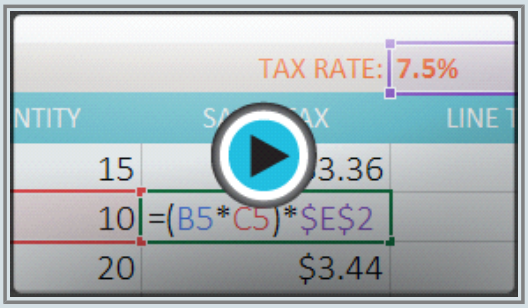
Introduction

There are two types of cell references: **relative** and **absolute**. Relative and absolute references behave differently when copied and filled to other cells. Relative references **change** when a formula is copied to another cell. Absolute references, on the other hand, remain **constant**, no matter where they are copied.

Optional: Download our Lesson 15 Practice Workbook.

Video: Cell References



Watch the video (5:26). Need help?

Relative References

By default, all cell references are **relative references**. When copied across multiple cells, they change based on the relative position of rows and columns. For example, if you copy the formula **=A1+B1** from row 1 to row 2, the formula will become **=A2+B2.** Relative references are especially convenient whenever you need to **repeat** the same calculation across multiple rows or columns.

To Create and Copy a Formula Using Relative References:

In the following example, we want to create a formula that will multiply each item's **price** by the **quantity**. Rather than creating a new formula for each row, we can create a single formula in cell **D2** and then copy it to the other rows. We'll use relative references so that the formula correctly calculates the total for each item.

1. Select the **cell** that will contain the formula. In our example, we'll select cell **D2**.

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	A	B	C	D	E
1	Menu Item	Price	Quantity	Total	
2	Empanadas: Beef Picadillo	$2.99	15		
3	Empanadas: Chipotle Shrimp	$3.99	10		
4	Empanadas: Black Bean & Plantain	$2.49	20		
5	Tamales: Chicken Tinga	$2.29	20		
6	Tamales: Vegetable	$2.29	30		
7	Arepas: Carnitas	$2.89	10		
8	Arepas: Queso Blanco	$2.49	20		
9	Empanadas: Apple Cinnamon	$3.19	40		
10	Beverages: Horchata	$1.89	25		
11	Beverages: Lemonade	$1.89	35		
12	Beverages: Tamarindo	$1.89	10		
13			Total		
14					

Selecting cell D2

2. Enter the **formula** to calculate the desired value. In our example, we'll type **=B2*C2**.

	A	B	C	D	E
1	Menu Item	Price	Quantity	Total	
2	Empanadas: Beef Picadillo	$2.99	15	=B2*C2	
3	Empanadas: Chipotle Shrimp	$3.99	10		
4	Empanadas: Black Bean & Plantain	$2.49	20		
5	Tamales: Chicken Tinga	$2.29	20		
6	Tamales: Vegetable	$2.29	30		
7	Arepas: Carnitas	$2.89	10		
8	Arepas: Queso Blanco	$2.49	20		
9	Empanadas: Apple Cinnamon	$3.19	40		
10	Beverages: Horchata	$1.89	25		
11	Beverages: Lemonade	$1.89	35		
12	Beverages: Tamarindo	$1.89	10		
13			Total		
14					

Entering the formula

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3. Press **Enter** on your keyboard. The formula will be **calculated** and the result will be displayed in the cell.
4. Locate the **fill handle** in the lower-right corner of the desired cell. In our example, we'll locate the fill handle for cell **D2**.

	Menu Item	Price	Quantity	Total
2	Empanadas: Beef Picadillo	$2.99	15	$44.85
3	Empanadas: Chipotle Shrimp	$3.99	10	
4	Empanadas: Black Bean & Plantain	$2.49	20	
5	Tamales: Chicken Tinga	$2.29	20	
6	Tamales: Vegetable	$2.29	30	
7	Arepas: Carnitas	$2.89	10	
8	Arepas: Queso Blanco	$2.49	20	
9	Empanadas: Apple Cinnamon	$3.19	40	
10	Beverages: Horchata	$1.89	25	
11	Beverages: Lemonade	$1.89	35	
12	Beverages: Tamarindo	$1.89	10	
13			Total	

Locating the fill handle

5. Click, hold and drag the **fill handle** over the cells you wish to fill. In our example, we'll select cells **D3:D12**.

