

4 Financial Functions, Data Tables, and Amortization Schedules

Objectives:

You will have mastered the material in this module when you can:

- Assign a name to a cell and refer to the cell in a formula using the assigned name
- Determine the monthly payment of a loan using the financial function PMT
- Understand the financial functions PV (present value) and FV (future value)
- Create a data table to analyze data in a worksheet
- Create an amortization schedule
- Control the color and thickness of outlines and borders
- Add a pointer to a data table
- Analyze worksheet data by changing values
- Use range names and print sections of a worksheet
- Set print options
- Protect and unprotect cells in a worksheet
- Hide and unhide worksheets and workbooks
- Use the formula checking features of Excel

Introduction

Two of the more powerful aspects of Excel are its wide array of functions and its capability of organizing answers to what-if questions. In this module, you will learn about financial functions such as the PMT function, which allows you to determine a monthly payment for a loan, and the PV function, which allows you to determine the present value of an investment.

This module introduces an additional what-if analysis tool, called a **data table**. You use a data table to automate data analyses and organize the results returned by Excel. Another important loan analysis tool is an amortization schedule. An **amortization schedule** shows the beginning and ending balances of a loan and the amount of payment that is applied to the principal and interest during each payment period.

What are we making?!

Project — Mortgage Payment Calculator with Data Table and Amortization Schedule

The project in this module follows proper design guidelines and uses Excel to create the worksheet shown in Figure 4-1. NCU, a credit union, provides mortgages (loans) for homes and other types of property. The credit union's chief financial officer has asked for a workbook that loan officers and customers can use to calculate mortgage payment information, review an amortization schedule, and compare mortgage payments for varying annual interest rates.

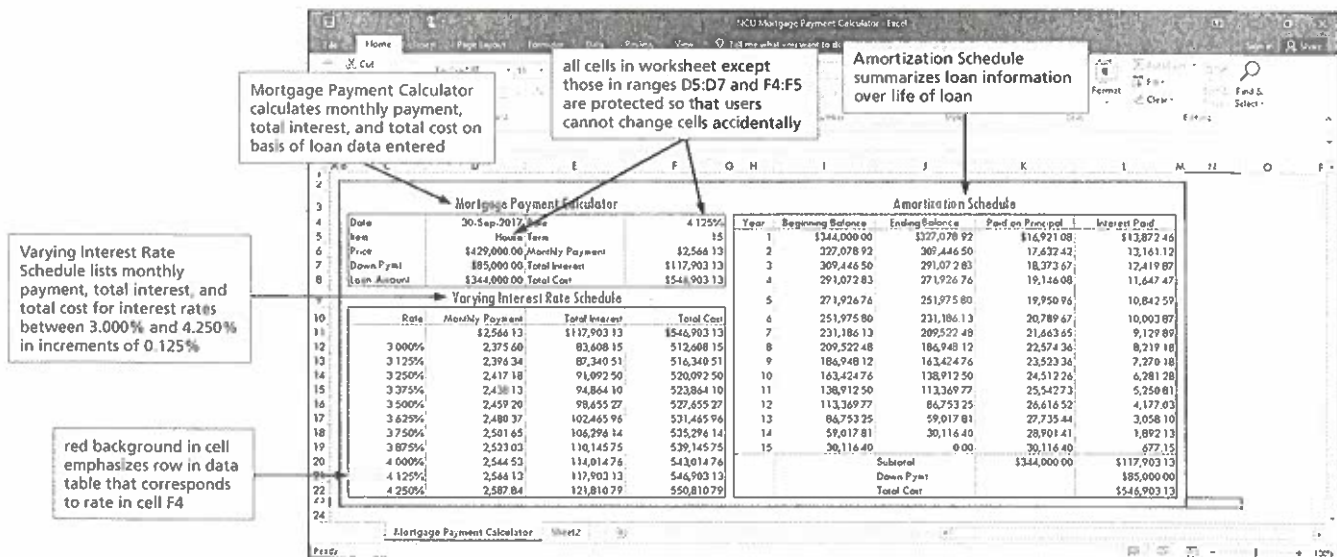


Figure 4-1

The requirements document for the NCU Mortgage Payment Calculator worksheet is shown in Figure 4-2. It includes the needs, source of data, summary of calculations, and special requirements.

Worksheet Title		NCU Mortgage Payment Calculator
Needs	An easy-to-read worksheet that <ol style="list-style-type: none"> 1. Determines the monthly payment, total interest, and total cost for a mortgage. 2. Shows a data table that answers what-if questions based on changing interest rates. 3. Highlights the rate in the data table that matches the actual interest rate. 4. Shows an amortization schedule that lists annual summaries of interest paid, principal paid, and balance on principal. 	
Source of data	Data supplied by the credit union includes interest rate and term of mortgage. Data supplied by the customer includes item to be purchased, price, down payment. All other data is calculated or created in Excel.	
Calculations	<ol style="list-style-type: none"> 1. The following calculations must be made for each mortgage: <ol style="list-style-type: none"> a. Mortgage Amount = Price – Down Payment b. Monthly Payment = PMT function c. Total Interest = 12 × Term × Monthly Payment – Loan Amount d. Total Cost = 12 × Term × Monthly Payment + Down Payment 2. The Amortization Schedule involves the following calculations: <ol style="list-style-type: none"> a. Beginning Balance = Loan Amount b. Ending Balance = PV function or zero c. Paid on Principal = Beginning Balance – Ending Balance d. Interest Paid = 12 × Monthly Payment – Paid on Principal or 0 e. Paid on Principal Subtotal = SUM function f. Interest Paid Subtotal = SUM function 	
Special Requirements	<ol style="list-style-type: none"> 1. Assign names to the ranges of the three major worksheet components separately and together to allow the worksheet components to be printed separately or together easily. 2. Use locked cells and worksheet protection to prevent loan officers and customers from inadvertently making changes to formulas and functions contained in the worksheet. 	

Figure 4-2

In addition, using a sketch of the worksheet can help you visualize its design. The sketch of the worksheet consists of titles, column and cell headings, the location of data values, and a general idea of the desired formatting (Figure 4-3).

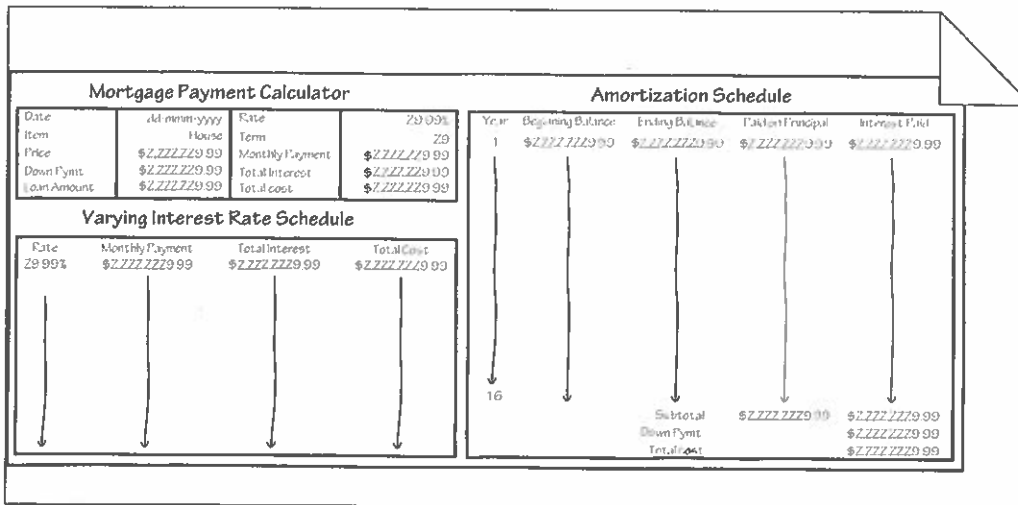


Figure 4-3

**BTW
Good Worksheet
Design**

Consider creating worksheets with an eye towards reusing them in the future. Carefully design worksheets as if they will be on display and evaluated by your fellow workers. Smart worksheet design starts with visualizing the results you need. A well-designed worksheet often is used for many years.

As shown in the worksheet sketch in Figure 4-3, the three basic sections of the worksheet are the Mortgage Payment Calculator on the upper-left side, the Varying Interest Rate Schedule data table on the lower-left side, and the Amortization Schedule on the right side. The worksheet will be created in this order.

With a good understanding of the requirements document, an understanding of the necessary decisions, and a sketch of the worksheet, the next step is to use Excel to create the worksheet.

In this module, you will learn how to create and use the workbook shown in Figure 4-1. The following roadmap identifies general activities you will perform as you progress through this module:

1. CREATE the MORTGAGE PAYMENT CALCULATOR in the worksheet.
2. CREATE a DATA TABLE in the worksheet.
3. CREATE the AMORTIZATION SCHEDULE in the worksheet.
4. FORMAT the WORKSHEET.

BTW

The Ribbon and Screen Resolution

Excel may change how the groups and buttons within the groups appear on the ribbon, depending on the computer's screen resolution. Thus, your ribbon may look different from the ones in this book if you are using a screen resolution other than 1366 x 768.

★ *Reminder: You must go step by step...*

To Apply a Theme to the Worksheet

The following steps apply the Integral theme to the workbook.

- 1 Run Excel and create a blank workbook in the Excel window.
- 2 Apply the Integral theme to the workbook.

↳ page layout tab >> color >> your

choice of colors

To Enter the Section and Row Titles and System Date

The next step is to enter the Mortgage Payment Calculator section title, row titles, and system date. The Mortgage Payment Calculator section title also will be changed to the Title cell style and vertically middle-aligned. The following steps enter the section title, row titles, and system date.

- 1 Select cell C3 and then type **Mortgage Payment Calculator** as the section title.

O&A

Why did I not begin creating the worksheet in cell A1?

Two rows at the top of the worksheet and two columns on the left of the worksheet will be left blank to provide a border around the worksheet.

- 2 Select the range C3:F3 and then click the 'Merge & Center' button (Home tab | Alignment group) to merge and center the section title in the selected range.
- 3 Click the Cell Styles button (Home tab | Styles group) and then click Title cell style in the Cell Styles gallery to apply the selected style to the active cell.
- 4 Click the Middle Align button (Home tab | Alignment group) to vertically center the text in the selected cell.

BTW

Global Formatting

To assign formats to all the cells in all the worksheets in a workbook, click the Select All button, right-click a sheet tab, and click 'Select All Sheets' on the shortcut menu. Next, assign the formats. To deselect the worksheets, hold down the SHIFT key and click the Sheet1 tab or select Ungroup sheets on the shortcut menu. You also can select a cell or a range of cells and then select all worksheets to assign formats to that cell or a range of cells on all worksheets in a workbook.

- 5 Select cell C4, type `Date` as the row title, and then press the TAB key to complete the entry in the cell and select the cell to the right.
- 6 With cell D4 selected, type `=NOW()` and then `Enter` to add a function to the cell that displays today's date.
- 7 Right-click cell D4 to open a shortcut menu and then click `Format Cells` on the shortcut menu to display the `Format Cells` dialog box. Click the `Number` tab to display the `Number` sheet, click `Date` in the `Category` list, scroll down in the `Type` list, and then click `14-Mar-2012` to select a date format.
- 8 Click the `OK` button (`Format Cells` dialog box) to close the `Format Cells` dialog box.
- 9 Enter the following text in the indicated cells:

BTW
Touch Screen Differences
 The Office and Windows interfaces may vary if you are using a touch screen. For this reason, you might notice that the function or appearance of your touch screen differs slightly from this module's presentation.

Cell	Text	Cell	Text
C5	Item	E4	Rate
C6	Price	E5	Term
C7	Down Pymt.	E6	Monthly Payment
C8	Loan Amount	E7	Total Interest
		E8	Total Cost

Handwritten notes:
 in → C5 type → Item
 in → E4 type → Rate

★ Spell these correctly and use proper capitalization and spacing!

To Adjust the Column Widths and Row Heights

To make the worksheet easier to read, the width of columns A and B will be decreased and used as a separator between the left edge of the worksheet and the row headings. Using a column(s) as a separator between sections on a worksheet is a technique used by spreadsheet specialists. The width of columns C through F will be increased so that the intended values fit. The height of row 3, which contains the title, will be increased so that it stands out. The height of rows 1 and 2 will be decreased to act as visual separators for the top of the calculator.

- 1 Click column heading A and then drag through column heading B to select both columns. Position the pointer on the right boundary of column heading B and then drag to the left until the ScreenTip indicates Width: .92 (12 pixels) to change the width of both columns.
- 2 Position the pointer on the right boundary of column heading C and then drag to the right until the ScreenTip indicates Width: 12.00 (101 pixels) to change the column width.
- 3 Click column heading D to select it and then drag through column headings E and F to select multiple columns. Position the pointer on the right boundary of column heading F and then drag until the ScreenTip indicates Width: 16.00 (133 pixels) to change multiple column widths.
- 4 Click row heading 1 to select it and then drag through row heading 2 to select both rows. Position the pointer on the bottom boundary of row heading 2 and then drag until the ScreenTip indicates Height: 9.00 (12 pixels).

Get them as close as you can. They do not have to be exact.

5 Select an empty cell to deselect the selected columns (Figure 4-4).

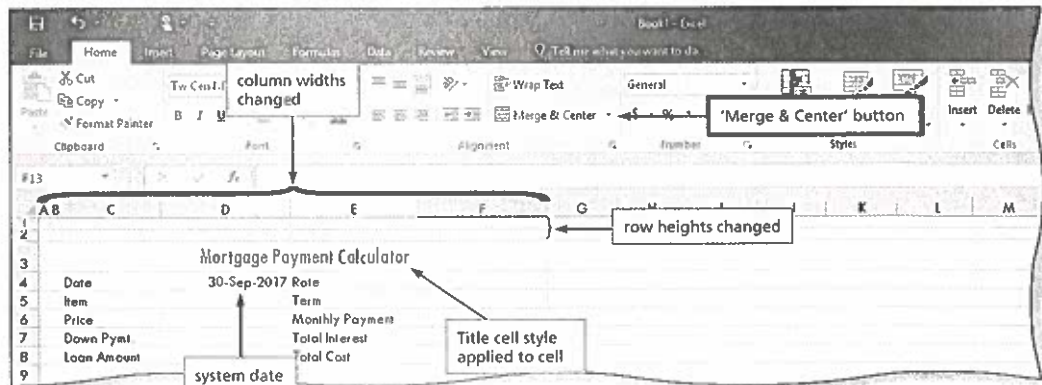


Figure 4-4

To Change the Sheet Tab Name

The following steps change the Sheet1 sheet tab name to a descriptive name and then save the workbook.

- 1 Double-click the Sheet1 tab and then enter **Mortgage Payment Calculator** as the sheet tab name.
- 2 Save the workbook on your hard drive, OneDrive, or other storage location using **NCU Mortgage Payment Calculator** as the file name.

Located @ the bottom, left + of the Excel screen.

Q&A Why should I save the workbook at this time?

You have performed many tasks while creating this workbook and do not want to risk losing work completed thus far.

BTW Cell References in Formulas

Are you tired of writing formulas that are difficult to decipher because of cell references? The Name Manager can help add clarity to your formulas by allowing you to assign names to cells. You then can use the names, such as **Rate**, rather than the cell reference, such as **D2**, in the formulas you create. To access the Name Manager, click the Name Manager button (Formulas tab | Defined Names group).

Creating Cell Names

Worksheets often have column titles at the top of each column and row titles to the left of each row that describe the data within the worksheet. You can use these titles within formulas when you want to refer to the related data by name. A **cell name** often is created from column and row titles. You also can define descriptive names that are not column titles or row titles to represent cells, ranges of cells, formulas, or constants. Names are global to the workbook. That is, a name assigned to a cell or cell range on one worksheet in a workbook can be used on other worksheets in the same workbook to reference the named cell or range. Assigning names to a cell or range of cells allows you to select them quickly using the Name box (shown in Figure 4-7). Clicking the name will select the corresponding cell or range, and highlight the cell or range on the worksheet.

To Format Cells before Entering Values

While you usually format cells after you enter values, Excel also allows you to format cells before you enter the values. The following steps assign the currency style format with a floating dollar sign to the ranges **D6:D8** and **F6:F8** before the values are entered.

- 1 Select the range **D6:D8** and, hold down the **CTRL** key, select the range **F6:F8**.
- 2 Right-click one of the selected ranges to display a shortcut menu and then click **Format Cells** on the shortcut menu to display the **Format Cells** dialog box.

- 3 If necessary, click the Number tab (Format Cells dialog box) to display the Number sheet, select Currency in the Category list, and then select the second format, \$1,234.10 (red font color), in the Negative numbers list.
- 4 Click the OK button (Format Cells dialog box) to assign the currency style format with a floating dollar sign to the selected ranges, D6:D8 and F6:F8 in this case.

→ This formats your #s so that if you get a negative #, the text will be red.

O&A What will happen when I enter values in these cells?
 As you enter numbers into these cells, Excel will display the numbers using the currency style format. You also could have selected the range C6:F8 rather than the nonadjacent ranges and assigned the currency style format to this range, which includes text. The currency style format has no impact on text in a cell.

To Enter the Loan Data

As shown in the Source of Data section of the requirements document in Figure 4-2, five items make up the loan data in the worksheet: the item to be purchased, the price of the item, the down payment, the interest rate, and the term (number of years) over which the loan is paid back. The following steps enter the loan data.

- 1 Select cell D5. Type **House** and then click the Enter button in the formula bar to enter text in the selected cell.
- 2 With cell D5 still active, click the Align Right button (Home tab | Alignment group) to right-align the text in the selected cell.
- 3 Select cell D6 and then enter **429000** for the price of the house.
- 4 Select cell D7 and then enter **85000** for the down payment.
- 5 Select cell F4 and then enter **4.125%** for the interest rate.
- 6 Click the Enter button in the formula bar to complete the entry of the interest rate, and then click the Increase Decimal button (Home tab | Number group) once to increase the number of decimal places to three.
- 7 Select cell F5 and then enter **15** for the number of years.
- 8 Click the Enter button in the formula bar to complete the entry of data in the worksheet (Figure 4-5).

BTW

When to Format

Excel lets you format cells (1) before you enter data, (2) when you enter data, through the use of format symbols; (3) incrementally after entering sections of data; and (4) after you enter all the data. Experienced users usually format a worksheet in increments as they build the worksheet, but occasions do exist when it makes sense to format cells before you enter any data.

BTW

Entering Percentages

When you format a cell to display percentages, Excel assumes that whatever you enter into that cell in the future will be a percentage. Thus, if you enter the number .5, Excel translates the value as 50%. A potential problem arises, however, when you start to enter numbers greater than or equal to one. For instance, if you enter the number 25, do you mean 25% or 2500%? If you want Excel to treat the number 25 as 25% instead of 2500% and Excel interprets the number 25 as 2500%, then click Options in the Backstage view. When the Excel Options dialog box appears, click Advanced in the left pane, and make sure the 'Enable automatic percent entry' check box in the right pane is selected.

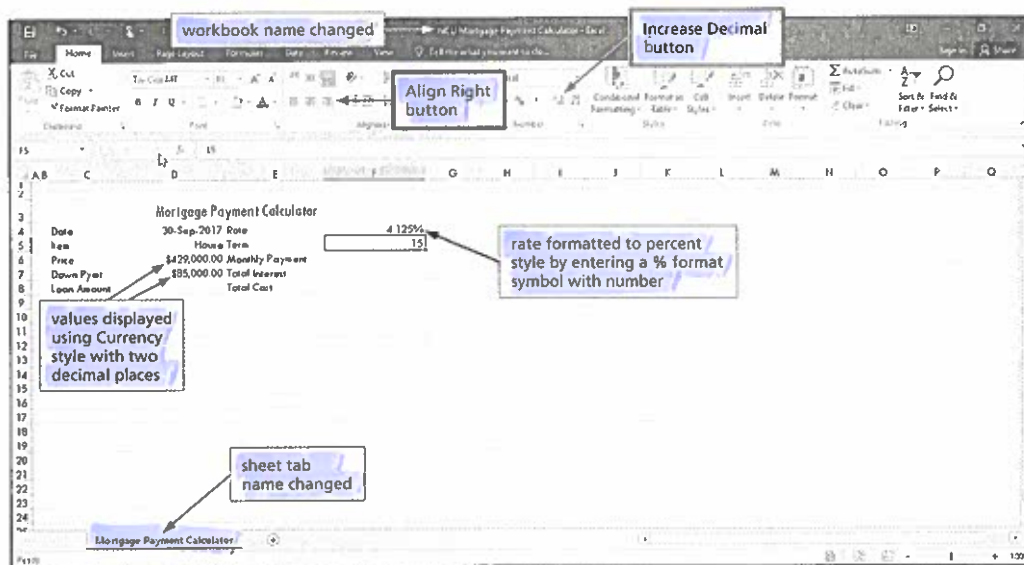


Figure 4-5

BTW

Entering Interest Rates

An alternative to requiring the user to enter an interest rate as a percentage, such as 4.125%, is to allow the user to enter the interest rate as a number without a percent sign (4.125) and then divide the interest rate by 1200, rather than 12.

Q&A Why are the entered values already formatted?

The values in cells D6 and D7 in Figure 4-5 are formatted using the currency style with two decimal places because this format was assigned to the cells prior to entering the values. Because the percent sign (%) was appended to 4.125 when it was entered in cell F4, Excel formats the interest rate using the percentage style with two decimal places (thus, the value appears as 4.13). Using the Increase Decimal button increased the number of visible decimal places to three.

