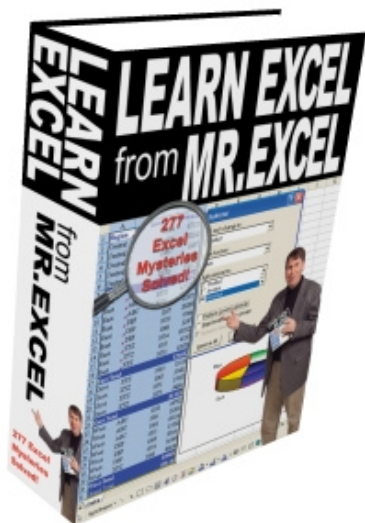




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Eight topics this week about time and dates in Excel.

TOTAL MINUTES THAT EXCEED AN HOUR

Problem: You have a series of cells with minutes and seconds from a number of experiments. The times are in the format of 123:45, meaning 123 minutes and 45 seconds. You want to be able to total the time and express it in minutes and seconds, as shown in Fig. 493.

	A	B
1	Trial	Time
2	1	123:40
3	2	234:56
4	3	180:02
5	4	129:04
6	5	132:00
7	6	131:00
8	7	172:00
9	8	174:00
10	9	140:00
11	10	153:00
12	11	145:00

Fig. 493

Strategy: The most important part of this solution is to enter the times correctly. In order to have Excel understand that these are minutes and seconds, time should be entered with a leading zero for hours.

- 1) Enter 0:123:40, as shown in Fig. 494.

	A	B
1	Trial	Time
2	1	0:123:40

Fig. 494

- 2) When you press Enter to accept the cell, Excel will change the value to a decimal portion of a day, as shown in Fig. 495.

	A	B
1	Trial	Time
2	1	0.08588

Fig. 495

**Part
II**

- 3) Select the cell and from the menu, choose Format – Cells. On the Number tab, click the Custom Number format, as shown in Fig. 496.

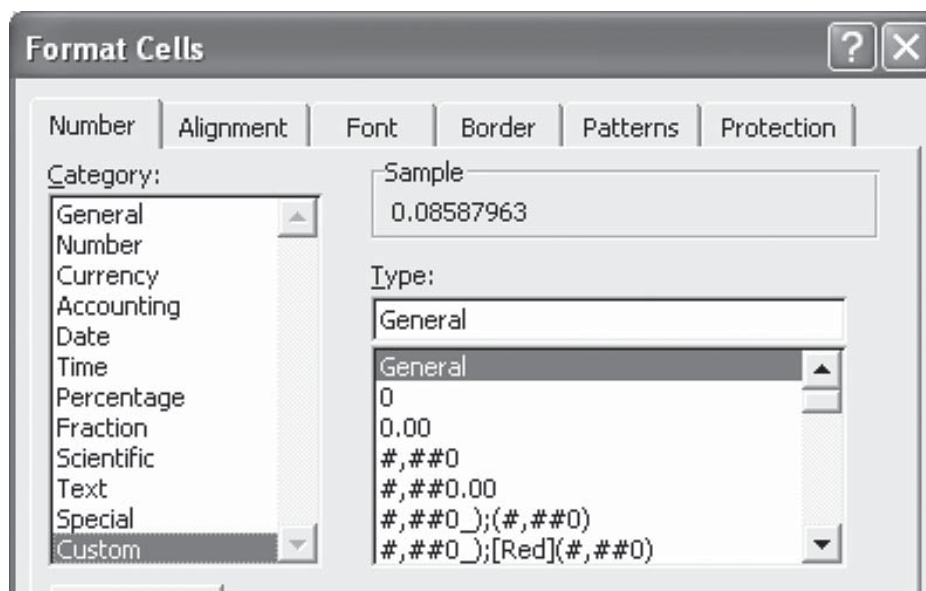


Fig. 496

- 4) In the Type box, change the Custom Number format from General to [m]:ss, as shown in Fig. 497. You will see in the Sample box that the entry is now formatted with just minutes and seconds. The square brackets tell Excel to display minutes in excess of an hour.

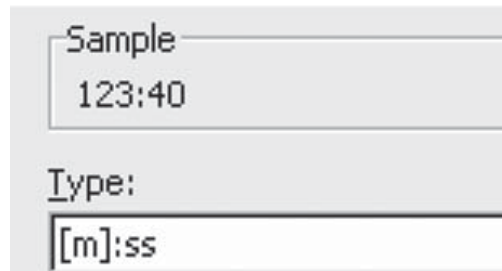


Fig. 497

- 5) Choose OK to close the Format Cells box. Your entry in B2 will appear correctly, as shown in Fig. 498.

B2		fx 2:03:40 AM			
	A	B	C	D	
1	Trial	Time			
2	1	123:40			
3	2				

Fig. 498

Note that in the formula bar in Fig. 498, Excel thinks that 123 minutes is 2:03 a.m. That is because 123 minutes after midnight is 2:03 a.m.

- 6) Before entering the rest of your time values, copy the numeric formatting from B2 to the rest of the cells in the table. Place the cell pointer in B2. Hit Ctrl+C to Copy. Highlight B3:B14. From the menu, select Edit – Paste Special. In the Paste Special box, select Formats, as shown in Fig. 499, and choose OK.



Fig. 499

- 7) You can now enter the remaining times, using the 0:234:56 format as you type, as shown in Fig. 500.

	A	B
1	Trial	Time
2	1	123:40
3	2	234:56
4	3	0:180:02
5	4	

Fig. 500

- 8) After entering all of the time entries, place the cell pointer in the Total row, as shown in Fig. 501.

	A	B
1	Trial	Time
2	1	123:40
3	2	234:56
4	3	180:02
5	4	129:04
6	5	132:00
7	6	131:00
8	7	172:00
9	8	174:00
10	9	140:00
11	10	153:00
12	11	145:00
13	Total	
14	Average	

Fig. 501

- 9) In the Standard toolbar, click the AutoSum button, as shown in Fig. 502.



Fig. 502

- 10) As shown in Fig. 503, Excel will propose a formula of =SUM(B2:B12). If this is correct, press Enter.

	A	B	C	D	
1	Trial	Time			
2	1	123:40			
3	2	234:56			
4	3	180:02			
5	4	129:04			
6	5	132:00			
7	6	131:00			
8	7	172:00			
9	8	174:00			
10	9	140:00			
11	10	153:00			
12	11	145:00			
13	Total	=SUM(B2:B12)			
14	Average	SUM(number1, [number2], ...)			
15					

**Part
II**

Fig. 503

11) Verify that the correct total appears, as shown in Fig. 504.

	A	B
1	Trial	Time
2	1	123:40
3	2	234:56
4	3	180:02
5	4	129:04
6	5	132:00
7	6	131:00
8	7	172:00
9	8	174:00
10	9	140:00
11	10	153:00
12	11	145:00
13	Total	1714:42

Fig. 504

Gotcha: Be very careful that the total cell is formatted with the square brackets around the M. If the square brackets are not around the M, Excel will show you only the minutes in excess of whole hours. In the case above, 1714 minutes is 28 hours and 34 minutes. With the wrong number format, you would see only 34 minutes and 42 seconds.