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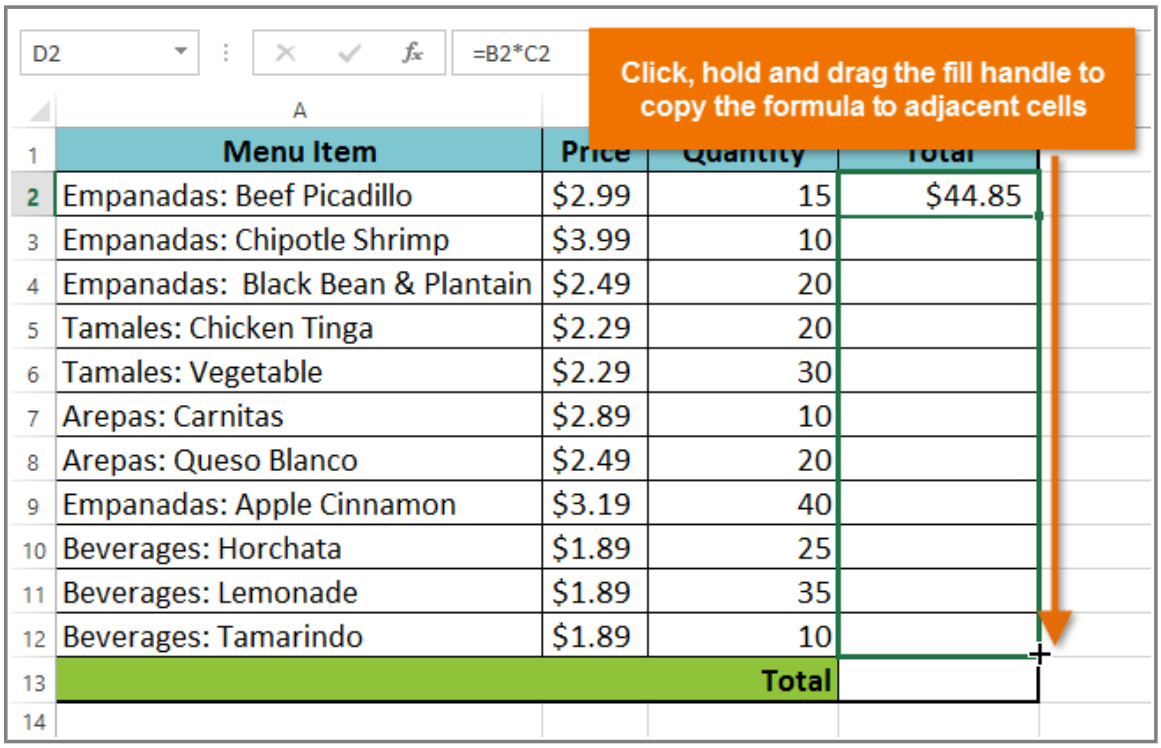

Dragging the fill handle over cells D3:D12

6. Release the mouse. The formula will be **copied** to the selected cells with **relative references** and the values will be calculated in each cell.

The copied formulas and calculated values

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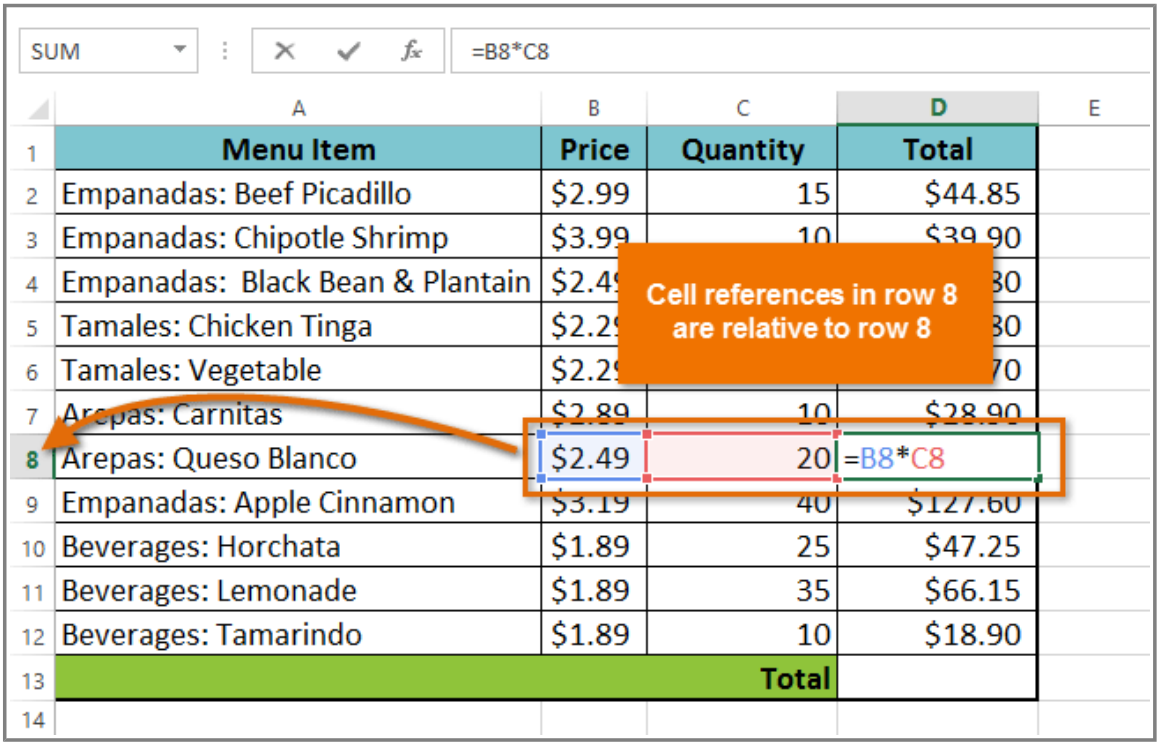
You can double-click the **filled cells** to check their formulas for accuracy. The relative cell references should be different for each cell, depending on its row.