To Create Names Based on Row Titles

1 CREATE MORTGAGE PAYMENT CALCULATOR | 2 CREATE DATA TABLE | 3 CREATE AMORTIZATION SCHEDULE
4 FORMAT WORKSHEET | 5 CREATE PRINT AREAS | 6 PROTECT CELLS | 7 CHECK FORMULAS

Why? Naming a cell that you plan to reference in a formula helps make the formula easier to read and remember.

For example, the loan amount in cell D8 is equal to the price in cell D6 minus the down payment in cell D7. According to what you learned in earlier modules, you can enter the loan amount formula in cell D8 as =D6 - D7. By naming cells D6 and D7 using the corresponding row titles in cells C6 and C7, however, you can enter the loan amount formula as =Price - Down_Pymt., which is clearer and easier to understand than =D6 - D7. In addition to assigning a name to a single cell, you can follow the same steps to assign a name to a range of cells. The following steps assign the row titles in the range C6:C8 to their adjacent cell in column D and assign the row titles in the range E4:E8 to their adjacent cell in column F.

1

- Select the range C6:D8.
- Display the Formulas tab.
- Click the 'Create from Selection' button (Formulas tab | Defined Names group) to display the Create Names from Selection dialog box (Figure 4-6).

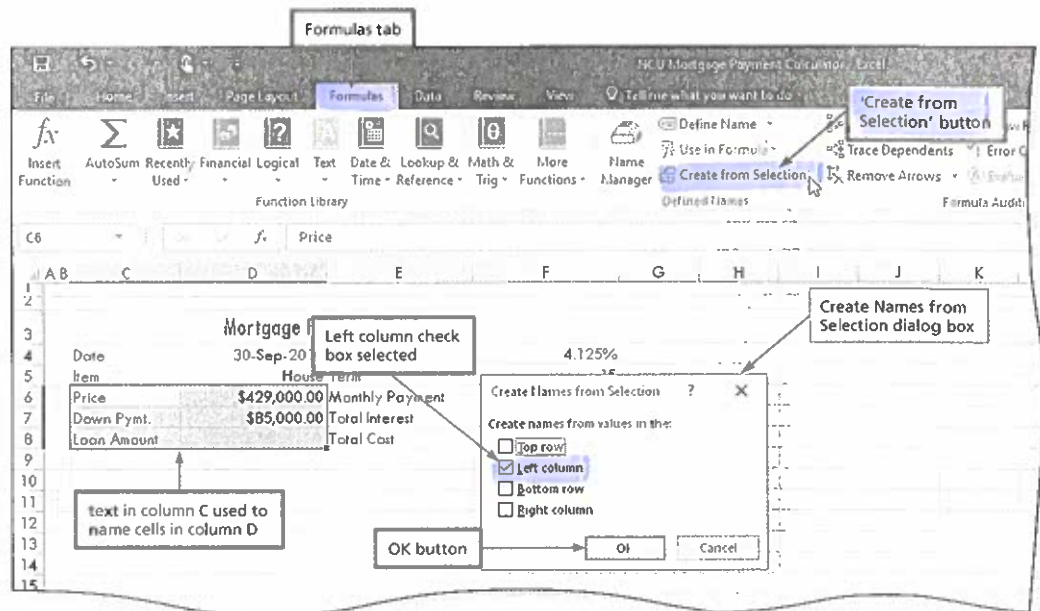


Figure 4-6

2

- Click the OK button (Create Names from Selection dialog box) to name the cells selected in the right column of the selection, D6:D8 in this case.
- Select the range E4:F8 and then click the 'Create from Selection' button (Formulas tab | Defined Names group) to display the Create Names from Selection dialog box.
- Click the OK button (Create Names from Selection dialog box) to assign names to the cells selected in the right column of the selection, F4:F8 in this case.

→ It will look like nothing happened, but that's ok! Go to the next step!

Q&A Are names absolute or relative cell references?

Names are absolute cell references. This is important to remember if you plan to copy formulas that contain names rather than cell references.

Q&A Is a cell name valid when it contains a period, as with the Down_Pymt. cell name?

Yes. Periods and underscore characters are allowed in cell names. A cell name may not begin with a period or an underscore, however.

Are there any limitations on cell names?

Names may not be longer than 255 characters.

- ! What if I make a mistake creating a cell name? Click the Name Manager button (Formulas tab | Defined Names group) to display the Name Manager dialog box. Select the range to edit or delete, and then click the appropriate button to edit or delete the selected range.

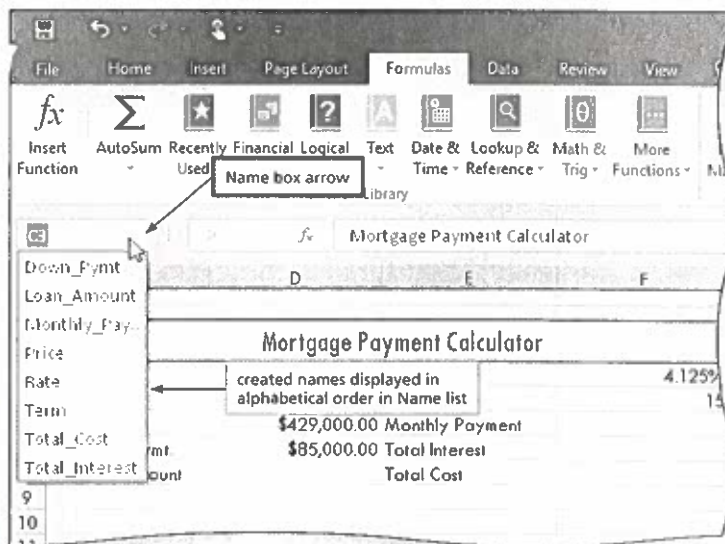


Figure 4-7

Other Ways

- | | | | |
|---|--|--|--|
| 1. Select cell or range, type name in Name box, press ENTER key | tab Defined Names group), type name, click OK button (New Name dialog box) | Defined Names group), click New (Name Manager dialog box), type name, click OK button (New Name dialog | box), click Close button (Name Manager dialog box) |
| 2. Select cell or range, click Define Name button (Formulas | 3. Select cell or range, click Name Manager button (Formulas tab | | 4. Select range, press CTRL+SHIFT+F3 |

What do you do if a cell you want to name does not have a text item in an adjacent cell?

If you want to assign a name that does not appear as a text item in an adjacent cell, use the Define Name button (Formulas tab | Defined Names group) or select the cell or range and then type the name in the Name box in the formula bar.

CONSIDER THIS

What do I need to consider when naming cells, and how can I use named cells?

You can use the assigned names in formulas to reference cells in the ranges D6:D8 or F4:F8. Excel is not case sensitive with respect to names of cells. You can enter the cell names in formulas in either uppercase or lowercase letters. To use a name that consists of two or more words in a formula, you should replace any space with the underscore character (_), as this is a commonly used standard for creating cell names. For example, the name, Down Pymt., can be written as down_pymt. or Down_Pymt. when you want to reference the adjacent cell D7. The Name Manager dialog box appears when you click the Name Manager button. The Name Manager dialog box allows you to create new names and edit or delete existing names.

To Enter the Loan Amount Formula Using Names

1 CREATE MORTGAGE PAYMENT CALCULATOR | 2 CREATE DATA TABLE | 3 CREATE AMORTIZATION SCHEDULE
4 FORMAT WORKSHEET | 5 CREATE PRINT AREAS | 6 PROTECT CELLS | 7 CHECK FORMULAS

Why? Once you have created names, you can use them instead of cell references in formulas. To determine the loan amount, enter the formula =Price - Down_Pymt. in cell D8. The following steps enter the formula using names.

- 1

 - Select cell D8.
 - Type =p and then scroll down the Formula AutoComplete list until you see the Price entry (Figure 4-8).

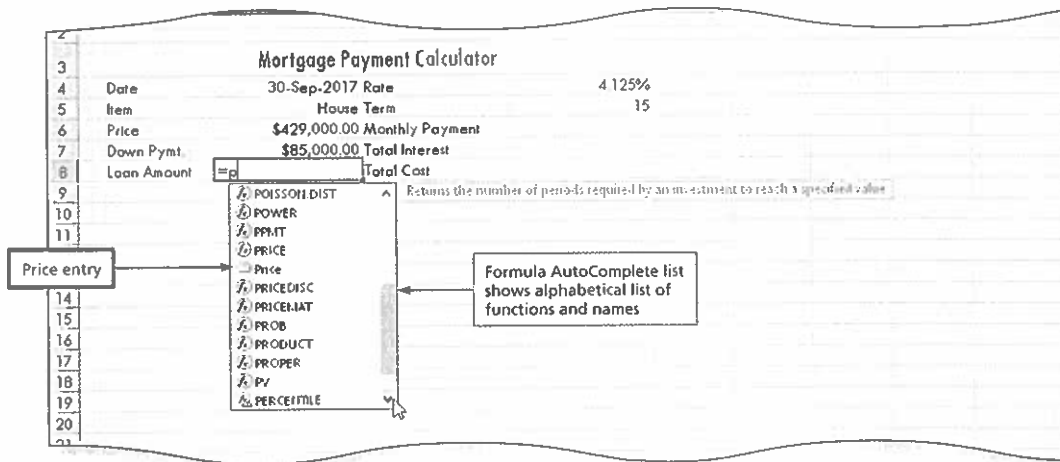


Figure 4-8

- 2

 - Double-click Price to enter it in cell D8.
 - Type -d.
 - Double-click Down_Pymt. in the Formula AutoComplete list to select it and display the formula in both cell D8 and the formula bar using the cell names instead of the cell references (Figure 4-9).

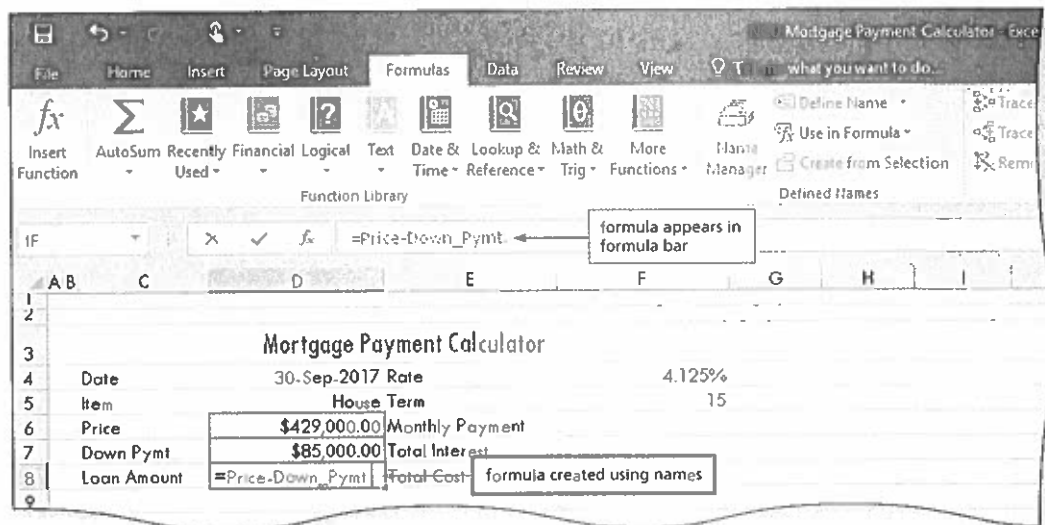


Figure 4-9

- 3

 - Click the Enter button to assign the formula to the selected cell, =Price-Down_Pymt. to cell D8 (Figure 4-10).

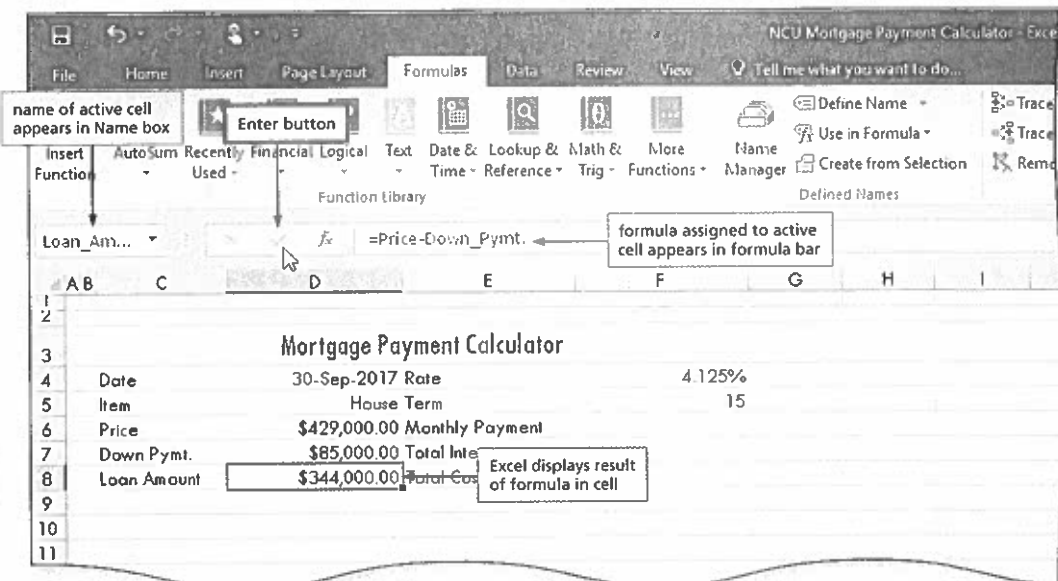


Figure 4-10

Q&A What happens if I enter my formula using Point mode instead of using names? If you enter a formula using Point mode and click a cell that has an assigned name, Excel will insert the name of the cell rather than the cell reference.

The PMT Function

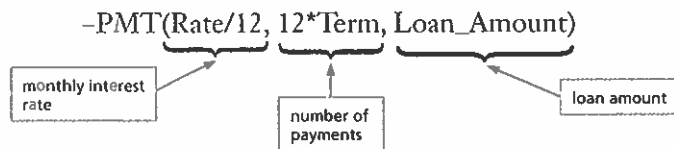
You can use Excel's PMT function to determine the monthly payment. The **PMT function** calculates the payment for a loan based on constant payments and a constant interest rate. The PMT function has three arguments: rate, periods, and loan amount. Its general form is as follows:

$$=PMT(\text{rate}, \text{periods}, \text{loan amount})$$

where rate is the interest rate per payment period, periods is the number of payments over the life of the loan, and loan amount is the amount of the loan.

In the worksheet shown in Figure 4–10, Excel displays the annual interest rate in cell F4. Financial institutions, however, usually calculate interest on a monthly basis. The rate value in the PMT function is, therefore, Rate / 12 (cell F4 divided by 12), rather than just Rate (cell F4). The periods (or number of payments) in the PMT function is 12 * Term (12 times cell F5) because each year includes 12 months, or 12 payments.

Excel considers the value returned by the PMT function to be a debit and, therefore, returns a negative number as the monthly payment. To display the monthly payment as a positive number, begin the function with a negative sign instead of an equal sign. The PMT function for cell F6 is:



1 CREATE MORTGAGE PAYMENT CALCULATOR | 2 CREATE DATA TABLE | 3 CREATE AMORTIZATION SCHEDULE
4 FORMAT WORKSHEET | 5 CREATE PRINT AREAS | 6 PROTECT CELLS | 7 CHECK FORMULAS

To Enter the PMT Function

Why? The next step in building the mortgage payment calculator is to determine the monthly payment for the mortgage. The following steps use the keyboard, rather than Point mode or the Insert Function dialog box, to enter the PMT function to determine the monthly payment in cell F6.

- 1

 - Select cell F6.
 - Type the function `-pmt (Rate/12, 12*Term, Loan_Amount` in cell F6, which also displays in the formula bar (Figure 4–11).

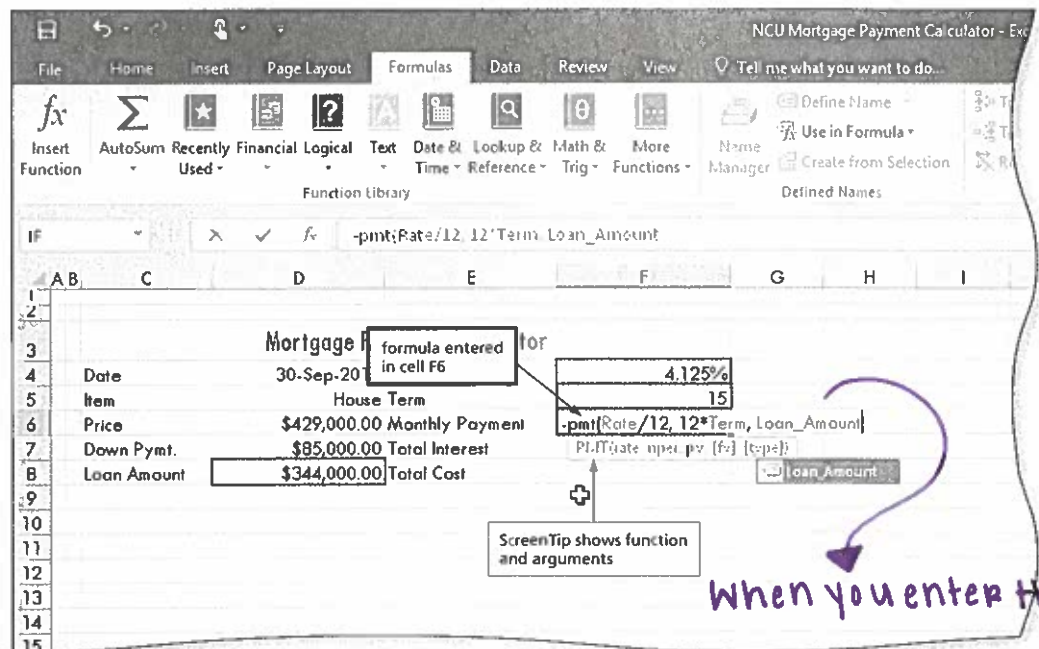


Figure 4–11

When you enter the words, if they are not color coded, you did not name them OR they

Q&A What happens as I begin to enter the function?
 The ScreenTip shows the general form of the PMT function (after you type the opening parenthesis). The arguments in brackets in the ScreenTip are optional and not required for the computation required in this project. The Formula AutoComplete list (Figure 4-8) shows functions and cell names that match the letters that you type on the keyboard. You can type the complete cell name, such as Loan_Amount, or double-click the cell name in the list. When you have completed entering the function and click the Enter button or press the ENTER key, Excel will add the closing parenthesis to the function. Excel also may scroll the worksheet to the right in order to accommodate the ScreenTip.

- 2. Click the Enter button in the formula bar to complete the function (Figure 4-12).

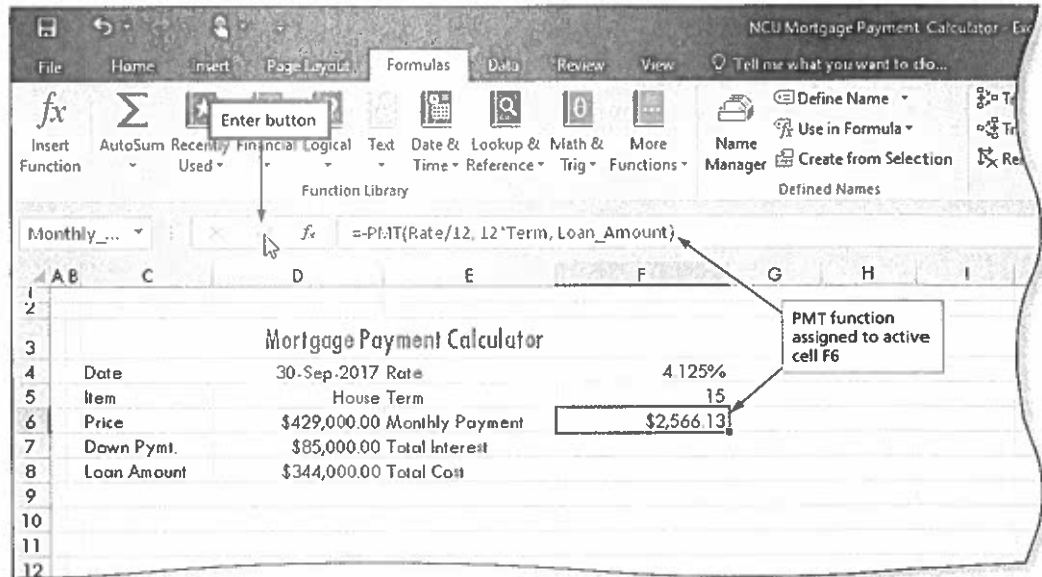


Figure 4-12

Other Ways

1. Click Financial button (Formulas tab | Function Library group), select PMT function, enter arguments, click OK button
2. Click Insert Function button in formula bar, select Financial category, select PMT function, click OK button, enter arguments, click OK button (Function Arguments dialog box)

Other Financial Functions

In addition to the PMT function, Excel provides more than 50 financial functions to help you solve the most complex finance problems. These functions save you from entering long, complicated formulas to obtain needed results. For example, the **FV function** returns the future value of an investment based on scheduled payments and an unchanging interest rate. The FV function requires the following arguments: the interest rate per period, the number of periods, and the payment made each period (which cannot change). For example if you want to invest \$200 per month for five years at an annual interest rate of 6%, the FV function will calculate how much money you will have at the end of five years. Table 4-1 summarizes three of the more frequently used financial functions.

