

Spreadsheet Case 2

Speedy Copy Service

Problem:	Develop a payroll register
Management skills:	Organization
PC skills:	Formulas Absolute and relative addressing
File:	SPEED_Q.XLS

Speedy Copy Service is a fast-service printing and reproduction service operating in Stamford Connecticut. Last year its gross revenue was over \$600,000. The single store currently has eight employees, although the number fluctuates during the course of the year. Business has been so good that the store's owner, Frank Losapio, is thinking about opening a second store nearby.

Frank currently processes the payroll manually. This is a fairly time-consuming process which prevents Frank from fulfilling other responsibilities. He must make all of the calculations for salary changes, deductions, and net pay using a hand-held calculator and then type the results onto a Payroll Register sheet. Frank then writes out the checks by hand. Payroll Registers are filed for internal accounting purposes and to provide information for federal and state tax reporting.

Frank would like to use his time more effectively for courting new business and keeping up with new reprographic technology. Also, there is a danger of miscalculations which are difficult to detect and correct. Frank would like to automate the process as much as possible to facilitate anticipated expansion.

Frank feels that there are so few checks to write that this part of the process could remain manual. However, many hours could be saved if he could automate all of the payroll calculations and the preparation of his Payroll Register report.

From your data diskette load SPEED_Q.XLS, which shows the basic format for the payroll register: the pay period, the names of the employees, social security numbers, hours worked and hourly pay rate. You should develop a worksheet which can automatically calculate weekly gross pay, net pay, and all deductions for each employee and provide year-to-date totals for each of these categories.

Weekly gross pay can be computed by multiplying pay rate by regular hours worked plus time and a half for overtime hours. Federal withholding tax should be set to 20% of gross pay; state withholding to 6%. FICA (the employee Social Security deduction) is currently 6.2% of the first \$68,400 during the calendar year. The Medicare deduction is 1.45% of gross pay for all wages during the calendar year. Since this is the first pay period of 1999, FICA and Medicare deductions must be taken for all employees during this pay period.

Tasks

There are 5 tasks to this problem:

1. Complete the column labels to include all deductions and net pay.
2. Make all appropriate format changes for numbers and percentages. Columns containing numbers should be formatted to show 2 decimal places to the right of the decimal point.
3. Create a box for all deductions and other variables in the lower left hand corner of the spreadsheet and label it 'Variable Factors'. This way changes in deductions and formulas can be made easily using the addressing function of spreadsheet software. By keeping all variable factors in a single small box, changes in the spreadsheet can be made very rapidly to respond to changing tax policy or other regulations. Listing all variables and formulas also allows all assumptions to be visible and clearly reported.
4. Use formulas to calculate gross pay, all deductions, and net pay. Be sure these formulas reference the appropriate cells in your variables box in the lower left hand corner of your spreadsheet.(e.g., `A56`) rather than actual values (e.g., 20%). Provide totals for gross pay, net pay, and each deduction category so that Frank can track his expenses for the pay period.
5. Print the spreadsheet. Try to fit the sheet on a single page.

Additional Problems

1. Frank has joined a group health plan through his local chamber of commerce. The cost to the employee for group health insurance is \$15 per week. Modify the Payroll Register worksheet to implement this plan and print it out.
2. Business is so good that Frank would like to give all employees a 10% raise. How much more would he have to pay out each week to do this? Modify the Payroll Register Worksheet to provide Frank with this information and print it out again.

Time Estimates

Expert: 30 minutes
Intermediate: 1 hour
Novice: 1.5 hours

Excel Tutorial For Spreadsheet Case 2

This case draws upon all of the skills acquired in Spreadsheet Case 1 plus new skills for using formulas, formatting and absolute and relative addressing. You will need to use COURSE.XLS again for this tutorial.

Suppose you want to expand your worksheet by including each student's final grade. You will need to add an extra column and label for FINAL GRADE and you will need to calculate the final grade for each student. The final exam counts for 50% of the final grade; the midterm for 35% and the quiz for 15%.

Formulas

To compute the final grade you would need to use a formula: A formula tells Excel what manipulations to perform on specific cell contents. The cells are specified using their cell references (e.g. A11, C3). Mathematical operators specify arithmetic operations. They are:

^	Exponentiation
*, /	Multiplication, Division
+, -	Addition, Subtraction
%	Percent (i.e. 75% represents 0.75)

Operations are always performed left to right within a formula in their order of precedence. The order of precedence in Excel corresponds to the order of the above list. Exponentiation will always be performed first, followed by multiplication and division, then addition and subtraction. Percent amounts are evaluated when they are encountered.