	Menu Item	Price	Quantity	Total
2	Empanadas: Beef Picadillo	$2.99	15	$44.85
3	Empanadas: Chipotle Shrimp	$3.99	10	$39.90
4	Empanadas: Black Bean & Plantain	$2.49	[illegible]	[illegible]30
5	Tamales: Chicken Tinga	$2.29	[illegible]	[illegible]30
6	Tamales: Vegetable	$2.29	[illegible]	[illegible]70
7	Arepas: Carnitas	$2.89	10	$28.90
8	Arepas: Queso Blanco	$2.49	20	=B8*C8
9	Empanadas: Apple Cinnamon	$3.19	40	$127.60
10	Beverages: Horchata	$1.89	25	$47.25
11	Beverages: Lemonade	$1.89	35	$66.15
12	Beverages: Tamarindo	$1.89	10	$18.90
13			Total	

Checking the copied formulas for accuracy

Absolute References

There may be times when you do not want a cell reference to change when filling cells. Unlike relative references, **absolute references** do not change when copied or filled. You can use an absolute reference to keep a row and/or column **constant**.

An absolute reference is designated in a formula by the addition of a **dollar sign ($)**. It can precede the column reference, the row reference, or both.

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A2	The column and the row do not change when copied
A$2	The row does not change when copied
$A2	The column does not change when copied

The three types of absolute references

You will usually use the **A2** format when creating formulas that contain absolute references. The other two formats are used much less frequently.

To Create and Copy a Formula Using Absolute References:

In our example, we'll use the 7.5% sales tax rate in cell **E1** to calculate the sales tax for all items in **column D**. We'll need to use the absolute cell reference **E1** in our formula. Since each formula is using the same tax rate, we want that reference to remain constant when the formula is copied and filled to other cells in column D.

1. Select the **cell** that will contain the formula. In our example, we'll select cell **D3**.

D3

	A	B	C	D	E
1			Sales Tax		7.5%
2	Menu Item	Price	Quantity	Sales Tax	Total
3	Empanadas: Beef Picadillo	$2.99	15		
4	Empanadas: Chipotle Shrimp	$3.99	10		
5	Empanadas: Black Bean & Plantain	$2.49	20		
6	Tamales: Chicken Tinga	$2.29	20		
7	Tamales: Vegetable	$2.29	30		
8	Arepas: Carnitas	$2.89	10		
9	Arepas: Queso Blanco	$2.49	20		
10	Empanadas: Apple Cinnamon	$3.19	40		
11	Beverages: Horchata	$1.89	25		
12	Beverages: Lemonade	$1.89	35		
13	Beverages: Tamarindo	$1.89	10		
14				Total	
15					