Table 4-1 Frequently Used Financial Functions

Function	Description
FV (rate, periods, payment)	Returns the future value of an investment based on periodic, constant payments and a constant interest rate.
PMT (rate, periods, loan amount)	Calculates the payment for a loan based on the loan amount, constant payments, and a constant interest rate.
PV (rate, periods, payment)	Returns the present value of an investment. The present value is the total amount that a series of future payments now is worth.

To Determine the Total Interest and Total Cost

The next step is to determine the total interest the borrower will pay on the loan (the lending institution's gross profit on the loan) and the total cost the borrower will pay for the item being purchased. The total interest (cell F7) is equal to the number of payments times the monthly payment, minus the loan amount:

$$=12 * \text{Term} * \text{Monthly_Payment} - \text{Loan_Amount}$$

The total cost of the item to be purchased (cell F8) is equal to the price plus the total interest:

$$=\text{Price} + \text{Total_Interest}$$

The following steps enter formulas to determine the total interest and total cost using names.

- 1 Select cell F7, use the keyboard to enter the formula `=12 * term * monthly_payment - loan_amount` to determine the total interest, and then click the Enter button.
- 2 Select cell F8 and then use the keyboard to enter the formula `=price + total_interest` to determine the total cost.
- 3 Select an empty cell to deselect cell F8 (Figure 4-13).
- 4 Save the workbook again on the same storage location with the same file name.

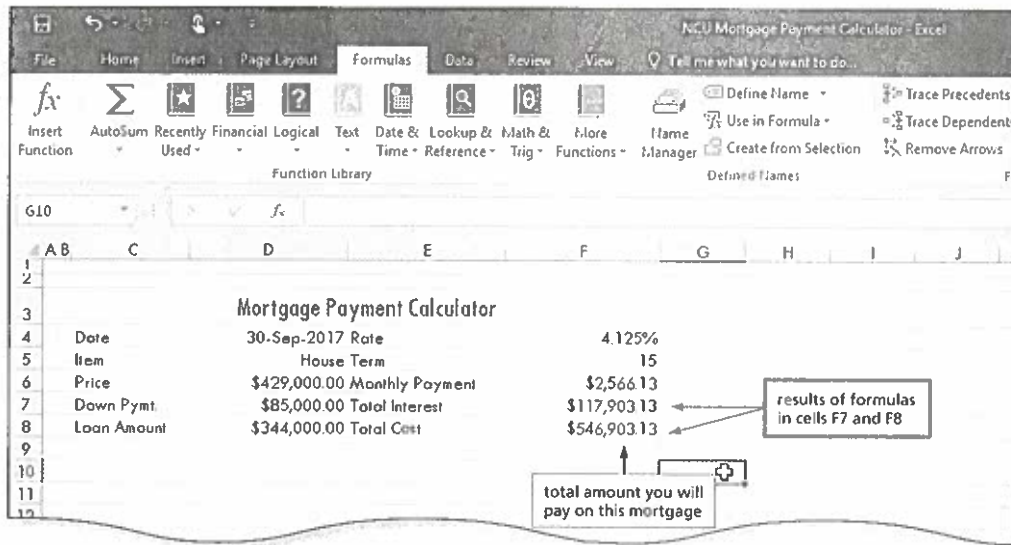


Figure 4-13

BTW

Range Finder

Remember to check all your formulas carefully. You can double-click a cell containing a formula and Excel will use Range Finder to highlight the cells that provide data for that formula. While Range Finder is active, you can drag the outlines from one cell to another to change the cells referenced in the formula, provided the cells have not been named.

BTW

Testing a Worksheet

It is good practice to test the formulas in a worksheet repeatedly until you are confident they are correct. Use data that tests the limits of the formulas. For example, you should enter negative numbers, zero, and large positive numbers when testing formulas.

~~To Enter New Loan Data~~ **skip!**

Assume you want to purchase a condominium for \$185,900.00. You have \$45,000 for a down payment and you want the loan for a term of 10 years. NCU currently is charging 3.625% interest for a 10-year loan. The following steps enter the new loan data.

- 1 Enter ~~Condominium~~ in cell D5.
- 2 Enter ~~185900~~ in cell D6.

- 3 Enter 45000 in cell D7.
- 4 Enter 3.625% in cell F4.
- 5 Enter 10 in cell F5, and then select an empty cell to recalculate the loan information in cells D8, F6, F7, and F8 (Figure 4-14).

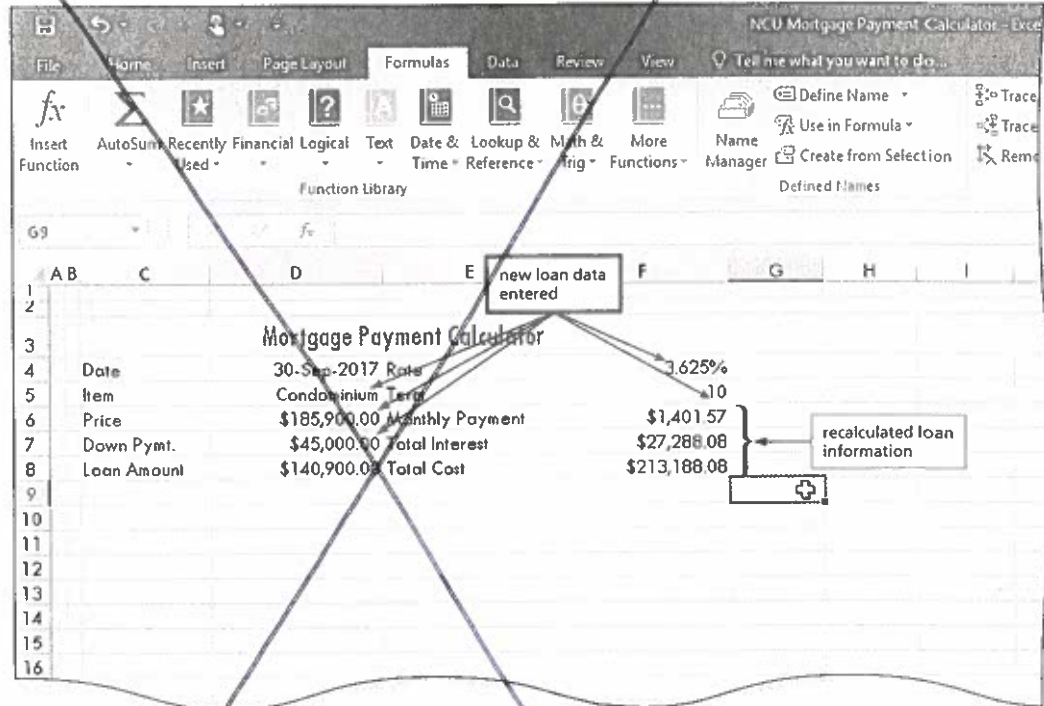


Figure 4-14

To Enter the Original Loan Data

The following steps reenter the original loan data.

- 1 Enter **House** in cell D5.
- 2 Enter 429000 in cell D6.
- 3 Enter 85000 in cell D7.
- 4 Enter 4.125 in cell F4.
- 5 Enter 15 in cell F5 and then select cell C10 to complete the entry of the original loan data.

BTW Expanding Data Tables

The data table created in this module is relatively small. You can continue the series of percentages to the bottom of the worksheet and insert additional formulas in columns to create as large a data table as you want.

Q&A What is happening on the worksheet as I enter the original data?
Excel instantaneously recalculates all formulas in the worksheet each time you enter a value. Once you have re-entered all the initial data, Excel displays the original loan information, as shown in Figure 4-13.

Can the Undo button on the Quick Access Toolbar be used to change back to the original data?

Yes. The Undo button must be clicked five times, once for each data item. You also can click the Undo arrow and drag through the first five entries in the Undo list.

Continue here...

Using a Data Table to Analyze Worksheet Data

You already have seen that if you change a value in a cell, Excel immediately recalculates any formulas that reference the cell directly or indirectly. But what if you want to compare the results of the formula for several different values? Writing down or trying to remember all the answers to the what-if questions would be unwieldy. If you use a data table, however, Excel will organize the answers in the worksheet for you.

A **data table** is a range of cells that shows answers generated by formulas in which different values have been substituted. Data tables must be built in an unused area of the worksheet (in this case, the range C9:F22). Figure 4-15a illustrates the content needed for the Data Table command. With a **one-input data table**, you can vary the value in one cell (in this worksheet, cell F4, the interest rate). Excel then calculates the results of one or more formulas and fills the data table with the results, as shown in Figure 4-15b.

The interest rates that will be used to analyze the loan formulas in this project range from 3.000% to 4.250%, increasing in increments of 0.125%. The one-input data table shown in Figure 4-15b illustrates the impact of varying the interest rate on three formulas: the monthly payment (cell F6), total interest paid (cell F7), and the total cost of the item to be purchased (cell F8). The series of interest rates in column C are called input values.

BTW

Data Tables

Data tables have one purpose: to organize the answers to what-if questions. You can create two kinds of data tables. The first type involves changing one input value to see the resulting effect on one or more formulas. The second type involves changing two input values to see the resulting effect on one formula.

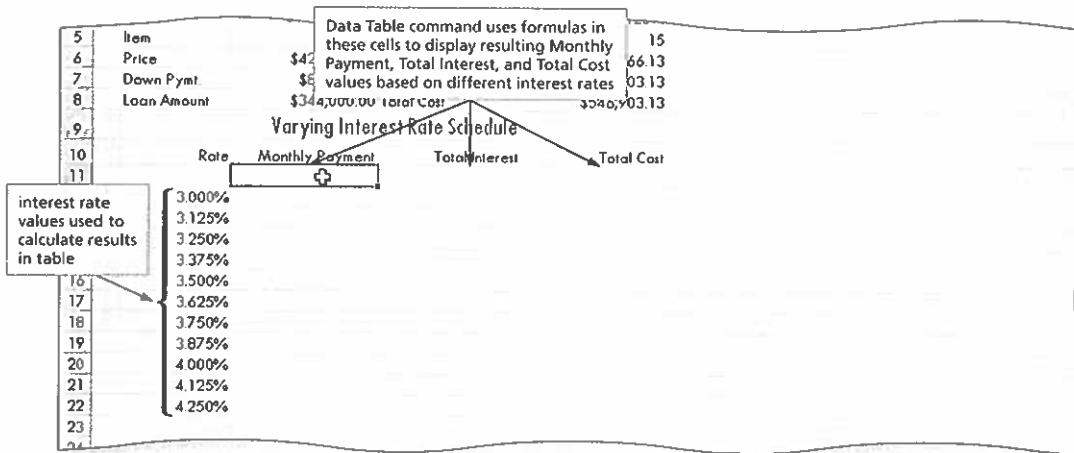


Figure 4-15 (a)

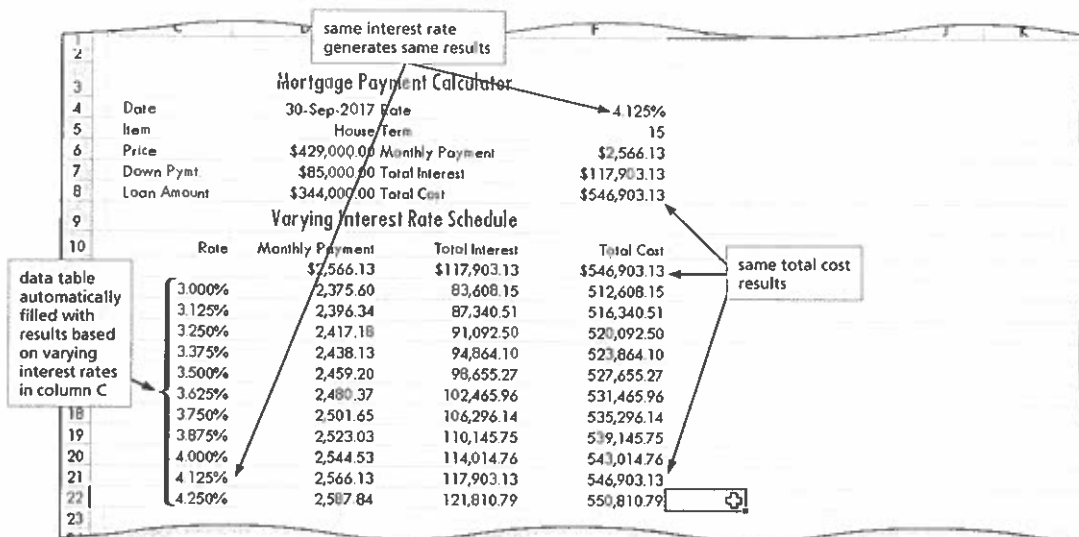


Figure 4-15 (b)

CONSIDER THIS

Can you use a data table when you need to vary the values in two cells rather than one?

An alternative to a one-input table is a two-input data table. A **two-input data table** allows you to vary the values in two cells. For example, you can use a two-input data table to see how your monthly mortgage payment will be affected by changing both the interest rate and the term of the loan.

To Enter the Data Table Title and Column Titles

The first step in constructing the data table shown in Figure 4–15b is to enter the data table section title and column titles in the range C9:F10 and adjust the heights of rows 9 and 10.

- 1 Select cell C9 and then type **Varying Interest Rate Schedule** as the data table section title.
- 2 Select cell C3 and then click the Format Painter button (Home tab | Clipboard group) to copy the format of the cell. Click cell C9 to apply the copied format to the cell.
- 3 Type **Rate** in cell C10, **Monthly Payment** in cell D10, **Total Interest** in cell E10, and **Total Cost** in cell F10 to create headers for the data table. Select the range C10:F10 and right-align the column titles.
- 4 Position the pointer on the bottom boundary of row heading 9 and then drag up until the ScreenTip indicates Height: 20.25 (27 pixels). *→ OR as close as you can get it*
- 5 Position the pointer on the bottom boundary of row heading 10 and then drag down until the ScreenTip indicates Height: 17.25 (23 pixels).
- 6 Click cell C12 to deselect the range C10:F10 (Figure 4–16).

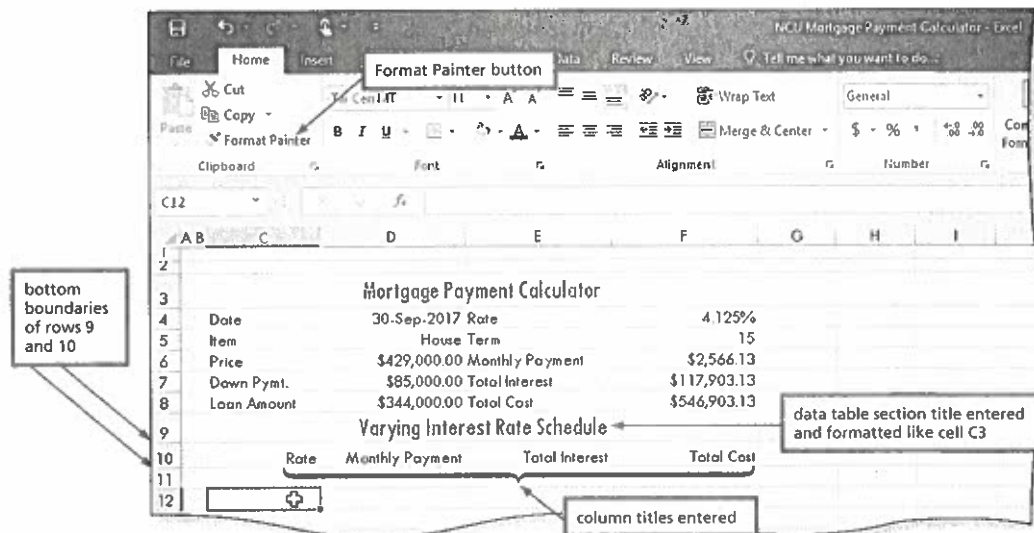


Figure 4–16

To Create a Percentage Series Using the Fill Handle

Why? These percentages will serve as the input data for the data table. The following steps create the percentage series in column C using the fill handle.

- With cell C12 selected, type 3.0% as the first number in the series.
 - Select cell C13 and then type 3.125% as the second number in the series.
 - Select the range C12:C13.
 - Drag the fill handle through cell C22 to create the border of the fill area as indicated by the shaded border (Figure 4-17). Do not lift your finger or release the mouse button.

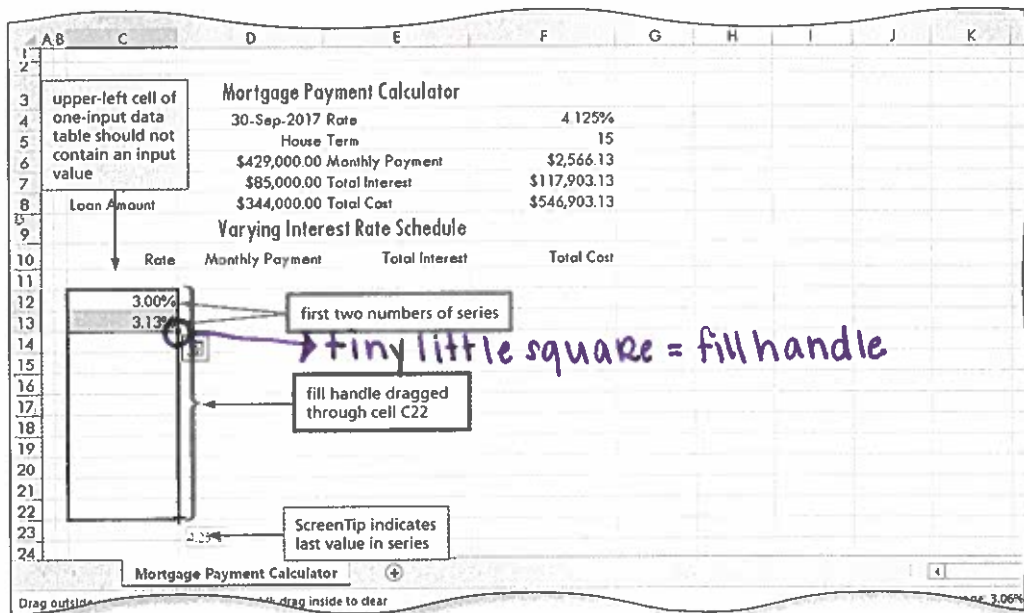


Figure 4-17

- Lift your finger or release the mouse button to generate the percentage series, in this case from 3.00% to 4.25%.
 - Click the Increase Decimal button (Home tab | Number group) to increase the number of decimal places shown to 3.
 - Click cell D11 to deselect the selected range, C12:C22 in this case (Figure 4-18).

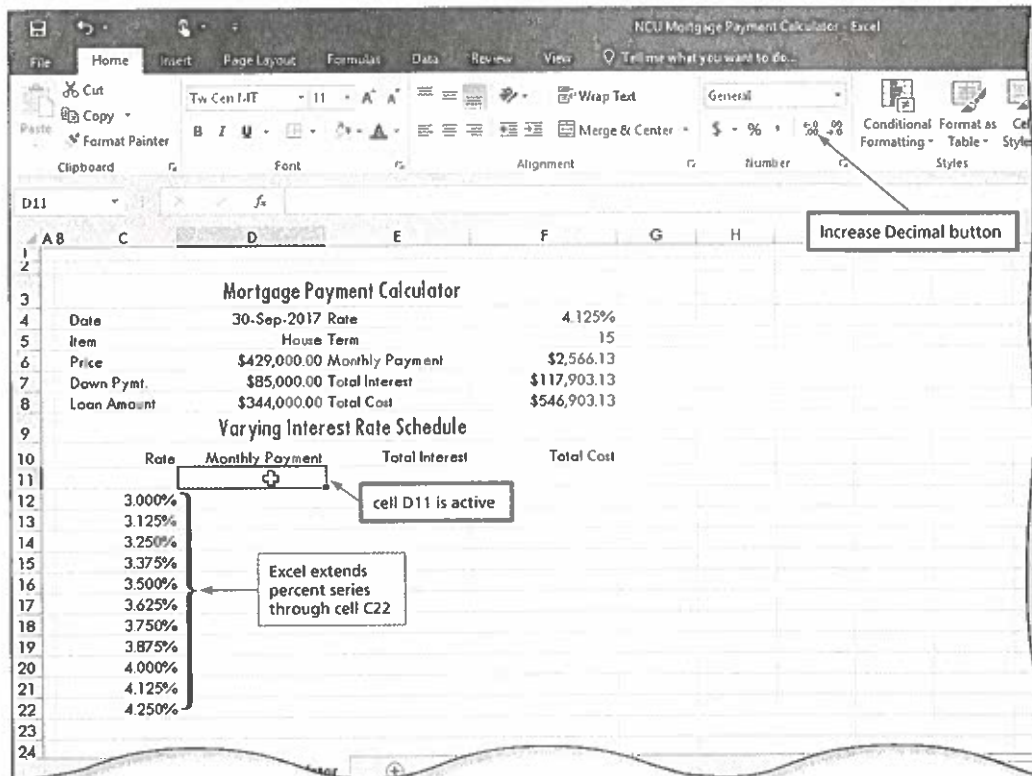


Figure 4-18

Q&A What is the purpose of the percentages in column C? The percentages in column C represent different annual interest rates,

which will be used when calculating the data table. The series begins in cell C12, not cell C11, because the cell immediately to the upper-left of the formulas in a one-input data table should not include an input value.

