of entering data across a row is to use the Tab key, which enters the data and then selects the next cell in the row. Once the row is complete, Excel is able to recognize a pattern and pressing the Enter key selects the cell in the first column that contains data in the next row. For example, cell A2 is selected when the Enter key is pressed after typing the data for cell D1:

	A	B	C	D	E
1	Item	Price	Quantity	Total	
2					

### numeric keypad

The numeric keypad can make the entering of large amounts of numeric data more efficient. Most keyboard require pressing the Num Lock key on the numeric keypad before numbers can be entered.

### replacing cell data

If a mistake is made when entering data, it can be corrected by selecting the cell and entering the correct data. The new data then replaces any previous data. If the mistake is noticed while typing the data, the Backspace key can be used to delete one character at a time.

## 8.5 Editing Cell Contents


### Editing in a Cell

Cell contents can be edited by selecting a cell and then pressing the F2 key, which displays the insertion point in the cell.

The insertion point is also displayed in the cell by double-clicking a cell.



Data in a cell is edited by first selecting the cell to display its contents on the Formula bar. Next, clicking the Formula bar creates an insertion point, which allows characters to be entered or deleted. The *insertion point* is a blinking vertical line that indicates where the next character typed will be placed. When the data has been corrected, the Enter button is clicked or the Enter key is pressed.

The contents of a selected cell are erased by pressing the Delete key. If a cell is cleared by mistake, immediately selecting **Undo** (Ctrl+Z) from the **Edit** menu or the Undo button () on the toolbar restores the contents of the cell. Clicking the Undo button arrow displays a list of the last 16 actions performed. Selecting an option from the list will undo that particular action. Note that saving a worksheet clears the list of any previous actions.

## Practice 1

In this practice you will create a new workbook and enter data.

### ① CREATE A NEW WORKBOOK

- a. On the Taskbar, click Start → New Office Document. The New Office Document dialog box is displayed.
  1. Click the Blank Workbook icon to select it.
  2. Select OK. Excel starts and a new, empty workbook is created and the first worksheet in the workbook is displayed. Note the features of the Excel window.

## ② ENTER COLUMN LABELS IN ROW 1

- Note that A1 is the active cell. Type Name and then click the Enter button (✓). Cell A1 now contains the label Name. Note that the active cell's contents are displayed on the Formula bar.
- Press the right-arrow key to select cell B1, then type Test 1.
- Press the Tab key. The label is entered and the next cell in the row is active.
- Type Test 2.
- Press the Tab key. The label is entered and cell D1 is the active cell.
- Continue this procedure to place the labels Test 3 in cell D1 and Test 4 in cell E1.

## ③ ENTER THE TEST DATES

- Click cell B2 and type the date 1/7/2003. Click the Enter button. Note that Excel right aligns the date when it is entered into the cell.
- Select cell C2, type the date 2/9/2003 and then press the Tab key. The data is entered and D2 is now the active cell.
- Enter the date 3/1/2003 in cell D2 and the date 4/1/2003 in cell E2.

## ④ ENTER THE STUDENT NAMES AND GRADES

Enter the following labels and values starting in cell A4 by typing the label or value and pressing the Tab key to enter the data and move to the next cell in the row. Press Enter at the end of the row.

Jones, D.	85	73	88	95
Neave, C.	92	88	85	91
Garcia, E.	72	63	67	72
McCallister, T.	87	92	85	93
Smith, L.	94	91	93	84
Bell, M.	70	74	80	85

## ⑤ EDIT A GRADE

- Select cell E9.
- On the Formula bar, click to the right of the number 5. The insertion point appears.
- Press the Backspace key once to delete the number 5.
- Type a 3 and then press Enter. The grade is now an 83.

Check – Your worksheet should look similar to:

	A	B	C	D	E
1	Name	Test 1	Test 2	Test 3	Test 4
2		1/7/2003	2/9/2003	3/1/2003	4/1/2003
3					
4	Jones, D.	85	73	88	95
5	Neave, C.	92	88	85	91
6	Garcia, E.	72	63	67	72
7	McCalliste	87	92	85	93
8	Smith, L.	94	91	93	84
9	Bell, M.	70	74	80	83

Note that the appearance of the worksheet will be modified in Practice 2 and Practice 3.

## 8.6 Saving, Closing, and Opening a Workbook and Quitting Excel

### Checking the Spelling

The spelling checker can help to ensure accurate spelling of text in a worksheet. Text is spell-checked by clicking the Spelling button (ABC) on the toolbar or by pressing the F7 key. Checking begins at the active cell. Cells that do not contain text are ignored. Selecting a range of cells (refer to Section 6.10) before spell checking checks only the selected range.


Selecting **Save** (Ctrl+S) from the **File** menu or clicking the **Save** button (floppy disk icon) on the toolbar saves the workbook. If the workbook is new and has not yet been named, the **Save As** dialog box is displayed. Excel uses the default name **Book1** for a new workbook. This should be changed to a descriptive file name. Excel automatically adds the **.xls** extension to the file name. After saving a workbook, it should be closed if no longer needed by selecting **Close** from the **File** menu.

If Excel is running, a workbook can be opened by selecting **Open** (Ctrl+O) from the **File** menu or by clicking the **Open** button (floppy disk with magnifying glass icon) on the toolbar, which displays the **Open** dialog box. If Excel is not running, a workbook can be opened by selecting **Open Office Document** from the **Start** menu on the **Windows Taskbar**, which displays the **Open Office Document** dialog box.


When Excel is no longer needed, it should be quit properly so that any worksheets in memory are not damaged or lost. Quitting Excel means that the application window is closed and the program is no longer in the computer's memory. Excel is quit by selecting **Exit** from the **File** menu or by clicking the **Close** button (X) in the upper-right corner of the application window. Attempting to quit Excel with an open worksheet that has been edited but not saved displays a dialog box asking if you want to save the worksheet.

## 8.7 Previewing and Printing a Spreadsheet

Selecting **Print Preview** from the **File** menu or the **Print Preview** button (magnifying glass icon) on the toolbar displays the worksheet as it will appear when printed. Features of **Print Preview** include:

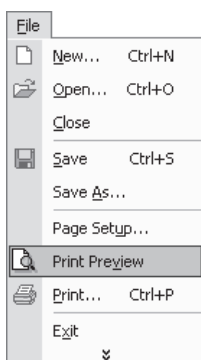
 **Zoom button** Enlarges the view so the data is easier to read.

 **Print button** Displays the **Print** dialog box.

 **Close button** Returns to **Normal** view. Pressing the **Esc** key also returns to **Normal** view.

If the worksheet display is correct in **Print Preview**, it can be printed by clicking the **Print** button which displays the **Print** dialog box. Selecting **OK** prints the portion of the worksheet that contains data. A worksheet should be saved before it is printed since a problem with the printer could cause the program to stop responding, resulting in the worksheet being lost.

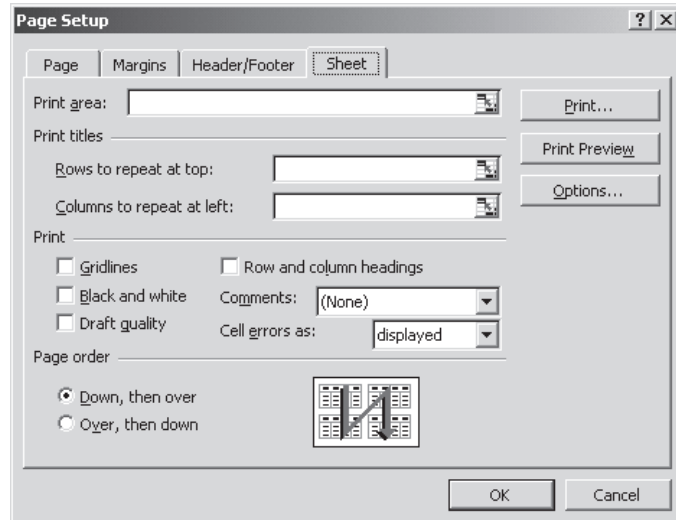
A worksheet can also be printed by selecting **Print** (Ctrl+P) from the **File** menu, which displays the **Print** dialog box. Selecting **OK** prints the portion of the worksheet that contains data. Clicking the **Print** button on the toolbar prints one copy of the worksheet using the default settings without displaying the **Print** dialog box.



### Dashed Lines

After print previewing a spreadsheet, dashed lines appear on the spreadsheet. The dashed lines indicate where one printed page ends and the next begins. Dashed lines also appear after printing a spreadsheet.

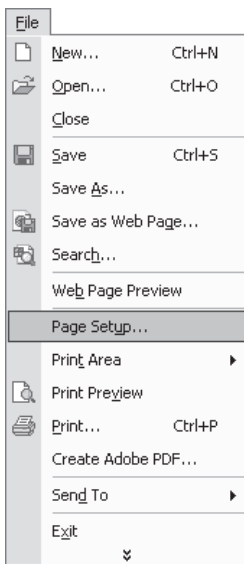
Gridlines and row and column headings can make a worksheet print-out easier to read. *Gridlines* are solid lines that mark off the rows and columns, similar to what appears on the screen in Excel. *Row* and *column headings* are the row numbers and column letters. Selecting Page Setup from the File menu displays the Page Setup dialog box. Selecting the Sheet tab displays the options.



Selecting the Gridlines and Row and column headings check boxes and then selecting OK displays gridlines and row and column headings when the worksheet is previewed or printed.

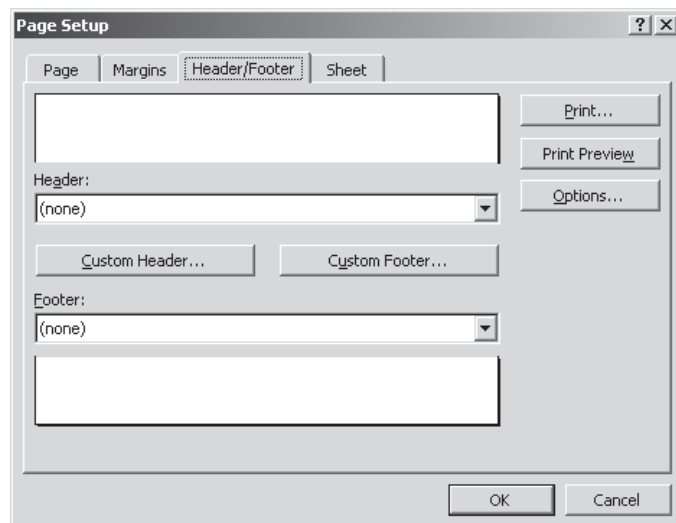
## 8.8 Adding a Header and Footer

Information such as the date or the file name can be included in a header or footer to help identify printouts. Headers and footers are automatically printed at the top and bottom of each worksheet page, respectively. A header or footer is added to a worksheet by selecting Page Setup from the File menu, which displays the Page Setup dialog box. Selecting the Header/Footer tab displays the options:

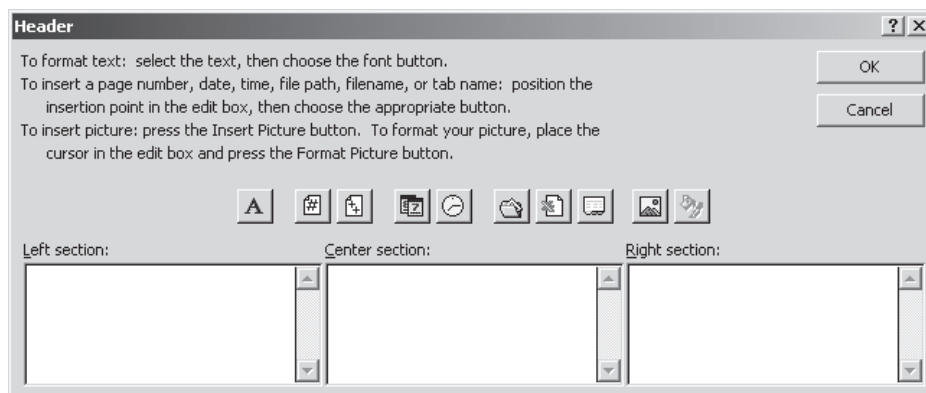


**Headers and Footers**

Headers and footers can also be added in Print Preview. In Print Preview, selecting the Setup button displays the Page Setup dialog box. Selecting the Header/Footer tab displays options for creating headers and footers.