Selecting cell D3

2. Enter the **formula** to calculate the desired value. In our example, we'll type =**(B3*C3)*E1**.

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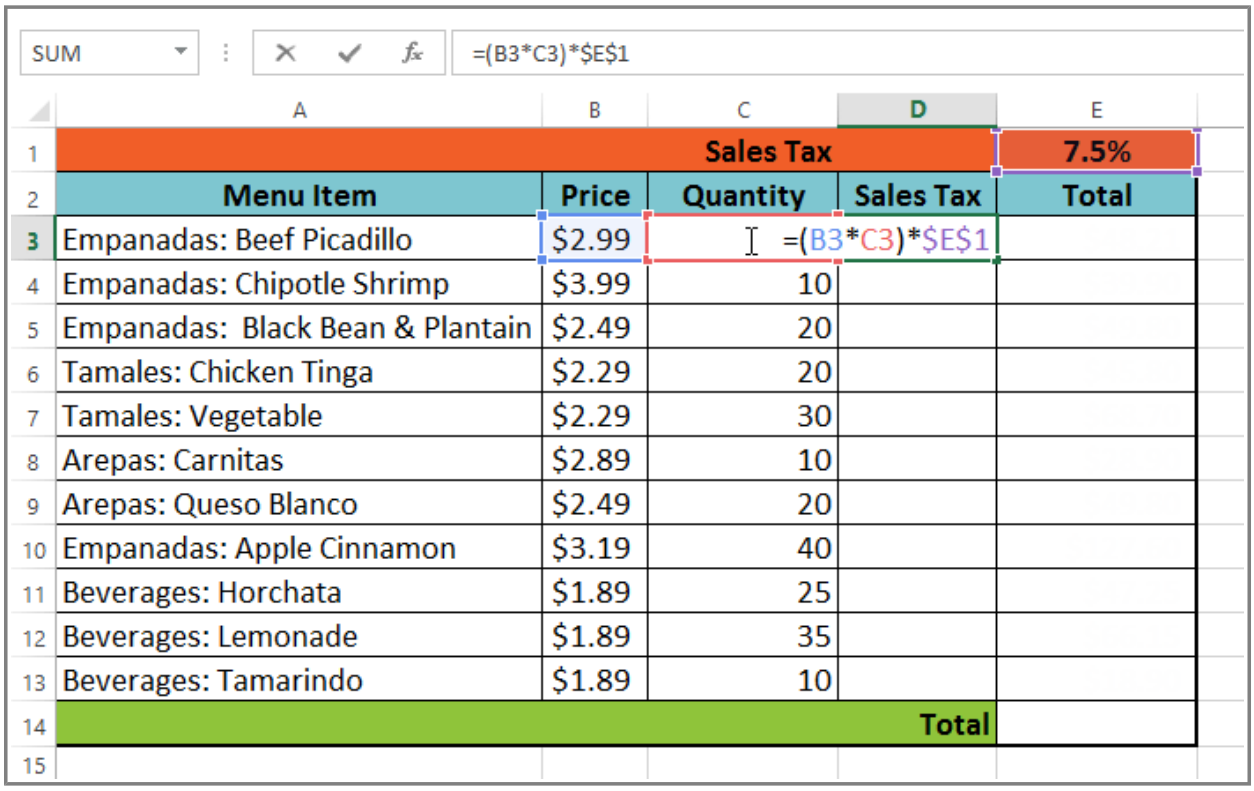

Entering the formula

3. Press **Enter** on your keyboard. The formula will calculate and the result will display in the cell.
4. Locate the **fill handle** in the lower-right corner of the desired cell. In our example, we'll locate the fill handle for cell **D3**.

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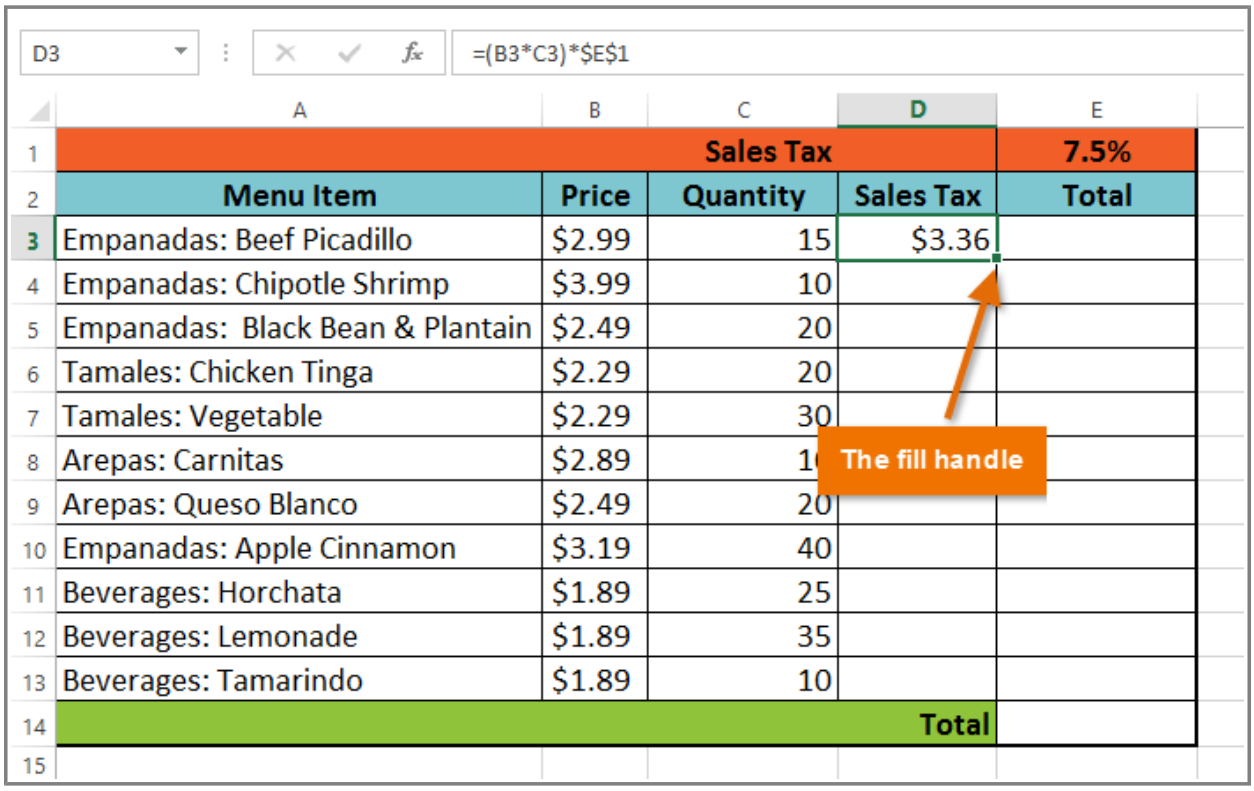

Locating the fill handle

5. Click, hold and drag the **fill handle** over the cells you wish to fill, cells **D4:D13** in our example.

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Dragging the fill handle

6. Release the mouse. The formula will be **copied** to the selected cells with an **absolute reference** and the values will be calculated in each cell.