Other Ways

1. Right-drag fill handle in direction to fill, click Fill Series on shortcut menu

BTW
Formulas in Data Tables

Any experienced Excel user will tell you that to enter the formulas at the top of the data table, you should enter the cell reference or name of the cell preceded by an equal sign. This ensures that if you change the original formula in the worksheet, Excel automatically will change the corresponding formula in the data table. If you use a cell reference, Excel also copies the format to the cell. If you use a name, Excel does not copy the format to the cell.

To Enter the Formulas in the Data Table

The next step in creating the data table is to enter the three formulas at the top of the table in cells D11, E11, and F11. The three formulas are the same as the monthly payment formula in cell F6, the total interest formula in cell F7, and the total cost formula in cell F8. The number of formulas you place at the top of a one-input data table depends on the purpose of the table. Some one-input data tables will have only one formula, while others might have several. In this case, three formulas are affected when the interest rate changes.

Excel provides four ways to enter these formulas in the data table: (1) retype the formulas in cells D11, E11, and F11; (2) copy cells F6, F7, and F8 to cells D11, E11, and F11, respectively; (3) enter the formulas `=monthly_payment` in cell D11, `=total_interest` in cell E11, and `=total_cost` in cell F11; or (4) enter the formulas `=F6` in cell D11, `=F7` in cell E11, and `=F8` in cell F11.

The best alternative to define the formulas in the data table is the fourth alternative, which involves using the cell references preceded by an equal sign. This method is best because (1) it is easier to enter; (2) if you change any of the formulas in the range F6:F8, the formulas at the top of the data table are immediately updated; and (3) Excel automatically will assign the format of the cell reference (currency style format) to the cell. Using the third alternative, which involves using cell names, is nearly as good an alternative, but Excel will not assign formatting to the cells when you use cell names. The following steps enter the formulas of the data table in row 11.

- 1 With cell D11 active, type `=f6` and then press the RIGHT ARROW key to enter the first parameter of the function to be used in the data table.
- 2 Type `=f7` in cell E11 and then press the RIGHT ARROW key.
- 3 Type `=f8` in cell F11 and then click the Enter button to assign the formulas and apply the Currency style format (Figure 4-19).

Q&A Why are these cells assigned the values of cells in the Mortgage Payment Calculator area of the worksheet?

It is important to understand that the entries in the top row of the data table (row 11) refer to the formulas that the loan officer and customer want to evaluate using the series of percentages in column C. Furthermore, recall that when you assign a formula to a cell, Excel applies the format of the first cell reference in the formula to the cell. Thus, Excel applies the currency style format to cells D11, E11, and F11 because that is the format of cells F6, F7, and F8.

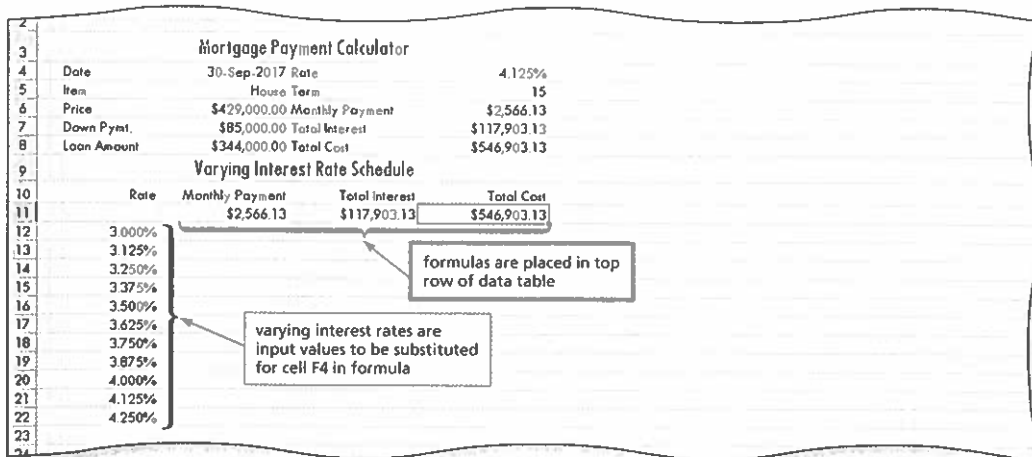


Figure 4-19

To Define a Range as a Data Table

After creating the interest rate series in column C and entering the formulas in row 11, the next step is to define the range C11:F22 as a data table. Cell F4 is the input cell for the data table, which means cell F4 is the cell in which values from column C in the data table are substituted in the formulas in row 11. *Why? You want Excel to generate the monthly payment, monthly interest, and total cost for the various interest rates.*

- 1
 - Select the range C11:F22 as the range in which to create the data table.
 - Display the Data tab and then click the 'What-If Analysis' button (Data tab | Forecast group) to display the What-If Analysis menu (Figure 4-20).

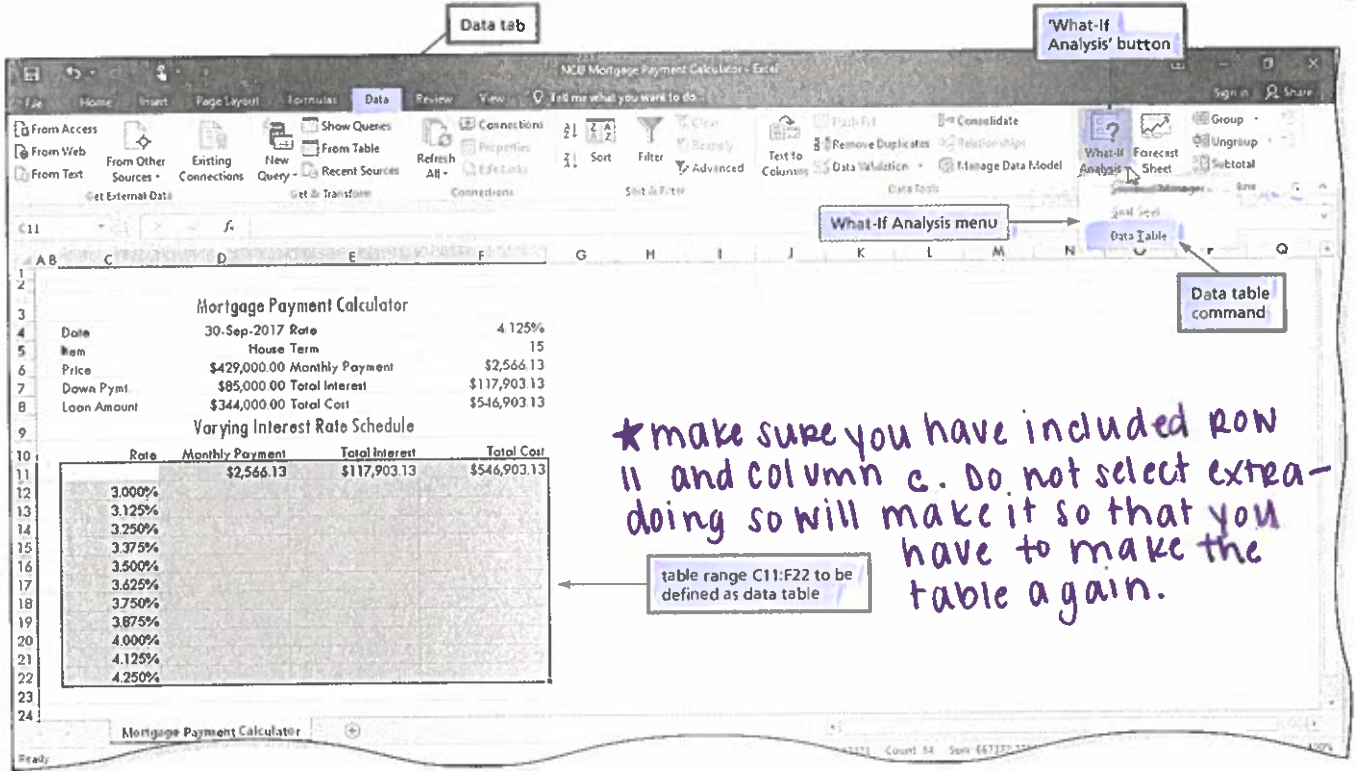


Figure 4-20

- 2
 - Click Data Table on the What-If Analysis menu to display the Data Table dialog box.
 - Click the 'Column input cell' box (Data Table dialog box) and then click cell F4 in the Mortgage Payment Calculator section of the spreadsheet to select the input cell for the data table (Figure 4-21).

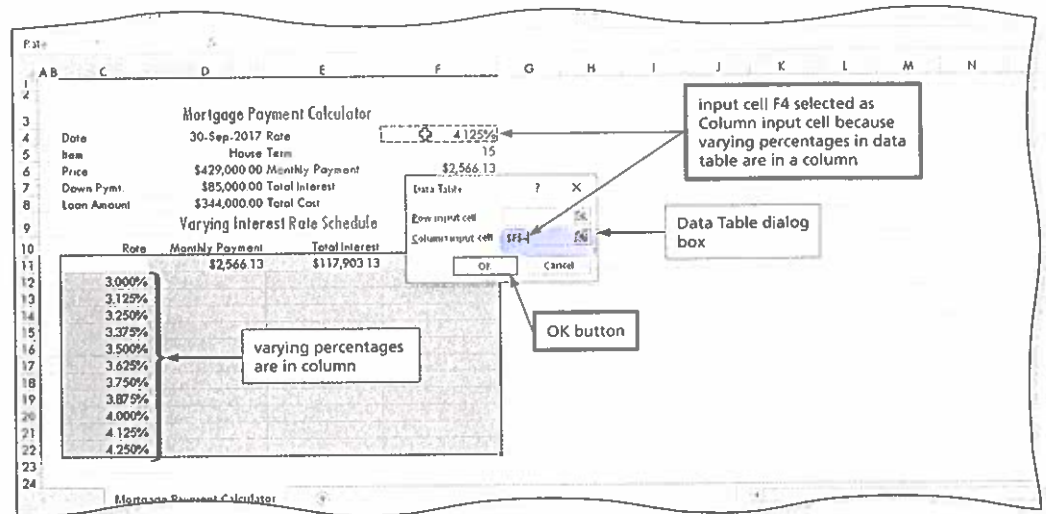


Figure 4-21

Q&A What is the purpose of clicking cell F4?

The purpose of clicking cell F4 is to select it for the Column input cell. A marquee surrounds the selected cell F4, indicating it will be the input cell in which values from column C in the data table are substituted in the formulas in row 11. \$F\$4 now appears in the 'Column input cell' box in the Data Table dialog box.

U3

- Click the OK button (Data Table dialog box) to create the data table.
- Apply the currency style with no currency symbol and the second format in the Negative numbers list to the range D12:F22.
- Deselect the selected range, D11:F22 in this case (Figure 4–22).

Q&A How does Excel create the data table?

Excel calculates the results of the three formulas in row 11 for each interest rate in column C and immediately fills columns D, E, and F of the data table. The resulting values for each interest rate are displayed in the corresponding rows.



Figure 4–22

More about Data Tables

The following list details important points you should know about data tables:

1. The formula(s) you are analyzing must include a cell reference to the input cell.
2. You can have as many active data tables in a worksheet as you want.
3. While only one value can vary in a one-input data table, the data table can analyze as many formulas as you want.
4. To include additional formulas in a one-input data table, enter them in adjacent cells in the same row as the current formulas (row 11 in Figure 4–22) and then define the entire new range as a data table by using the Data Table command on the What-If Analysis menu.

BTW

Amortization Schedules

Hundreds of websites offer amortization schedules. To find these websites, use a search engine, such as Google, and search using the keywords, amortization schedule.

Creating an Amortization Schedule

The next step in this project is to create the Amortization Schedule section on the right side of Figure 4–23. An amortization schedule shows the beginning and ending balances of a loan and the amount of payment that applies to the principal and interest for each year over the life of the loan. For example, if a customer wanted to pay off the loan after

six years, the Amortization Schedule section would tell the loan officer what the payoff would be (cell J10 in Figure 4–23). The Amortization Schedule section shown in Figure 4–23 will work only for loans of up to 15 years; however, you could extend the table to any number of years. The Amortization Schedule section also contains summaries in rows 20, 21, and 22. These summaries should agree exactly with the corresponding amounts in the Mortgage Payment Calculator section in the range C3:F8.

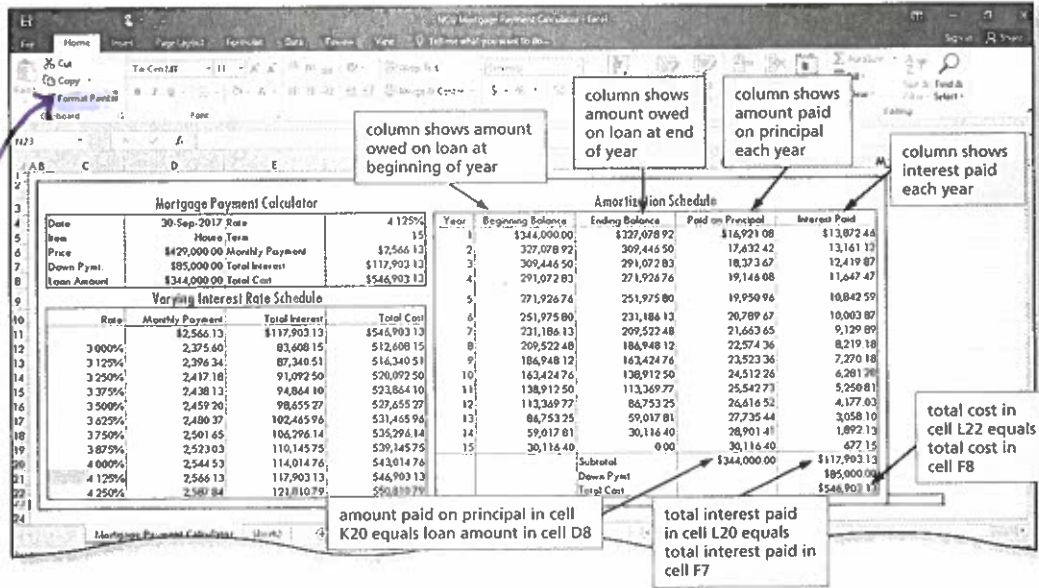


Figure 4–23

To Change Column Widths and Enter Titles

The first step in creating the Amortization Schedule section is to adjust the column widths and enter the section title and column titles. The following steps adjust column widths and enter column titles for the Amortization Schedule section.

- 1 Position the pointer on the right boundary of column heading G and then drag to the left until the ScreenTip shows Width: .92 (12 pixels) to change the column width.
- 2 Position the pointer on the right boundary of column heading H and then drag to the left until the ScreenTip shows Width: 6.00 (53 pixels) to change the column width.
- 3 Drag through column headings I through L to select them. Position the pointer on the right boundary of column heading L and then drag to the right until the ScreenTip shows Width: 16.00 (133 pixels) to change the column widths.
- 4 Select cell H3. Type **Amortization Schedule** and then press the ENTER key to enter the section title.
- 5 Select cell C3, click the **Format Painter** button (Home tab | Clipboard group) to activate the format painter, and then click cell H3 to copy the format of cell C3.
- 6 Click the 'Merge & Center' button (Home tab | Alignment group) to split the selected cell, cell H3 in this case. Select the range H3:L3 and then click the 'Merge & Center' button (Home tab | Alignment group) to merge and center the section title over the selected range.
- 7 Enter the following column headings in row 4: **Year** in cell H4, **Beginning Balance** in cell I4, **Ending Balance** in cell J4, **Paid on Principal** in cell K4, and **Interest Paid** in cell L4. Select the range H4:L4 and then click the **Center** button (Home tab | Alignment group) to center the column headings.

get as close as you can.

BTW

Column Borders

In this module, columns A and G are used as column borders to divide sections of the worksheet from one another, as well as from the row headings. A column border is an unused column with a significantly reduced width. You also can use row borders to separate sections of a worksheet.

8 Select cell H5 to display the centered section title and column headings (Figure 4-24).



Q&A Why was cell H3 split, or unmerged, in Step 6?

After using the format painter, Excel attempted to merge and center the text in cell H3 because the source of the format, cell C3, is merged and centered across four columns. The Amortization Schedule section, however, includes five columns. Splitting cell H3 changed cell H3 back to being one column instead of including four columns. Next, the section heading was merged and centered across five columns as required by the design of the worksheet.

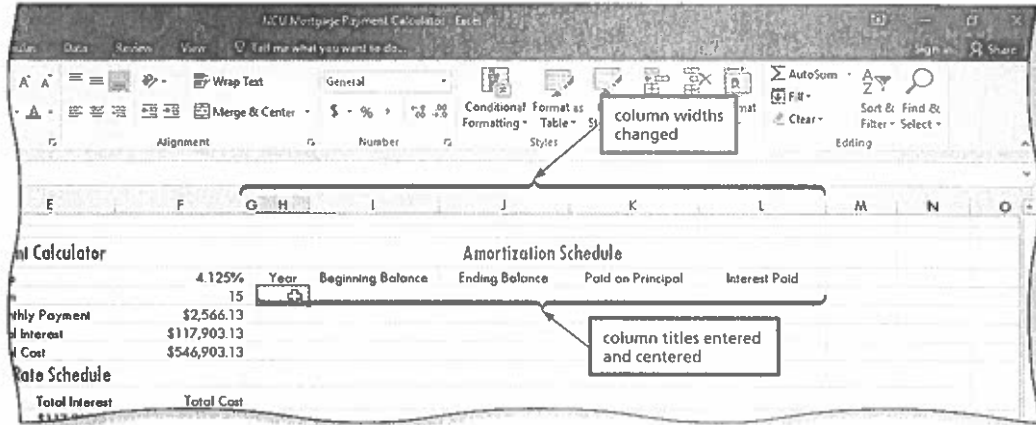


Figure 4-24

To Create a Series of Integers Using the Fill Handle

The next step is to use the fill handle to create a series of numbers that represent the years during the life of the loan. The series begins with 1 (year 1) and ends with 15 (year 15). The following steps create a series of years in the range H5:H19.

- 1** With cell H5 active, type 1 as the initial year. Select cell H6 and then type 2 to represent the next year.
- 2** Select the range H5:H6 and then drag the fill handle through cell H19 to complete the creation of a series of integers, 1 through 15 in the range H5:H19 in this case (Figure 4-25).

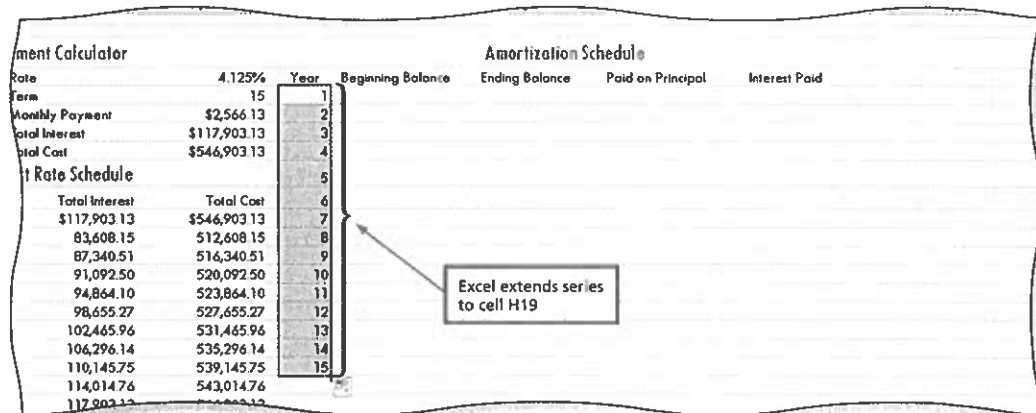


Figure 4-25

Q&A Why is year 5 of the amortization schedule larger than the other rows in the amortization schedule?

The design of the worksheet called for a large font size for the varying interest rate schedule section of the worksheet, which is in row 9 of the worksheet. To accommodate the larger font size, the height of row 9 was increased. Year 5 of the worksheet is in the taller row 9 and, therefore, is taller than the other years in the amortization schedule.

Formulas in the Amortization Schedule

Four formulas form the basis of the amortization schedule. These formulas are found in row 5. Later, these formulas will be copied through row 19. The formulas are summarized in Table 4–2.

Table 4–2 Formulas for the Amortization Schedule

Cell	Column Heading	Formula	Example
I5	Beginning Balance	=D8	The beginning balance (the balance at the end of a year) is the initial loan amount in cell D8.
J5	Ending Balance	=IF(H5<=\$F\$5, PV(\$F\$4/12, 12*(\$F\$5-H5), -\$F\$6), 0)	The ending balance (the balance at the end of a year) is equal to the present value of the payments paid over the remaining life of the loan. (This formula is fully explained in the following text.)
K5	Paid on Principal	=I5-J5	The amount paid on the principal at the end of the year is equal to the beginning balance (cell I5) minus the ending balance (cell J5).
L5	Interest Paid	=IF(I5>0, 12*\$F\$6-K5, 0)	The interest paid during the year is equal to 12 times the monthly payment (cell F6) minus the amount paid on the principal (cell K5).