As shown in Fig. 505, the formula for an average time in B14 is:

=AVERAGE(B2:B12)

B14		fx =AVERAGE(B2:B12)			
	A	B	C	D	E
1	Trial	Time			
2	1	123:40			
3	2	234:56			
4	3	180:02			
5	4	129:04			
6	5	132:00			
7	6	131:00			
8	7	172:00			
9	8	174:00			
10	9	140:00			
11	10	153:00			
12	11	145:00			
13	Total	1714:42			
14	Average	155:53			

Fig. 505

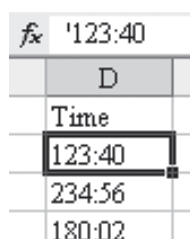
Summary: The formula to total a column of time entries is intuitive. However, using the proper numeric formats to allow the formula to work is very complex. The key is to use a custom number format with square brackets around the M. Also, you need to enter the times using 0 for the hours.

Commands Discussed: Format – Cells – Numeric

Functions Discussed: =SUM(); =AVERAGE()

CONVERT TEXT TO MINUTES AND SECONDS

Problem: Someone in another department set up a spreadsheet with hundreds of time values. However, instead of using Excel time formats, they entered each cell as text, as shown in Fig. 506. How can you convert the text entries to real Excel times?



<i>fx</i>	'123:40
	D
	Time
	123:40
	234:56
	180:02

Fig. 506

**Part
II**

Strategy: Use the TIME function. This function requires three arguments: hours, minutes, and seconds. The function will handle normal times, such as =TIME(1,23,40), which will return 1:23 a.m. with 40 seconds. It will also handle strange times, such as =TIME(0,123,40), to represent the 123 minutes and 40 seconds, as shown in the first cell above.

You will enter the TIME function in a temporary column next to your data. If there is already data in column E, insert a new column E.

Select the cells in the new column and format them with the proper custom number format. In this case, you need the [m]:ss format discussed in the preceding chapter, “Total Minutes that Exceed an Hour”.

The challenge is then to create a formula that will parse the minutes and seconds from the text entry. You will use a series of nested functions.

- =FIND(“:”,D2) will find and tell you the location of the colon in the text entry. This function, less 1, can be used as the second parameter of the =LEFT function in the next step.
- =LEFT(D2,FIND(“:”,D2)–1) will return just the minutes portion of the entry in D2. This function can be used for the minutes parameter of the TIME function.

- =RIGHT(D2,2) will return just the seconds portion of the entry in D2. This parameter can be used as the seconds parameter of the TIME function.
- 1) As shown in Fig. 507, enter the following formula in cell E2: =TIME(0,LEFT(D2,FIND(":",D2)-1),RIGHT(D2,2)). This will have Excel return a time with 0 hours, and the proper number of minutes and seconds from the text entry.

fx =TIME(0,LEFT(D2,FIND(":",D2)-1),RIGHT(D2,2))					
	D	E	F	G	H
	Time				
	123:40	123:40			
	234:56				
	180:02				

Fig. 507

- 2) Double-click the Fill handle in cell E2 to copy the formula down to all of the rows with data in column D, as shown in Fig. 508. The Fill handle is the black square dot in the lower right corner of the cell pointer.

	D	E
	Time	
	123:40	123:40
	234:56	234:56
	180:02	180:02
	129:04	129:04

Fig. 508

Additional Details: Before you can delete column D, you need to change the times in column E from formulas to values. Highlight the cells in column E. Use Ctrl+C to Copy. Without changing the selection, use Edit – Paste Special to display the Paste Special dialog, as shown in Fig. 509. Choose Values and then OK.

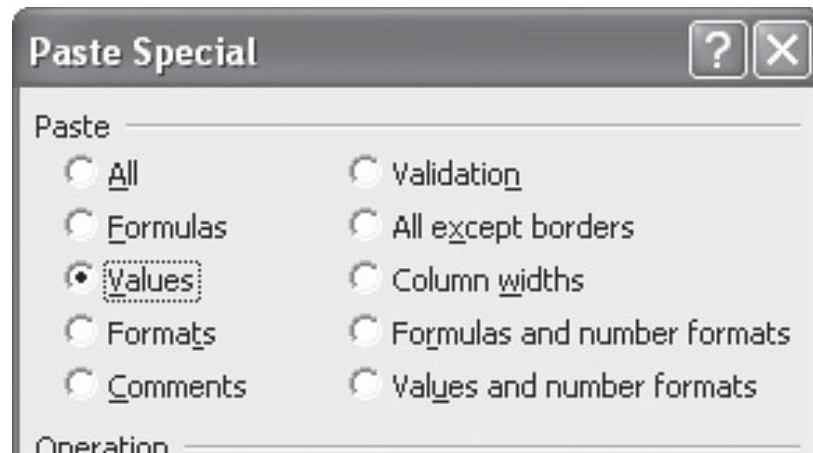


Fig. 509

**Part
II**

Summary: The TIME(Hours,Minutes,Seconds) function is very useful in converting text entries to real times. It is critical to have times and dates entered as real Excel times and dates instead of text if you want to do any math with the entries.

Commands Discussed: Format – Cells – Numeric; Edit – Paste Special

Functions Discussed: =TIME(); =LEFT(); =RIGHT()

CONVERT TEXT TO HOURS, MINUTES, AND SECONDS

.....

Problem: Someone in yet another department set up a spreadsheet with hundreds of time values (maybe your company should buy all of these people this book...). However, instead of using Excel time formats, they entered each cell as text with hours, minutes, seconds, and AM or PM, as shown in Fig. 510. How can you convert the text entries to real Excel times?

<i>f</i> x	'1:23:45 AM
	D
	1:23:45 AM
	2:34:56 PM
	3:45:61 AM
	4:56:12 AM
	5:12:34 PM

Fig. 510

Strategy:

- 1) Use the =TIMEVALUE() function. As shown in Fig. 511, this function requires one argument – a text value that looks like a valid time.

