

# MS 365 Excel Basics #3

## Number Formatting and the ROUND Function

**Goal of Video #3:** Learn that Number Formatting can sometimes make formula answers look like the wrong answer, or cause the wrong answer when you do not properly use the ROUND function.

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### Number Formatting

- 1) What does Number Formatting do?
  - i. Number Formatting allows you to change how the Number is displayed without actually changing the underlying number that sits in the cell.
    1. For example, in this picture, the Decrease Decimal button is used to display no decimals, but we can still see the decimals in the Formula Bar:

Number is not changed when Number Formatting is applied

Decrease Decimal button click 4 times

Number is displayed on the surface of the cell with zero decimals showing.

Employee Sales	
Abdi	35061
Gigi	25341.7
Pham	24428.47
Tyrone	33965.6
Sioux	29549.56
Miki	25175.7
Naoya	47516.87

2. Number Formatting allows you to display numbers on the **surface of the cell** without changing the number that **sits in the cell**.
3. You can think of Number Formatting as a “Façade”. In the above picture, the Façade shows the number 35061, but underneath that façade is the actual number 35060.7056.

2) Formulas do not “see” Number Formatting.

- i. Formulas make calculations on the underlying number that sits in the cell.
- ii. Formulas do NOT make calculations on the Number Formatting that you see on the surface of the cell.
- iii. For example, in this picture, the formula shows an answer of 199, but  $100 * 2$  is really 200!! What is going on? If you look in the Formula Bar it shows that the value in cell A2 is really 99.5. Because formulas make calculations on the underlying number that sits in the cell, the formula makes the calculation on  $99.5 * 2 = 199$ .

Formula Bar shows the number that the formula uses to make calculation.

The screenshot shows an Excel spreadsheet with columns A (Price), B (Quantity), and C (Total). Row 1 contains headers. Row 2 contains values: Price is 100, Quantity is 2, and Total is 199. The Formula Bar shows the value 99.5 for cell A2. A red arrow points from the text box above to the Formula Bar. Another red arrow points from the text box below to cell A2.

	A	B	C	D	E
1	Price	Quantity	Total		Formula in cell:
2	100	2	199		Formula in cell C2 is: =A2*B2 (Price*Quantity)

Number is displayed to show zero decimals, but formula does not “see” Number

- iv. Formulas make their calculation on the actual numbers in the cells, not the numbers that are displayed on the surface of the cells.
- v. To fix this visual mistake, we need to increase the decimals for cell A2. This picture shows the decimals increased for cell A2:

The screenshot shows the same Excel spreadsheet as above, but now cell A2 displays the value 99.5. The Formula Bar still shows 99.5. A red arrow points from the text box above to the Formula Bar.

	A	B	C	D	E
1	Price	Quantity	Total		Formula in cell:
2	99.5	2	199		Formula in cell C2 is: =A2*B2 (Price*Quantity)

3) Number Formatting can save us a lot of time with data entry.

- i. In the picture below the numbers on the right are the digits that you type in. The numbers on the left have Currency Number Format applied so the dollar signs and decimal point and decimals are displayed.

	A	B	C	D
1		Sales		Sales
2		45		\$45.00
3		65.2		\$65.20
4		78.99		\$78.99
5		100		\$100.00

We only had to type the two digits: 45

Currency Number Format shows \$ sign, decimal and two zeros.

ii.

4) Compare General Number Formatting, Currency Number Format and Accounting Number Format:

1. General Number Formatting:
  - i. General Number Formatting = What you see is what is in the cell.
  - ii. If you apply General Number Formatting, it will wipe away all of the previously applied Number Formatting to reveal what number actually sits in the cell.
  - iii. Applying General Number Formatting ERASES all previously applied Number Formatting.
  - iv. General Number Formatting is the default Number Formatting on all cells.
2. Accounting Number Format:
  - i. Fixed dollar sign (left edge of cell).
  - ii. Negatives are in parenthesis.
  - iii. Zeros are dashes.
  - iv. Decimals always line up.
  - v. When you use Accounting Number Format it may hide decimals by displaying fewer decimals than are actually in the cell. This may lead to formula errors due to fact the formula calculates on the underlying number and not the displayed number.
3. Currency:
  - i. Floating dollar sign.
  - ii. You choose how to show negatives.
  - iii. Zeros are zeros.
  - iv. Decimals usually line up.
  - v. When you use Currency Number Format it may hide decimals by displaying fewer decimals than are actually in the cell. This may lead to formula errors due to fact the formula calculates on the underlying number and not the displayed number.