Selecting Custom Header or Custom Footer displays another dialog box where header or footer text is entered. For example, selecting Custom Header displays the Header dialog box:













Text typed in the Left section, Center section, or Right section boxes is left, center, or right aligned in the header, respectively. Buttons in the dialog box are used to insert codes at the insertion point:

### Viewing Headers and Footers

Headers and footers can be viewed by selecting **Print Preview** from the **File** menu.

If a header or footer contains a picture or more than a couple of lines of text, it may overlap with the worksheet data. In the Print Preview window, selecting **Margins** displays the header, top, bottom, and footer margins. If there is an overlap problem, the margin handles can be dragged to the correct position on the page.

-  Font button formats header and footer text.
-  Page Number button inserts the current page number.
-  Total Pages button inserts the total number of pages.
-  Date button inserts the current date.
-  Time button inserts the current time.
-  Path & File button inserts the path and file name.
-  File Name button inserts the file name.
-  Sheet Name button inserts the sheet name. (Sheets names are discussed in Chapter 8.)
-  Insert Picture button inserts a picture.
-  Format Picture button modifies an inserted picture.

When the worksheet is previewed or printed, the codes are replaced with the appropriate information.


## Practice 2

In this practice you will add headers and footers to a worksheet and then save the worksheet. The worksheet created in Practice 1 should still be displayed.


### ① CREATE A HEADER AND A FOOTER

Select **File** → **Page Setup**. A dialog box is displayed.

1. Select the Header/Footer tab if those options are not already displayed.

2. Select Custom Header. The Header dialog box is displayed.
  - a. Click in the Center section box. The insertion point appears.
  - b. Click the Date button (). The code &[Date] is placed in the box.
  - c. Select OK. The dialog box is removed.
3. Select Custom Footer. The Footer dialog box is displayed.
  - a. Click in the Right section box and then type your name.
  - b. Select OK. The dialog box is removed.
4. Select OK. The dialog box is removed.

## ② PREVIEW THE WORKSHEET

- a. Select **F**ile → **P**rint **P**review. The worksheet is displayed in print preview. Note the header and footer. Also note how it is difficult to read the worksheet data because there are no gridlines or row and column headings.
- b. Select **C**lose to return to Normal view.
- c. Select **F**ile → **P**age **S**etup. A dialog box is displayed.
  1. Select the Sheet tab to display those options.
  2. Select the Gridlines check box.
  3. Select the Row and column headings check box.
  4. Select OK. The dialog box is removed.
- d. On the toolbar, click the Print Preview button (). Note how much easier the worksheet is to read.
- e. Select **C**lose to return to Normal view.

## ③ SAVE THE WORKBOOK AND THEN PRINT THE WORKSHEET

- a. Select **F**ile → **S**ave. A dialog box is displayed.
  1. Use the Save in box and the contents box below it to select the appropriate location for the file to be saved.
  2. In the File name box, replace the existing text with Grades.
  3. Select Save. The workbook is saved and the dialog box removed.
- b. Select **F**ile → **P**rint. A dialog box is displayed.
  1. Select OK. The printout contains the worksheet with a header, footer, gridlines, and row and column headings.

## ④ CLOSE GRADES

Select **F**ile → **C**lose.

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## 8.9 Changing the Width of a Column

### The Width Command

The width of a column can be increased or decreased by selecting **Width** from the **Column** submenu in the **Format** menu, which displays the Column Width dialog box. Typing a number in the Column width box and then selecting **OK** changes the width of the column that contains the active cell.

The width of multiple columns can be changed to the same width by first selecting the columns and then dragging the right boundary of one of the columns or selecting the **Width** command.

### sizing a column boundary

### Changing Row Height

Row height can be increased or decreased by dragging the bottom boundary of the row number or by selecting **Height** from the **Row** submenu in the **Format** menu.

### adjacent cells, range

The width of a column can affect the way Excel displays numeric data. If a cell is not wide enough to display its value, scientific notation is used. For example, the value 123456789012 is displayed as 1.23457E+11. Labels are displayed in their entirety until they encounter another cell that contains data. For example, typing This is a long label in cell A1 produces:

	A	B	C
1	This is a long label		
2			

Cell A1 stores This is a long label. Even though B1 appears to contain data, it is empty. Entering data in cell B1 produces:

	A	B	C
1	This is a long label	2	
2			

Cell A1 still stores This is a long label, but only the characters that fit in the width of the cell are displayed. The full contents can be seen on the Formula bar when cell A1 is the active cell. The entire label in A1 can be displayed by changing the width of column A.

The width of a column is changed by dragging the right boundary of the column. Pointing to the *boundary*, the bar separating the column letters at the top of the worksheet, changes the pointer shape to a double-headed arrow:

	C	D	

### Dragging the boundary changes the width of column C

Dragging the boundary to the right increases the width of the column, and dragging to the left decreases the width. Note that the width of the entire column is changed. The width of a single cell cannot be changed.

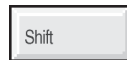
A quick and efficient technique for changing the width of a column is to double-click the right boundary of the column. This changes the width of the column so that it is just wide enough to display the data it contains.

## 8.10 Selecting Cells

Adjacent worksheet cells can be selected together to form a range. *Adjacent cells* are cells that are next to each other. A *range* is a selection of two or more cells. Dragging the pointer from one cell to another is one way to create a range:

	A	B	C	D	E
1					
2					
3					
4					
5					
6					

*The pointer was placed on cell B2 and then dragged to cell D5 to create this range*



**selecting rows and columns**

Another way to create a range is to first select the starting cell, then hold down the Shift key and click the last cell in the range.

An entire row or column is selected by first pointing to a row number or column letter, which displays an arrow indicating what row or column is being selected, and then clicking the row number or column letter.

**select all**

Clicking the Select All button selects the entire worksheet:

Select All button

	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					

### Selecting Non-adjacent Cells

A range can consist of non-adjacent cells. A range of non-adjacent cells is created by selecting the first cell or range of cells and then holding down the Ctrl key and selecting other cells or ranges.

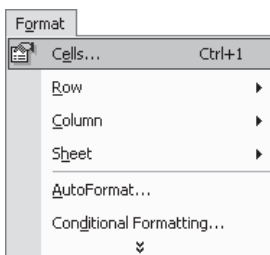
The keyboard can also be used to select a range by first selecting the starting cell, then holding down the Shift key and using the arrow keys to define the range.

## 8.11 Formatting Alignments and Fonts

Formatting is applied to cells to make the data easier to understand. Formatting does not change the data stored in a cell, only the way it is displayed.

Unless cells are formatted otherwise, labels are left aligned, and values and times/dates are right aligned. For this reason, labels and values displayed in the same column do not line up. For example, the test labels and dates in the Grades worksheet do not align in the column.

Selecting **C**ells from the **F**ormat menu displays the Format Cells dialog box. Selecting the **A**lignment tab displays the options:



### Cell Alignment

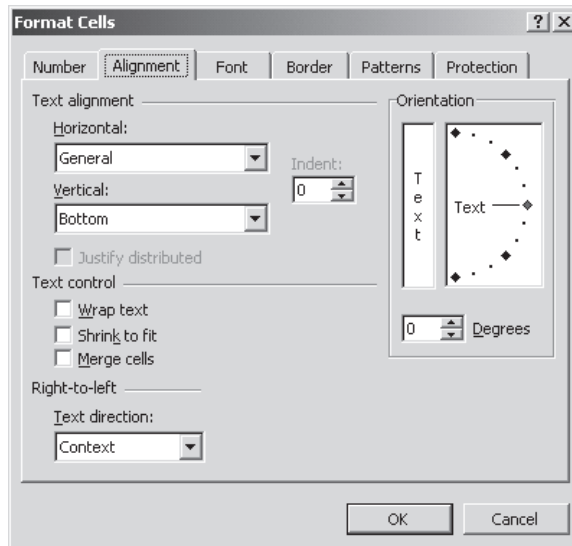
The **O**rientation option in the **F**ormat **C**ells dialog box is used to rotate cell contents.

The **V**ertical list in the **F**ormat **C**ells dialog box is used to change the vertical alignment of data in a cell when the height of the cell is larger than the data in it.

## Clearing Cell Formats

Selecting **Formats** from the **Clear** submenu in the **Edit** menu removes any formatting applied to the active cell and leaves the data unchanged.

Selecting **All** from the **Clear** submenu in the **Edit** menu removes the contents and formatting of the active cell.



## Character Formatting

When the active cell is formatted, the entire contents of the cell are affected. To format only a few characters in an active cell, select the characters on the Formula bar and then apply the format.

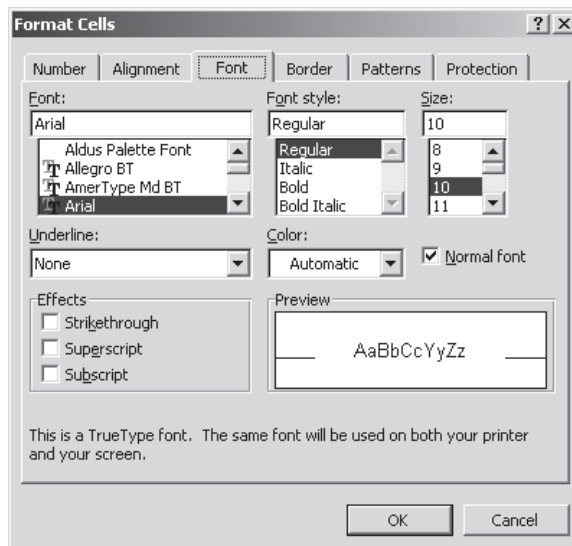
Selecting **Left (Indent)**, **Center**, or **Right (Indent)** from the **Horizontal** list and then selecting **OK** changes the alignment of the active cell accordingly. The **Align Left** (≡), **Center** (≡), and **Align Right** (≡) buttons on the toolbar can also be used to change the alignment of the active cell.

Selecting the **Wrap text** check box allows for more than one line of text within a cell. Excel automatically determines if the next word will fit or if it must go to the next line in the cell. This feature is useful for long column headings.

Selecting the **Font** tab in the **Format Cells** dialog box displays options for changing the font, font size, and style of the data in a selected cell:

## Font Size

Changing the font size of worksheet labels can help distinguish between labels, such as titles and column headings, and the data. The row height adjusts automatically when the font size is changed.



## Merge and Center

Data entered into a single cell can be centered across several cells that are combined or merged together. Data is centered across several cells by first entering the data in the upper left-most cell, selecting the cells to merge, and then clicking the **Merge and Center** button (≡) on the toolbar.

Merged cells can be split by selecting the merged cells and then clicking the **Merge and Center** button.

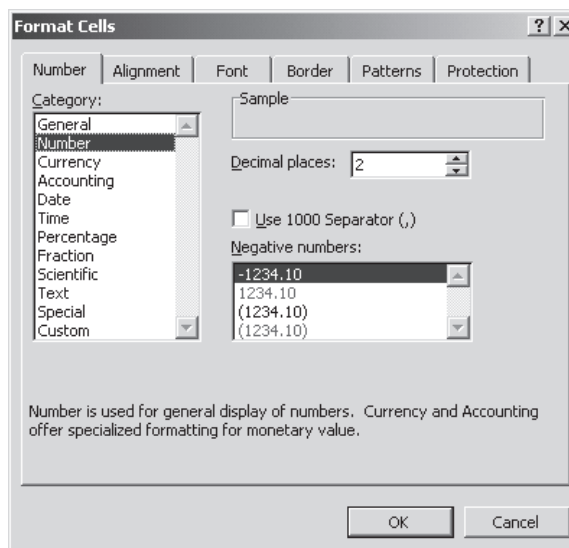
Font and font size can also be changed by selecting format options from the **Font** and **Font Size** boxes on the toolbar. The **Bold** (B), **Italic** (I), and **Underline** (U) buttons on the toolbar can also be used to change the font style.