	D	E	F
	1:23:45 AM	=timevalue(D1)	
	2:34:56 PM		

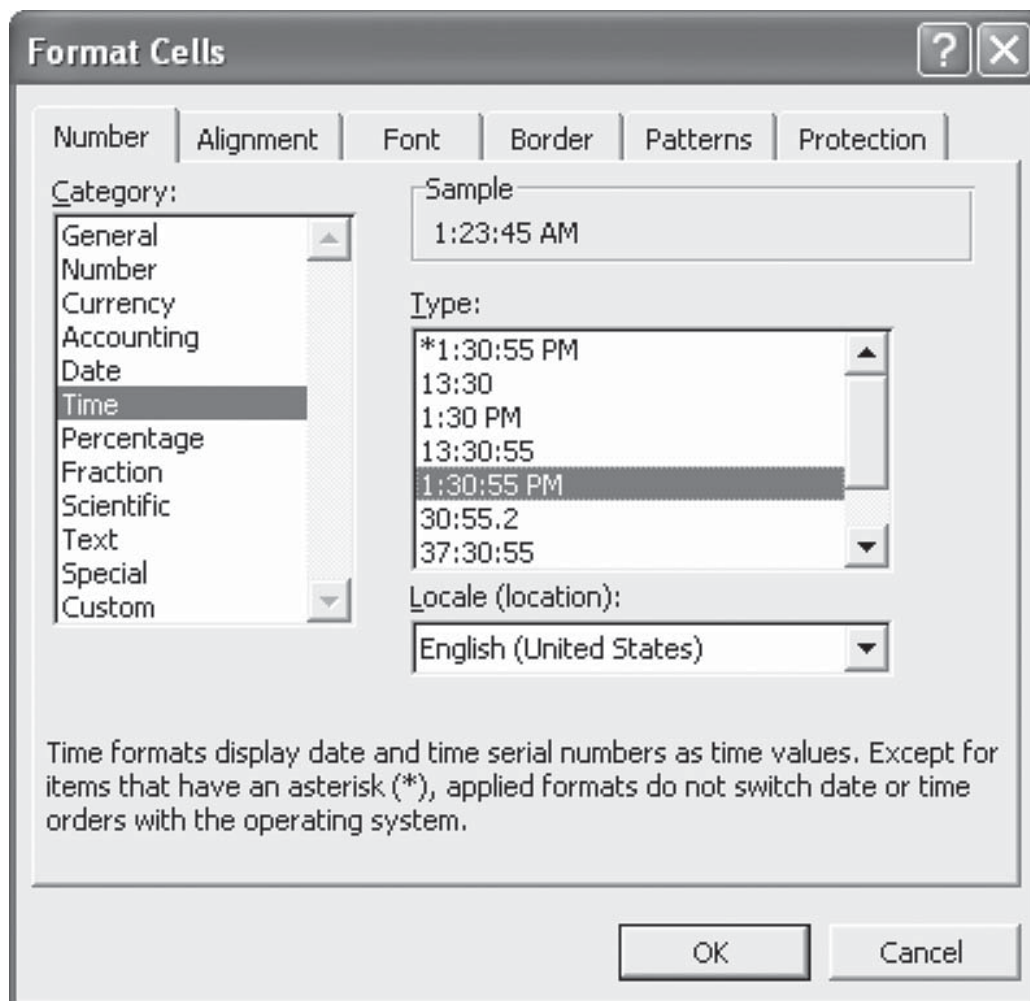
Fig. 511

- 2) Do not be alarmed when you hit Enter to accept the formula. Excel will normally display the result as the decimal portion of one day, as shown in Fig. 512.

<i>f</i> x	=TIMEVALUE(D1)	
	D	E
	1:23:45 AM	0.05816

Fig. 512

- 3) Select the cell. Hit Ctrl+1 to display the Format Cells dialog box. As shown in Fig. 513, on the Number tab, choose an appropriate format from the time section.



**Part
II**

Fig. 513

As shown in Fig. 514, the result of the formula will now look like a real time.

f_x	=TIMEVALUE(D1)	
	D	E
	1:23:45 AM	1:23:45 AM
	2:34:56 PM	

Fig. 514

- 4) Double-click the Fill handle in cell E1 to copy the formula down to all of the rows with data in column D, as shown in Fig. 515. The Fill handle is the black square dot in the lower right corner of the cell pointer.

Gotcha: Beware; the TIMEVALUE function cannot convert an invalid time. As shown in cell D3 in Fig. 515, someone entered a time with 61 seconds. Although the TIME function could handle 61 seconds, the TIMEVALUE function cannot. Scan through the results looking for #VALUE! errors before changing the formulas to values.

D	E
1:23:45 AM	1:23:45 AM
2:34:56 PM	2:34:56 PM
3:45:61 AM	#VALUE!
4:56:12 AM	4:56:12 AM
5:12:34 PM	5:12:34 PM

Fig. 515

Additional Details: Before you can delete column D, you need to change the times in column E from formulas to values. Highlight the cells in column E. Use Ctrl+C to Copy. Without changing the selection, use Edit – Paste Special to display the Paste Special dialog, as shown in Fig. 516. Choose Values and then OK.

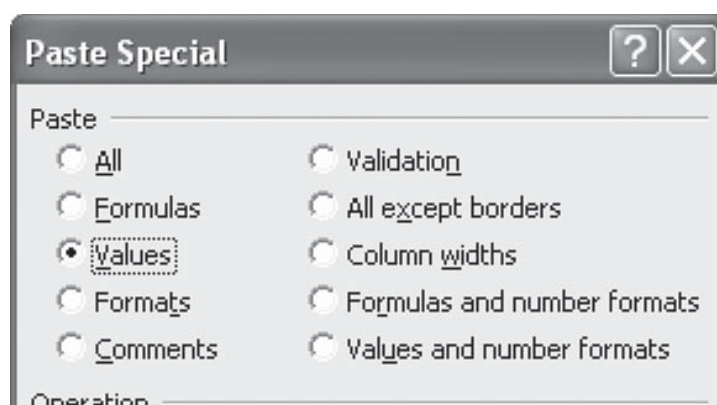


Fig. 516

Summary: The TimeValue function can convert text entries to real times. It is critical to have times and dates entered as real Excel times and dates instead of text if you want to do any math with the entries.

Commands Discussed: Format – Cells – Number; Edit – Paste Special

Functions Discussed: =TIMEVALUE()

CONVERT TIMES FROM H:MM TO M:SS

Problem: You entered the results of a running challenge for the students in your gym class. The results ranged from 2 minutes 35 seconds to 3 minutes and 15 seconds. When you total the times, something is clearly wrong. If you have eleven students at around 3 minutes each, you would expect an answer around 33 minutes. Instead, Excel gives you a total of 7:42, as shown in Fig. 517.

**Part
II**

	A	B
1	Runner	Time
2	Andy	2:35
3	Bob	3:01
4	Carol	2:41
5	David	2:56
6	Ed	3:15
7	Frank	2:56
8	Gerry	2:32
9	Hank	3:04
10	Isabel	2:51
11	John	2:49
12	Kevin	3:02
13	Total	7:42
14		

Fig. 517

Although you thought that you were entering 2 minutes and 35 seconds, if you place the cell pointer in B2, and examine the formula bar, you will notice that Excel thought that you meant 2 hours and 35 minutes, as shown in Fig. 518.