4. Example:

General	Currency	Accounting
Sales	Sales	Sales
45	\$45.00	\$ 45.00
0	\$0.00	\$ -
78.99	\$78.99	\$ 78.99
100	\$100.00	\$ 100.00
-101	-\$101.00	\$ (101.00)
98.2	\$98.20	\$ 98.20
20	\$20.00	\$ 20.00

i.

5) Percentage Number Formatting:

- i. What is a percentage?
  - 1. How many parts out of 100?
    - i. If the tax rate is 9.95%, this means that you must pay 9.95 pennies out of every 100 pennies (or one dollar).
- ii. What Percentage Number Format does:
  - 1. For the number 0.03, Percentage Number Formatting displays the number with:
    - i. The decimal slid two positions to the right and
    - ii. A percentage sign.
    - iii. 0.03 displays as 3.00%
  - 2. For a tax rate of 1.45%, you have to remember that the underlying number is 0.0145.

	A	B	C	D	E	F	G	H	I	J
1	Tax Rate	9.50%		9.5 pennies for every \$1.			Don't get trick by Percentage Number Formatting:			
2	Tax Rate	0.095		9.5 pennies for every \$1.				Someone decreased		
3							Tax Rate	1%	decimals	
4							Amount	1		
5	Tax Rate	3.00%		3 pennies for every \$1.			Tax Amount	0.0145	=H4*H3	
6	Tax Rate	0.03		3 pennies for every \$1.						
7							1% of \$1 is 1 penny, right?			
8							Formulas do NOT "see" Number Formatting.			
9							Formula Calculate on underlying Number			
10										
11										
12	<b>Percentage Number Formatting</b>									
13	For the number 0.03,									
14	Percentage Number Formatting displays the number with:									
15										
16	1) The decimal slid two positions to the right									
17	and									
18	2) A percentage sign.									
19										
20	0.03 displays as 3.00%									
21										

# ROUND Function

Reminder of how we round numbers by hand:

**How to round by hand?**

**1) Pick position you want to round to**

2) look at digit to right:

5 or bigger ==>> add one to position you are rounding to and remove unwanted digits

4 or less ==>> remove unwanted digits

52.727625	52.7 <b>2</b> 7625	52.72 <b>7</b> 625	52.7( <b>2+1</b> ) <del>7625</del>	52.73
52.724584	52.7 <b>2</b> 4584	52.72 <b>4</b> 584	52.7( <b>2+0</b> ) <del>4584</del>	52.72

We can use the ROUND function to remove unwanted decimals

- 1) We can use the ROUND function to remove unwanted decimals.
- 2) ROUND Function arguments:
  - i. **Number** argument contains the number you want to round. In this picture we want to round the Tax Deduction Amount, B13\*\$B\$18:

12	Payroll:		No ROUND	ROUND
13	Employee	Gross Pay	Tax Deduction	Tax Deduction
14	Lillian Holt	689.25	\$52.73	=ROUND(B14:B16*B19,2)
15	Jasmine Phelps	765.71	\$58.58	ROUND(number, num_digits)
16	Sadie Hudson	687.43	\$52.59	\$52.59
17	<b>Total</b>		\$163.89	\$163.90
18				
19	Tax Rate	0.0765		

- ii. **Num\_digits** argument is the position you would like to round to. For example, because the penny position is two digits to the right of the decimal, you would use a 2 for rounding to the penny. Like in this picture:

12	Payroll:		No ROUND	ROUND
13	Employee	Gross Pay	Tax Deduction	Tax Deduction
14	Lillian Holt	689.25	\$52.73	=ROUND(B14:B16*B19,2)
15	Jasmine Phelps	765.71	\$58.58	ROUND(number, num_digits)
16	Sadie Hudson	687.43	\$52.59	\$52.59
17	<b>Total</b>		\$163.89	\$163.90
18				
19	Tax Rate	0.0765		

