**IF Statements**

* Assume that if you order up to 500 units of a product, you pay $3.00 per unit. If you order from 501 through 1200 units, you pay $2.70 per unit. If you order from 1201 through 2000 units, you pay $2.30 per unit. If you order more than 2000 units, you pay $2.00 per unit. How can you write a formula that expresses the purchase cost as a function of the number of units purchased?
* Your worksheet contains quarterly revenues for Wal-Mart. Can you easily compute the revenue for each year and place it in the row containing the first quarter's sales for that year?

The situations listed above seem to have little in common. However, setting up Excel 2007 models for each of these situations requires the use of an IF statement The IF formula is the single most useful formula in Excel. IF formulas let you conduct conditional tests on values and formulas, mimicking (to a limited degree) the conditional logic provided by computing languages such as C, C++, and Java.

An IF formula begins with a condition such as A1>10. If the condition is true, the formula returns the first value listed in the formula; otherwise, we move on within the formula and repeat the process.

**Assume that if you order up to 500 units of a product, you pay $3.00 per unit. If you order from 501 through 1200 units, you pay $2.70 per unit. If you order from 1201 through 2000 units, you pay $2.30 per unit. If you order more than 2000 units, you pay $2.00 per unit. How can you write a formula that expresses the purchase cost as a function of the number of units purchased?**

You can find the solution to this question on the Quantity Discount worksheet in the file ***Ifstatement.xlsx***. The worksheet is shown in Figure 1.  **Figure 1. You can use an IF formula to model quantity discounts.**



Suppose cell A9 contains our order quantity. We can compute an order's cost as a function of the order quantity by implementing the following logic:

* If A9 is less than or equal to 500, the cost is 3\*A9.
* If A9 is from 501 through 1200, the cost is 2.70\*A9.
* If A9 is from 1201 through 2000, the cost is 2.30\*A9.
* If A9 is more than 2000, the cost is 2\*A9.

We begin by linking the range names in A2:A4 to cells B2:B4, and linking the range names in cells D2:D5 to cells C2:C5. Then we implement this logic in cell B9 with the following formula:

**=IF(A9<=\_cut1,price1\*A9,IF(A9<=\_cut2,price2\*A9,IF(A9<=\_cut3,price3\*A9,price4\*A9)))**

To understand how Excel computes a value from this formula, recall that IF statements are evaluated from left to right. If the order quantity is less than or equal to 500 (cut1), the cost is given by price1\*A9. If the order quantity is not less than or equal to 500, the formula checks to see whether the order quantity is less than or equal to 1200. If this is the case, the order quantity is from 501 through 1200, and the formula computes a cost of price2\*A9. Next, we check whether the order quantity is less than or equal to 2000. If this is true, the order quantity is from 1201 through 2000, and our formula computes a cost of price3\*A9. Finally, if the order cost has not yet been computed, our formula defaults to the value price4\*A9. In each case, the IF formula returns the correct order cost. Note that I typed in three more order quantities in cells A10:A12 and copied our cost formula to B10:B12. For each order quantity, our formula returns the correct total cost.

*An IF formula containing more than one IF statement is called a nested IF formula.*

Your worksheet contains quarterly revenues for Wal-Mart. Can you easily compute the revenue for each year and place it in the row containing the first quarter's sales for that year?

The file **Walmartrev.xlsx** contains quarterly revenues (in millions of dollars) for Wal-Mart. (See Figure 3.) Rows 6, 10, 14, and so on contain the revenues for the first quarter of each year. In each of these rows, we would like to compute total revenues for the year in column E. In other rows, column E should be blank. We could enter in cell E6 the formula SUM(D6:D9) and copy this formula to E10, then E14, then E18, and so on. There must be a better way. Using an IF statement with two neat Excel functions, (ROW() and MOD()), gives us an easy way to enter our formula once and then copy the formula. The function ROW(cell reference) yields the row of reference. The function =ROW(A6) would yield a 6, whereas if we are in row 6 the =ROW() function would also yield a 6. The function MOD(number,divisor) yields the remainder when number is divided by divisor. For example, MOD(9,4) yields 1, whereas MOD(6,3) yields 0. Note that we want our formula to work only in rows that leave a remainder of 2 when divided by 4. Therefore, copying from E6 to E7:E57 the formula =IF(MOD(ROW(),4)=2,SUM(D6:D9)," ") will ensure that we add up revenues for the current year only in rows that leave a remainder of 2 when divided by 4. This means that we compute annual revenues only in the first quarter of each year, as desired.

**Figure 2.**



IF statements can get rather large. How many IF statements can be nested in a cell? What is the maximum number of characters allowed in an Excel formula?
In Excel 2007, you can nest up to 64 IF statements in a cell. In previous versions of Excel, you could nest a maximum of 7 IF statements. In Excel 2007, a cell can contain up to 32,000 characters. Previous versions of Excel allowed only 1000 characters in a cell.

**Problems**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1.** | Suppose the price of a product will change at dates in the future, as follows:

| **Date** | **Price** |
| --- | --- |
| On or before February 15, 2009 | $8 |
| From February 16, 2009, through April 10, 2010 | $9 |
| From April 11, 2010, through January 15, 2011 | $10 |
| After January 15, 2011 | $11 |

 Using file IF-1.xlsx, write a formula that will compute the price of the product based on the date the product is sold. |
| **2.** | The Blue Yonder Airline flight from Seattle to New York has a capacity of 250 people. The airline sold 270 tickets for the flight at a price of $300 per ticket. Tickets are nonrefundable. The variable cost of flying a passenger (mostly food costs and fuel costs) is $30 per passenger. If more than 250 people show up for the flight, the flight is overbooked and Blue Yonder must pay overbooking compensation of $350 per person to each overbooked passenger. Develop a worksheet that computes Blue Yonder's profit based on the number of customers who show up for the flight.  |
| **3.** | Our drug company believes a new drug will sell 10,000 units during 2004. They expect two competitors to enter the market. The year in which the first competitor enters, our company expects to lose 30 percent of its market share. The year in which the second competitor enters, the company expects to lose 15 percent of its market share. The size of the market is growing at 10 percent per year. Given values of the years in which the two competitors enter, develop a worksheet that computes the annual sales for the years 2004–2013.  |
| **4.** | A clothing store has ordered 100,000 swimsuits. It costs $22 to produce a swimsuit. They plan to sell them until August 31 at a price of $40 and then mark the price down to $30. Given values for demand through August 31 and after August 31, develop a worksheet to compute the profit from this order.  |
| **5.** | The first quarter of the year is January–March; the second quarter, April–June; the third quarter, July–September; and the fourth quarter, October–December. Write a formula that returns (for any given date) the quarter of the year. Hint: to determine the month use the function =MONTH(date). |
| **6.** | Write a formula that returns a person's age, given his or her date of birth.  |
| **7.** | The file Addresses.xlsx gives people's names on one line, their street address on the next line, and their city, state, and zip code on the following line. How could you put each person's information on one line?  |
| **8.** | The School of Fine Art has 100 lockers numbered 1–100. At present, all lockers are open. We begin by closing every locker whose number evenly divides by 3. Then we "toggle" (toggling means opening a closed locker and closing an open locker) each locker whose number is divisible by 4; then toggle each locker whose number is divisible by 5,..., and finally toggle each locker whose number is divisible by 100. How many lockers are now open?  |
| **9.** | The file Matchlist.xlsx contains a list of people who bought your product in February and a list of people who bought it in March. Determine how many of your February customers purchased your product in March.  |
| **10.** | Set up a "calendar worksheet" that takes a given month and year as inputs and tells you the day of the week on which each day of the month occurs. |