## 8.12 Formatting Numeric Data

Cells storing numeric data should be properly formatted to reflect the type of value stored. For example, values representing money should display a \$ sign and two decimal places. Selecting **Cells (Ctrl+1)** from the **Format** menu displays the **Format Cells** dialog box. Selecting the **Number** tab displays numeric formatting options:

### Displaying the Format Cells Dialog Box

The **Format Cells** dialog box can also be displayed by right-clicking a cell or range of cells and then selecting **Format Cells** from the menu.



### Getting Rid of #####

Formatting a value in a cell may add additional characters to the value. For example, selecting the **Currency Style** button adds a dollar sign, a decimal point, and two decimal places to the value.

If the column is not wide enough to display the additional characters, a series of number signs (#####) is displayed in the cell. Increasing the width of the column removes the number signs and displays the value and its formatting.

### Decimal Places

The number of decimal places in a selected format can be changed by selecting the **Increase Decimal** button (▲) or the **Decrease Decimal** button (▼) on the toolbar.

- **Number** formats the active cell to display values with two decimal places.
- **Currency** formats the active cell to display values with a dollar sign and two decimal places.
- **Accounting** is similar to **Currency** except the dollar sign aligns itself at the left edge of the cell. Clicking the **Currency Style** button (☞) on the toolbar is the same as applying the **Accounting** format.
- **Percentage** formats the active cell to display values as a percentage with two decimal places. For example, a cell storing the value 0.15 formatted as percentage displays 15.00%. Clicking the **Percent Style** button (☞) on the toolbar formats the cell as percentage with no decimal places.
- **Scientific** formats the active cell to display values in scientific notation with two decimal places.

There are three options associated with numeric formats. The number of decimal places can be changed by selecting or typing a number in the **Decimal places** box. For large numbers, the **Use 1000 Separator (,)** check box displays values with separating commas, such as 1,000,000. The **Negative numbers** list displays different formats for negative numbers.

A cell is automatically formatted if a \$, %, or a decimal position is typed with the number. For example, entering \$45.67 in a cell formats that cell to display any number with a dollar sign and two decimal places. If 34 is then entered in that cell, \$34.00 is displayed. Entering 45% in a cell formats that cell to display any number with a percent sign and no decimal places. If 55.3 is then entered in that cell, 55% is displayed.



Formatting a cell does not change the value that is stored in the cell, only how that value is displayed. Number signs (####) are displayed if a cell is not wide enough to display the formatted number.

#### *time/date*

Time/date values can also be formatted by selecting one of the many Date or Time options in the Format Cells dialog box. Examples of date formats include 3-14-01 and March 14, 2001. Examples of time formats include 1:30:55 PM and 1:30 PM.

#### *Format Painter button*



Cell formatting can be copied to another cell or range of cells by first selecting the cell that contains the formatting to be copied and then selecting the Format Painter button () on the toolbar, which changes the pointer to a plus sign and a paint brush (). Clicking a cell or range of cells copies the selected cell's formatting.

## Practice 3


In this practice you will format the Grades workbook. Start Excel if it is not already running.

### ① OPEN GRADES

Select **File** → **O**pen. A dialog box is displayed.


1. Use the Look in list and the contents box below it to display the file name Grades.
2. In the contents box, click Grades.
3. Select **O**pen. A copy of Grades is transferred to the computer's memory and a window is displayed with the worksheet.

### ② BOLD THE NAME LABEL

- a. Select cell A1.
- b. On the toolbar, click the Bold button () . The label is now bold.

### ③ WIDEN COLUMN A BY DRAGGING



Note that the label in cell A7 is cut off because the column is too narrow to display it entirely.

- a. Point to the boundary between columns A and B. The pointer changes to a double-headed arrow () .
- b. Drag the boundary to the right approximately halfway across column B. Column A should be wide enough to display the entire label in cell A7. If not, drag the column boundary farther to the right.

### ④ RIGHT ALIGN AND BOLD THE TEST LABELS

- a. Drag the pointer from cell B1 to cell D1. Cells B1 through D1 are selected as a range.
- b. Select **Format** → **C**ells. A dialog box is displayed.
  1. Select the Alignment tab if the those options are not already displayed.
  2. In the Horizontal list, select Right (Indent).
  3. In the Indent box, select or type 0 if it is not already displayed.
  4. Select the Font tab. The font options are displayed.
  5. In the Font style list, select Bold.
  6. Select OK. The labels are right aligned and bold.

## ⑤ COPY CELL FORMAT

- a. Select cell D1.
- b. On the toolbar, click the Format Painter button (). The pointer changes to a plus sign and a paint brush () when moved onto the worksheet.
- c. Click cell E1. The format of cell D1 is copied to cell E1.

## ⑥ FORMAT THE DATES

- a. Select cell B2.
- b. Hold the Shift key down and then click cell E2. Cells B2 through E2 are selected as a range.
- c. Select **Format** → **Cells**. A dialog box is displayed.
  1. Select the Number tab. The number formatting options are displayed.
  2. In the Category list, click Date if it is not already selected.
  3. Scroll the Type list if necessary until a date similar to 3/14/01 is displayed.
  4. Click the date to select it.
  5. Select OK. The dates in row 2 now display the year with two digits.

## ⑦ SAVE AND CLOSE THE MODIFIED GRADES

- a. Select **File** → **Save**. The workbook is saved.
- b. Select **File** → **Close**. The workbook is removed from Excel.

## ⑧ QUIT EXCEL

Select **File** → **Exit**. Excel is removed from the screen.

## 8.13 Using Formulas to Perform Calculations

### The Formula Bar

The Formula bar displays the contents of the active cell instead of the value displayed in the cell. For example, if the Formula bar shows =2+3, the cell displays 5. When looking for errors in a worksheet, the Formula bar is the first place to start.

One benefit of using a worksheet is its ability to perform calculations using formulas. *Formulas* are mathematical statements used to calculate values. Every formula in Excel must begin with an equal sign (=). For example, entering the formula =25 \* 3 in a cell displays the value 75.

The following mathematical operators can be used in a formula:

Exponentiation	^
Multiplication	*
Division	/
Addition	+
Subtraction	-

Exponentiation means to raise a value to a power and is represented by the caret (^) symbol. For example,  $2^3=8$  is expressed as  $2^3 = 8$ .

## Remembering the Order of Operations

To remember the order of operations, memorize this simple phrase:

Please  
Excuse  
My Dear  
Aunt Sally

The initials correspond to the order in which the mathematical expression is evaluated:

Parenthesis  
Exponents  
Multiply Divide  
Add Subtract

Excel evaluates a mathematical expression using a specific *order of operations*. Exponentiation is performed first, multiplication and division next, and then addition and subtraction. Two operators of the same precedence, for example + and -, are evaluated in order from left to right. For example, the expression  $5 + 2 * 3 - 1$  evaluates to 10 because multiplication is performed first and then the addition and subtraction. For example:

Formula	Resulting value
=2*2+3*2	10
=25*8/4	50
=35+12/3	39
=3+5*8+7	50

The order in which Excel evaluates a mathematical expression can be changed by including parentheses in an expression. Operations within parentheses are evaluated first. For example, the result of  $(5 + 2) * 3 - 1$  is 20 because 5 and 2 were added before the multiplication and subtraction was performed. For example:

Formula	Resulting value
=(3+5)*(8+7)	120
=3^2*8-4	68
=6+2^2	10
=(6+2)^2	64

## formula error checker

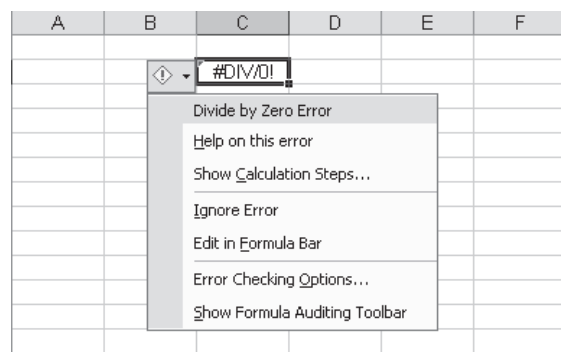
### Triangle Indicators

The triangle indicators that appear in cells have different meanings depending on the triangle's placement and color.

A green triangle in the upper-left corner of a cell indicates an error. A red triangle in the upper-right corner of a cell indicates a comment has been added to the cell. A comment is a note that explains the cell contents. A purple triangle in the lower-right corner of a cell indicates a smart tag. Smart tags recognize certain types of data that are commonly used in other applications.

When a formula is entered in a cell, Excel automatically checks the formula for errors. Entering an invalid formula in a cell causes Excel to display an error value in the cell and a triangle in the upper-left corner of the cell. For example, a number cannot be divided by zero because the result is mathematically undefined. Therefore, entering  $=10/0$  displays  $\#DIV/0!$  in the cell.

Selecting the cell with the error value displays the Trace Error button (◊) to the left of the cell. Clicking the Trace Error button displays a list of options:



The error is described in the top gray line of the list. Selecting **Ignore Error** removes the Trace Error button and the triangle from the worksheet. Selecting **Edit in Formula Bar** places the formula on the Formula bar where it can be edited.

## Practice 4

In this practice you will enter formulas into the cells of a new, empty workbook to perform calculations.

### ① CREATE A NEW WORKBOOK

### ② ENTER LABELS

- Enter the label Example Formulas in cell A1.
- Bold the label. Note that the text extends into the next cell.
- Double-click the boundary between columns A and B. Column A is widened just enough to display the label.
- Select cell A2 and enter the label Formula.
- Select cell B2 and enter the label Result.
- Italicize both labels and right align the label in cell B2.

### ③ ENTER A LABEL AND A FORMULA

- Select cell A3.
- Type 20/50 and then click the Enter button. The result is a label because it is not preceded by an equal sign.
- Select cell B3.
- Type =20/50 and then click the Enter button. The result 0.4 is displayed. Note that the formula is displayed on the Formula bar, and the result of the formula is shown in the cell:

	A	B	C
1	<b>Example Formulas</b>		
2	<i>Formula</i>	<i>Result</i>	
3	20/50	0.4	

### ④ ENTER FORMULAS

- Enter each of the labels and formulas shown below in the cells indicated. Note the resulting values of the formulas:

In cell <b>A4</b> enter	20*50	In cell <b>B4</b> enter	=20*50	to display	1000
<b>A5</b>	20-50	<b>B5</b>	=20-50		-30
<b>A6</b>	2+20*5+50	<b>B6</b>	=2+20*5+50		152
<b>A7</b>	(2+20)*(5+50)	<b>B7</b>	=(2+20)*(5+50)		1210
<b>A8</b>	20/0	<b>B8</b>	=20/0		#DIV/0!

- Select cell B8 if it is not already selected. Note the triangle in the top-left corner and the Trace Error button (🔍).
- Click the Trace Error button. A list of options is displayed. Note the first entry indicates the formula contains a "Divide by Zero Error".
  - Select **Ignore Error**. The triangle and the Trace Error button are removed.

### ⑤ SAVE THE WORKBOOK

Save the workbook in the appropriate folder naming it Formula Examples.

## 8.14 Using Cell References in Formulas

A cell reference may be used in a formula so that the value stored in the cell is used in the calculation of the formula. When Excel evaluates the formula, it uses the cell reference to locate the value needed in the calculation. For example, in the worksheet below cell C1 contains a formula that references values in cells A1 and B1:

	C1			fx	=B1/A1
	A	B	C		
1	20	50	2.5		
2					

### Circular References

A circular reference occurs when a cell's formula refers to itself. For example, placing the formula =B5-C1 in cell B5 creates a circular reference.

A circular reference also occurs when a cell's formula refers to another cell that contains a cell reference to the current cell. For example, placing the formula =B5-C1 in cell D10 creates a circular reference if either B5 or C1 contain a formula that references D10.

