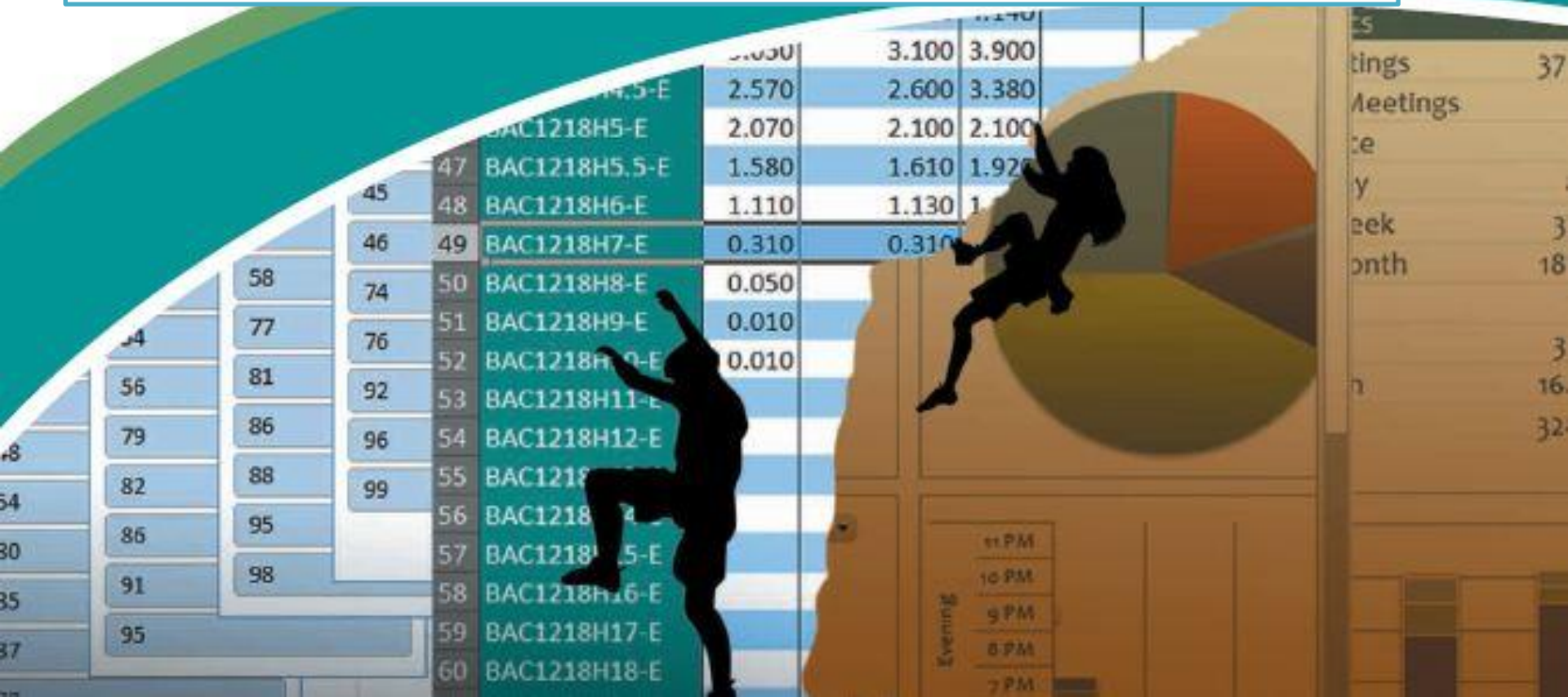
Succeeding in Business™ with Microsoft® Excel® 2013
A Problem-Solving Approach

Chapter 1

Applying Fundamental Excel Skills and Tools in Problem Solving



Chapter Introduction

- Fundamental skills and tools encountered when working with Excel to solve problems and support decision making
- Writing formulas in cells to perform calculations
- Designing a workbook so that calculations can be automatically updated if input values are changed
- Formatting options that can be applied to cells and ranges of cells
- Ability to correct spreadsheet errors
- Rules that affect how information is displayed and calculations are performed in an Excel worksheet

Chapter Introduction (continued)

- Using simple functions (i.e., shortcuts available for predefined tasks)
- Results of copying formulas with different kinds of cell references