B2		fx 2:35:00 AM		
	A	B	C	D
1	Runner	Time		
2	Andy	2:35		
3	Bob	3:01		

Fig. 518

Strategy: One solution is to re-enter all of the formulas, using 0:02:35 as the format. This is probably the fastest method for 11 entries, but if you had hundreds of entries, there is a better way. You can use a series of nested functions to extract the Hour and Minute from the incorrect entry and then use the results in the TIME function.

- 1) As shown in Fig. 519, in column D, use the =HOUR(B2) function to return the portion of the time before the colon.

D2		fx =HOUR(B2)			
	A	B	C	D	E
1	Runner	Time			
2	Andy	2:35		2	
3	Bob	3:01			
4	Carol	2:41			

Fig. 519

- 2) In cell E2, use the =MINUTE(B2) to return the portion of the time after the colon, as shown in Fig. 520.

fx =MINUTE(B2)			
B	C	D	E
Time			
2:35		2	35

Fig. 520

- 3) You will use the `=TIME` function in cell C2, as shown in Fig. 521. This function requires an hour, a minute, and a second. The hour will be 0. The minute will be the result of the `HOUR` function in D2. The second will be the result of the `MINUTE` function in E2. The complete formula is `=TIME(0,D2,E2)`.

fx =TIME(0,D2,E2)				
B	C	D	E	
Time				
2:35	12:02 AM	2	35	
3:01				

Fig. 521

**Part
II**

- 4) As usual, don't be immediately alarmed that the result of the formula is not what you expected. Select the cell. Hit `Ctrl+1` to display the Format Cells dialog. On the Number tab, select a time format such as `13:30:55`, as shown in Fig. 522.

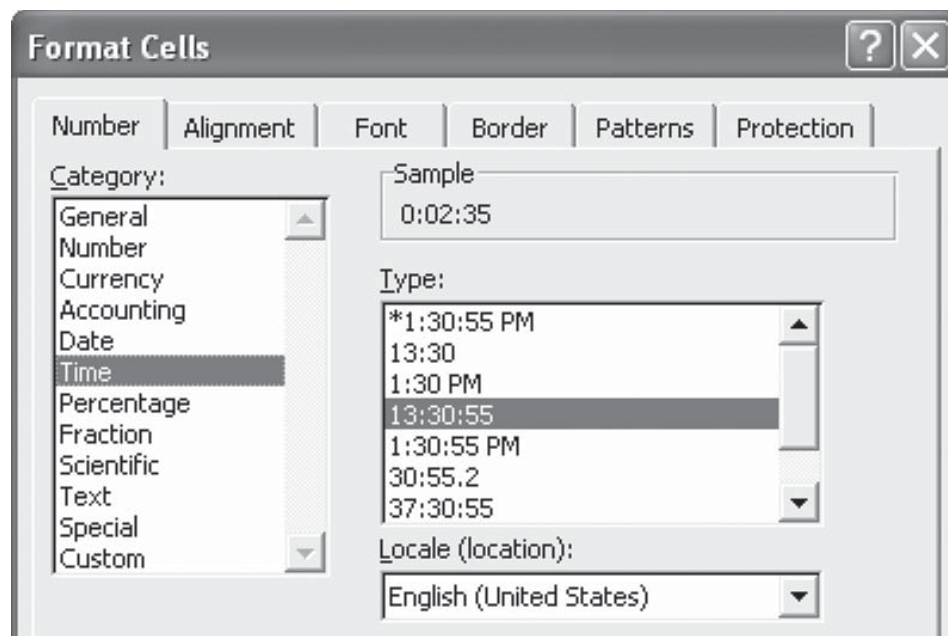


Fig. 522

- 5) Alternatively, select the Custom category and type a custom number format of M:SS, as shown in Fig. 523.

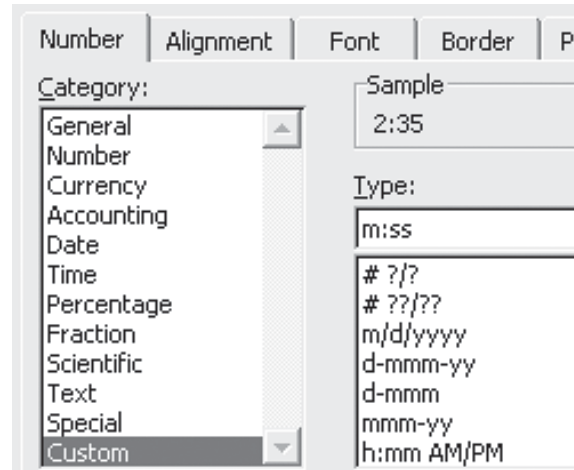


Fig. 523

It always seems funny that you've gone through all of the work in this chapter in order to get cell C2 to look exactly like the original cell in B2, as shown in Fig. 524. This is one of the reasons that working with times in Excel is so confusing.

	C2				
			fx	=TIME(0,D2,E2)	
	A	B	C	D	E
1	Runner	Time			
2	Andy	2:35	2:35	2	35
3	Bob	3:01			

Fig. 524

- 6) As shown in Fig. 525, select cells C2:E2. Double-click the Fill handle (the black square dot in the lower right corner of E2).

C	D	E
2:35	2	35

Fig. 525

- 7) Using the Fill handle trick will copy the formulas down to all rows with data in the adjacent column B. This will copy the formulas down to the total row, which is not what you want. Delete the formulas from C13:E13.
- 8) Copy the total formula from B13 to C13. As shown in Fig. 526, you will see that it now returns 31 minutes, a number that is about right.

	A	B	C
1	Runner	Time	
2	Andy	2:35	2:35
3	Bob	3:01	3:01
4	Carol	2:41	2:41
5	David	2:56	2:56
6	Ed	3:15	3:15
7	Frank	2:56	2:56
8	Gerry	2:32	2:32
9	Hank	3:04	3:04
10	Isabel	2:51	2:51
11	John	2:49	2:49
12	Kevin	3:02	3:02
13	Total	7:42	0:31

**Part
II**

Fig. 526

To correct the format in C13, there are two options. If you had foresight, rather than doing a Copy and Paste from B13 to C13, you could have done Edit – Paste Special – Formulas to copy the formula, but not the number format. It is hard to have such foresight!

- 9) To fix the format in Fig. 526, select cell C12. Ctrl+C to Copy. Select cell C13, as shown in Fig. 527. Do Edit – Paste Special – Formats – OK.

11	John	2:49	2:49
12	Kevin	3:02	3:02
13	Total	7:42	31:42
14			

Fig. 527

- 10) The Paste Special Format command will wipe out the bold formatting in C13, so hit Ctrl+B to bold the cell again.

Additional Details: Before you can delete columns B, D, and E, you need to change the times in column C from formulas to values. Highlight the cells in C2:C12. Use Ctrl+C to Copy. Without changing the selection, use Edit – Paste Special to display the Paste Special dialog. Choose Values and then OK.