A dialog box is displayed if a circular reference occurs.

As a cell reference is typed, the border of the referenced cell is outlined in a colored border. Cell references can be typed in uppercase or lowercase letters. However, Excel automatically converts a cell reference to uppercase letters when entered.

Formulas that contain cell references are automatically recalculated when the value in a referenced cell changes. For example, in the worksheet below, cell D2 contains a formula that references cells B2 and C2. If the value in cell B2 or C2 changes, the formula will automatically recalculate:

	D2			fx	=B2*C2
	A	B	C	D	E
1	Item	Price	Quantity	Total	
2	Pen	\$1.00	100	\$100.00	
3					

A formula cannot reference the cell it is stored in. For example, the formulas above cannot be stored in cells B3 or C2 because this would cause an error called a *circular reference*.

## Practice 5

In this practice you will enter formulas that contain cell references. Open Formula Examples if it is not already displayed.

### ① ENTER A LABEL AND VALUES

- Select cell A10 and enter the label Example Formulas with Cell References.
- Bold the label.
- Select cell A11 and enter the label Formula.
- Select cell B11 and enter the label Result.
- Italicize both labels and right align the label in cell B11.
- Select cell E10 and enter the value 20.
- Select cell F10 and enter the value 50.

## ② ENTER FORMULAS

- Select cell A12.
- Type E10/F10 and then click the Enter button. The result is a label because it is not preceded by an equal sign.
- Select cell B12.
- Enter the formula =E10/F10. Note that as a cell reference is typed, the border of the cell is outlined in a colored border. The result 0.4 is displayed.
- Enter each of the labels and formulas shown below in the cells indicated. Note the resulting values of the formulas:

In cell <b>A13</b>	enter	E10*F10	In cell <b>B13</b>	enter	=E10*F10	to display	1000
<b>A14</b>		E10-F10	<b>B14</b>		=E10-F10		-30
<b>A15</b>		2+E10*5+F10	<b>B15</b>		=2+E10*5+F10		152
<b>A16</b>		(2+E10)*(5+F10)	<b>B16</b>		=(2+E10)*(5+F10)		1210
<b>A17</b>		E10^2+F10^2	<b>B17</b>		=E10^2+F10^2		2900
<b>A18</b>		(E10+F10)^2	<b>B18</b>		=(E10+F10)^2		4900

## ③ CHANGE THE VALUE IN CELL E10

- Select cell E10.
- Enter 30 to replace the current value. Every formula in the worksheet referencing cell E10 is automatically recalculated. A key advantage of using formulas with cell references is that they automatically recalculate when values in the cells they reference change.

Check – Your worksheet should look similar to:

	A	B	C	D	E	F
1	<b>Example Formulas</b>					
2	<i>Formula</i>	<i>Result</i>				
3	20/50	0.4				
4	20*50	1000				
5	20-50	-30				
6	2+20*5+50	152				
7	(2+20)*(5+50)	1210				
8	20/0	#DIV/0!				
9						
10	<b>Example Formulas with Cell References</b>				30	50
11	<i>Formula</i>	<i>Result</i>				
12	E10/F10	0.6				
13	E10*F10	1500				
14	2+E10*5+F10	202				
15	(2+E10)*(5+F10)	1760				
16	E10^2+F10^2	3400				
17	(E10+F10)^2	6400				

## ④ SAVE, PRINT, AND THEN CLOSE THE MODIFIED FORMULA EXAMPLES

- Create a header with the date center aligned and a footer with your name right aligned.
- Save the modified Formula Examples.
- Print a copy of the worksheet.
- Close the workbook.

## 8.15 Using Functions to Perform Calculations

### function arguments

For performing common calculations, Excel contains built-in functions that can be included in a formula. A *function* performs a calculation that results in a single value. A function requires data, called *arguments*, to perform its calculation. The arguments of a function are enclosed in parentheses after the function name and are usually cell references.

### SUM function

The *SUM function* adds the values of the cells in the range. For example, to add the values stored in cells A1, B5, and E7, a formula is used that contains the built-in SUM function can be used:

function  
=SUM(A1,B5,E7)  
arguments

### Typing Functions

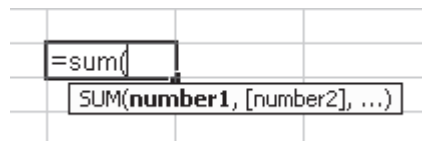
Functions can be typed in uppercase or lowercase letters. However, Excel automatically converts a function to uppercase letters when entered.

In the example above, the values to be summed are stored in nonadjacent cells. Therefore, the SUM arguments are separated by commas. When adjacent cells are the arguments of a function, a range of cells may be referenced by typing the first cell reference followed by a colon (:), and then the last cell reference. For example, to add the values in cells G1, G2, and G3:

function  
=SUM(G1:G3)  
arguments

As a range is typed, the border of the range is outlined with a colored border and the value produced from the calculation is formatted with the same format as the argument cells.

Functions are useful because they often make a formula shorter and are less error-prone, especially when a large range of cells is involved. As a function is being typed, an argument tooltip is displayed illustrating the structure, or syntax, of the function:



### AVERAGE function

Another function is *AVERAGE*, which adds the values of the cells in the range and then divides the result by the number of cells in the range. For example, the formula `=AVERAGE(C12:C17)` sums the values in cells C12, C13, C14, C15, C16, and C17 and then divides the total by 6.

The SUM and AVERAGE functions ignore cells that contain text or are empty when their cell references are included as arguments.

## 8.16 Common Error Values

If a formula cannot produce a result, an error value is displayed in the cell. For example, the #DIV/0 error value indicates the formula is trying to divide by zero. Other common error values include:

**#REF** The formula contains a reference that is not valid.

**#NUM** A numeric value is invalid, such as a value that is too large or too small.

**#VALUE** The formula is using the wrong type of argument, such as a label instead of a value.

**#####** The result of the formula is too wide to fit in the column. If the result should fit in the column, check the formula for errors. This error value can also indicate that the result of the formula is a negative time or date value.



Selecting the cell with the error value displays the Trace Error button (the icon) to the left of the cell. Clicking the Trace Error button displays a list of options for correcting the error.

### Practice 6

In this practice you will use functions to calculate the total and average sales for a candy store.

#### ① OPEN CANDY SALES

Open CANDY SALES, which is a data file for this text.

#### ② FORMAT THE CELLS

- Select cells B2 through B10. The sales amounts are selected as a range.
- Select **Format** → **Cells**. A dialog box is displayed.
  - Select the **Number** tab if those options are not already displayed.
  - In the **Category** list, select **Currency**.
  - Select or type **2** in the **Decimal places** box if it is not already there.
  - Select **OK**. The values are displayed as currency with 2 decimal places.

#### ③ USE A FUNCTION TO SUM THE VALUES

Select cell B11 and enter the formula:

```
=SUM(B2:B10)
```

The sum \$300,632.03 is displayed. Note how the total is also formatted as currency because it is summing values that have already been formatted as currency.

#### ④ USE A FUNCTION TO AVERAGE THE VALUES

Select cell B12 and enter the formula:

```
=AVERAGE(B2:B10)
```

The average sales, \$33,403.56, is displayed in cell B12.

## ⑤ CREATE A HEADER AND FOOTER

Create a header with the date center aligned and a footer with your name right aligned.

## ⑥ SAVE, PRINT, AND THEN CLOSE THE MODIFIED CANDY SALES

### 8.17 Entering Formulas - Pointing

When typing a formula, cell references can be entered by pointing. *Pointing* is a technique where a formula is typed up to where a cell reference should appear and then a cell is clicked, which places its reference in the formula. Selecting a range of cells places the cell range in the formula. Pointing is the best method for entering cell references into a formula because typing errors are avoided.

For example, in the worksheet below, =SUM( was typed into cell C5. The range was then entered into the formula by dragging the pointer from cell C2 to cell C4. The colon (:) is automatically inserted by Excel:

	A	B	C	D	E
1	<b>Product Number</b>	<b>Product Name</b>	<b>Inventory</b>		
2	001-787-0	Lawn Chair	529		
3	001-498-2	Umbrella	120		
4	006-211-8	Outdoor Table	70		
5		<b>Inventory Total:</b>	=sum(C2:C4)		
6			SUM(number1, [number2], ...)		
7					

*Selecting a block of cells enters its range into a formula*

The formula is completed by clicking the Enter button or pressing Enter. Note that Excel automatically adds a right parenthesis.

### 8.18 Displaying Formulas



Worksheet formulas are displayed at their cell locations by pressing Ctrl+` (grave accent):

	A	B	C	D	E
1	<b>Product Number</b>	<b>Product Name</b>	<b>Inventory</b>	<b>Unit Price</b>	<b>Total</b>
2	001-787-0	Lawn Chair	529	\$10.00	\$5,290.00
3	001-498-2	Umbrella	120	\$15.00	\$1,800.00
4	006-211-8	Outdoor Table	70	\$20.00	\$1,400.00
5		<b>Inventory Total:</b>	<b>719</b>		<b>\$8,490.00</b>

*Before pressing Ctrl+`*

	A	B	C	D	E
1	<b>Product Number</b>	<b>Product Name</b>	<b>Inventory</b>	<b>Unit Price</b>	<b>Total</b>
2	001-787-0	Lawn Chair	529	10	=C2*D2
3	001-498-2	Umbrella	120	15	=C3*D3
4	006-211-8	Outdoor Table	70	20	=C4*D4
5		<b>Inventory Total:</b>	=SUM(C2:C4)		=SUM(E2:E4)
6					
7					
8					
9					

*After pressing Ctrl+`*

The grave accent key is located above the Tab key on the keyboard. When formulas are displayed, column widths may need adjusting. The Formula Auditing toolbar, which contains advanced formula editing features, is automatically displayed.

Displaying formulas does not change the worksheet, only the way it is displayed. Printing when formulas are displayed prints the formulas stored in the cells rather than the values. Pressing `Ctrl+`` again removes the Formula Auditing toolbar and displays values in each cell, although any column widths that were increased remain wider and need to be reformatted.

## Practice 7

In this practice you will enter formulas to calculate the average grade on a test and a student's average in the Grades worksheet.

### ① OPEN GRADES

Open Grades, which was last modified in Practice 3.

### ② USE A FORMULA TO AVERAGE THE GRADES FOR TEST 1

- Select cell B10.
- Type `=AVERAGE(`
- Select cells B4 to B9. Excel enters the cell references for the selected range into the formula.
- Press Enter. The average for Test 1, 83.33333, is displayed in cell B10.

### ③ CALCULATE A STUDENT'S AVERAGE

Select cell F4 and use pointing to enter the formula `=AVERAGE(B4:E4)`. The average 85.25 is displayed.

### ④ ADD TITLES FOR THE NEW INFORMATION

- Select cell F1 and enter the label Student Average.
- Format the label as bold and right aligned if it is not already formatted.
- Change the column width so that the label is displayed entirely.
- Select cell A10 and enter the label Test Average.
- Format the label as italic and right aligned.

### ⑤ VIEW AND PRINT THE FORMULAS

- Save the modified Grades.
- Press `Ctrl+`` (located above the Tab key). Worksheet formulas are displayed at their cell locations and the Formula Auditing toolbar is displayed.
- Press `Ctrl+`` to again display only the values of each cell.

### ⑥ SAVE THE MODIFIED GRADES

## 8.19 Copying Adjacent Cells

### Fill handle

#### Series

If a cell contains a date, time, or a combination of text and a number, then a series is created when the Fill handle is dragged. For example, in the spreadsheet below, cells A1 through A3 were selected and then the Fill handle dragged to cell C3:

	A	B	C
1	Jan	Feb	Mar
2	2:00 PM	3:00 PM	4:00 PM
3	Test 1	Test 2	Test 3

A series of numbers is also created by selecting two cells and then dragging the Fill handle. For example, selecting a cell that contains 2 and an adjacent cell that contains 4 and then dragging the Fill handle produces a series of even numbers; 6, 8, 10, and so on.