D3 | =(B3*C3)*E1

	A	B	C	D	E
1			Sales Tax		7.5%
2	Menu Item	Price	Quantity	Sales Tax	Total
3	Empanadas: Beef Picadillo	$2.99	15	$3.36	
4	Empanadas: Chipotle Shrimp	$3.99	10	$2.99	
5	Empanadas: Black Bean & Plantain	$2.49	20	$3.74	
6	Tamales: Chicken Tinga	$2.29	20	$3.44	
7	Tamales: Vegetable	$2.29	30	$5.15	
8	Arepas: Carnitas	$2.89	10	$2.17	
9	Arepas: Queso Blanco	$2.49	20	$3.74	
10	Empanadas: Apple Cinnamon	$3.19	40	$9.57	
11	Beverages: Horchata	$1.89	25	$3.54	
12	Beverages: Lemonade	$1.89	35	$4.96	
13	Beverages: Tamarindo	$1.89	10	$1.42	
14				Total	
15					

The copied formulas and calculated values

You can double-click the **filled cells** to check their formulas for accuracy. The absolute reference should be the same for each cell, while the other references are relative to the cell's row.

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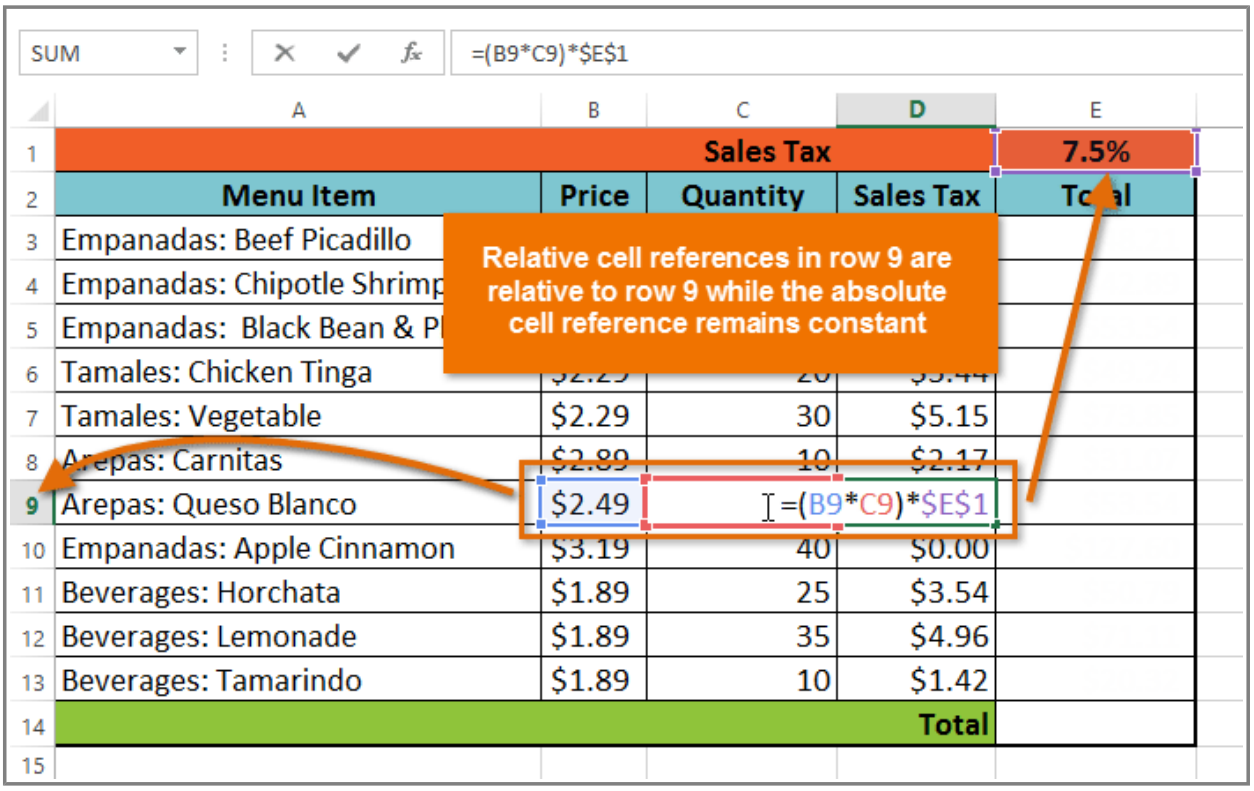

Checking the formulas for accuracy

Be sure to include the **dollar sign** (**$**) whenever you're making an absolute reference across multiple cells. The dollar signs were omitted in the example below. This caused Excel to interpret it as a relative reference, producing an incorrect result when copied to other cells.