Parentheses can be used to override the order of precedence. Operations inside parentheses will be performed before those outside the parentheses. The order of operations remains the same within the parentheses, however. When multiple sets of parentheses are employed, the operations within the innermost set of parentheses will be performed before those within the next set.

Thus, the formula for James Jackson's final grade would be:

=B9*.15+C9*.35+D9*.50

or alternatively

=B9*15%+C9*35%+D9*50%

Enter this formula in cell E9. This cell will display Jackson's final grade. Note that the first cell in the formula is preceded by a = sign. In order to be treated as a formula, rather than a label, a formula must begin with an equals (=) symbol.

Thus a formula to add the contents of cells A6 and B6 must be expressed as =A6+B6. If you try to type this formula as A6+B6, it will be treated as a label.

It is usually more accurate and reliable to create the cell references by using the cursor keys to point a mobile selecting cell with a moving border and finish with the next operator (+, -, *, /) or ENTER. Similarly, cell references can be created using the mouse cursor and left button.

Formula Errors

If you try to enter a formula with a logical or mathematical error, Excel will show a message box stating what error has occurred. To proceed you must press the OK Button. If you want further information on the error you can select the Help Button, which will provide a broader explanation of the error. You need only correct the problem to continue.

Another common problem is the circular reference, which is a formula that directly or indirectly refers back to the same cell it resides in. For example, if you tried to enter in cell B12 the formula =A12+B12, an error box will appear stating a circular reference has occurred, and a message "Circular: B12" would appear at the bottom of your screen. This is because cell B12 is an operand in the operation, as well as the cell that holds the result of the calculation. The "Circular: B12" message will disappear when the circular reference is corrected.

Absolute and Relative Addressing

Suppose that we want to make our worksheet more flexible for future changes. The professor may decide that the quiz should only contribute 10% toward the final grade and the midterm 40%. In that case, the formula for the final grade would have to be adjusted to change the percentage weight applied to the midterm and quiz.

You could, of course, re-enter the new formulas. But an easier way to keep track of the percentage weight assigned to each grade would be to list the percentages assigned to each grade in an unused portion of the spreadsheet. Formulas would reference the cell addresses where these percentages reside rather than the percentages themselves.

Set up an Assumptions section in the upper left-hand corner of your worksheet. Move the course list down so that the column labels are in row 14. Enter the label "Assumptions" in cell A7 and enter underlining in cell A8. Below that, in cells A9 through A11 enter the labels "Quiz," "Midterm," and "Final Exam." In cells B9 through B11 you would enter the percentage weights for each of these grades.

You could then develop a formula to reference the cells where these percentages resided rather than using the percentages themselves. The formula for James Jackson's grade (which should be entered in cell E16 since the worksheet was moved down) would then be:

$$=B16*\$B\$9+C16*\$B\$10+D16*\$B\$11$$

The \$ designates an *absolute address*. An absolute address is one that will not change when that address is copied. Excel's default is to treat an address as a *relative address*, meaning that when you copy or move a formula, the addresses of the cells in the formula will be adjusted automatically to fit the new location. A relative address has no \$ symbols. Any formula with multiple cell references can have absolute, relative and mixed (see next section) all in the one formula.

In other words, if you copied the formula in cell E16 for James Jackson's grade to cell E17 for Pauln Parker, the formula in E17 would automatically adjust to add the proper cell addresses for Parker's grade. The formula bar would show the formula in E17 to be $=B17*\$B\$9+C17*\$B\$10+D17\$B\11 .

Mixed Addressing

There will be certain situations where you will want to combine relative and absolute addressing; that is, create a cell reference that is part relative and part absolute. Either the column letter or the row number remains constant.

For example, an address of \$B21 means that absolute addressing will be used on the column portion of the address, but relative addressing will be used on the row portion. Conversely, an address of B\$21 means that absolute addressing will be used on the row portion of the address and relative addressing on the column portion. You will need to use relative, absolute, and mixed addressing throughout your *Solve it!* Spreadsheet Cases.

Formatting

Suppose you want to express the percentages in your Assumptions section as 50% rather than .5. You can change the format in which numeric information appears by using Excel **Format/Cells** commands.