Just out of curiosity, what about that value in B13? Even if Excel thought we had 31 hours, why is it showing only 7 hours and 42 minutes? Select the cell. Hit F2 to edit the formula. Hit F9 to calculate the formula. You will see that Excel thinks this total is 1.320833, as shown in Fig. 528. This means that 31 hours is about 1.3 days. The default numeric format in B13 was causing Excel to only show the portion of hours in excess of whole days.

	A	B	C	
1	Runner	Time		
2	Andy	2:35	2:35	
3	Bob	3:01	3:01	
4	Carol	2:41	2:41	
5	David	2:56	2:56	
6	Ed	3:15	3:15	
7	Frank	2:56	2:56	
8	Gerry	2:32	2:32	
9	Hank	3:04	3:04	
10	Isabel	2:51	2:51	
11	John	2:49	2:49	
12	Kevin	3:02	3:02	
13	Total	1 32083333333333		

Fig. 528

After hitting F9 to see the result of the formula, hit the Esc key to return to the formula.

Summary: Beware – some entries can be ambiguous. What may seem like three minutes to you might be interpreted as three hours by Excel. Always select the cell and look in the formula bar to see if Excel is using hours or minutes.

Commands Discussed: Edit – Paste Special – Formats

Functions Discussed: =HOUR(); =MINUTE(); =TIME()

DISPLAY DATES AS MONTHS

Problem: Your dataset shows the actual date for each invoice, as shown in Fig. 529. When you print the invoice register, you would like to print this date as the month.

	A	B	C	D
1	Month	Customer	Invoice	Revenue
2	1/5/05	Ainsworth	1101	20,992
3	1/14/05	Air Canada	1102	72,030
4	1/16/05	Chevron	1103	13,438
5	1/22/05	Sun Life Financial	1104	58,901
6	1/23/05	Verizon	1105	4,937
7	2/3/05	Sears Canada	1106	74,173
8	2/5/05	Bell Canada	1107	43,097
9	2/12/05	Exxon	1108	25,991
10	2/17/05	Texaco	1109	47,662
11	3/3/05	Compaq	1110	42,172
12	3/6/05	SBC Communications	1111	6,475
13	3/9/05	Compton Petroleum	1112	72,587
14	3/21/05	Shell Canada	1113	69,013
15	3/29/05	Ford	1114	18,244
16	3/31/05	Sears	1115	46,756

Fig. 529

Strategy: You can use a numeric format to force dates to display the month instead of the actual date.

- 1) Select the range of dates. If you have thousands of rows of data, here is one shortcut. Put the cell pointer in A2. Hit the End key. Hold down Shift while you hit the Down Arrow.
- 2) From the menu, select Format – Cells (or hit Ctrl+1). In the Format Cells dialog, choose the Number tab.
- 3) In the Category list box, choose Date.

- 4) In the Type list box, scroll through and find the format for either “Mar-01” or “March-01”. Select the desired format and choose OK, as shown in Fig. 530.

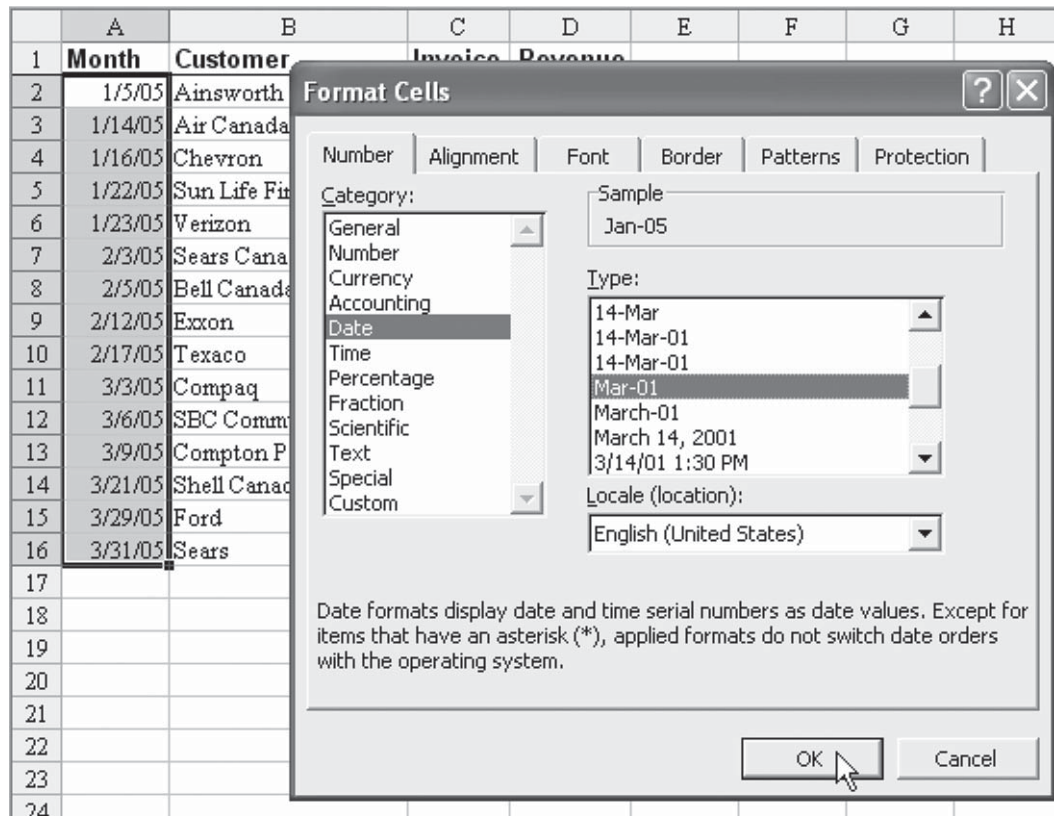


Fig. 530

Result: The daily dates will appear as monthly dates, as shown in Fig. 531.

	A	B	C	D
1	Month	Customer	Invoice	Revenue
2	Jan-05	Ainsworth	1101	20,992
3	Jan-05	Air Canada	1102	72,030
4	Jan-05	Chevron	1103	13,438
5	Jan-05	Sun Life Financial	1104	58,901
6	Jan-05	Verizon	1105	4,937
7	Feb-05	Sears Canada	1106	74,173
8	Feb-05	Bell Canada	1107	43,097
9	Feb-05	Exxon	1108	25,991
10	Feb-05	Texaco	1109	47,662
11	Mar-05	Compaq	1110	42,172
12	Mar-05	SBC Communications	1111	6,475
13	Mar-05	Compton Petroleum	1112	72,587
14	Mar-05	Shell Canada	1113	69,013
15	Mar-05	Ford	1114	18,244
16	Mar-05	Sears	1115	46,756

**Part
II**

Fig. 531

This tip is fine for printing and even for doing automatic subtotals. It will not work for sorting, formulas, or pivot tables. See the next tip for more details if you need to actually transform the column into months.