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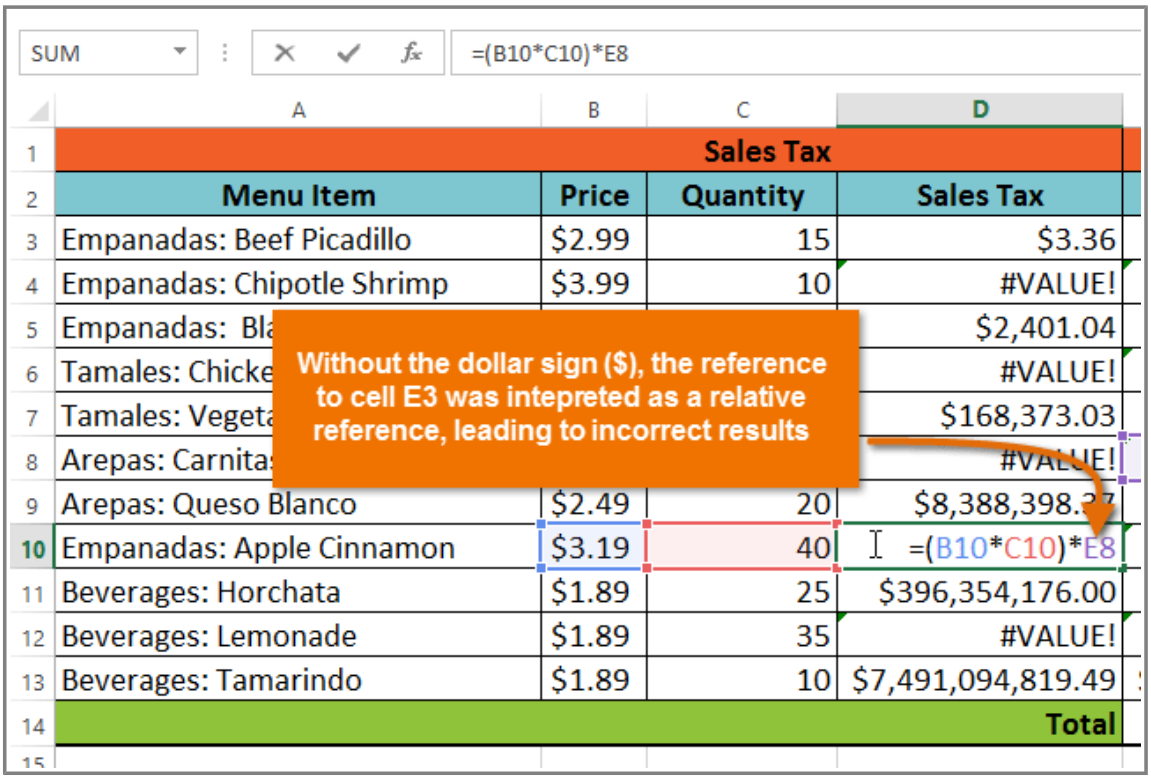

The result of an incorrect absolute reference

Using Cell References with Multiple Worksheets

Excel allows you to refer to any cell on any **worksheet**, which can be especially helpful if you want to reference a specific value from one worksheet to another. To do this, you'll simply need to begin the cell reference with the **worksheet name** followed by an **exclamation point** (!). For example, if you wanted to reference cell **A1** on **Sheet1**, its cell reference would be **Sheet1!A1**.

Note that if a worksheet name contains a **space**, you will need to include **single quotation marks** (**' '**) around the name. For example, if you wanted to reference cell **A1** on a worksheet named **July Budget**, its cell reference would be **'July Budget'!A1**.

To Reference Cells Across Worksheets:

In our example below, we'll refer to a cell with a calculated value between two worksheets. This will allow us to use the **exact same value** on two different worksheets without rewriting the formula or copying data between worksheets.

1. Locate the cell you wish to reference and note its worksheet. In our example, we want to reference cell **E14**

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on the **Menu Order worksheet**.