#### The Auto Fill Options Button

Clicking the Auto Fill Options button displays a list of options including:

**Copy Cells** is the default setting that copies both the cell contents and formatting.

**Fill Series** creates a series out of the copied data.

**Fill Formatting Only** copies the format from the selected cell and not the content.

**Fill Without Formatting** copies the cell contents and not the formatting.

Cell contents are copied to adjacent cells using the Fill handle. The *Fill handle* is the solid square in the lower-right corner of a selected cell or range:


	A	B	C	D
1	<b>Pizza Delray</b>			
2	<b>Cost Analysis</b>			
3				
4	<b>Ingredients</b>	<b>Cheese</b>	<b>Pepperoni</b>	<b>Vegetarian</b>
5	Pizza Dough	\$1.00	\$1.00	\$1.00
6	Cheese	\$2.00	\$1.50	\$1.50
7	Pepperoni		\$1.50	
8	Sauce	\$0.50		
9				

Fill handle

The pointer changes to a **+** when placed on the Fill handle. Dragging the Fill handle copies the contents of the selected cell or range to the selected adjacent cells:

	A	B	C	D	E
1	<b>Pizza Delray</b>				
2	<b>Cost Analysis</b>				
3					
4	<b>Ingredients</b>	<b>Cheese</b>	<b>Pepperoni</b>	<b>Vegetarian</b>	
5	Pizza Dough	\$1.00	\$1.00	\$1.00	
6	Cheese	\$2.00	\$1.50	\$1.50	
7	Pepperoni		\$1.50		
8	Sauce	\$0.50	\$0.50	\$0.50	
9					

The contents of cell B8 is copied to adjacent cells by dragging the Fill handle

When the Fill handle is used to copy cell contents, the Auto Fill Options button () is displayed below and to the right of the last cell in the range. The Auto Fill Options button is removed when a key is pressed or a command is selected.

Commands from the **Fill** submenu in the **Edit** menu can also be used to copy the contents of a cell to adjacent selected cells. **Down** (Ctrl+D) is used if the selected cells are in a column, and **Right** (Ctrl+R) is used if the selected cells are in a row.

## 8.20 Copying Formulas

When a formula is copied, the cell references in the formula are automatically changed relative to the new row or column. For example, in the worksheet below, cell B10 contains the formula =SUM(B5:B9). Copying this cell to cells C10 and D10 creates the formula =SUM(C5:C9) in cell C10 and =SUM(D5:D9) in cell D10.

	A	B	C	D
1	<b>Pizza Delray</b>			
2	<b>Cost Analysis</b>			
3				
4	<b>Ingredients</b>	<b>Cheese</b>	<b>Pepperoni</b>	<b>Vegetarian</b>
5	Pizza Dough	\$1.00	\$1.00	\$1.00
6	Cheese	\$2.00	\$1.50	\$1.50
7	Pepperoni		\$1.50	
8	Sauce	\$0.50	\$0.50	\$0.50
9	Vegetables			\$1.25
10	<b>Total Cost</b>	<b>\$3.50</b>	<b>\$4.50</b>	<b>\$4.25</b>

Cell references that reflect the row or column they have been copied to are called *relative cell references*.

### relative cell references

#### Rounding vs. Formatting

Formatting only affects the way the information is displayed. Whereas, the ROUND function changes the value stored in the cell.

Excel follows certain rules when rounding numbers. A number with a decimal portion greater than or equal to 0.5 is rounded up and a number with a decimal portion less than 0.5 is rounded down.

A negative number as the second argument of the ROUND function rounds a value to the nearest 10s, 100s, etc. For example =ROUND(72.86,-1) displays 70. The formula =ROUND(72.866,-2) displays 100.

## 8.21 The ROUND Function

The ROUND function changes a value by rounding it to a specific number of decimal places. The first argument of the ROUND function is the value to be rounded, and the second argument is the number of decimal places to which the result is rounded. For example, to round the value stored in cell C16 to one decimal place, the formula =ROUND(C16,1) is used. If the value stored in C16 is 42.851, the rounded result is 42.9.

Often the result of a formula should be rounded. For example, the test averages should be rounded to 1 decimal places in the Grades worksheet. This means that the class average on Test 1 would be computed as 83.3, not 83.33333. To round the result of a formula, the formula is the first argument and the desired number of decimal places to round to is the second argument. For example, the average of all the Test 1 grades is rounded to 1 decimal place with the formula:

=ROUND(AVERAGE(B3:B8),1)

To round a value to the nearest whole number, a 0 can be used to indicate no decimal places: =ROUND(AVERAGE(B3:B8),0).

## Practice 8

In this practice you will copy the formulas in the Grades worksheet and use the ROUND function. Open Grades if it is not already displayed.

### ① COPY A FORMULA USING THE FILL HANDLE

- Select cell B10. Note the Fill handle in the lower-right corner of the cell.
- Point to the Fill handle of the cell. The pointer changes to cross hairs (+).
- Drag the Fill handle from cell B10 to cell E10. The formula is copied to cells C10 through E10 and the Auto Fill Options button is displayed. The Auto Fill Options button will not be used and should be ignored.
- Select cell E10. Note that the formula displayed on the Formula bar shows how the cell references have been automatically changed.

## ② COPY ANOTHER FORMULA USING THE FILL HANDLE

- a. Select cell F4.
- b. Drag the Fill handle from cell F4 to cell F9. The formula is copied. The first Auto Fill Options button is removed and another Auto Fill Options button appears below and to the right of cell F9. The Auto Fill Options button will not be used and should be ignored.

## ③ ROUND A TEST AVERAGE TO 1 DECIMAL PLACE

- a. Select cell B10.
- b. On the Formula bar, click between the equal sign and the word AVERAGE and type: ROUND(  
c. Click at the end of the formula and type ,1) so that the formula on the Formula bar is:

=ROUND(AVERAGE(B4:B9),1)

Click the Enter button. The average is now rounded to 1 decimal place, 83.3.

## ④ ROUND ALL TEST AVERAGES TO 1 DECIMAL PLACE

- a. Select cell B10 if it is not already selected.
- b. Drag the Fill handle from cell B10 to cell E10. The formula is copied.

## ⑤ ROUND A STUDENT AVERAGE TO 1 DECIMAL PLACE

- a. Select cell F4.
- b. On the Formula bar, click between the equal sign and the word AVERAGE and type: ROUND(  
c. Move the cursor to the end of the formula and type ,1) so that the formula is:

=ROUND(AVERAGE(B4:E4),1)

Click the Enter button. The average is now rounded to 1 decimal place, 85.3.

## ⑥ ROUND ALL STUDENT AVERAGES TO 1 DECIMAL PLACE

- a. Select cell F4 if it is not already selected.
- b. Use the Fill handle to copy the formula in cell F4 to cells F5 through F9.

## ⑦ FORMAT STUDENT AVERAGES TO DISPLAY 0 DECIMAL PLACES

- a. Select cells F4 through F9 if they are not already selected.
- b. Select **Format** → **Cells**. A dialog box is displayed.
  1. Select the Number tab if those options are not already displayed.
  2. Select Number.
  3. Select or type 0 in the Decimal places box.
  4. Select OK. The averages are displayed with 0 decimal places.
  5. Click on a blank cell to remove the selection. The selection is removed.

Check – Your worksheet should look similar to:

	A	B	C	D	E	F
1	<b>Name</b>	<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>	<b>Test 4</b>	<b>Student Average</b>
2		1/7/03	2/9/03	3/1/03	4/1/03	
3						
4	Jones, D.	85	73	88	95	85
5	Neave, C.	92	88	85	91	89
6	Garcia, E.	72	63	67	72	69
7	McCallister, T.	87	92	85	93	89
8	Smith, L.	94	91	93	84	91
9	Bell, M.	70	74	80	83	77
10	<i>Test Average</i>	83.3	80.2	83	86.3	

### ⑧ **SAVE, PRINT, AND THEN CLOSE THE MODIFIED GRADES**

- Save the modified Grades.
- Display formulas. Change the column widths as necessary so all the formulas are displayed entirely.
- Print the worksheet.
- Close the workbook without saving changes. The only change that is not being saved is the displaying of the formulas.

### ⑨ **QUIT EXCEL**

## Chapter Summary

### *spreadsheet application*

A spreadsheet is data displayed in rows and columns. A spreadsheet application, such as Microsoft Excel, is used to electronically store data. Benefits of using a spreadsheet application include the ability to easily perform calculations on data and to automatically recalculate values when changes are made to the data.

### *workbook worksheet*

In Excel, spreadsheet files are called workbooks, and each workbook contains three worksheets, also called sheets. Worksheets are used to present data in an organized format.



Blank  
Workbook

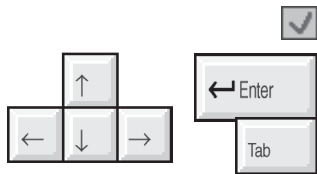
### *active cell*

A new workbook is created by selecting the Blank Workbook icon and then OK in the New Office Document dialog box. In the Excel window, rows are identified by numbers and columns by letters. A cell is the intersection of a row and column and is identified by its cell reference. For example, D4 is the cell reference of the cell located at the intersection of column D and row 4. The selected cell is called the active cell and is displayed with a bold outline. The Name box displays the cell reference of the active cell, and the Formula bar displays the contents of the active cell.

### *Name box*

### *labels, values times/dates*

Worksheet cells can store three types of data: labels, values, and times/dates. Labels are text and cannot be used in calculations. Values are numeric and can be used in calculations. Times/dates are either times (10:30 AM) or calendar dates (9/21/2003), and both can be used in certain types of calculations.



### *editing cell contents*

Data is entered into a cell by selecting that cell, typing the data and then pressing the Enter button. Pressing the Enter key, Tab key, or arrow key after typing data into a cell enters the data and then moves the active cell to an adjacent cell, in a direction depending on which key is pressed.

Data in a cell is edited by first selecting the cell to display its contents on the Formula bar. Next, clicking the Formula bar creates an insertion point, which allows characters to be entered or deleted. The contents of a selected cell are erased by pressing the Delete key. If a cell is cleared by mistake, immediately selecting Undo from the Edit menu or the Undo button on the toolbar restores the contents of the cell.



Selecting Save (Ctrl+S) from the File menu or clicking the Save button on the toolbar saves the workbook. A saved workbook that has been closed may be opened later by selecting Open from the File menu or by selecting the Open button on the toolbar. Excel is quit by selecting Exit from the File menu.



Selecting Print Preview from the File menu or the Print Preview button on the toolbar displays the worksheet as it will appear when printed. In Print Preview, selecting Print displays the Print dialog box where selecting OK prints the portion of the worksheet that contains data. A worksheet can also be printed by selecting Print from the File menu. Gridlines and row and column headings can make a worksheet printout easier to read. Information such as the date or the file name can be included in a header or footer to help identify printouts. Headers and footers are automatically printed at the top and bottom of each worksheet page, respectively.

### *deleting cell contents*

### *gridlines*

### *row and column headings*

### *headers and footers*

### *changing column width*

### *range*

The width of a column is changed by dragging its right boundary or double-clicking the right boundary of the column.

Adjacent worksheet cells can be selected together to form a range. Adjacent cells are cells that are next to each other. A range is a selection of two or more cells.

### *formatting*

Formatting is applied to cells to make the data easier to understand. Formatting does not change the data stored in a cell, only the way it is displayed. The Cells command from the Format menu is used to display the Format Cells dialog box where formatting options can be selected. The toolbar can also be used to select formatting options.

### *formulas*

Formulas are mathematical statements used to calculate values. All formulas must begin with an equal sign (=) and may contain cell references. For example, if cell B5 stores the value 12 and cell C8 stores 10, the formula =B5\*C8 would display 120. Excel uses an order of operations when evaluating a formula. First it performs exponentiation, then multiplication and division, and finally addition and subtraction. Operations of the same priority are performed from left to right. The order of operations is changed by using parentheses.

### *error checking*

When a formula is entered in a cell, Excel automatically checks the formula for errors. Entering an invalid formula in a cell causes Excel to display an error value in the cell and a triangle in the upper-left corner of the cell.