- 3) Some options for the num\_digits argument in ROUND:
  - i. Round to penny (hundredths position) = 2
  - ii. Round to dollar (ones position) = 0
  - iii. Round to thousands (thousands position) = -3

4) Here is an example of how we use ROUND to remove unwanted decimals, rather than Number Formatting:

G15 : X ✓ fx =ROUND(D15\*C15,2)

	A	B	C	D	E	F	G
12							
13	<b>Payroll:</b>			No Number Format	Currency Number Format does NOT Remove Decimals	ROUND Removes Decimals after Penny Position	
14	<b>Employee</b>	<b>Tax Rate</b>	<b>Gross Pay</b>	<b>Tax Deduction</b>			<b>Tax Deduction</b>
15	Lillian Holt	0.0765	689.25	52.727625		\$52.73	52.73
16				Formula in above	Formula in above cell	Formula in above	
17				<b>num_digit argument in ROUND Function:</b>			
18				Round to penny (hundredths position) use 2			
19				Round to dollar (ones position) use 0			
20				Round to thousands (thousands position) use -3			

5) When you MUST use ROUND:

- i. You are required to round, like with Money.
- ii. You have extraneous decimals, like past the penny position.
- iii. You will use formula result in a subsequent formula.

6) If you don't use ROUND when you are required to, you may calculate the incorrect amounts, like in the following Payroll example:

D13 : X ✓ fx =ROUND(B14:B16\*B19,2)

	A	B	C	D	E
11	<b>Payroll:</b>		No ROUND	ROUND	
12	<b>Employee</b>	<b>Gross Pay</b>	<b>Tax Deduction</b>	<b>Tax Deduction</b>	
13	Lillian Holt	689.25	\$52.73	\$52.73	
14	Jasmine Phelps	765.71	\$58.58	\$58.58	
15	Sadie Hudson	687.43	\$52.59	\$52.59	
16		<b>Total</b>	\$163.89	\$163.90	
17					
18	<b>Tax Rate</b>	0.0765			
19					
20					
21					
22					
23					
24					
25					

\$163.89 is not the correct total because the SUM Function is adding all of the extraneous decimals.

\$163.90 is the correct total because each of the Tax Deduction amounts has been properly rounded using ROUND.

7)

8) In business we mostly need to use round when we are multiplying decimals and the unit is Money.

- i. Examples:
  1. Payroll
  2. Invoices
  3. Taxes

9) You are not required to use round if you will never use the formula result in another formula. Then you can just use Number Formatting to display the numbers with the correct number of decimals.

### 10) Invoice example:

	A	B	C	D	E	F	G
22	<b>Invoicing:</b>					<b>Tax Rate</b>	
23	Invoice Number		1025				9.75%
24	<b>Item</b>	<b>Price</b>	<b>Units</b>	<b>Total</b>			
25	1" screws	0.0513	31	\$1.59		=ROUND(B25:B27*C25:C27,2)	
26	2" screws	0.0775	21	\$1.63			
27	6" lock pads	1.057	11	\$11.63			
28				<b>Subtotal</b>	\$14.85	=SUM(D25:D27)	
29				<b>Tax</b>	\$1.45	=ROUND(D28*F23,2)	
30				<b>Total</b>	\$16.30	=SUM(D28:D29)	
31	Thanks for your Order!						

### 11) Income Tax Example:

	A	B	C	D
33	**Payroll Taxes and Invoices often times have to round to the penny.			
34	**Sometimes for INCOME TAXES you have to round to the dollar.			
35				
36		<b>Tax Rate</b>		
37		0.155		
38	Income Tax:			
39	<b>Taxable Amount</b>	<b>Tax rounded to dollar</b>		
40	\$2,345.98	\$364.00		=ROUND(A40:A43*B37,0)
41	\$345.49	\$54.00		
42	\$235.80	\$37.00		
43	\$2,541.12	\$394.00		
44	<b>Toatl</b>	<b>\$849.00</b>		