Of the four formulas in Table 4–2, perhaps the most difficult to understand is the PV function that will be assigned to cell J5. The **PV function** returns the present value of an annuity. An **annuity** is a series of fixed payments (such as the monthly payment in cell F6) made at the end of each of a fixed number of periods (months) at a fixed interest rate. You can use the PV function to determine the amount the borrower still owes on the loan at the end of each year. The PV function has three arguments: rate, number of periods, and payment amount per period. Its general form is as follows:

$$=PV(\text{rate}, \text{period}, \text{payment})$$

where rate is the interest rate per payment period, period is the number of payments remaining in the life of the loan, and payment is the amount of the monthly payment.

The PV function is used to determine the ending balance after the first year (cell J5) by using a term equal to the number of months for which the borrower still must make payments. For example, if the loan is for 15 years (180 months), then the borrower still owes 168 payments after the first year (180 months–12 months). The number of payments outstanding can be determined from the formula $12*(\$F\$5-H5)$ or $12*(15-1)$, which equals 168. Recall that column H contains integers that represent the years of the loan. After the second year, the number of payments remaining is 156, and so on.

If you assign the PV function as shown in Table 4-2 to cell J5 and then copy it to the range J6:J19, the ending balances for each year will be displayed properly. However, if the loan is for fewer than 15 years, any ending balances for the years beyond the term of the loan are invalid. For example, if a loan is taken out for 5 years, then the rows representing years 6 through 15 in the amortization schedule should be zero. The PV function, however, will display negative numbers for those years even though the loan already has been paid off.

To avoid displaying negative ending balances, the worksheet should include a formula that assigns the PV function to the range I5:I19 as long as the corresponding year in column H is less than or equal to the number of years in the term (cell F5). If the corresponding year in column H is greater than the number of years in cell F5, then the ending balance for that year and the remaining years should be zero. The following IF function causes either the value of the PV function or zero to be displayed in cell J5, depending on whether the corresponding value in column H is greater than — or less than or equal to — the number of years in cell F5. Recall that the dollar signs within the cell references indicate the cell references are absolute and, therefore, will not change as you copy the function downward.

$$=IF(H5<= \$F\$5, PV(\$F\$4/12, 12*(\$F\$5-H5), -\$F\$6), 0)$$

logical test
value if true
value if false

In the preceding formula, the logical test determines if the year in column H is less than or equal to the term of the loan in cell F5. If the logical test is true, then the IF function assigns the PV function to the cell. If the logical test is false, then the IF function assigns zero (0) to the cell. You also could use two double-quote symbols (“ ”) to indicate to Excel to leave the cell blank if the logical test is false.

The PV function in the IF function includes absolute cell references (cell references with dollar signs) to ensure that the references to cells in column F do not change when the IF function later is copied down the column.

To Enter the Formulas in the Amortization Schedule

1. FORMAT WORKSHEET | 2. CREATE PRINT AREAS | 3. CREATE AMORTIZATION SCHEDULE
4. FORMAT WORKSHEET | 5. CREATE PRINT AREAS | 6. PROTECT CELLS | 7. CHECK FORMULAS

Why? Creating an amortization schedule allows you to see the costs of a mortgage and the balance still owed for any year in the term of the loan. This information can be very helpful when making financial decisions. The following steps enter the four formulas shown in Table 4-2 into row 5. Row 5 represents year 1 of the loan.

1. Select cell I5 and then enter =d8 as the beginning balance of the loan.
2. Select cell J5 and then type =if(h5<=\$f\$5, pv(\$f\$4/12, 12*(\$f\$5-h5), -\$f\$6), 0) as the entry (Figure 4-26).

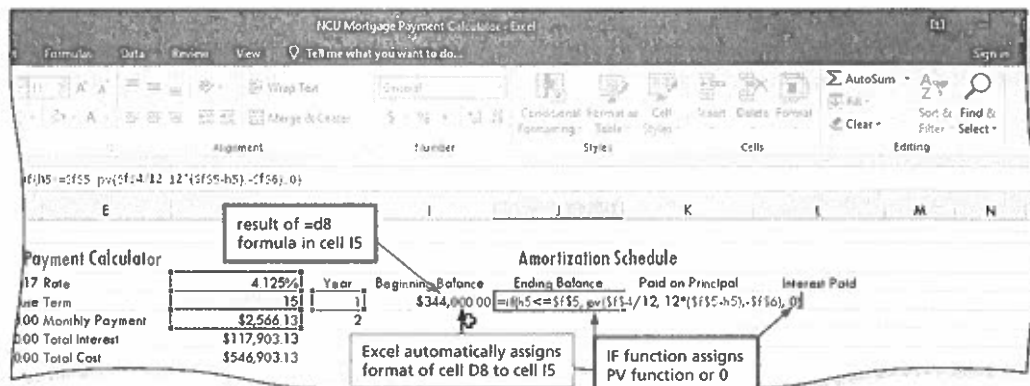


Figure 4-26

2

- Click the Enter button in the formula bar to insert the formula in the selected cell (Figure 4-27).

Q&A

What happens when the Enter button is clicked?

Excel evaluates the IF function in cell J5 and displays the result of the PV function (327078.9227), because the value in cell H5 (1) is less than the term of the loan in cell F5 (15). With cell J5 active, Excel also displays the formula in the formula bar. If the borrower wanted to pay off the loan after one year, the cost would be \$327,078.92.

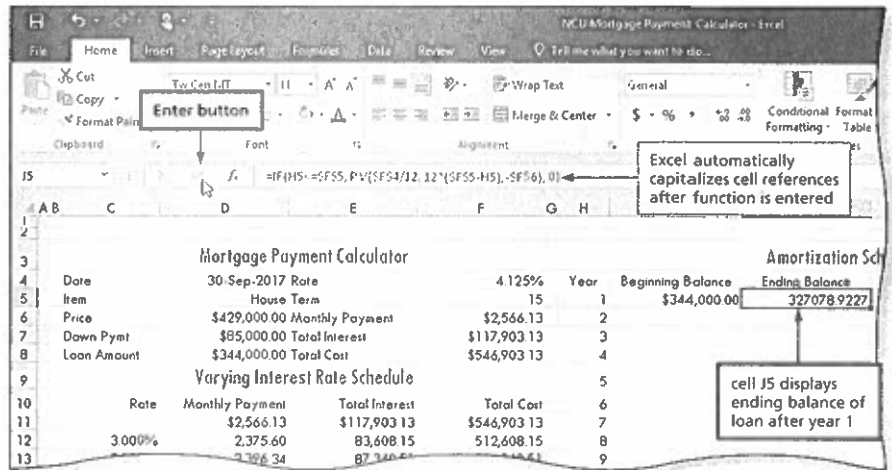


Figure 4-27

3

- Select cell K5. Enter the formula $=I5 - J5$ and then press the RIGHT ARROW key to complete the entry and select cell L5.
- Enter the formula $=IF(I5 > 0, 12 * \$F\$6 - K5, 0)$ in cell L5 (Figure 4-28).

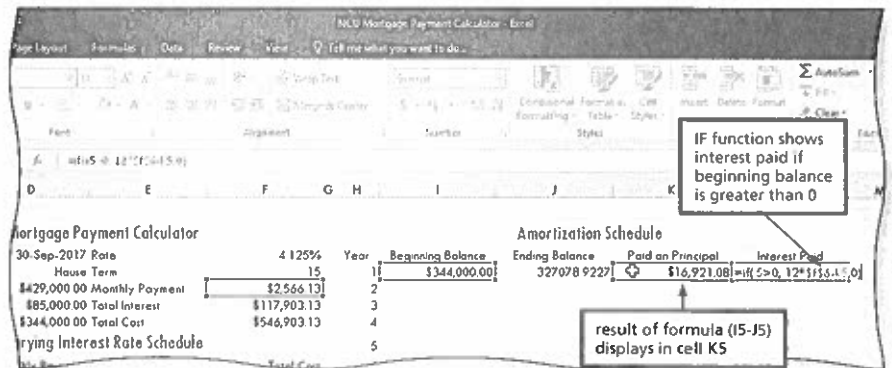


Figure 4-28

4

- Click the Enter button in the formula bar to complete the entry of the formula (Figure 4-29).

O&A

Why are some of the cells in the range I5:L5 not formatted?

When you enter a formula in a cell, Excel assigns the cell the same format as the first cell reference in the formula. For example, when you enter $=D8$ in cell I5, Excel assigns the format in cell D8 to cell I5. The same applies to cell K5. Although this method of formatting also works for most functions, it does not work for the IF function. Thus, the results of the IF functions in cells J5 and L5 are formatted using the general style format, which is the default format when you open a new workbook.

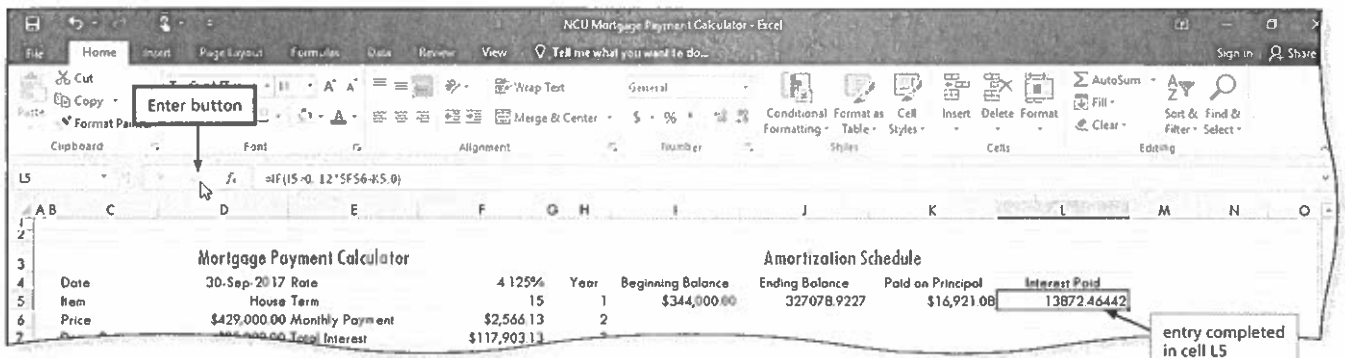


Figure 4-29

To Copy the Formulas to Fill the Amortization Schedule

1 CREATE MORTGAGE PAYMENT CALCULATOR | 2 CREATE DATA TABLE | 3 CREATE AMORTIZATION SCHEDULE
4 FORMAT WORKSHEET | 5 CREATE PRINT AREAS | 6 PROTECT CELLS | 7 CHECK FORMULAS

Why? With the formulas entered into the first row, the next step is to copy them to the remaining rows in the amortization schedule. The required copying is straightforward, except for the beginning balance column. To obtain the next year's beginning balance (cell I6), last year's ending balance (cell J5) must be used. After cell J5 (last year's ending balance) is copied to cell I6 (next year's beginning balance), then I6 can be copied to the range I7:I19. The following steps copy the formulas in the range J5:L5 and cell I6 through to the remainder of the amortization schedule.

- 1
 - Select the range J5:L5 and then drag the fill handle down through row 19 to copy the formulas through the amortization schedule, J6:L19 in this case (Figure 4-30).

Q&A Why do some of the numbers seem incorrect?
 Many of the numbers are incorrect because the cells in column I — except for cell I5 — do not yet contain values.

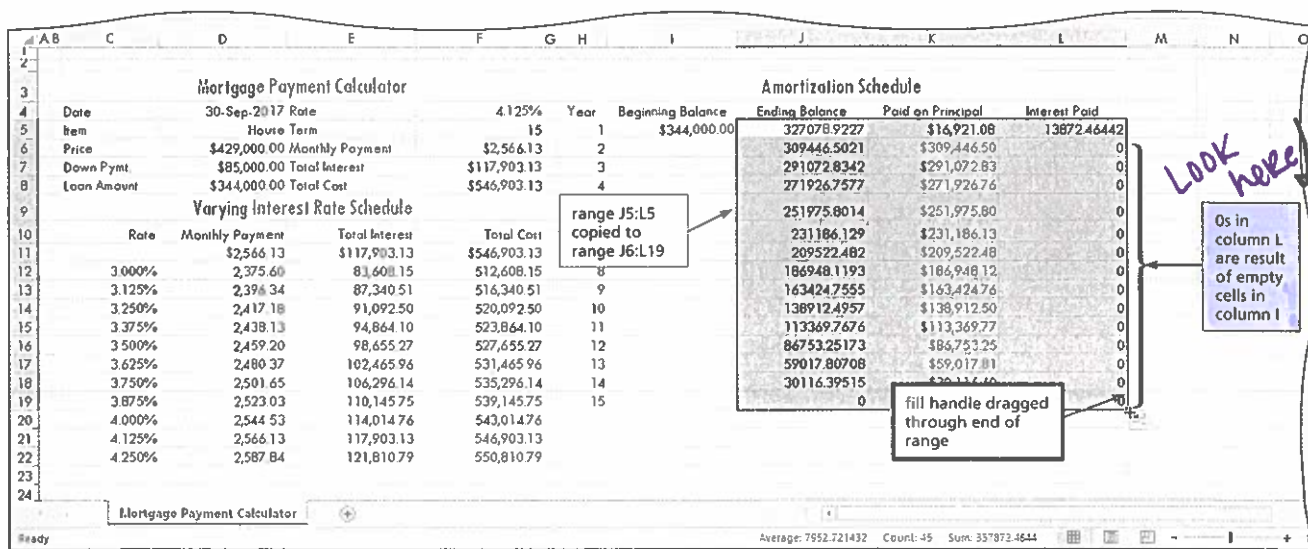


Figure 4-30

- 2
 - Select cell I6, type =J5 as the cell entry, and then click the Enter button in the formula bar to display the ending balance (327078.9227) for year 1 as the beginning balance for year 2 (Figure 4-31).

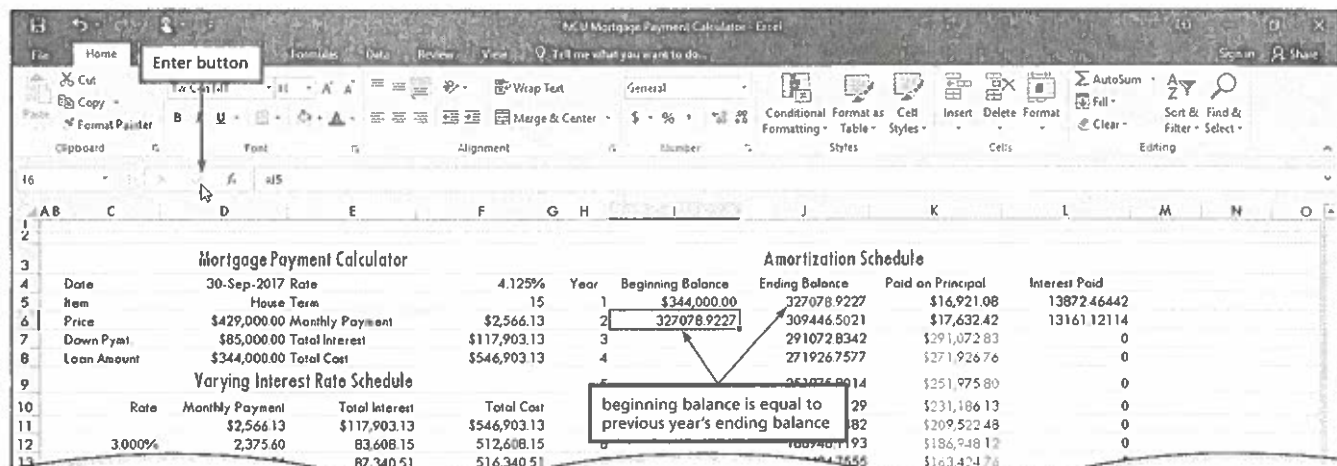


Figure 4-31

3

- With cell I6 active, drag the fill handle down through row 19 to copy the formula in cell I6 (=J5) to the range I7:I19 (Figure 4–32).

Q&A What happens after the fill operation is complete?
 Because the cell reference J5 is relative, Excel adjusts the row portion of the cell reference as it is copied downward. Thus, each new beginning balance in column I is equal to the ending balance of the previous year.

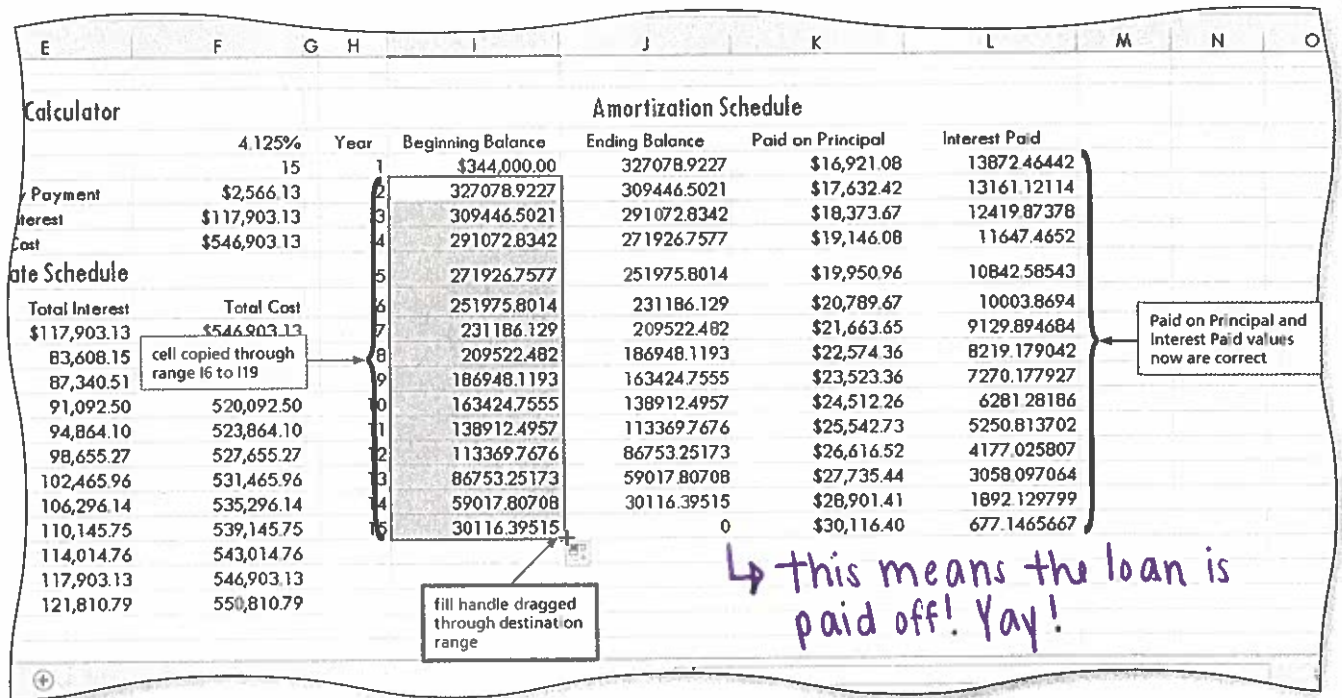


Figure 4–32

Other Ways

1. Select cells containing formulas to copy, click Copy (Home tab | Clipboard group), select destination cell or range, click Paste (Home tab | Clipboard group)

You're Almost there!! ...

To Enter the Total Formulas in the Amortization Schedule

The next step is to determine the amortization schedule totals in rows 20 through 22. These totals should agree with the corresponding totals in the Mortgage Payment Calculator section (range F7:F8). The following steps enter the total formulas in the amortization schedule.

- 1 Select cell J20 and then enter **Subtotal** as the row title.
- 2 Select the range K20:L20 and then click the Sum button (Home tab | Editing group) to sum the selected range.
- 3 Select cell J21 and then enter **Down Pymt.** as the row title.
- 4 Select cell L21 and then enter **=d7** to copy the down payment to the selected cell.
- 5 Select cell J22 and then enter **Total Cost** as the row title.

- 6 Select cell L22, type $=K20 + L20 + L21$ as the total cost, and then click the Enter button in the formula bar to complete the amortization schedule totals (Figure 4-33).

Q&A

What was accomplished in the previous steps?

The formula assigned to cell L22 ($=K20+L20+L21$) sums the total amount paid on the principal (cell K20), the total interest paid (cell L20), and the down payment (cell L21). Excel assigns cell K20 the same format as cell K5 because cell K5 is the first cell reference in $=SUM(K5:K19)$. Furthermore, because cell K20 was selected first when the range K20:L20 was selected to determine the sum, Excel assigned cell L20 the same format it assigned to cell K20. Finally, cell L21 was assigned the currency style format, because cell L21 was assigned the formula $=d7$, and cell D7 has a currency style format. For the same reason, the value in cell L22 appears with the currency style format.