Additional Details: If you need to display the month with a four-digit date, you will have to use a custom number format. In the Format Cells dialog, use the Custom category, as shown in Fig. 532. In the type box, use one of these formats:

- mmm yyyy for a format like “Mar 2005”
- mmmm yyyy for a format like “March 2005”

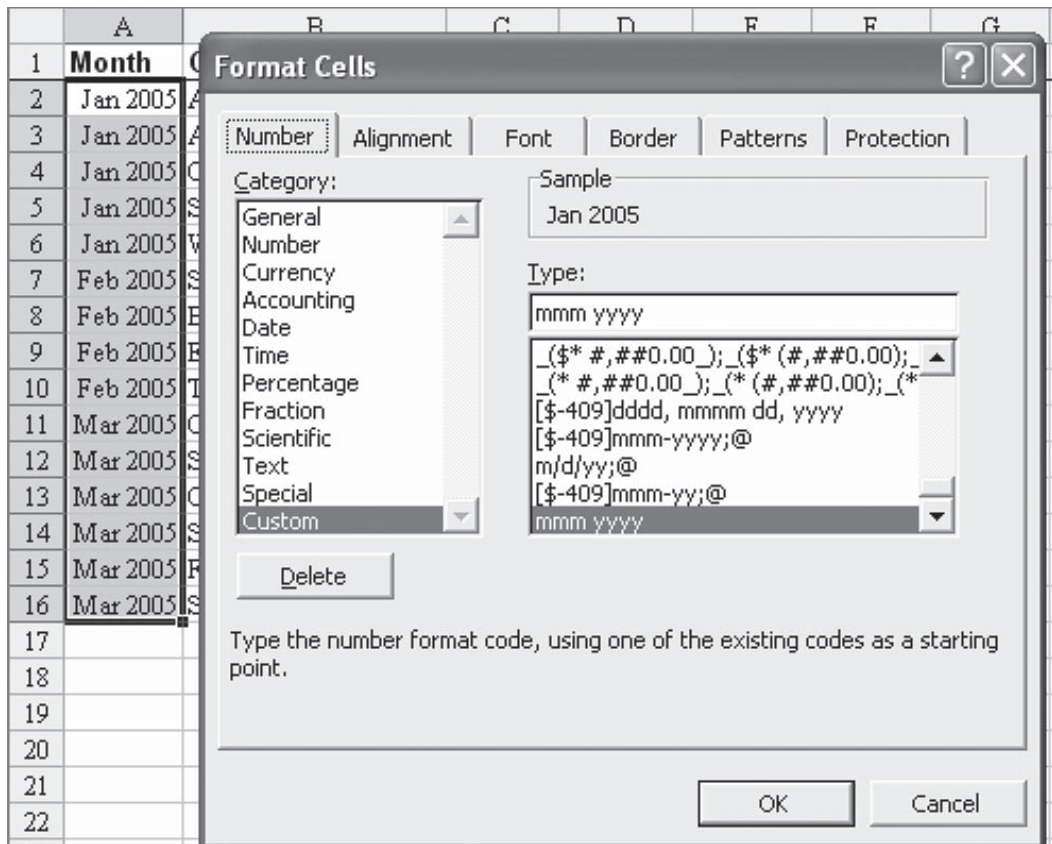


Fig. 532

Summary: Use a custom number format to make daily dates appear as monthly dates if you are printing or doing automatic subtotals. Do not use it if you want to sort or use the dates in formulas.

Commands Discussed: Format – Cells – Number

GROUP DATES BY MONTH

Problem: Your data has a series of invoice dates. You need to group the data by month. In the previous chapter, you learned how to format a date to look like a month. However, when you format a date to look like a month, the underlying value is still really the fifth of the month. You can see that it is the 5th by selecting the cell and looking at the value in

the formula bar, as shown in Fig. 533. Some data analyses will not produce the desired result of one subtotal per month.

A2		fx 1/5/2005		
	A	B	C	D
1	Date	Customer	Invoice	Revenue
2	Jan-2005	Bell Canada	1101	20,992
3	Jan-2005	Compton Petroleum	1102	72,030
4	Jan-2005	Exxon	1103	13,438
5	Jan-2005	Sears	1104	58,901
6	Jan-2005	Texaco	1105	4,937
7	Feb-2005	Verizon	1106	74,173
8	Feb-2005	Air Canada	1107	43,097
9	Feb-2005	Compaq	1108	25,991
10	Feb-2005	Ford	1109	47,662
11	Mar-2005	Sun Life Financial	1110	42,172
12	Mar-2005	Ainsworth	1111	6,475
13	Mar-2005	Chevron	1112	72,587
14	Mar-2005	Sears Canada	1113	69,013
15	Mar-2005	SBC Communications	1114	18,244
16	Mar-2005	Shell Canada	1115	46,756

**Part
II**

Fig. 533

Strategy: For some tasks, simply formatting the dates to look like months will work. As shown in Fig. 534, if you create automatic subtotals by the Date field, you will get the desired results.

1	2	3	A	B	C	D
1			Date	Customer	Invoice	Revenue
2			Jan-2005	Bell Canada	1101	20,992
3			Jan-2005	Compton Petroleum	1102	72,030
4			Jan-2005	Exxon	1103	13,438
5			Jan-2005	Sears	1104	58,901
6			Jan-2005	Texaco	1105	4,937
7			Jan-2005 Total			170,298
8			Feb-2005	Verizon	1106	74,173
9			Feb-2005	Air Canada	1107	43,097
10			Feb-2005	Compaq	1108	25,991
11			Feb-2005	Ford	1109	47,662
12			Feb-2005 Total			190,923
13			Mar-2005	Sun Life Financial	1110	42,172
14			Mar-2005	Ainsworth	1111	6,475
15			Mar-2005	Chevron	1112	72,587
16			Mar-2005	Sears Canada	1113	69,013
17			Mar-2005	SBC Communications	1114	18,244
18			Mar-2005	Shell Canada	1115	46,756
19			Mar-2005 Total			255,247
20			Grand Total			616,468

Fig. 534

However, if you attempt to test which fields are equal, it will not work. As shown in Fig. 535, the formula to detect a new month fails.

E2		fx =IF(A2<>A1,"Yes","No")				
	A	B	C	D	E	F
1	Date	Customer	Invoice	Revenue	New Month?	
2	Jan-2005	Bell Canada	1101	20,992	Yes	
3	Jan-2005	Compton Petroleum	1102	72,030	Yes	
4	Jan-2005	Exxon	1103	13,438	Yes	
5	Jan-2005	Sears	1104	58,901	Yes	
6	Jan-2005	Texaco	1105	4,937	Yes	
7	Feb-2005	Verizon	1106	74,173	Yes	

Fig. 535

Similarly, a COUNTIF formula will not work, as shown in Fig. 536.

D1		fx =COUNTIF(A4:A18,A1)			
	A	B	C	D	
1	Jan-2005			0	
2					
3	Date	Customer	Invoice	Revenue	
4	Jan-2005	Bell Canada	1101	20,992	
5	Jan-2005	Compton Petroleum	1102	72,030	
6	Jan-2005	Exxon	1103	13,438	

Fig. 536

Even pivot tables will not work, as shown in Fig. 537.