Firstly, select the cells you want to change by selecting the range B9:B11.

The **Format/Cells** command activates the Format Cells dialog box, as explained in the tutorial for Spreadsheet Case 1. This box has six formatting tabs: Number, Alignment, Font, Border, Patterns, Protection. To change the format of numbers select Number. Do this by clicking on the tab label at the top of the box. The Format Category list is divided into the different types of numerical appearance. Select Percentage with zero decimal places and press the OK Button.

You should see the effects of this formatting on the three figures in the Assumptions area of the worksheet. They will be displayed as percentage figures: 15%, 35% and 50%. Excel often provides shortcuts to frequently used commands and operations by allocating buttons on Toolbars. In this case, Excel has placed a Percent Style Button on the Formatting Toolbar. To format the current cell(s) in a Percent Style simply press the Percent Style Button:



The different Number categories are:

General format is the default format for all new worksheets. With the General format the values are displayed in their natural state, no suppression or compression of formatting is permitted. Scientific notation will be used to display numbers that are too large or too small to be displayed normally. The General format displays up to 11 digits.

Number formats display a fixed number of decimal places, negative values are red, negative values in brackets, and combinations of these characteristics.

Accounting format displays four accounting formats keeping the dollar sign to the left of the cell, showing negative values in brackets and show zero values as hyphens.

Date and **Time** formats can represent dates and times in a number of formats where they can be used by Excel date and time functions in mathematical calculations. Default date formats include:

d/mm/yy	(Example 2/02/80)
d-mmm-yy	(Example 2-Feb-80)
d-mmm	(Example 2-Feb)
mmm-yy	(Example Feb-80)
d/mm/yy h:mm	(Example 2/02/80 15:15)

Default time formats include:

h:mm AM/PM	(Example 3:15 PM)
h:mm:ss AM/PM	(Example 3:15:30 PM)
h:mm	(Example 15:15)
h:mm:ss	(Example 15:15:30)
d/mm/yy h:mm	(Example: 2/02/80 15:15)
mm:ss	(Example: 15:30)
mm:ss.0	(Example: 15:30.0)
[h]:mm:ss	(Example: 75:30:00)

In this last format, 75:30 is displayed as 75:30. In the format h:mm:ss, 75:30 would be displayed as 3:30:00. Placing square brackets around the hours displays the literal value.

In order to use date and time formats, you must use one of the Excel date and time functions (such as =DATE, =DATEVALUE, =TIME, =TIMEVALUE, or =NOW) to enter dates and times onto your worksheet. Excel date functions will be treated in more detail in Spreadsheet Case 8. A date can also be entered as a label if it is not involved in any calculations.

Percentage format displays numbers as percentages. The number of decimal places in the default formats are zero and two.

Fraction format displays numbers as fractions, separating whole numbers and the fractional parts.

Scientific format displays data in exponential scientific notation.

Text format displays the values as labels rather than values.

Currency format places a dollar sign before each number and uses commas to separate hundreds from thousands, etc. The option for zero or two decimal places and for red or black negative values.

Custom format can be used to create custom formats for numbers such as product codes.

After you have finished formatting, calculating final grades, and adding a column heading for FINAL GRADE your worksheet should look like Figure 3-3.

Totalling the Values in a Range


This case requires totals of gross pay, net pay and all deductions for the payroll register so that the employer can determine the total amount paid out for each of these categories during a particular pay period. The =SUM function of your spreadsheet software

can help you do this. The =SUM function calculates the sum of all of the values in a specified range. The form of the =SUM function is:

=SUM(range)

For example, if you wanted to total the percentages in the Assumptions section of your sample worksheet to make sure they added up to 100 percent, you could use the =SUM function instead of the formula =B9+B10+B11. The values in range B9:B11 could be totalled much more easily by entering in cell B15:

=SUM(B9:B11)

Excel provides a shortcut for this formula: the Sum Button .

This button appears on the Standard Toolbar and if pressed, the =SUM formula will be placed in the current cell and a sample range will be assumed, typically above or to the left of the current cell. All you have to do is press ENTER to complete the operation. Try the button as well as entering the formula yourself. When entering the formula, select the range B9:B11 using the cursor keys or the mouse, rather than typing the range. This tends to be easier and more accurate; typing is more prone to error.

Save COURSE.XLS with the changes you made during this tutorial session. You will need it for subsequent Spreadsheet Cases.

Figure 3-3