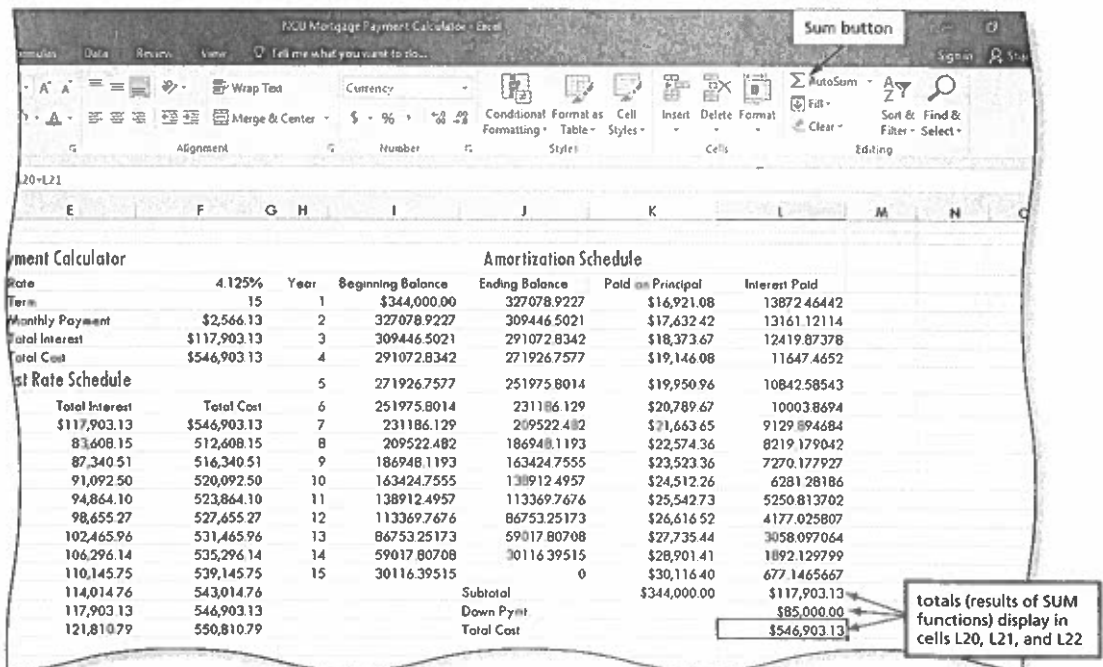


Figure 4-33

To Format the Numbers in the Amortization Schedule

The next step in creating the amortization schedule is to format it so that it is easier to read. When the beginning balance formula ($=d8$) was entered earlier into cell I5, Excel copied the currency style format along with the value from cell D8 to cell I5. The following steps copy the currency style format from cell I5 to the range J5:L5. The comma style format then will be assigned to the range I6:L19.

- 1 Select cell I5 and then click the Format Painter button (Home tab | Clipboard group) to turn on the format painter. Drag through the range J5:L5 to assign the currency style format to the cells.
- 2 Select the range I6:L19 and then right-click the selected range to display a shortcut menu. Click Format Cells on the shortcut menu to display the Format Cells dialog box and then, if necessary, click the Number tab (Format Cells dialog box) to display the Number sheet.

- 3 Select Currency in the Category list to select a currency format, select None in the Symbol list to choose no currency symbol, and then click the second format, 1,234.10, in the Negative numbers list to create a currency format.
- 4 Click the OK button (Format Cells dialog box) to apply the currency format to the selected range.
- 5 Deselect the range I6:L19 and display the numbers in the amortization schedule, as shown in Figure 4–34.

BTW

Round-Off Errors

If you manually add the numbers in column L (range L5:L19) and compare it to the sum in cell L20, you will notice that the total interest paid is \$0.01 off. This round-off error is due to the fact that some of the numbers involved in the computations have additional decimal places that do not appear in the cells. You can use the ROUND function on the formula entered into cell L5 to ensure the total is exactly correct. For information on the ROUND function, click the Insert Function button in the formula bar, click 'Math & Trig' in the 'Or select a category' list, scroll down in the 'Select a function' list, and then click ROUND.

BTW

Undoing Formats

If you began assigning formats to a range and then realize you made a mistake and want to start over, select the range, click the Cell Styles button (Home tab | Styles group), and then click Normal in the Cell Styles gallery.

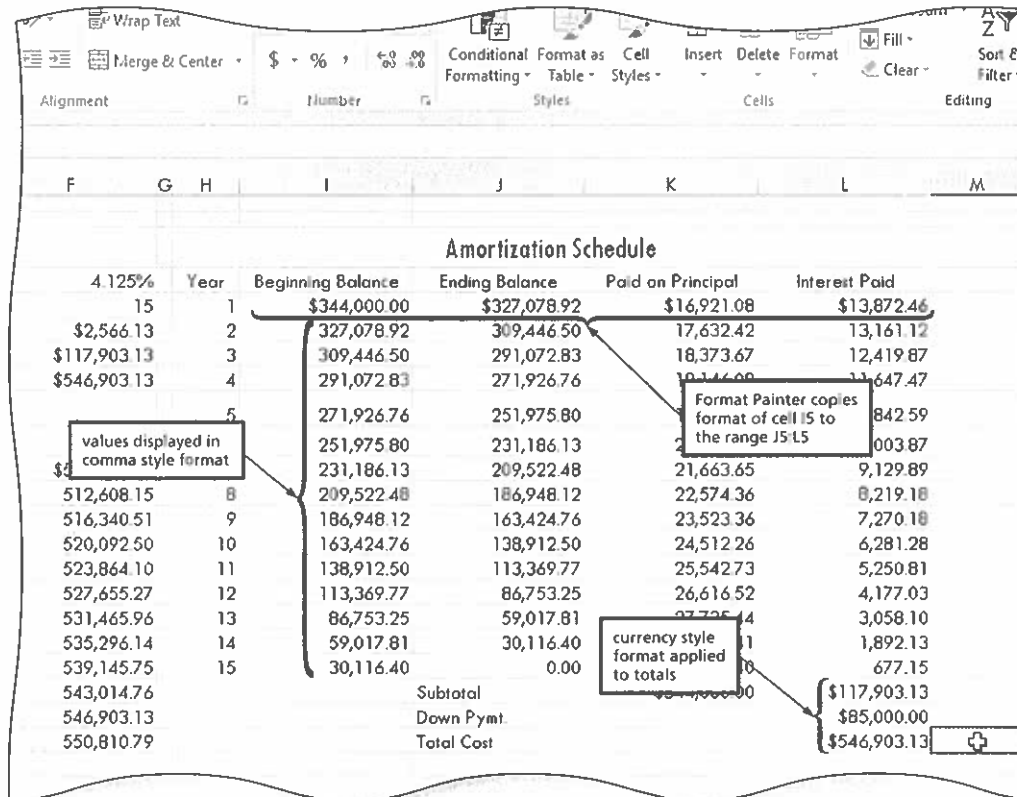


Figure 4–34

Formatting the Worksheet

Previous modules introduced you to outlining a range using cell borders or cell background colors to differentiate portions of a worksheet. The Borders button (Home tab | Font group), however, offers only a limited selection of border thicknesses. To control the color and thickness, Excel requires that you use the Border sheet in the Format Cells dialog box.

To Add Custom Borders to a Range

Why? Borders can be used to distinguish the different functional parts of a worksheet. The following steps add a medium blue border to the Mortgage Payment Calculator section. To subdivide the row titles and numbers further, light borders also are added within the section, as shown in Figure 4–1.

- 1 Select the range C4:F8 and then right-click to display a shortcut menu and mini toolbar (Figure 4-35).

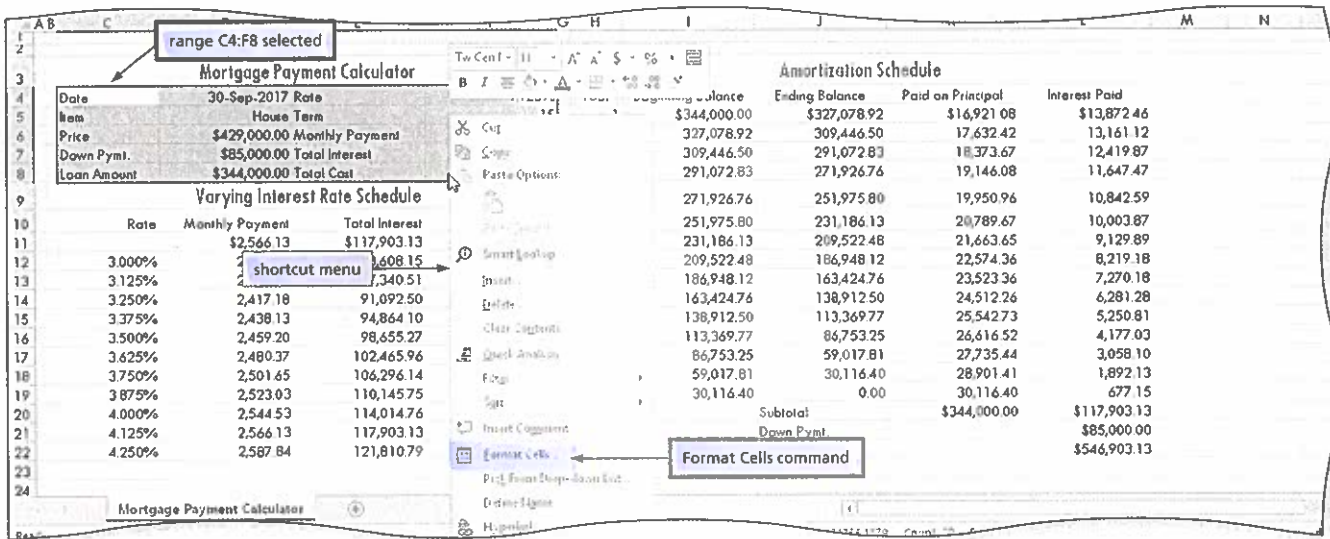


Figure 4-35

- 2
 - Click Format Cells on the shortcut menu to display the Format Cells dialog box.
 - Display the Border tab (Format Cells dialog box).
 - Click the Color arrow to display the Colors palette and then select a color of your choice. Theme Colors area.
 - Click the medium border in the Style area (column 2, row 5) to select the line style for the border.
 - Click the Outline button in the Presets area to preview the outline border in the Border area (Figure 4-36).

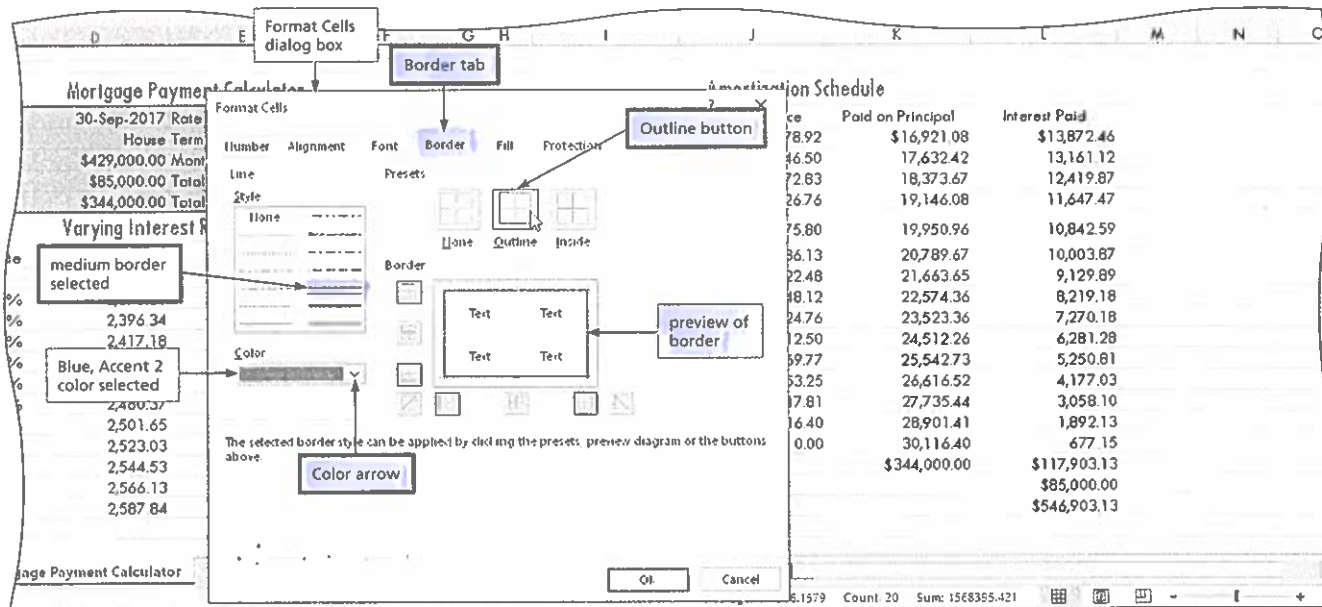


Figure 4-36

3

- Click the light border in the Style area (column 1, row 7) and then click the Vertical Line button in the Border area to preview the blue vertical border in the Border area (Figure 4-37).

Q&A

How do I create a border?
As shown in Figure 4-37, you can add a variety of borders with different colors to a cell or range of cells. It is important that you select border characteristics in the order specified in the steps; that is, (1) choose the border color, (2) choose the border line style, and then (3) choose the border type. This order first defines the border characteristics and then applies those characteristics. If you do these steps in any other order, you may not end up with the borders you intended.

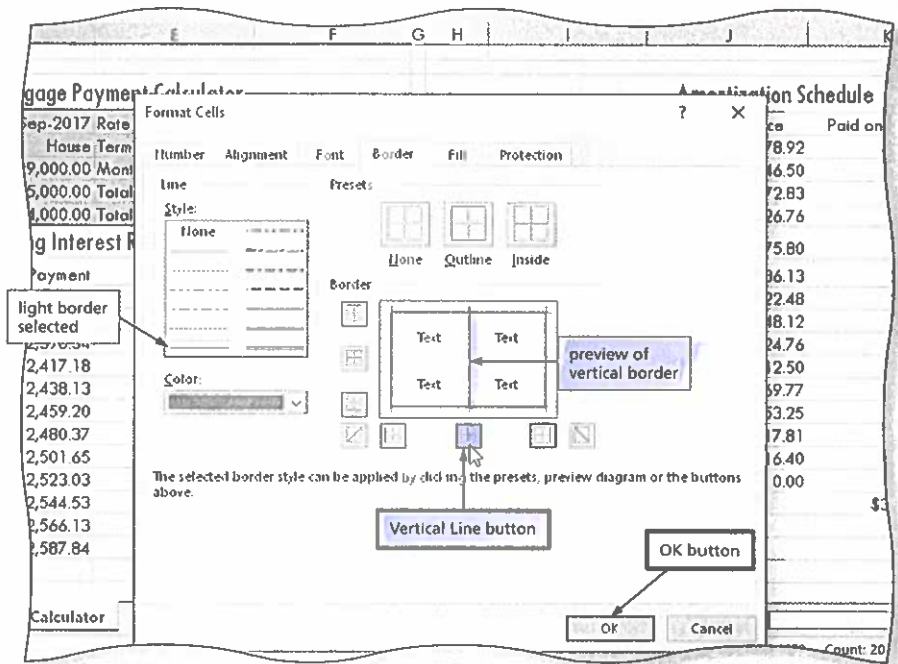


Figure 4-37

4

- Click the OK button to add a blue outline with vertical borders to the right side of each column in the selected range, C4:F8 in this case (Figure 4-38).

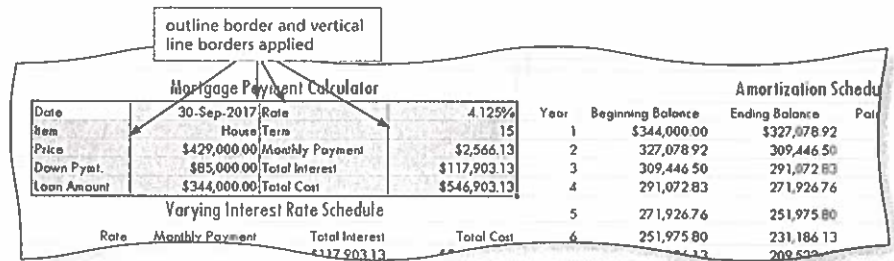


Figure 4-38

Other Ways

- Click More Borders button arrow (Home tab | Font group), click More Borders, select border options, click OK
- Click Format button (Home tab | Cells group), click Format Cells, click Border tab, select border options, click OK

To Add Borders to the Varying Interest Rate Schedule

The following steps add the same borders you applied to the Mortgage Payment Calculator to the Varying Interest Rate Schedule.

- Select the range C10:F22. Right-click the selected range to display a shortcut menu and then click Format Cells on the shortcut menu to display the Format Cells dialog box.
- If necessary, click the Border tab (Format Cells dialog box) to display the Border sheet. Click the Color arrow to display the Colors palette and then click *a color of choice*.
- Click the medium border in the Style area (column 2, row 5). Click the Outline button in the Presets area to preview the border in the Border area.

- 4 Click the light border in the Style area (column 1, row 7). Click the Vertical Line button in the Border area to preview the border in the Border area.
- 5 Click the OK button (Format Cells dialog box) to apply custom borders to the selected range.
- 6 Select the range C10:F10 and then use the Format Cells dialog box to apply a blue, light bottom border to the selected range.
- 7 Deselect the range to display the worksheet, as shown in Figure 4–39.

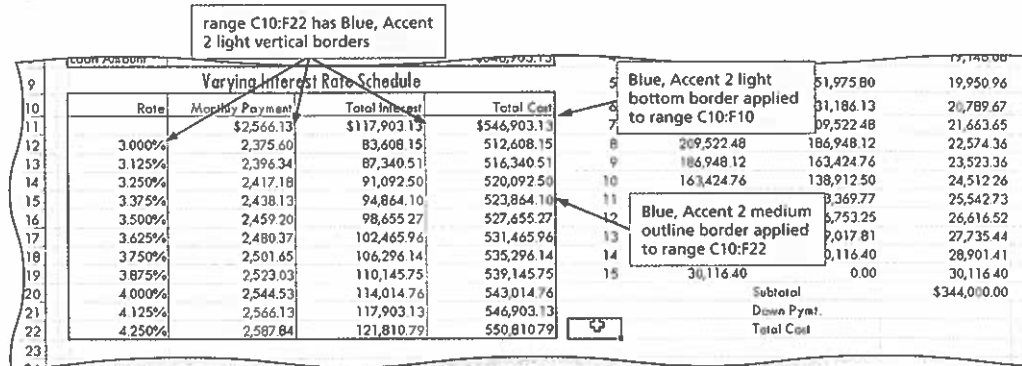


Figure 4–39

To Add Borders to the Amortization Schedule

The following steps add the borders to the Amortization Schedule.

- 1 Select the range H4:L22, and then display the Format Cells dialog box.
- 2 Apply a *color of choice* medium border style using the Outline preset.
- 3 Change the border style to light (column 1, row 7) and then click the Vertical Line button in the Border area to preview the border in the Border area.
- 4 Click the OK button to apply custom borders to the selected range.
- 5 Select the range H5:L19 and then use the Format Cells dialog box to apply *an* upper border and a blue, light bottom border to the selected range.
- 6 Deselect the range to display the worksheet, as shown in Figure 4–40.

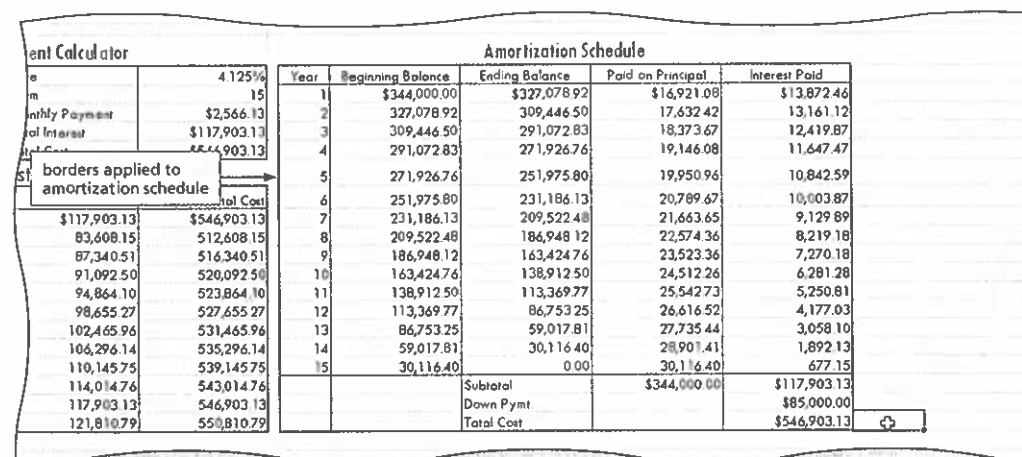


Figure 4–40

To Use Borders and Fill Color to Visually Define and Group the Financial Tools

The following steps add a border and fill color to the entire group of financial tools on the worksheet.

- 1 Change the height of row 23 to 9.0 (12 pixels).
- 2 Change the width of column M to .92 (12 pixels). *approximate*
- 3 Select the range B2:M23.
- 4 Add a **Dark Green, Accent 5, (column 9, row 1)** heavy style (column 2, row 6) Outline border to the selected range. *color choice*
- 5 With the range B2:M23 still selected, click the Fill Color arrow (Home tab | Font group) and apply a fill color of White, **Background 1 (column 1, row 1)** to the selected range. Deselect the range (Figure 4-41).
- 6 Save the workbook again on the same storage location with the same file name.