**SUM**

**AVERAGE**

**ROUND**

**pointing  
displaying formulas**

**Fill handle**

**relative cell references**

Excel contains built-in functions that are used to perform common calculations. The formula =SUM(B3:B8) includes the SUM function. The formula's argument, B3:B8, is called a range and defines the cells to be summed. The formula =AVERAGE(C3:C7) averages the values in the cells C3, C4, C5, C6, and C7. The formula =ROUND(C5,2) rounds the value stored in cell C5 to two decimal places. Similarly, the formula =ROUND(AVERAGE(B7:F7),1) rounds the average of the values in the range B7:F7 to one decimal place.

Cell references can be entered into a formula by clicking the cell. This technique is called pointing. The formulas in a worksheet are displayed by pressing Ctrl+`.

The contents of a selected cell or block of cells are copied to a row or column of adjacent cells by dragging the Fill handle or selecting the Down and Right commands from the Fill submenu. When this is done, the cell references in the copied formulas automatically change to reflect the new row or column they are in. Cell references that reflect the row or column they have been copied to are called relative cell references.

## Vocabulary

**Active cell** The selected cell displayed with a bold outline. Data can only be entered into an active cell.

**Adjacent cells** Cells that are next to each other.

**Argument** Data required by a function to perform calculations.

**Arrow keys** Enters data and then selects the next cell in the direction of the arrow key.

**AVERAGE** Function that adds the values of the cells in a range and divides the result by the number of cells in the range.

**Boundary** The bar separating the column letters at the top of the worksheet.

**Cell** The intersection of a row and column. Each cell can store a single item of data.

**Cell reference** The column letter and row number used to identify a cell, such as B3.

**Circular reference** An error that occurs when a formula references the cell it is stored in.

**Column letter** Letter at the top of the worksheet used to identify individual columns.

**Date** Data in the form of a calendar date.

**Enter key** Enters data and then selects the next cell in the column.

**Esc key** Cancels data entry and restores the original contents of the cell.

**Fill handle** The solid square in the lower-right corner of a selected cell that is used to copy the contents of a cell to adjacent cells.

**Formula** Mathematical statement used to calculate a value. A formula must always begin with an equal sign. For example, =C5+D7+E8 is a formula.

**Formula bar** Area near the top of the worksheet window that displays the contents of the active cell.

**Function** Performs a calculation that results in a single value. The formula =SUM(B3:B8) contains the SUM function.

**Gridlines** Solid lines that mark off the rows and columns in a worksheet.

**Insertion Point** A blinking vertical line that indicates where the next character typed will be placed.

**Label** Text stored in a cell that cannot be used in calculations.

**Microsoft Excel** A spreadsheet application in the Microsoft Office suite.

**Name box** Located near the top of the worksheet window. Displays the cell reference of the active cell.

**Order of operations** The rules Excel uses to evaluate a mathematical expression.

**Pointing** Clicking a cell to place its reference in a formula.

**Range** Selection of two or more cells.

**Relative cell reference** A cell reference that when copied reflects the row or column it has been copied to.

**ROUND** Function that changes a value by rounding it to a specific number of decimal places.

**Row number** The number down the left side of the worksheet used to identify individual rows.

**Scroll bars** Used to display rows and columns not currently visible in the worksheet.

**Sheet tabs** Used to display the three worksheets in the workbook.

**Spreadsheet** Data displayed in rows and columns.

**Spreadsheet application** Used to electronically store data. Microsoft Excel is an example.

**SUM** Function that adds the values in a range of cells.

**Tab key** Enters data and then selects the next cell in the row.


**Time** Data in the form of a time (i.e., 12:30 PM).

**Value** Numeric data that is stored in a cell that can be used in calculations.


**Workbook** An Excel spreadsheet file.


**Worksheet** Sheets in an Excel workbook used to present data in an organized format.


## Excel Commands and Buttons

 **Align Left button** Left aligns the contents of the active cell. Found on the toolbar.

 **Align Right button** Right aligns the contents of the active cell. Found on the toolbar.

 **Auto Fill Options button** Displayed when the Fill handle is used to copy cell contents.

 **Bold button** Formats the active cell as bold. Found on the toolbar.

 **Cancel button** Cancels data entry and restores the original contents of the cell. Found on the Formula bar.

**Cells command** Displays a dialog box where alignment, font, and number formatting options are selected. Found in the **Format** menu.

 **Center button** Centers aligns the contents of the active cell. Found on the toolbar.

**Close command** Removes the worksheet from the Excel window and the computer's memory. Found in the **File** menu.

 **Currency Style button** Applies the Accounting format to the active cell. Found on the toolbar.

**Down command** Copies the cell contents into the selected cells of a column. Found in the **Fill** submenu in the **Edit** menu.

**Edit in Formula bar command** Places the formula on the Formula bar where it can be edited. Found in the list displayed by clicking the Trace Error button.

 **Enter button** Enters data and leave the active cell in its current position. Found on the Formula bar.


**Exit command** Quits Excel. Found in the **File** menu. The Close button () can be used instead of the command.

**Font box** Displays a list of fonts to choose from. Found on the toolbar.

**Font Size box** Displays a list of font sizes to choose from. Found on the toolbar.

 **Format Painter button** Copies cell formatting. Found on the toolbar.

**Ignore Error command** Removes the Trace Error button and the triangle from the worksheet. Found in the list displayed by clicking the Trace Error button.


 **Italic button** Formats the active cell as italic. Found on the toolbar.


**New Office Document command** Displays the New Office Document dialog box. Found in the **Start** menu.

**Open Office Document command** Opens an existing workbook. Found in the **Start** menu.

**Open command** Opens a saved workbook if Excel is running. Found in the **File** menu. The Open button () on the toolbar can be used instead of the command.


**Page Setup command** Displays a dialog box where options for printing with gridlines and row and column headings and creating a header or footer can be selected. Found in the **File** menu.

 **Percent Style button** Formats the active cell as percentage with no decimal places. Found on the toolbar.


**Print command** Displays a dialog box used for printing a worksheet. Found in the **File** menu. The Print button () on the toolbar can be used instead of the command.


**Print Preview command** Displays the worksheet as it will appear when printed. Found in the **File** menu. The Print Preview button () on the toolbar can be used instead of the command.

**Right command** Copies the cell contents into the selected cells of a row. Found in the **Fill** submenu in the **Edit** menu.

**Save command** Saves a workbook. Found in the **File** menu. The Save button () on the toolbar can be used instead of the command.

 **Trace Error button** Displays a list of options for correcting an error. Displayed when clicking a cell that contains an error.

**Undo command** Restores the previous action. Found in the **Edit** menu. The Undo button () on the toolbar can be used instead of the command.

 **Underline button** Formats the active cell as underlined. Found on the toolbar.

## Review Questions

### Sections 8.1 — 8.12

1. What is a spreadsheet?
2. a) What are spreadsheets called in Excel?  
b) How many worksheets does a new workbook contain?
3. List two benefits of using a spreadsheet application.
4. List the steps for creating a new Excel workbook.
5. a) How are individual columns identified on a worksheet?  
b) How are individual rows identified on a worksheet?  
c) What are scroll bars used for?
6. a) What is a cell?  
b) Give an example of a cell reference.  
c) Where can data be entered?  
d) What does the Name box display?  
e) What does the Formula bar display?  
f) What are the sheet tabs used to display?
7. List two ways to change the active cell.
8. How many of each of the following types of entries are stored in the Grades worksheet shown in Practice 1?
  - a) labels
  - b) values
  - c) dates
  - d) times
9. After selecting a cell and typing data, what happens when you:
  - a) click the Enter button?
  - b) press the Enter key?
  - c) press the Tab key?
  - d) press the Esc key?
10. a) What can be used to efficiently enter large amounts of numeric data?  
b) If a mistake has been made entering data into a cell, how can it be corrected?
11. List the steps required to edit data in a cell.
12. What is the insertion point?
13. a) What is displayed when the Undo button arrow is clicked?  
b) What happens to the list of previous actions when a workbook is saved?
14. a) List two ways to save a worksheet.  
b) What should be done if the worksheet has been saved and is no longer needed?
15. a) List the steps required to view a worksheet as it will appear when printed.  
b) In Print Preview, what button can be selected to enlarge the view?
16. What options can be selected from the Page Setup dialog box to make a worksheet printout easier to read?
17. List the steps required to have your name left aligned and the current date right aligned in the header of a worksheet.
18. Is it possible to change the width of only a single cell?
19. List the steps required to increase the width of a column.
20. a) What is a range?  
b) List two ways to select the range B3 through C12.  
c) How is an entire column selected?  
d) What button selects the entire worksheet?
21. List the steps required to:
  - a) format a cell to display a number with 3 decimal places.
  - b) bold and right align the contents of a cell.
  - c) format a cell to display a value in dollars to 2 decimal places.
22. What button can be used to copy a selected cell's format?

### Sections 8.13 — 8.21

23. Briefly explain what a formula is and give two examples.

24. a) What is meant by order of operations?  
 b) Which operation is performed first?  
 c) Which operation is performed last?  
 d) How can the order of operations be changed?
25. If 10/20 is entered into a cell, Excel considers it a label. How must the entry be changed so that 10 will be divided by 20?
26. What value would be calculated by Excel for each of the following formulas?  
 a) =2+7\*5+4  
 b) =(2+7)\*(5+4)  
 c) =5+10/5  
 d) =(5+10)/5  
 e) =2^3+4
27. a) What is displayed in a cell if an invalid formula is entered?  
 b) What button is displayed when a cell with an error value is selected?  
 c) Where can a description of an invalid formula error be found?
28. In a formula, do cell references have to be typed in capital letters?
29. What value would be calculated by Excel for each of the following formulas if cell C15 stores a value of 16 and cell D8 a value of 4?  
 a) =C15\*D8  
 b) =C15+5+D8  
 c) =C15\*5+D8  
 d) =C15\*(5+D8)  
 e) =C15/D8
30. What is a circular reference?
31. a) What is a function?  
 b) What does a function require to perform a calculation?
32. Write a formula that uses a function to calculate:  
 a) the sum of the values stored in cells B4, B5, B6, and B7.  
 b) the sum of the values stored in cells B4, C4, D4, and E4.  
 c) the average of the values stored in the column of cells D7 to D35.  
 d) the average of the values stored in the row of cells F3 to J3.
33. List and describe two common error values.
34. What is usually the best method for entering cell references in a formula?
35. How can the formulas stored in the cells of a worksheet be displayed instead of the values they calculate?
36. a) List the steps required to copy the contents of cell A1 into cells A2, A3, A4, and A5 using the Fill handle.  
 b) List the steps required to copy the contents of cell C1 into cells D1, E1, and F1 using the Fill command.
37. a) What is a relative cell reference?  
 b) List the steps required to copy the formula =AVERAGE(C5:C9) stored in cell C22 into the range of cells D22 to G22 so that the formula correctly calculates the average for each column.
38. What will be displayed in cell A2 if the value stored in cell C5 is 98.345 and the formula =ROUND(C5,2) is stored in cell A2?
39. Using functions, write a formula to calculate:  
 a) the sum of the values in cells C5, C6, C7, C8, and C9 rounded to 2 decimal places.  
 b) the sum of the values in cells B5, C5, D5, and E5 rounded to the nearest integer.  
 c) the average of the values in cells A1, A2, A3, B1, B2, and B3 rounded to 1 decimal place.

## Exercise 1 Activity

A worksheet can be used to determine the time you spend on different activities during one week.

- a) Create a new workbook.
- b) Enter the following labels in row 1 starting in column A: Activity, Sun, Mon, Tue, Wed, Thu, Fri, Sat.
- c) Bold all the labels in row 1. Right align all the days of the week labels.
- d) Change the width of columns B through H so they are just wide enough to display the data entirely.
- e) Starting in row 3, enter the appropriate label and number of hours you spend each day of the week on each of the following activities:
  - school classes
  - athletics
  - extracurricular groups and clubs
  - studying and doing homework
  - eating
  - sleeping
  - watching television or listening to music
  - talking on the phone
  - doing housework
  - working at a job

Change the width of column A to display all the labels entirely. Format all the hours to display 1 decimal place.