	A	B
1	Drop Page Fields Here	
2		
3	Sum of Revenue	
4	Date ▼	Total
5	Jan-2005	20992
6	Jan-2005	72030
7	Jan-2005	13438
8	Jan-2005	58901
9	Jan-2005	4937
10	Feb-2005	74173
11	Feb-2005	43097
12	Feb-2005	25991
13	Feb-2005	47662
14	Mar-2005	42172
15	Mar-2005	6475
16	Mar-2005	72587
17	Mar-2005	69013
18	Mar-2005	18244
19	Mar-2005	46756
20	Grand Total	616468
21		

**Part
II**

Fig. 537

If you want to sort by customer alphabetically within a month, you will not get the desired results. As shown in Fig. 538, Verizon on February 3 will appear before Air Canada on February 5.

	A9		fx 2/3/2005
	A	B	C
1	Jan-2005		
2			
3	Date	Customer	Invoice
8	Jan-2005	Texaco	1105
9	Feb-2005	Verizon	1106
10	Feb-2005	Air Canada	1107
11	Feb-2005	Compaq	1108

Fig. 538

So, although the special case of creating subtotals does work, in almost every other case you will need to use a formula to transform the dates in column A to a real month.

- 1) Insert a new column A with a heading of Month. Format the date column with an m/d/yy format. As shown in Fig. 539, the formula for the new month column is =B2-Day(B2)+1.
- 2) Copy that formula down and format the column as months.

A2		fx =B2-DAY(B2)+1			
	A	B	C	D	E
1	Month	Date	Customer	Invoice	Revenue
2	Jan-05	1/5/05	Bell Canada	1101	20,992
3	Jan-05	1/14/05	Compton Petroleum	1102	72,030
4	Jan-05	1/16/05	Exxon	1103	13,438
5	Jan-05	1/22/05	Sears	1104	58,901

Fig. 539

Here is why this works. The DAY(1/5/2005) function will return the number 5 because the date is the fifth of the month. January 5 minus 5 days will give you December 31. Add 1 to get back to the first day of this month.

Alternate Strategy: You will prefer the above formula because it is shorter and faster. You could also have used a formula like =DATE(YEAR(B2),MONTH(B2),1). However, this formula requires three function calls instead of one.

Summary: Use the DAY function in a formula to convert a date to the first of the month.

Commands Discussed: Subtotal; Pivot Table; Sort

Functions Discussed: =DAY(); =DATE(); =YEAR(); =MONTH(); =COUNTIF()

CALCULATE LAST DAY OF MONTH

Problem: Your dataset shows the actual date for each invoice, as shown in Fig. 540. You want a formula to convert this to the last day of the month.

	A	B	C	D
1	Date	Customer	Invoice	Revenue
2	1/5/2005	Ainsworth	1101	20,992
3	1/14/2005	Air Canada	1102	72,030
4	1/16/2005	Chevron	1103	13,438
5	1/22/2005	Sun Life Financial	1104	58,901
6	1/23/2005	Verizon	1105	4,937
7	2/3/2005	Sears Canada	1106	74,173
8	2/5/2005	Bell Canada	1107	43,097
9	2/12/2005	Exxon	1108	25,991
10	2/17/2005	Texaco	1109	47,662
11	3/3/2005	Compaq	1110	42,172
12	3/6/2005	SBC Communications	1111	6,475
13	3/9/2005	Compton Petroleum	1112	72,587
14	3/21/2005	Shell Canada	1113	69,013
15	3/29/2005	Ford	1114	18,244
16	3/31/2005	Sears	1115	46,756

Fig. 540

**Part
II**

Strategy: Finding the last day of the month is trickier than finding the first day of the month. For the first day, you are always looking for a day of 1. For the last day, you might be looking for 31, 30, 28, or even 29 in February during leap years. Excellers have tried many different tricks for this problem. Many first attempts involve testing to see if the MONTH(A2) is equal to 1, 3, 4, 7, 8, 10, or 12 to assign a final date of 31. As you can imagine, this nested IF statement gets rather large.

One day this was being discussed on the MrExcel board and Aladin Akyurek chimed in with his elegant solution. Aladin pointed out that it is easy to figure out the first date of the next month. After you have figured this out, you can simply subtract one from the first of next month to get the date for the last of this month. Here is a table showing this logic.

Invoice Date	First of Next Month	Less 1 Day
2/17/2003	3/1/2003	2/28/2003
2/17/2004	3/1/2004	2/29/2004
3/17/2004	4/1/2004	3/31/2004
4/17/2004	5/1/2004	4/30/2004

To figure out the first of the next month, you will use the DATE function. This function requires three arguments, the Year, the Month, and the Day. You know that the Day will be 1. The Month should be the month of the date + 1. The year should be the year of the date. It is obvious this will work in the first row of our example, as shown in Fig. 541.

E2		fx =DATE(YEAR(A2),MONTH(A2)+1,1)-1			
	A	B	C	D	E
1	Date	Customer	Invoice	Revenue	Last of Month
2	1/5/2005	Ainsworth	1101	20,992	1/31/2005
3	1/14/2005	Air Canada	1102	72,030	

Fig. 541

=YEAR(A2) is 2005.

=Month(A2) is 1. =Month(A2)+1 is 2.

=DATE(2005,2,1) will return February 1, 2005.

=DATE(2005,2,1)-1 will return January 31, 2005.

However, it is not so obvious that this formula would work if the Date in A2 were December 5, 2005. In this case, you would have:

=YEAR(A2) is 2005.

=Month(A2) is 12.

=Month(A2)+1 is 13.

Thus, you are asking for a date of =DATE(2005,13,1). It would seem like this would not work! What is the first day of the thirteenth month of 2005? Amazingly, Excel handles this with ease. As shown in Fig. 542, Excel returns a value of January 1, 2006.

fx =DATE(2005,13,1)	
D	E
1/1/2006	

Fig. 542

Then, subtract 1 from the result. `=DATE(YEAR(A2),MONTH(A2)+1,1)-1` will return 12/31/2005, which is the correct last day of the month, as shown in Fig. 543.

	E2		fx =DATE(YEAR(A2),MONTH(A2)+1,1)-1			
	A	B	C	D	E	
1	Date	Customer	Invoice	Revenue	Last of Month	
2	12/5/2005	Ainsworth	1101	20,992	12/31/2005	
3	1/14/2005	Air Canada	1102	72,030		

Fig. 543

I've said it before, but the fact that Microsoft allows the DATE function to correctly return the forty-seventh day of the eighteenth month of 2005 is miraculous and incredibly useful. See the result in Fig. 544.