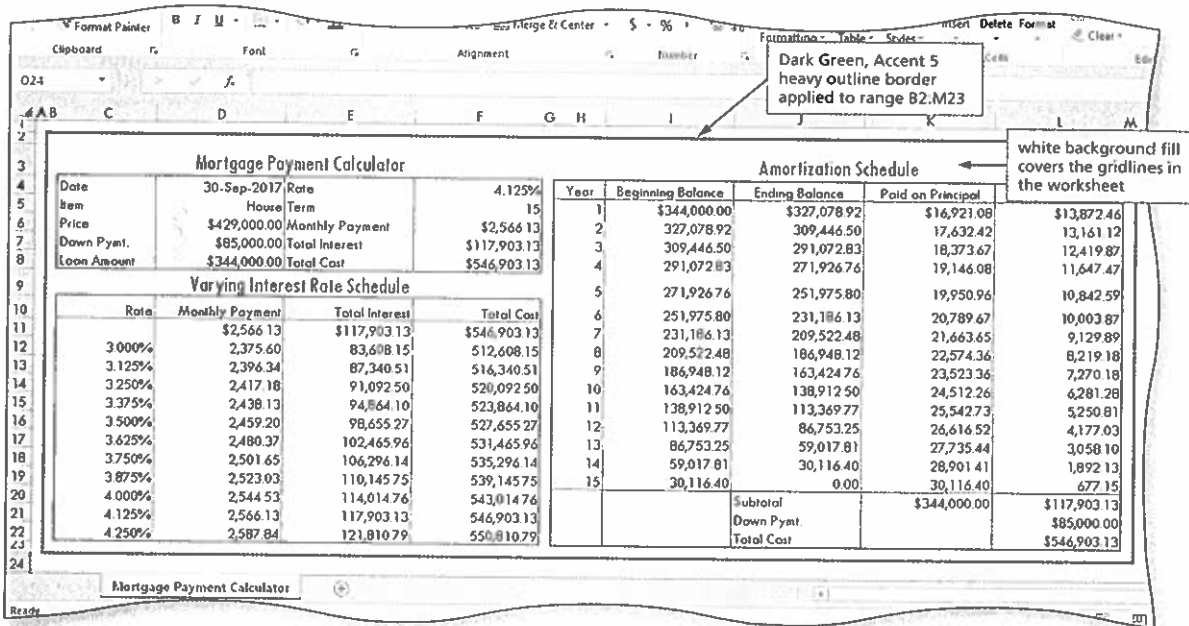


Figure 4-41

Highlighting Cells in the Data Table Using Conditional Formatting

If the interest rate in cell F4 is between 3.000% and 4.250% and its decimal portion is a multiple of 0.125 (such as 4.125%), then one of the rows in the data table agrees exactly with the monthly payment, interest paid, and total cost in the range F6:F8. For example, in Figure 4-41 row 21 (4.125%) in the data table agrees with the results in the range F6:F8, because the interest rate in cell C21 is the same as the interest rate in cell F4. Analysts often look for the row in the data table that agrees with the input cell results. You can use conditional formatting to highlight a row, or a single cell in the row.

BTW
Conditional Formatting
 You can add as many conditional formats to a range as you like. After adding the first condition, click the Conditional Formatting button (Home tab | Styles group) and then click New Rule to add more conditions. If more than one condition is true for a cell, then Excel applies the formats of each condition, beginning with the first.

To Add a Pointer to the Data Table Using Conditional Formatting

1 CREATE MORTGAGE PAYMENT CALCULATOR | 2 CREATE DATA TABLE | 3 CREATE AMORTIZATION SCHEDULE
4 FORMAT WORKSHEET | 5 CREATE PRINT AREAS | 6 PROTECT CELLS | 7 CHECK FORMULAS

Why? To make the row with the active interest rate stand out, you can add formatting that serves as a pointer to that row. To add a pointer, you can use conditional formatting to highlight the cell in column C that agrees with the input cell (cell F4). The following steps apply conditional formatting to column C in the data table.

- Select the range C12:C22 and then click the Conditional Formatting button (Home tab | Styles group) to display the Conditional Formatting gallery.
 - Point to 'Highlight Cells Rules' to display the submenu (Figure 4-42).

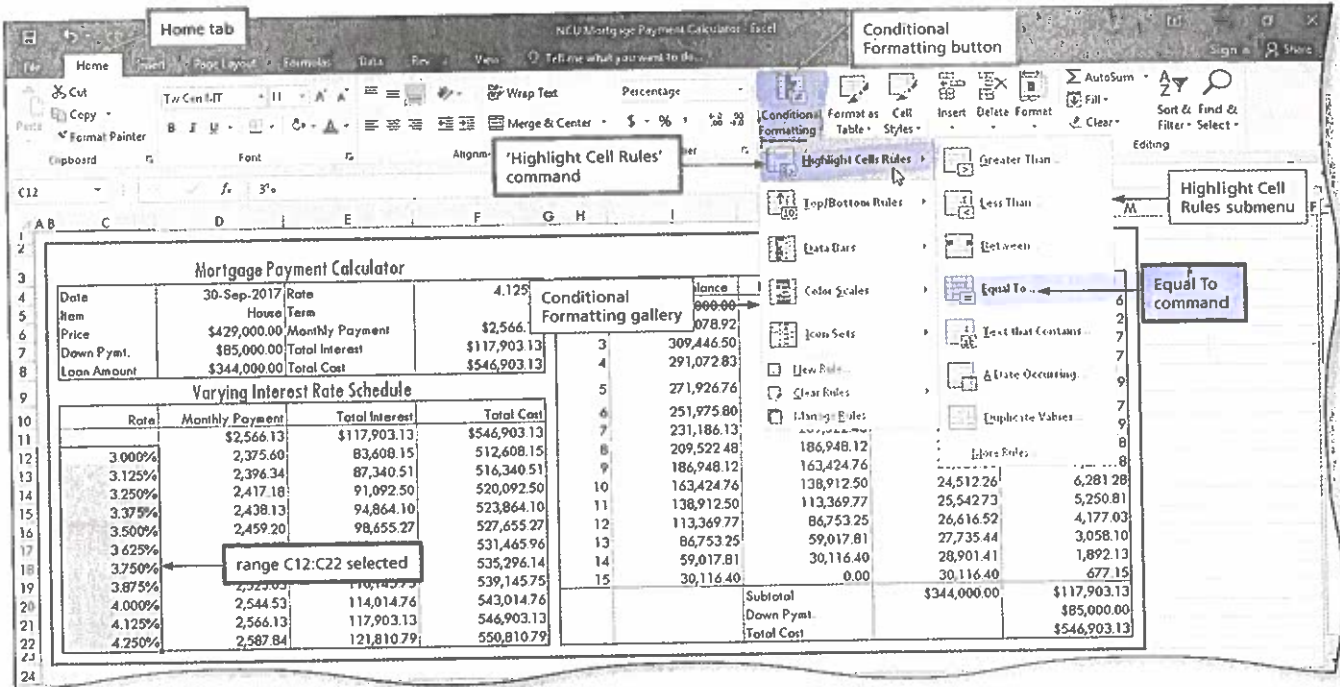


Figure 4-42

- Click Equal To on the Highlight Cells Rules submenu to display the Equal To dialog box.
 - Type =F\$4 in the 'Format cells that are EQUAL TO:' box (Equal To dialog box) (Figure 4-43).

can change if you'd like.

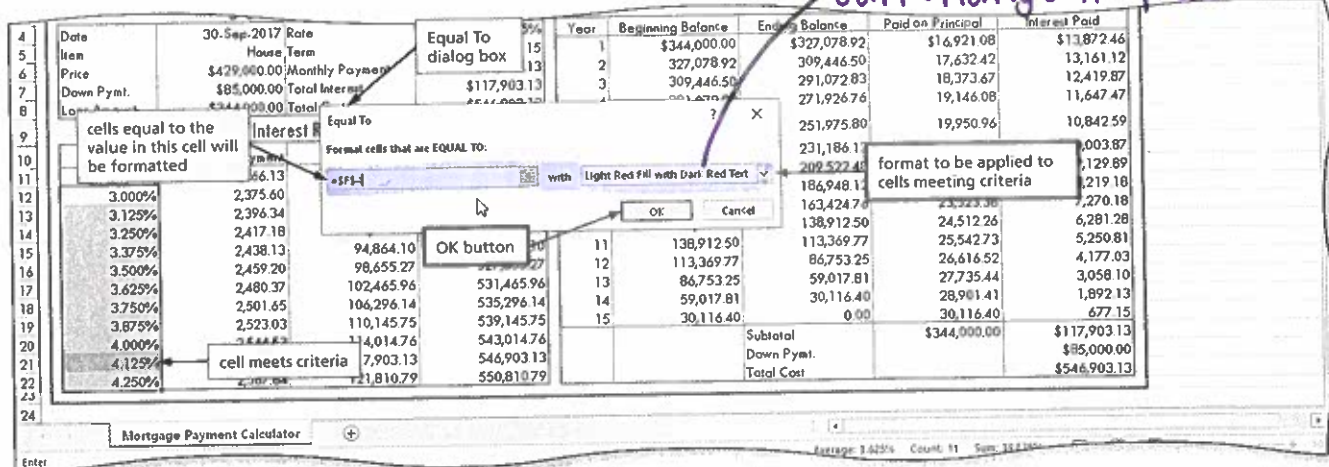


Figure 4-43

- Click the OK button to apply the conditional formatting rule.
- Deselect the range (Figure 4-44).

Q&A How does Excel apply the conditional formatting? Cell C21 in the data table, which contains the value, 4.125%, appears with a red background and dark red text, because the value 4.125% is the same as the interest rate value in cell F4.

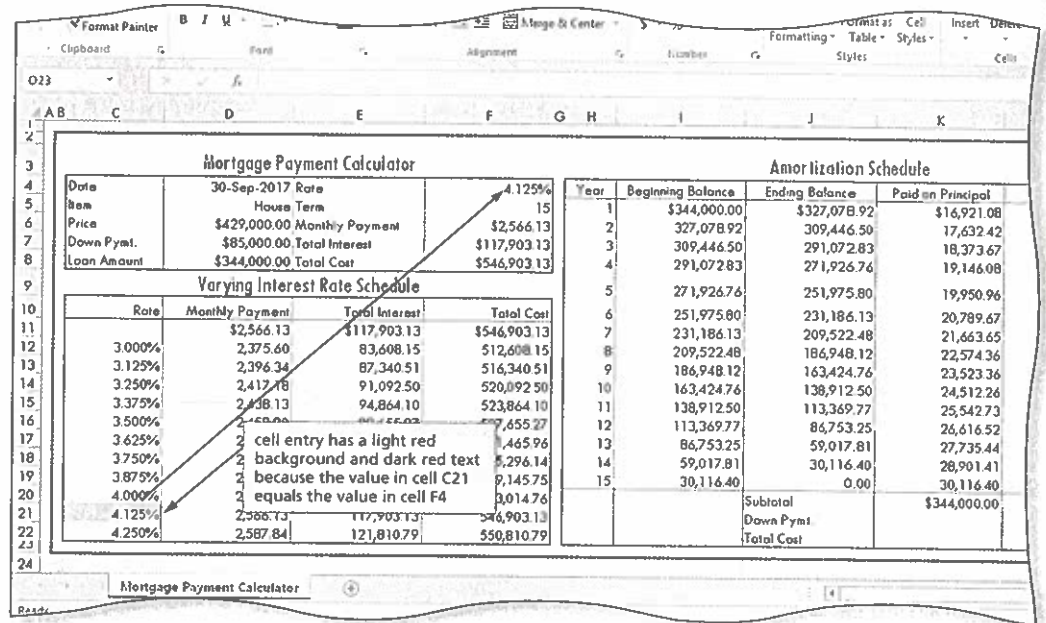


Figure 4-44

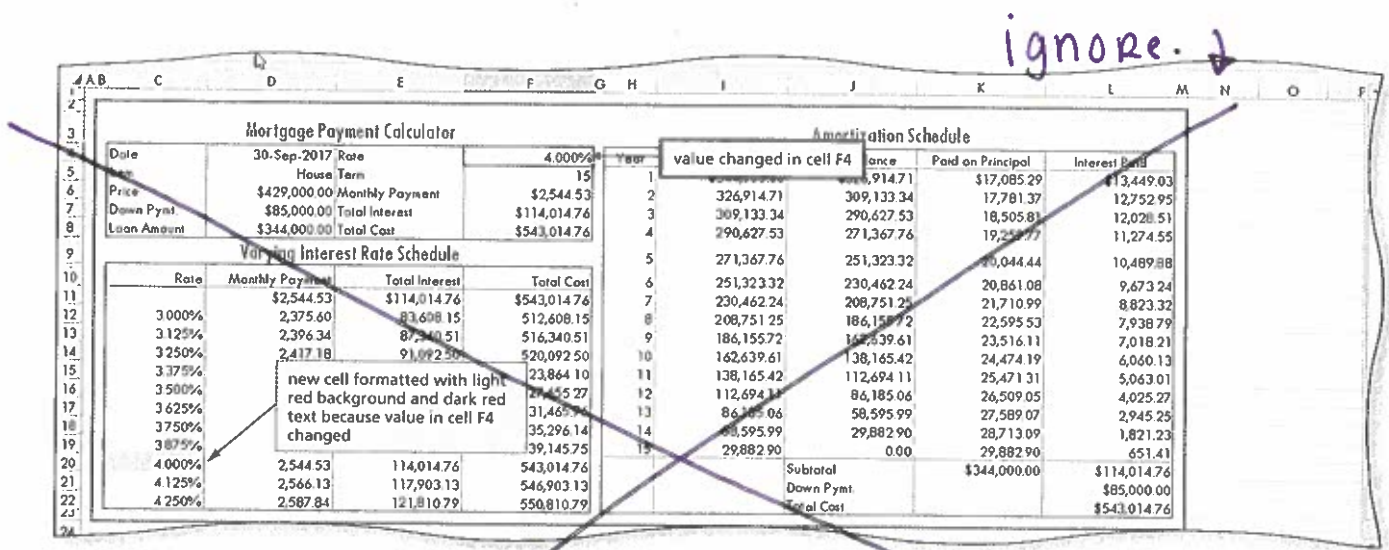


Figure 4-45

- Enter 4.125 in cell F4 to return the Mortgage Payment Calculator, Varying Interest Rate Schedule, and Amortization Schedule sections to their original states.

Q&A What happened when I changed the interest rate from 4.125% to 4.000%? The cell containing the new rate received a red background and dark red text, while the original cell (cell C21) reverted to its original formatting (Figure 4-45). The red background and dark red text serve as a pointer in the data table to indicate which row agrees with the input cell (cell F4). When the loan officer using this worksheet enters a new percentage in cell F4, the pointer will move or disappear. The formatting will disappear if the interest rate in cell F4 falls outside the range of the data table or does not appear in the data table, for example, if the interest rate is 5.000% or 4.100%.

To Enter New Loan Data

With the Mortgage Payment Calculator, Varying Interest Rate Schedule, and Amortization Schedule sections of the worksheet complete, you can use them to generate new loan information. For example, assume you want to purchase land for \$125,000.00. You have \$30,000.00 for a down payment and want a seven-year loan. NCU currently is charging 3.625% interest for a seven-year loan on land. The following steps enter the new loan data.

- 1 Enter **Land** in cell D5.
- 2 Enter **125000** in cell D6.
- 3 Enter **30000** in cell D7.
- 4 Enter **3.625** in cell F4.
- 5 Enter **7** in cell F5 and then press the DOWN ARROW key to calculate the loan data.
- 6 Click on an empty cell to display the worksheet, as shown in Figure 4-46.

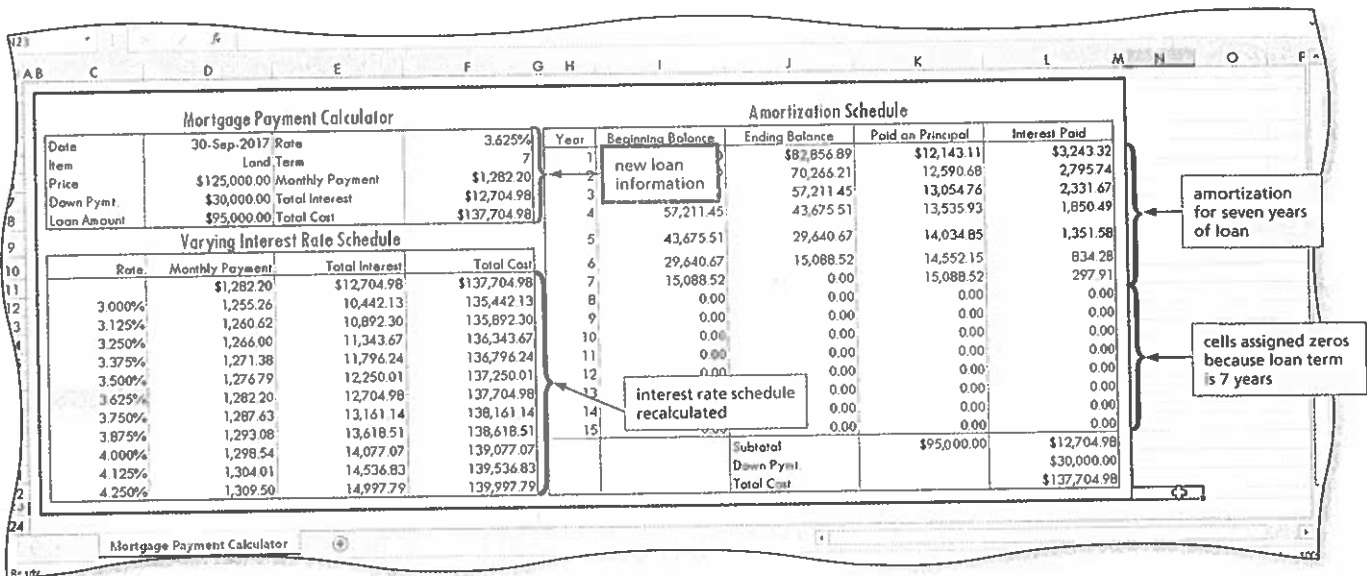


Figure 4-46

To Enter the Original Loan Data

The following steps reenter the original loan data.

- 1 Enter **House** in cell D5.
- 2 Enter **429000** in cell D6.
- 3 Enter **85000** in cell D7.
- 4 Enter **4.125** in cell F4.
- 5 Enter **15** in cell F5.

You will find a completed version on the blog!

Now: check capitalization, spelling, calculations, format of #s, etc., then go to the blog to find submission directions!

Apply Your Knowledge

Reinforce the skills and apply the concepts you learned in this module.

Loan Payment Calculator

Note: To complete this assignment, you will be required to use the Data Files. Please contact your instructor for information about accessing the Data Files.

Instructions: Run Excel. Open the workbook Apply 4–1 Loan Payment Calculator. You will re-create the Loan Payment Calculator pictured in Figure 4–66. You will be instructed to print several times in this assignment. If requested or allowed by your instructor, consider saving paper by printing to a PDF file.

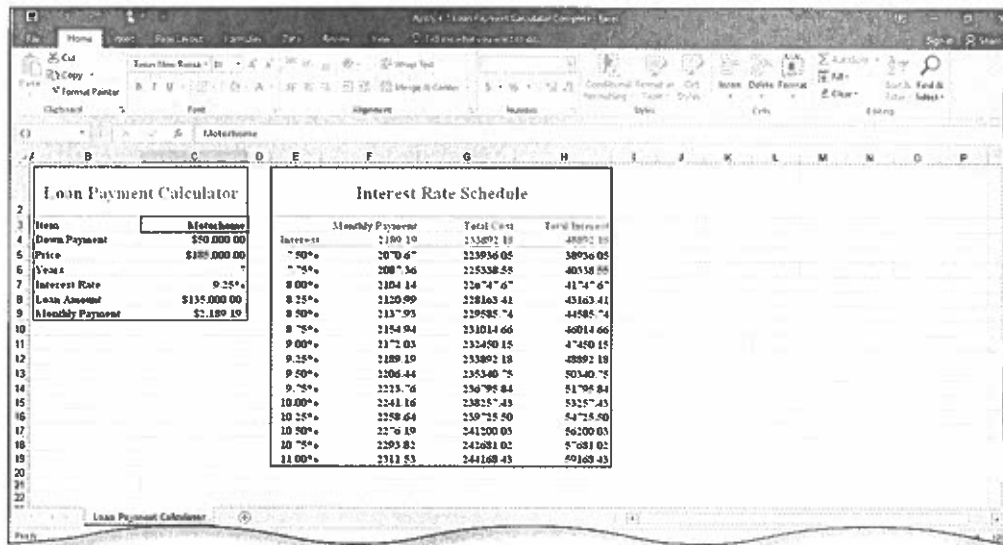


Figure 4–66

Perform the following tasks:

1. Select the range B4:C9. Use the 'Create from Selection' button (Formulas tab | Defined Names group) to create names for cells in the range C4:C9 using the row titles in the range B4:B9.
2. Enter the formulas shown in Table 4–4.

Table 4–4 Loan Payment Calculator and Interest Rate Schedule Formulas	
Cell	Formula
C8	=Price-Down_Payment
C9	=PMT(Interest_Rate/12, 12*Years, Loan_Amount)
F4	=Monthly_Payment
G4	=12*Monthly_Payment*Years+Down_Payment
H4	=G4-Price

3. Use the Data Table button in the What-If Analysis gallery (Data tab | Forecast group) to define the range E4:H19 as a one-input data table. Use the Interest Rate in the Loan Payment Calculator as the column input cell.
4. Use the Page Setup dialog box to select the Fit to and 'Black and white' options. Select the range B2:C9 and then use the 'Set Print Area' command to set a print area. Use the Print button in the Print gallery in the Backstage view to print the worksheet. Use the 'Clear Print Area' command to clear the print area.