	A	B	C	D	E
5	Empanadas: Black Bean & Plantain	$2.49	20	$3.74	$53.54
6	Tamales: Chicken Tinga	$2.29	20	$3.44	$49.24
7	Tamales: Vegetable	$2.29	30	$5.15	$73.85
8	Arepas: Carnitas	$2.89	10	$2.17	$31.07
9	Arepas: Queso Blanco	$2.49	20	$3.74	$53.54
10	Empanadas: Apple Cinnamon	$3.19	40	$9.57	$137.17
11	Beverages: Horchata	$1.89	25	$3.54	$50.79
12	Beverages: Lemonade	$1.89	35	$4.96	$71.11
13	Beverages: Tamarindo	$1.89	10	$1.42	$20.32
14				Total	$587.65
15					
16					

Menu Order | Catering Invoice

Cell E14

2. Navigate to the desired **worksheet**. In our example, we'll select the **Catering Invoice** worksheet.

12	Beverages: Lemonade	$1.89	35	$4.96	$71.11
13	Beverages: Tamarindo	$1.89	10	$1.42	$20.32
14				Total	$587.65
15					
16					

Menu Order | Catering Invoice

Navigating to Sheet2

3. The **selected worksheet** will appear.
4. Locate and select the **cell** where you want the value to appear. In our example, we'll select cell **B2**.

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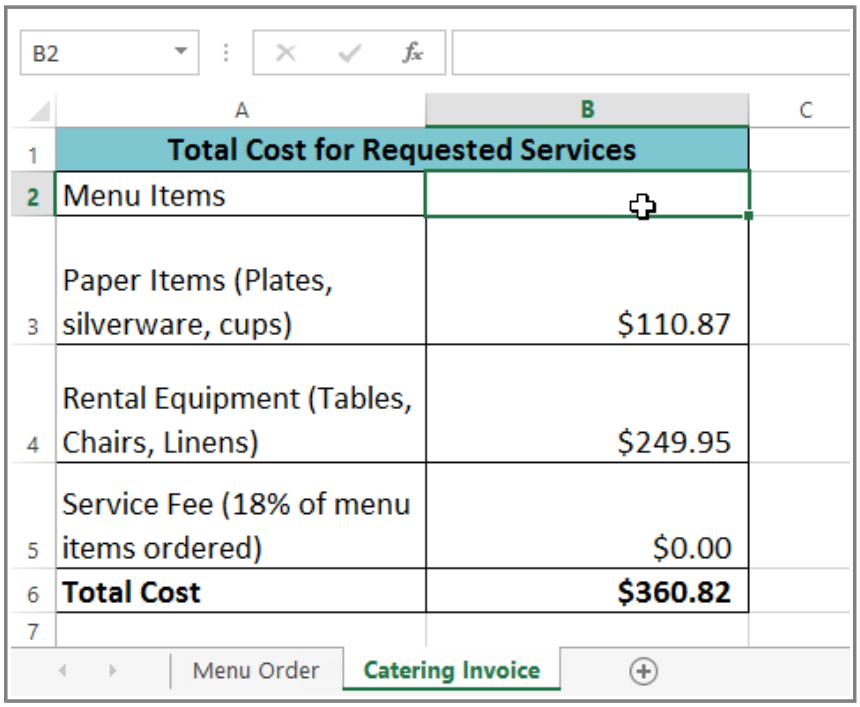
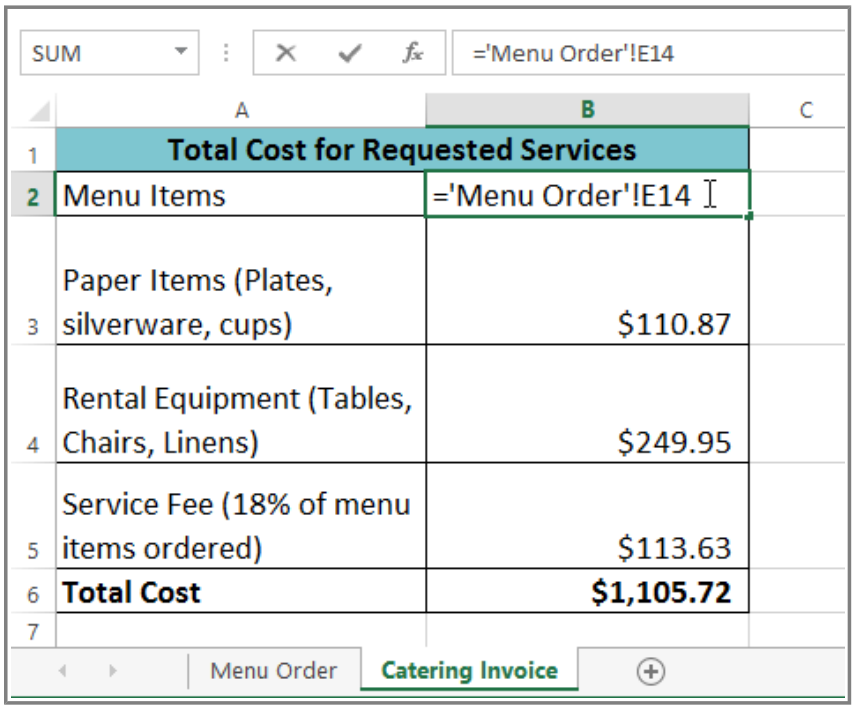


Selecting cell B2

5. Type the **equal sign (=)**, the **sheet name** followed by an **exclamation point** (!), and the **cell address**. In our example, we'll type **='Menu Order'!E14**.