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II**

	fx =DATE(2005,18,47)	
	D	E
	17-Jul-06	

Fig. 544

So, the formula used in cell E2 in Fig. 545 can be copied down to all rows of the dataset. Your new column E now calculates the last day of the month for each date.

	E2		fx =DATE(YEAR(A2),MONTH(A2)+1,1)-1			
	A	B	C	D	E	
1	Date	Customer	Invoice	Revenue	Last of Month	
2	1/5/2005	Ainsworth	1101	20,992	1/31/2005	
3	1/14/2005	Air Canada	1102	72,030	1/31/2005	
4	1/16/2005	Chevron	1103	13,438	1/31/2005	
5	1/22/2005	Sun Life Financial	1104	58,901	1/31/2005	
6	1/23/2005	Verizon	1105	4,937	1/31/2005	
7	2/3/2005	Sears Canada	1106	74,173	2/28/2005	
8	2/5/2005	Bell Canada	1107	43,097	2/28/2005	
9	2/12/2005	Exxon	1108	25,991	2/28/2005	
10	2/17/2005	Texaco	1109	47,662	2/28/2005	
11	3/3/2005	Compaq	1110	42,172	3/31/2005	
12	3/6/2005	SBC Communications	1111	6,475	3/31/2005	
13	3/9/2005	Compton Petroleum	1112	72,587	3/31/2005	
14	3/21/2005	Shell Canada	1113	69,013	3/31/2005	
15	3/29/2005	Ford	1114	18,244	3/31/2005	
16	3/31/2005	Sears	1115	46,756	3/31/2005	

Fig. 545

Summary: To find the last day of a month, use the DATE() function to calculate the first of the next month and then subtract one day. This sure-fire method will find the last day, even if it falls on the 31st, 30th, 28th, or 29th.

Functions Discussed: =DATE(); =YEAR(); =MONTH()

CREATE A TIMESHEET THAT CAN TOTAL OVER 24 HOURS

Problem: You set up the timesheet shown below. Cell D2 contains a formula of C2–B2. Cell D2 is formatted with a time format of h:mm. Everything works fine for this part-time employee, as shown in Fig. 546.

	D9		fx =SUM(D2:D8)		
	A	B	C	D	E
1	Day	Start	End	Hours	
2	Mon	8:00 AM	11:00 AM	3:00	
3	Tue	8:00 AM	11:00 AM	3:00	
4	Wed	8:00 AM	11:00 AM	3:00	
5	Thu	8:00 AM	11:00 AM	3:00	
6	Fri	9:00 AM	12:00 PM	3:00	
7	Sat			0:00	
8	Sun			0:00	
9	Total For the Week			15:00	
10					

Fig. 546

However, when you attempt to use the timesheet for someone who works full time, the total does not work. This person worked eight hours each day plus an extra three hours on Saturday. Their total should be 43 hours, yet the worksheet is reporting that they worked only 19 hours, as shown in Fig. 547.

	A	B	C	D
1	Day	Start	End	Hours
2	Mon	8:00 AM	4:00 PM	8:00
3	Tue	8:00 AM	4:00 PM	8:00
4	Wed	8:00 AM	4:00 PM	8:00
5	Thu	8:00 AM	4:00 PM	8:00
6	Fri	9:00 AM	5:00 PM	8:00
7	Sat	8:00 AM	11:00 AM	3:00
8	Sun			0:00
9	Total For the Week			19:00
10				

Fig. 547

Strategy: Remember that Excel stores dates as the number of days elapsed since January 1, 1900. Excel stores times as a portion of a day. 6 a.m. is stored as 0.25 because 25 percent of the day is elapsed by 6 a.m.

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II**

In the above scenario, Excel knows that the total is 43 hours. However, it thinks that 43 hours after midnight on January 1, 1900 is 7 p.m. on January 2, 1900. That cell really wants to report that it is 7 p.m. on January 2. This makes no sense in the current context. When you use a custom number format of h:mm, you are basically telling Excel to ignore the date and only report the time.

The solution is to use the non-intuitive custom number format of [h]:mm. The square brackets around the h allow Excel to report times in excess of 24 hours.

- 1) Select cell D9. Hit Ctrl+1 to display the Format Cells dialog. Select the Number tab. In the Category list, choose Custom. The type box will show the current numeric format for the cell, as shown in Fig. 548.

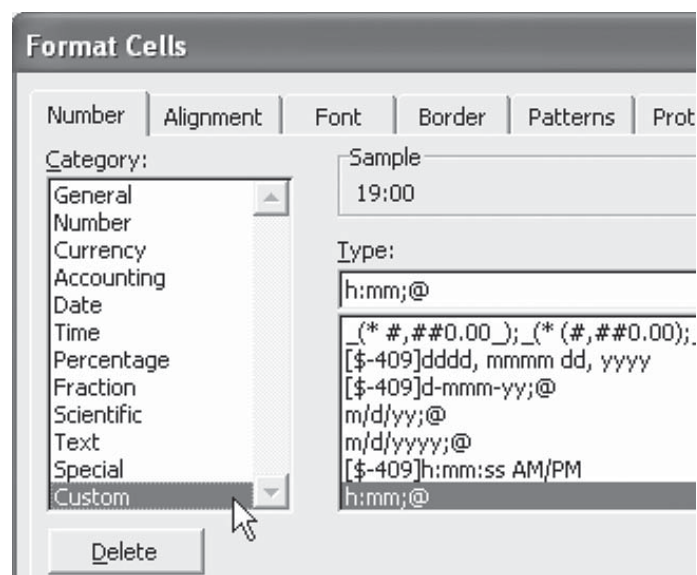


Fig. 548

- 2) Click in the Type box and add square brackets around the h. As shown in Fig. 549, you will see in the Sample area that the cell is now reporting 43 hours.

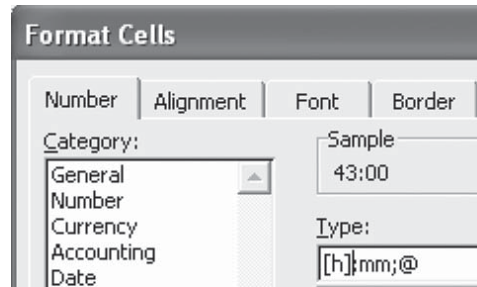


Fig. 549

Result: The time sheet reports the correct total, as shown in Fig. 550.

	A	B	C	D
1	Day	Start	End	Hours
2	Mon	8:00 AM	4:00 PM	8:00
3	Tue	8:00 AM	4:00 PM	8:00
4	Wed	8:00 AM	4:00 PM	8:00
5	Thu	8:00 AM	4:00 PM	8:00
6	Fri	9:00 AM	5:00 PM	8:00
7	Sat	8:00 AM	11:00 AM	3:00
8	Sun			0:00
9	Total For the Week			43:00
10				

Fig. 550

Summary: Use the non-intuitive square brackets around the h in a custom number format in order to display hours in excess of 24.

Commands Discussed: Format – Cells – Numeric