Continued >

Apply Your Knowledge *continued*

5. Name the following ranges: B2:C9 – **Calculator**; E2:H19 – **Rate_Schedule**; and B2:H19 – **All_Sections**. Print each range by selecting the name in the Name box and using the Print Selection option on the Print tab in the Backstage view.
6. Unlock the range C3:C7. Protect the worksheet so that the user can select only unlocked cells.
7. Press **CTRL+`** and then print the formulas version in landscape orientation. Press **CTRL+`** again to return to the values version.
8. Hide and then unhide the Loan Payment Calculator worksheet. Hide and then unhide the workbook. Delete the extra worksheet you made so that you could hide the Loan Payment Calculator worksheet. Unprotect the worksheet and then hide columns E through H. Select columns D and I and reveal the hidden columns. Hide rows 11 through 19. Print the worksheet. Select rows 10 and 20 and unhide rows 11 through 19. Protect the worksheet.
9. Determine the monthly payment and print the worksheet for each data set: (a) Item = **Home**; Down Payment = \$50,000.00; Price = \$244,900.00; Years = 15; Interest Rate = 4.125%; (b) Item = **Debt Consolidation Loan**; Down Payment = \$0.00; Price = \$25,000.00; Years = 5; Interest Rate = 11.75%. Set the values in cells C3:C7 back to the Motorhome values after completing the above calculations.
10. If requested by your instructor, add your initials to cell E3. You will need to unprotect the worksheet and unlock the cell to do so. Make sure to lock the cell and protect the worksheet after adding your initials.
11. Save the workbook using the file name, Apply 4–1 Loan Payment Calculator Complete. Submit the revised workbook as specified by your instructor.
12. 🌀 How would you revise the Interest Rate Schedule to be more informative to the user?

Extend Your Knowledge

Extend the skills you learned in this module and experiment with new skills. You may need to use Help to complete the assignment.

Retirement Planning

Note: To complete this assignment, you will be required to use the Data Files. Please contact your instructor for information about accessing the Data Files.

Instructions: Run Excel. Open the workbook Extend 4–1 403B Planning Sheet. The data file contains a financial calculator for a 403(b) retirement plan. You will create a two-input data table that will help employees understand the impact that the amount they invest and the rate of return will have on their retirement earnings (Figure 4-67). Recall from the module that a two-input data table allows for two variables (amount invested and rate of return, in this case) in a formula.

403B Planning Sheet		Impact of Varying Annual Return and Employee Percent Invested											
		Annual Return in Left Column and Employee Percent Invested in Top Row											
		3.00%	4.00%	5.00%	6.00%	7.00%	8.00%	9.00%	10.00%	11.00%	12.00%		
3	Annual Return	3.00%	4.00%	5.00%	6.00%	7.00%	8.00%	9.00%	10.00%	11.00%	12.00%		
4	Employee Percent Invested	3.00%	4.00%	5.00%	6.00%	7.00%	8.00%	9.00%	10.00%	11.00%	12.00%		
5	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
6	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
7	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
8	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
9	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
10	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
11	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
12	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
13	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
14	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
15	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
16	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
17	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
18	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
19	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
20	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
21	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
22	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
23	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		
24	Expected Future Value	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00		

Figure 4-67

Perform the following tasks:

1. Type **Impact of Varying Annual Return and Employee Percent Invested** in cell I1. Type **Annual Return in Left Column and Employee Percent Invested in Top Row** in cell I3.
2. Save the workbook using the file name, **Extend 4-1 403B Planning Sheet Complete**.
3. Change the width of column H to 0.67 (8 pixels). Merge and center the titles in cells I1 and I3 over columns I through Q. Format the titles using the Title cell style for both the title and subtitle, a font size of 18 for the title, and a font size of 14 for the subtitle. Change the column widths of columns I through Q to 13.00 (96 pixels). Format cells I1 and I3 to match the fill and font color in cell B1.
4. For a two-input data table, the formula you are analyzing must be assigned to the upper-left cell in the range of the data table. Because cell C14 contains the future value formula to be analyzed, enter **=C14** in cell I4.
5. Use the fill handle to create two lists of percentages: (a) 3.00% through 12.00% in increments of 0.50% in the range I5:I23 and (b) 3.00% through 10.00% in increments of 1.00% in the range J4:Q4.
6. Use the Data Table button in the What-If Analysis gallery (Data tab | Forecast group) to define the range I4:Q23 as a two-input data table. Enter **C8** in the 'Row input cell' box and **C5** in the 'Column input cell' box (Data Table dialog box). Click the OK button to populate the table.
7. Format the two-input data table using a white font color and the fill color used in cells B3:G12. Bold ranges I4:Q4 and I5:I23. Format cells J5:Q23 to match the number format used in cells F5:G12. Place a light border around the range I3:Q23, light borders between columns in that same range, and a bottom border on the range I4:Q4.
8. Protect the worksheet so that the user can select only unlocked cells (C3:C6 and C8:C9).
9. If necessary, change the print orientation to landscape. Print the worksheet using the Fit to option. Print the formulas version of the worksheet.
10. If requested by your instructor, change the name in cell C3 to your name.
11. Save your changes to the workbook and submit the revised workbook as specified by your instructor.
12. 🌀 How could you improve the design of the worksheet to make the impact of various combinations of Employee Investment and Expected Annual Return more easily identified?

Expand Your World

Create a solution that uses cloud or web technologies by learning and investigating on your own from general guidance.

Down Payment Options for a Home

Note: To complete this assignment, you will be required to use the Data Files. Please contact your instructor for information about accessing the Data Files.

Instructions: You are planning to buy a home as soon as you can save enough to make a 20% down payment. Your task is to create a calculator that you can use to determine possible savings options, and to share this calculator with family using OneDrive. Run Excel and open the workbook, Expand 4-1 Down Payment Calculator.

Perform the following tasks:

1. Save the file using the file name Expand 4-1 Down Payment Calculator Complete.
2. Identify a home for sale in your local housing market that you would consider buying. Use the asking price for that home as the current value of the house, or use an online tool such as Zillow.com to find the current estimated value of the home. Enter this value in your Down Payment Calculator, and calculate the needed down payment.
3. Determine the amount you consider reasonable as a monthly savings toward a down payment, and enter this in your down payment calculator.
4. Use the Future Value function to calculate how much you could save, using the rate of return and years to save in the worksheet. Remember to use a minus sign before the function so that the calculation will appear positive.
5. Create a two-input data table that calculates the future value of savings. You can decide which two inputs you would like to use for your data table.
6. Format the worksheet using techniques you have learned to present the worksheet content in a visually appealing form.
7. If requested by your instructor, save the file on OneDrive.
8. Use Excel Online to create two charts showing the relationship between the future value of savings and the two inputs from your data table.
9. Submit the workbook as specified by your instructor.
10. 🌀 Why did you select the two inputs used in your data table? How useful are they for evaluating down payment savings options?

In the Labs

Design, create, modify and/or use a workbook following the guidelines, concepts, and skills presented in this module. Labs 1 and 2, which increase in difficulty, require you to create solutions based on what you learned in the module; Lab 3 requires you to apply your creative thinking and problem-solving skills to design and implement a solution.

Lab 1: Analyzing Education Savings

Problem: You have been asked by the employee relations and resource department to develop an education planning worksheet that will allow each current employee to see the effect (dollar accumulation) of investing a percentage of his or her monthly salary in a 529(c) Education Savings plan over a period of years (Figure 4-68). Employees can contribute up to \$15,000 per year per child to

plans. The employee relations and resource department wants a one-input data table to show the future value of the investment for different years. The final worksheet is shown in Figure 4-68.

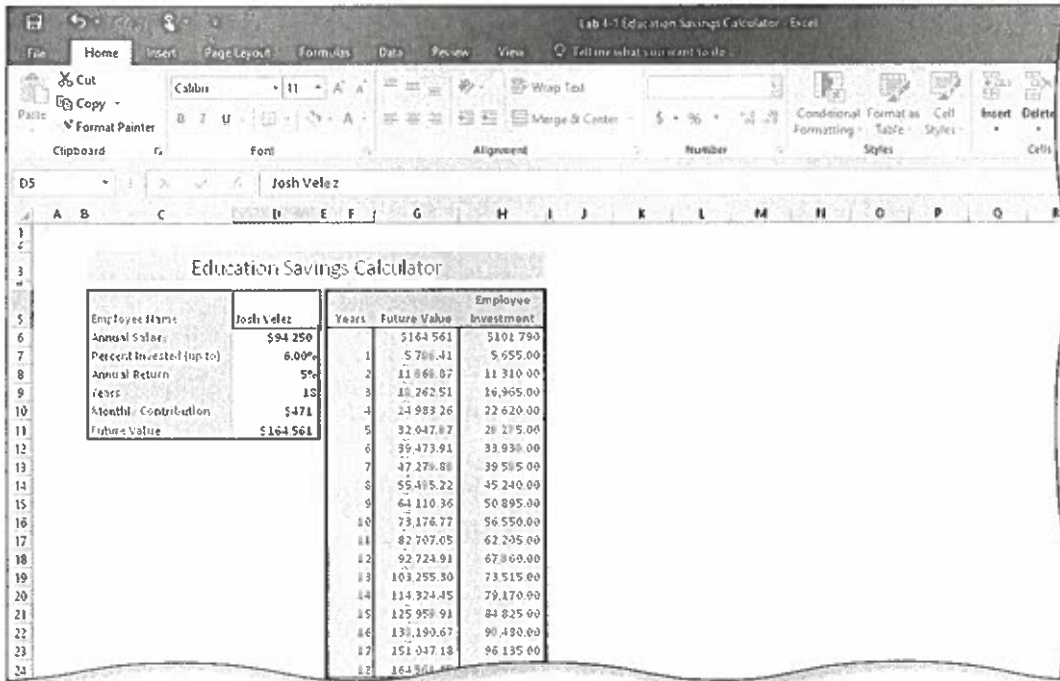


Figure 4-68

Perform the following tasks:

1. Run Excel. Apply the Retrospect theme to the worksheet. Change the column widths to the following: A and F = 6.57 (51 pixels); B, E, and I = 0.75 (9 pixels); C = 22.14 (160 pixels); D, G, and H = 12.71 (94 pixels). Change the heights of rows 2, 4, and 25 to 8.25 (11 pixels).
2. In cell C3, enter **Education Savings Calculator** as the worksheet title. Merge and center cell C3 across columns C through H. Apply the Title cell style to cell C3. Change the background color of C3 to **Olive Green, Text 2, Lighter 80%** and change its font color to **Brown, Accent 3, Darker 25%**. *you pick the colors 😊*
3. Enter **Employee Name** in cell C5, **Annual Salary** in cell C6, **Percent Invested (up to)** in cell C7, **Annual Return** in cell C8, **Years** in cell C9, **Monthly Contribution** in cell C10, and **Future Value** in cell C11. Add the data in Table 4-5 to column D. Use the currency and percent style formats to format the numbers in the range D6:D8. *(Right click the cell >> format cells >> number >> ...)*

Table 4-5 Education Savings Employee Data

Row Title	Data
Employee Name	
Annual Salary	\$94,250
Percent Invested	6.00%
Annual Return	5%
Years	18

Your first and last name - you may need to make the column wider.

4. Use the Create from Selection button (Formulas tab | Defined Names group) to assign the row titles in column C (range C6:C11) as cell names for the adjacent cells in column D. Use these newly created names to assign formulas to cells in the range D10:D11. *↓*

This means select C6:D11 >> Formulas >> Create from selection >> OK

Continued >

- approximately

In the Labs *continued*

- a. Employee Monthly Contribution (cell D10) = $\text{IF}(\text{Percent_Invested_up_to} * \text{Annual_Salary} < 15000, \text{Percent_Invested_up_to} * \text{Annual_Salary} / 12, 15000 / 12)$
- b. Future Value (cell D11) = $-\text{FV}(\text{Annual_Return}/12, \text{Years}*12, \text{Monthly_Contribution})$
The Future Value function (FV) returns to the cell the future value of the investment. The future value of an investment is its value at some point in the future based on a series of payments of equal amounts made over a number of periods while earning a constant rate of return.
- c. If necessary, use the Format Painter button (Home tab | Clipboard group) to assign the currency style format in cell D6 to the range D10:D11. *OR Right click >> format cells...*
5. Add the ~~background color Orange, Accent 1, Lighter 60%~~, and the font color ~~Olive Green, Text 2~~ to cells C5:C11, and a medium outside border to the range C5:D11, as shown in Figure 4-68. *colors are your choice.*
6. *add the data table in Figure 4-68 to the range F5:H24*
by doing the following: ↓
- a. Enter and format the table column titles in row 5 as shown in Figure 4-68.
- b. Use the fill handle to create the series of years beginning with 1 and ending with 18 in increments of 1 in column F, beginning in cell F7.
- c. In cell G6, enter $=D11$ as the formula. In cell H6, enter $=12 * D10 * D9$ as the formula (recall that using cell references in the formulas means Excel will copy the formats).
- d. Use the Data Table command to define the range F6:H24 as a one-input data table. Use cell D9 as the column input cell. *See p. 203 if you need help... → make the #s look like the picture.*
- e. Format the numbers in the range G7:H24 using the comma style format. Add the background color ~~Orange, Accent 1, Lighter 60%~~, the font color ~~Olive Green, Text 2~~, and a light bottom border to cells F5:H5. Add light vertical borders to cells F6:H24, and a medium outside border to the range F5:H24, as shown in Figure 4-68.
7. Add a fill pattern with the pattern color ~~Tan, Accent 5, Lighter 60%~~ and the ~~pattern style 12.5% Gray~~ to the range B2:I25. *Hint: Look on the Fill sheet in the Format Cells dialog box. Change the sheet tab name to Education Savings Calculator and color to Orange, Accent 1, Lighter 60%, as shown in Figure 4-68.*

Change the Employee Name in cell D5 to your name.

11. Save the workbook using the file name, Lab 4-1 Education Savings Calculator.

**submit to turnitin.com AFTER you have checked your work. You will not get to submit again.*

Lab 2: Consumer Debt Analysis and Interest Comparison Table

Problem: As part of an ongoing program to educate incoming students about the financial realities of credit cards, you have been asked to create a consumer debt analysis worksheet including an interest comparison table, as shown in Figure 4-69. This worksheet, which will be distributed during freshman orientation as part of the electronic orientation package, also should demonstrate the goal-seeking capabilities of Excel.

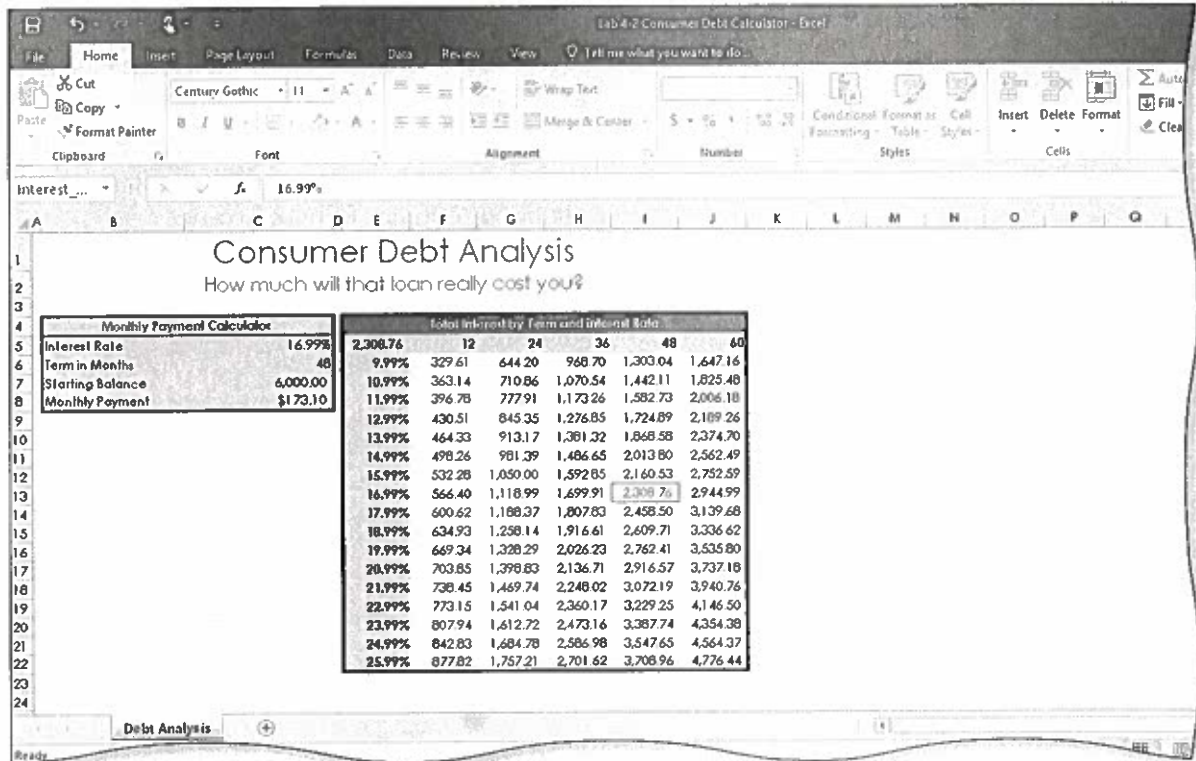


Figure 4-69

Perform the following tasks:

1. Run Excel. Apply the ~~Ion Boardroom~~ **Choice** theme to a new worksheet. Change the width of columns A and D to .85 (11 pixels), columns B:C to 21.25 (175 pixels), and columns E:J to 9.50 (81 pixels).
2. Enter the worksheet title, **Consumer Debt Analysis**, in cell B1, apply the Title cell style, change its font size to 28-point and font color to ~~Plum, Accent 1~~ **Choice**. Enter the worksheet subtitle, **How much will that loan really cost you?**, in cell B2, and apply the Title cell style, and change its font color to ~~Plum, Accent 1~~. One at a time, merge and center cells B1 and B2 across columns B through J.
3. Type **Monthly Payment Calculator** in cell B4, and merge and center the range B4:C4. Type **Total Interest by Term and Interest Rate** in cell E4, and then merge and center the range E4:J4. Bold the text in cells B4 and E4. Type **Interest Rate** in cell B5, **Term in Months** in cell B6, **Starting Balance** in cell B7, and **Monthly Payment** in cell B8. Create the series shown in E6:E22 (enter 9.99% in cell E6, 10.99% in cell E7, and then use the Fill Handle to fill the remaining percentages through cell E22) and F5:J5 (enter 12, 24, 36, 48, and 60 in the cells, respectively). Use the Create from Selection button (Formulas tab | Defined Names group) to assign the row titles in the range **B5:C8**.
4. Enter 16.99% in cell C5, 48 in cell C6, and 6000 in cell C7. Apply the comma style format to cell C7. Determine the monthly payment amount by entering the PMT function in cell C8.

$$= -pmt(Interest_Rate/12, 12*(Term - In_months/12), Starting_Balance)$$
5. Enter a formula for total interest paid in cell E5. Total interest is determined by calculating the total of all monthly payments for the term, and then subtracting the starting balance from that total.

$$= (Term_in_months * monthly_payment) - starting_balance$$

P. 203

Continued >

In the Labs *continued*

- use p-203 to help!
6. Create the interest comparison table in the range E5:J22 by creating a two-input data table. Row and column inputs will be Term in Months and Interest Rate, respectively.
 7. Format the numbers in cell E5 and the range F6:J22 to use the comma style. Use conditional formatting to format the cell in the two-input data table that is equal to the Total Interest in cell E5 to a font color of Plum, Accent 1, and a light box border of Plum, Accent 1. → to look like the example.
 8. Change the colors and draw the borders as shown in Figure 4-69. Change the sheet tab name to Debt Analysis and the tab color to Plum, Accent 1. Colors = choice
 9. Add the word, for, at the end of the title in cell B1, followed by your initials.
 - 10.
 - 11.
 12. Save the workbook using the file name, Lab 4-2 Consumer Debt Calculator.
 13. Submit the assignment as requested by your instructor. → turnitin.com

Lab 3: Consider This: Your Turn

Apply your creative thinking and problem-solving skills to design and implement a solution.

Determining the Break-Even Point

Part 1: You have been hired by Alison Chang, owner of a small start-up company, to create a data table that analyzes the break-even point for a new product she is developing. She would like you to analyze the break-even point for prices ranging from \$12.99 to \$17.99 per unit, in \$0.50 increments. You can calculate the number of units she must sell to break even (break-even point) if you know the fixed expenses, the price per unit, and the expense (cost) per unit. The following formula determines the break-even point:

$$\text{Break-Even Point} = \text{Fixed Expenses} / (\text{Price per Unit} - \text{Expense per Unit})$$

Assume Fixed Expenses = \$7,000; Price per Unit = \$14.99; and Expense per Unit = \$8.00.

Use the concepts and techniques presented in this module to determine the break-even point and then create the data table. Use the Price per Unit as the input cell and the break-even value as the result. Protect the worksheet so that only cells with data can be selected. Submit your assignment in the format specified by your instructor.

You can calculate additional break-even points by using a two-way table and varying Fixed Expenses or Expense per Unit in addition to Price per Unit. Which of the following provides the owner with a wider range of break-even points: varying Fixed Expenses between \$6500 and \$7000 in increments of \$250 or varying Expense per Unit between \$7.60 and \$8.00 in increments of \$0.20?

Part 2: ☀ You made several decisions while creating the worksheet for this assignment. How did you set up the worksheet? How did you decide how to create the data table? What additional break-even points did you calculate, and why?