Referencing a cell on Sheet1

6. Press **Enter** on your keyboard. The **value** of the referenced cell will appear. If the **value** of cell E14 changes

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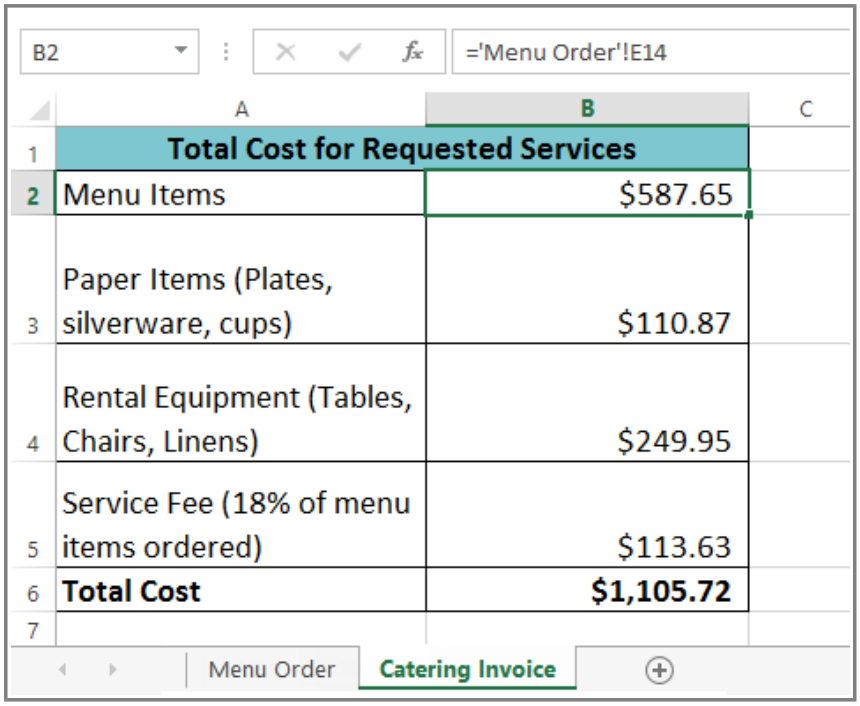
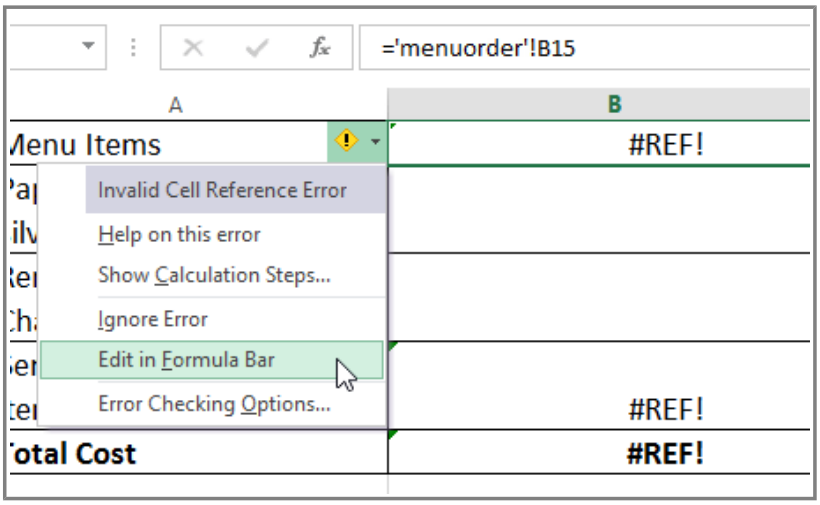
on the Menu Order worksheet, it will be **updated** automatically on the Catering Invoice worksheet.



The referenced cell

If you **rename** your worksheet at a later point, the cell reference will be updated automatically to reflect the new worksheet name.

If you enter a worksheet name incorrectly, the **#REF!** error will appear in the cell. In our example below, we've mistyped the name of the worksheet. Click the **Error** button and then select the desired option from the drop-down menu to **edit** or **ignore** the error.



Correcting a cell reference error

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Challenge!

1. Open an existing Excel workbook. If you want, you can use the Lesson 15 Practice Workbook.
2. Create a formula that uses a **relative reference**. If you are using the example, use the **fill handle** to fill in the formula in cell **E4** through **E14**. Double-click a cell to see the copied formula and the relative cell references.
3. Create a formula that uses an **absolute reference**. If you are using the example, correct the formula in cell **D4** to refer only to the tax rate in cell **E2** as an **absolute reference**, then use the fill handle to fill the formula from cell **D4** to **D14**.
4. Try referencing a cell across **worksheets**. If you are using the example, create a cell reference in cell **B3** on the **Catering Invoice** worksheet for cell **E15** on the **Menu Order** worksheet.

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