- f) Save the workbook naming it Activity.
- g) Most people's schedules do not account for all 24 hours in a day. Include a row, after the last activity, and enter formulas that use a function to calculate the amount of unaccounted time in your schedule for each day. Include an appropriate label for the unaccounted time.
- h) In cell I1, enter the label Total Hours. Enter formulas that use a function to calculate the total hours spent for the week on each activity. Format the total hours as number with 1 decimal place if it is not already formatted.
- i) In cell J1, enter the label Avg. Hours. Enter formulas that use a function to calculate the average number of hours spent per day on each activity for the week.
- j) Change the column widths as necessary so that all the data is displayed entirely.
- k) Create a header with your name right aligned.
- l) Save the modified Activity and print a copy with gridlines and row and column headings.
- m) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 2

## Squeaky Clean Cars

The owner of Squeaky Clean Cars wants to use a worksheet to keep track of his budgeted and actual expenses.

- a) Create a new workbook.
- b) Enter the data as shown below. Change the column widths as necessary so that all the data is displayed entirely and format the numeric values as currency with 2 decimal places:

	A	B	C	D
1	Squeaky Clean Cars			
2				
3		June Expenses Budget		
4		Budgeted	Actual	
5				
6	Soap	\$35.00	\$28.65	
7	Wax	\$50.00	\$43.45	
8	Vinyl Cleaner	\$25.00	\$32.75	
9	Window Cleaner	\$15.00	\$20.50	
10	Sponges and Towels	\$10.00	\$12.56	
11				

- c) Save the workbook naming it Squeaky Clean Cars.
- d) The owner would like to know the difference between what was budgeted and what he actually spent. In cell D4, enter the label Difference. Enter formulas that use cell references to subtract the actual costs from the budgeted costs.
- e) In cell A11, enter the label Total: and right align it. Enter formulas that use a function to total the Budgeted and Actual columns.
- f) Bold the labels in column A and row 3. Italicize and right align the labels in row 4. Change the column widths as necessary so that all the data is displayed entirely.
- g) Create a header with your name right aligned.
- h) Save the modified Squeaky Clean Cars and print a copy with gridlines and row and column headings.
- i) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 3

## Swim Meet

A swim team wants to use a worksheet to keep track of the last swim meet's results.

- Create a new workbook.
- Enter the data as shown below. Change the column widths as necessary so that all the data is displayed entirely and format the average times with an appearance similar to 13:30:55:

	A	B	C	D	E
1	Swimming Event	Floyd	Abby	Eric	Katrina
2					
3	100 M Freestyle	2:54:00	2:45:40	2:55:06	2:23:36
4	100 M Breaststroke	3:07:17	3:12:40	2:56:27	3:28:16
5	100 M Butterfly	2:57:15	2:45:12	3:10:36	2:58:56
6	100 M Backstroke	3:00:30	2:45:18	2:55:09	3:12:16
7	200 M Individual Medley	3:56:50	5:25:25	4:34:07	4:24:36
8	400 M Medley Relay	5:34:08	5:45:02	5:46:25	5:51:32

- Save the workbook naming it Swim Meet.
- In cell F1, enter the label Avg. Time. Enter formulas that use a function to calculate the average time of each swimming event.
- Italicize all the labels in row 1. Right align all the swimmers' names and the Avg. Time label in row 1. Change the column widths as necessary so that all the data is displayed entirely.
- Create a header with your name right aligned.
- Create a footer with the text September 10 Swim Meet Results center aligned.
- Save the modified Swim Meet and print a copy with gridlines and row and column headings.
- Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 4

## Student Stats

The Admissions department at a local university wants to use a worksheet to keep track of the statistics on the number of undergraduate and graduate students in each college.

- Create a new workbook.
- Enter the data as shown below. Change the column widths as necessary so that all the data is displayed entirely:

	A	B	C
1	College	Undergraduate	Graduate
2			
3	Business	3098	250
4	Education	1356	189
5	Liberal Arts	2589	180
6	Pharmacy	2398	212
7	Social Science	1586	98

- c) Save the workbook naming it Student Stats.
- d) In cell A8, enter the label *Total:* and then right align and italicize it. Enter formulas that use a function to calculate the total number of undergraduate students and the total number of graduate students at the university.
- e) In cell A9, enter the label *Average:* and then right align and italicize it. Enter formulas that use a function to calculate the average number of undergraduate students and the average number of graduate students at the university.
- f) Format the numeric values to display commas and 0 decimal places.
- g) Bold all the labels in row 1. Right align the Undergraduate and Graduate labels. Change the column widths as necessary so that all the data is displayed entirely.
- h) Create a header with your name right aligned.
- i) Create a footer with the current date center aligned.
- j) Save the modified Student Stats and print a copy with gridlines and row and column headings.
- k) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 5 Coral Employees

The accountant for Coral county has decided to use a worksheet for the city hall payroll.

- a) Create a new workbook.
- b) Enter the data as shown below. Change the column widths as necessary so that all the data is displayed entirely and format the salaries as currency with 0 decimal places:

	A	B	C
1	First Name	Last Name	Salary
2			
3	Sang	Cho	\$42,000
4	Jill	Grossman	\$25,500
5	Jason	Jones	\$26,000
6	Christa	Smith	\$28,900
7	Tanya	White	\$32,000

- c) Save the workbook naming it Coral Employees.
- d) Employees are paid weekly. In cell D1, enter the label *Weekly Pay.* Enter formulas that use cell references to calculate the weekly pay for each employee. Weekly pay is calculated by dividing the salary by 52 weeks in a year.
- e) In cell B8, enter the label *Average:* and then right align and italicize it. Enter formulas that use a function to calculate the average salary and weekly pay for the employees. Format the average weekly pay as currency with 2 decimal places.
- f) Bold all the labels in row 1. Right align the Salary and Weekly Pay labels. Change the column widths as necessary so that all the data is displayed entirely.
- g) Modify the weekly pay formulas to use a function to round the weekly pay amounts in column D to 0 decimal places (do not round the average weekly pay formula). Note that the average weekly pay also changes because the numbers have been rounded.

- h) Create a header with your name right aligned.
- i) Save the modified Coral Employees and print a copy with gridlines and row and column headings.
- j) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 6 Dive Log

Researchers of a coral reef study want to use a worksheet to computerize their scuba diving log.

- a) Create a new workbook.
- b) Enter the following data starting in cell A1:

	A	B	C	D	E
1	Date	Depth (m)	Duration (min)	Water Temp (Celsius)	Visibility (m)
2					
3	5/8/2003	10	60	26	10
4	5/10/2003	18	45	25	12
5	5/11/2003	13	50	27	9
6	5/13/2003	27	15	23	10
7	5/14/2003	11	53	28	11

- c) Save the workbook naming it Dive Log.
- d) In cell A8, enter the label Average: and then right align and italicize it. Enter formulas that use a function to average the depth and duration of all five dives.
- e) Modify the average depth and duration formulas to use a function to round the results to 0 decimal places.
- f) Right align and italicize the labels in row 1. Change the column widths as necessary so that all data is displayed entirely.
- g) Create a header with your name right aligned.
- h) Save the modified Dive Log and print a copy with gridlines and row and column headings.
- i) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 7

## Pizza Palace

The owner of Pizza Palace wants to use a worksheet to keep track of expenses.

- a) Create a new workbook.
- b) Enter the data as shown below. Change the column widths as necessary so that all the data is displayed entirely and format the expenses as currency with 2 decimal places:

	A	B	C	D
1	Pizza Palace			
2	Expenses per Pizza			
3				
4	Ingredients	Everything	Vegetarian	Cheese
5				
6	Dough	\$1.25	\$1.25	\$1.25
7	Cheese	\$1.50	\$1.50	\$1.50
8	Sauce	\$0.50	\$0.50	\$0.50
9	Pepperoni	\$0.75	\$0.00	\$0.00
10	Sausage	\$1.00	\$0.00	\$0.00
11	Onion	\$0.15	\$0.15	\$0.00
12	Mushroom	\$0.35	\$0.35	\$0.00
13	Green Pepper	\$0.40	\$0.40	\$0.00

- c) Save the workbook naming it Pizza Palace.
- d) In cell A14, enter the label *Cost of Pizza:* and then right align and italicize it. Enter formulas that use a function to calculate the total cost of each pizza type.
- e) Bold the labels in rows 1 and 2.
- f) Bold the labels in row 4. Right align the pizza type labels. Change the column widths as necessary so that all the data is displayed entirely.
- g) Create a header with your name right aligned.
- h) Create a footer with the current date center aligned.
- i) Save the modified Pizza Palace and print a copy with gridlines and row and column headings.
- j) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 8 Balance Sheet

A balance sheet lists a company's assets (what they own), liabilities (what they owe), and stockholders' equity (the owners' investments) as of a specific date. The owner of Northern Light's Gym wants use a worksheet to computerize the company's balance sheet.

- a) Create a new workbook.
- b) Enter the data and apply formatting as shown below:

	A	B	C	D	E	F
1			<b>Northern Light's Gym</b>			
2			<b>Balance Sheet</b>			
3			<b>Month Ended Jan 31, 2003</b>			
4						
5	<i>Assets:</i>			<i>Liabilities:</i>		
6		Cash	\$12,000		Accounts Payable	\$75,987
7		Accounts Receivable	\$15,000	<i>Stockholder's Equity:</i>		
8		Gym Equipment	\$45,000		Stockholder's Equity	\$95,003
9		Office Computers	\$98,990			
10						
11		<b>Total Assets:</b>		<b>Total Liabilities and Stockholder's Equity:</b>		

- c) Save the workbook naming it Balance Sheet.
- d) In cell C11, enter a formula that uses a function to calculates the total assets.
- e) In cell F11, enter a formula that uses cell references to calculates the total liabilities and stockholder's equity.
- f) Create a header with your name right aligned.
- g) Save the modified Balance Sheet and print a copy with gridlines and row and column headings.
- h) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 9 Temp Conversion

The local university's Meteorology department wants to use a worksheet to convert Fahrenheit temperatures to the equivalent Celsius temperatures.

- a) Create a new workbook.
- b) Enter the data and apply formatting as shown below. In cell E3 enter the formula  $=5/9*(B3-32)$  to convert the Fahrenheit temperature stored in cell B3 to degrees Celsius:

	A	B	C	D	E
1	<b>Temperature Conversion</b>				
2					
3	Fahrenheit Temp:	20		Celsius Temp:	-6.66667

- c) Save the workbook naming it Temp Conversion.
- d) Modify the formula in cell E3 to use a function to round the result to 0 decimal places.

- e) Enter the following Fahrenheit temperatures in cell B3, one at a time: 0, 32, and 80. What Celsius temperature does each of these convert to?
- f) In row 5, have the worksheet convert temperatures from a Celsius temperature entered in cell B5 to a Fahrenheit temperature displayed in cell E5. Use 26 for the Celsius temperature. Include appropriate labels. The formula needed for converting from degrees Celsius to Fahrenheit is  $=9/5*B5+32$ . Use a function to round the result to 0 decimal places. Change the column widths as necessary so that all the data is displayed entirely.
- g) Enter the following Celsius temperatures in cell B5, one at a time: 0, 12, and -21. What Fahrenheit temperature does each of these convert to?
- h) Create a header with your name right aligned.
- i) Save the modified Temp Conversion and print a copy with gridlines and row and column headings.
- j) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 10 Upgrade Costs

A technology coordinator wants to use a worksheet to project computer-related costs through the year 2007. Years 2002 and 2003 have already been established.

- a) Create a new workbook.
- b) Enter the following data starting in cell A1. Format the costs as currency with 0 decimal places:

	A	B	C	D
1	Year	Hardware	Software	Training
2				
3	2002	\$15,750	\$5,500	\$2,500
4	2003	\$0	\$8,000	\$2,500

- c) Save the workbook naming it Upgrade Costs.
- d) Hardware is upgraded every other year with an expected 15% increase over the last upgrade and software costs are expected to increase 7% each year starting in 2004. The training budget is \$2,500 per year. Enter formulas that use cell references to calculate the costs for years 2004 through 2007.
- e) Use a function to round the formulas for the hardware and software costs to 0 decimal places. Format all of the numeric values as currency with 0 decimal places.
- f) Format the labels in row 1 as right aligned and bold. Change the column widths as necessary so that all the data is displayed entirely.
- g) In cell E1, enter the label Total Expenses. Enter formulas that use a function to calculate the total expenses projected each year. Change the column width as necessary so that all the data is displayed entirely.

- h) Note the triangle in the upper-left corner of the cell indicating an error. Select the cell and then click the Trace Error button. The error is described as Formula Omits Adjacent Cells and results from the dates in column A not being included in the formula that calculates the total expenses. Since the dates are not suppose to be included in the formula, select Ignore Error from the list of options.
- i) Create a header with your name right aligned.
- j) Save the modified Upgrade Costs and print a copy with gridlines and row and column headings.
- k) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 11 Class Scores

Worksheets can be used to keep track of your class grades. Create a worksheet of your grades in this class for the chapters you have covered so far. This exercise assumes assignments are graded using a point system. For example, review questions are worth 20 points and tests are worth 100 points.

- a) Create a new workbook.
- b) Enter your points for the practices, review questions, exercises, and tests. Also, enter the total points possible for each chapter. Include appropriate labels and proper formatting as shown below. Your worksheet will have different data but should look similar to:

	A	B	C	D	E	F	G
1		<b>Ch 1</b>	<b>Ch 2</b>	<b>Ch 3</b>	<b>Ch 4</b>	<b>Ch 5</b>	<b>Ch 6</b>
2							
3	Practices	<i>None</i>	25	25	30	27	25
4	Review Questions	20	15	20	20	18	20
5	Exercises	<i>None</i>	<i>None</i>	50	45	43	47
6	Test	91	89	85	94	85	90
7	<i>Possible Points</i>	120	150	200	200	200	200

- c) Save the workbook naming it Class Scores.
- d) In cell H1, enter the label Total Points. Enter formulas that use a function to calculate the total points you earned for the practices, review questions, exercises, and tests. Also calculate the total points possible and format the totals to display commas and 0 decimal places.
- e) Change the column widths as necessary so that all the data is displayed entirely.
- f) In cell A8, enter the label Current Grade and then right align, bold, and italicize it. In cell B8, enter a formula that uses cell references and a function to calculate your grade as a percentage. Your grade is calculated by dividing the total points you earned by the total points possible. Format your current grade as a percentage with 0 decimal places and bold.
- g) Create a header with your name right aligned.
- h) Create a footer with the text Computer Class Grades center aligned.
- i) Save the modified Class Scores and print a copy with gridlines and row and column headings.

- j) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 12 Checkbook

Worksheets can be helpful with personal financial management. Sally wants to organize her finances using a worksheet as a checkbook register.

- a) Create a new workbook.  
b) Enter the data and apply formatting as shown below:

	A	B	C	D	E
1	Date	Transaction	Description	Expenses	Income
2					
3	1-Feb-2003	Opening Deposit			\$200.00
4	5-Feb-2003	Coral Gas	Gas for car	\$20.00	
5	8-Feb-2003	Deposit	Paycheck		\$100.00
6	10-Feb-2003	Sally's Diner	Dinner out	\$15.35	
7	15-Feb-2003	Coral Square Cinema	Movie	\$6.75	
8	17-Feb-2003	Deposit	Birthday check		\$25.00
9	18-Feb-2003	Book Palace	Magazines	\$15.98	
10	19-Feb-2003	Fully Belly	Dinner out	\$10.50	
11	22-Feb-2003	Coral Square Mall	Lunch out	\$5.75	
12	24-Feb-2003	Coral Gas	Gas for car	\$15.00	
13	26-Feb-2003	Deposit	Paycheck		\$100.00

- c) Save the workbook naming it Checkbook.  
d) In cell F1, enter the label Balance and right align and bold it if it is not already formatted.  
e) In column F, enter formulas that use cell references to calculate the balance after each transaction. To calculate the balance, subtract the expense from the previous balance and add the income to the previous balance.  
f) In cell C14, enter the label Total: and then right align and bold it. Enter formulas that use a function to calculate the total expenses and total income for the month.  
g) Create a header with your name right aligned.  
h) Create a footer with the text Personal Finances center aligned.  
i) Save the modified Checkbook and print a copy with gridlines and row and column headings.  
j) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 13

## Income Statement

An income statement lists a company's revenue (money they earn), expenses (money they pay out), and net income/loss (revenue minus expenses) for a specific time period. Fluffy Bakery is a small home business that wants to use a worksheet to produce an income statement.

- a) Create a new workbook.
- b) Enter the data and apply formatting as shown below:

	A	B	C	D	E
1			<b>Fluffy Bakery</b>		
2			<b>Income Statement</b>		
3			<b>for the years 2002-2004</b>		
4					
5		<b>2002</b>	<b>2003</b>	<b>2004</b>	
6	<b>Revenue:</b>				
7	Cookie Sales	\$15,500	\$16,896	\$17,864	
8	Cake Sales	\$27,589	\$26,298	\$25,982	
9	Bread Sales	\$24,980	\$25,298	\$25,398	
10	<i>Total Revenues:</i>				
11	<b>Expenses:</b>				
12	Advertising	\$5,000	\$4,500	\$4,500	
13	Baking Supplies	\$2,000	\$1,000	\$2,750	
14	Ingredients	\$13,275	\$15,298	\$16,490	
15	Salaries	\$30,000	\$30,000	\$35,000	
16	Utilities	\$6,570	\$7,250	\$8,090	
17	<i>Total Expenses:</i>				
18	<b>Net Income/(Loss):</b>				

- c) Save the workbook naming it Income Statement.
- d) In row 10, enter formulas that uses a function to calculate the total revenue for each year.
- e) In row 17, enter formulas that use a function to calculate the total expenses for each year.
- f) In row 18, enter formulas that use cell references to calculate the net income or loss for each year. The net income/loss is calculated by subtracting total expenses from total revenue. Format the values as currency with 0 decimal places, if necessary.
- g) Create a header with your name right aligned.
- h) Save the modified Income Statement and print a copy with gridlines and row and column headings.
- i) Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 14

## Budget

A student wants to use a worksheet to create a personal budget for her fall semester in college.

- Create a new workbook.
- Enter the data and apply formatting as shown below:

	A	B	C	D	E	F	G	H	I
1	<b>Personal Budget</b>								
2									
3		<b>Sep-03</b>		<b>Oct-03</b>		<b>Nov-03</b>		<b>Dec-03</b>	
4		Budgeted	<i>Actual</i>	Budgeted	<i>Actual</i>	Budgeted	<i>Actual</i>	Budgeted	<i>Actual</i>
5	<b>Income:</b>								
6	Loan	\$7,000	\$7,000	\$0	\$0	\$0	\$0	\$0	\$0
7	Job	\$1,000	\$925	\$500	\$465	\$500	\$485	\$600	\$725
8	Parents	\$5,500	\$5,500	\$0	\$0	\$0	\$0	\$0	\$0
9	<i>Total:</i>								
10	<b>Expenses:</b>								
11	Tuition	\$6,000	\$5,943	\$0	\$0	\$0	\$0	\$0	\$0
12	Room/Board	\$5,500	\$5,575	\$0	\$0	\$0	\$0	\$0	\$0
13	Books	\$700	\$635	\$0	\$45	\$0	\$0	\$0	\$0
14	Food	\$300	\$315	\$300	\$325	\$300	\$320	\$250	\$375
15	Entertainment	\$150	\$0	\$50	\$80	\$50	\$0	\$100	\$100
16	Clothes	\$50	\$0	\$50	\$80	\$50	\$0	\$100	\$100
17	<i>Total:</i>								

- Save the workbook naming it Budget.
- In row 9, enter formulas that use a function to calculate the total budgeted and actual income for each month.
- In row 17, enter formulas that use a function to calculate the total budgeted and actual expenses for each month.
- In cell A18, enter the label Savings: and right align and italicize it. Enter formulas that use cell references to calculate the savings for each month. Savings are calculated by subtracting the total expenses from the total income.
- Change the column widths as necessary so that all the data is displayed entirely.
- Create a header with your name right aligned.
- Save the modified Budget and print a copy with gridlines and row and column headings.
- Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Exercise 15

## Brochure Costs

A worksheet can be used to calculate the costs of producing brochures in different quantities. The cost of the brochure is made up of fixed costs and variable costs. Fixed costs remain the same no matter how many brochures are produced. Variable costs change depending on the number of brochures produced.

- Create a new workbook.
- Enter the data and apply formatting as shown below:

	A	B	C	D	E	F
1	<b>Brochure Costs</b>					
2						
3	<b>Number of Brochures:</b>	100	250	500	750	1000
4						
5	<b>Fixed Costs:</b>					
6	Art work	\$500.00	\$500.00	\$500.00	\$500.00	\$500.00
7	Salaries	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00	\$1,500.00
8	Initial setup fee	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00	\$1,000.00
9	<b>Variable Costs:</b>					
10	Paper					
11	Printing					
12	Labor					
13	Shipping					

- Save the workbook naming it Brochure Costs.
- The breakdown of variable costs per brochure are:

	100	250	500	750	1000
Paper	\$0.20	\$0.18	\$0.15	\$0.12	\$0.10
Printing	\$0.12	\$0.11	\$0.10	\$0.09	\$0.08
Labor	\$0.07	\$0.07	\$0.06	\$0.05	\$0.04
Shipping	\$0.10	\$0.09	\$0.08	\$0.08	\$0.07

Variable costs are calculated by multiplying the variable cost per brochure by the number of brochures produced. In cells B10 through F13, enter formulas that use cell references and the constant values listed above to calculate the variable costs. Format the cells as currency with 2 decimal places.

- In cell A14, enter the label Total Costs: and right align and bold it. Enter formulas that use a function to calculate the total cost of producing the different quantity of brochures. Total cost is calculated by adding the fixed costs plus the variable costs.
- In cell A15, enter the label Cost per Brochure: and right align and bold it. Enter formulas that use cell references to calculate the cost per brochure of producing the different quantities of brochures. Cost per brochure is calculated by dividing the total costs by the number of brochures produced.
- Create a header with your name right aligned.
- Save the modified Brochure Costs and print a copy with gridlines and row and column headings.
- Display the formulas in the cells instead of values. Change the column widths as necessary so that the formulas are completely displayed. Print a copy with gridlines and row and column headings.

## Advanced

### Exercise 16 Club

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Create a new workbook that stores relevant numbers about a club or organization that you belong to. The worksheet should contain at least five columns and five rows of data. Include at least two formulas in the worksheet. Format the worksheet appropriately and include informative headers or footers. Save the workbook naming it Club and print a copy with gridlines and row and column headings. Print a copy of the worksheet so that formulas are displayed in the cells instead of values.

## Advanced

### Exercise 17 Vacation Costs

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Create a new workbook that stores estimated costs for vacations to at least three different countries you would like to visit. The worksheet should contain at least four columns and four rows of data. Include at least two formulas and one function in the worksheet. Format the worksheet appropriately and include informative headers or footers. Save the workbook naming it Vacation Costs and print a copy with gridlines and row and column headings. Print a copy of the worksheet so that formulas are displayed in the cells instead of values.

## Advanced

### Exercise 18 Fund-raiser Finances

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Create a new workbook that stores financial information about a fund-raiser you have participated in. The worksheet should contain at least six columns and six rows of data. Include at least three formulas and two functions in the worksheet. Format the worksheet appropriately and include informative headers or footers. Save the workbook naming it Fund-raiser Finances and print a copy with gridlines and row and column headings. Print a copy of the worksheet so that formulas are displayed in the cells instead of values.