To go to Level 1, click here

To go to Level 2, click here

To go to Level 3, click here

Functions Covered in This Chapter

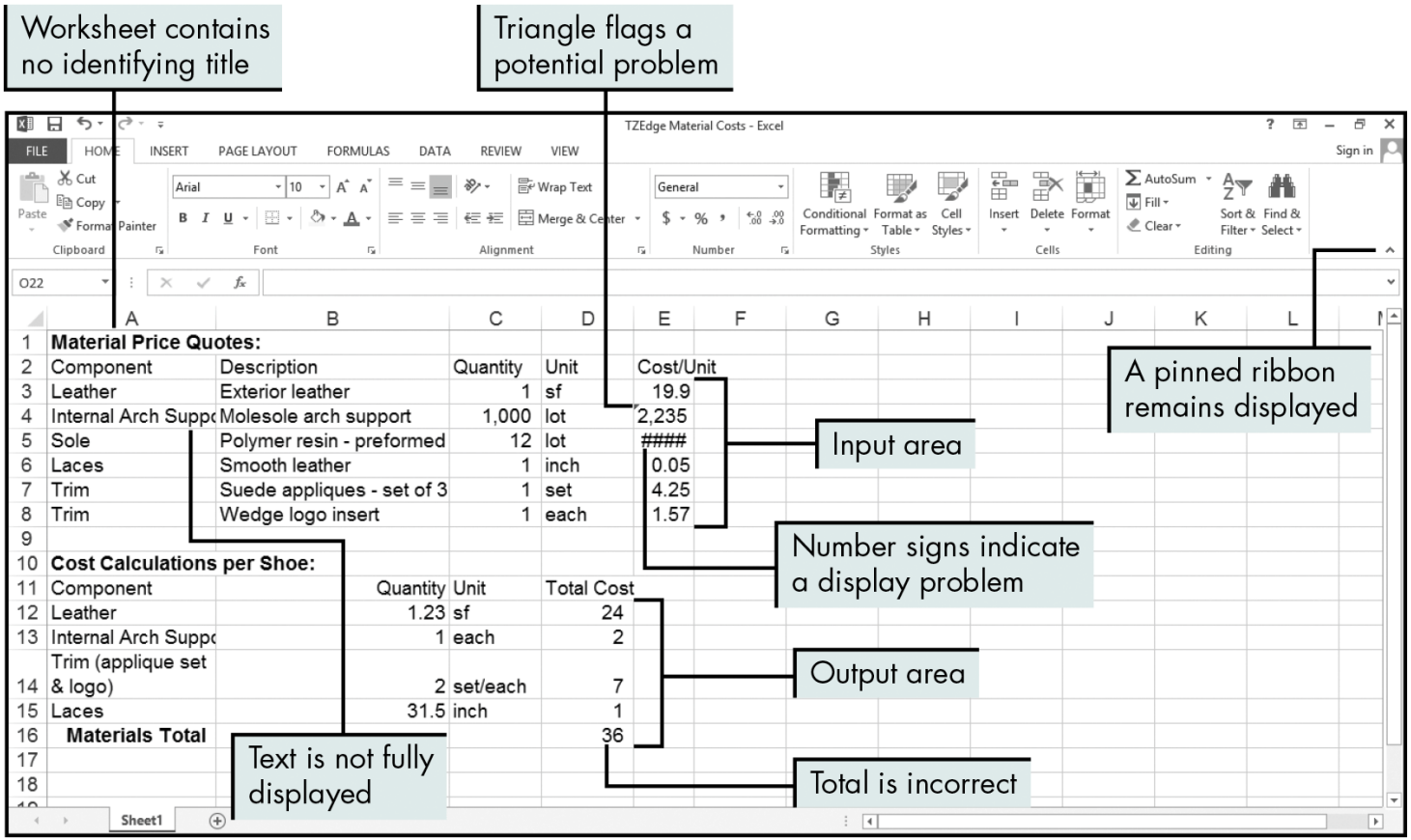
- AVERAGE
- COUNT
- COUNTA
- MIN
- MAX
- SUM

Level 1 Objectives: Identifying and Correcting Common Errors in Formatting and Formulas

- Define common Excel error messages
- Correct basic formatting problems in a worksheet
- Correct errors in formulas
- Understand precision vs. display of cell values

Examining a Basic Worksheet for Errors

Figure 1.1: Initial worksheet for TZEdge



Examining a Basic Worksheet for Errors (continued)

Table 1.1: Excel error messages

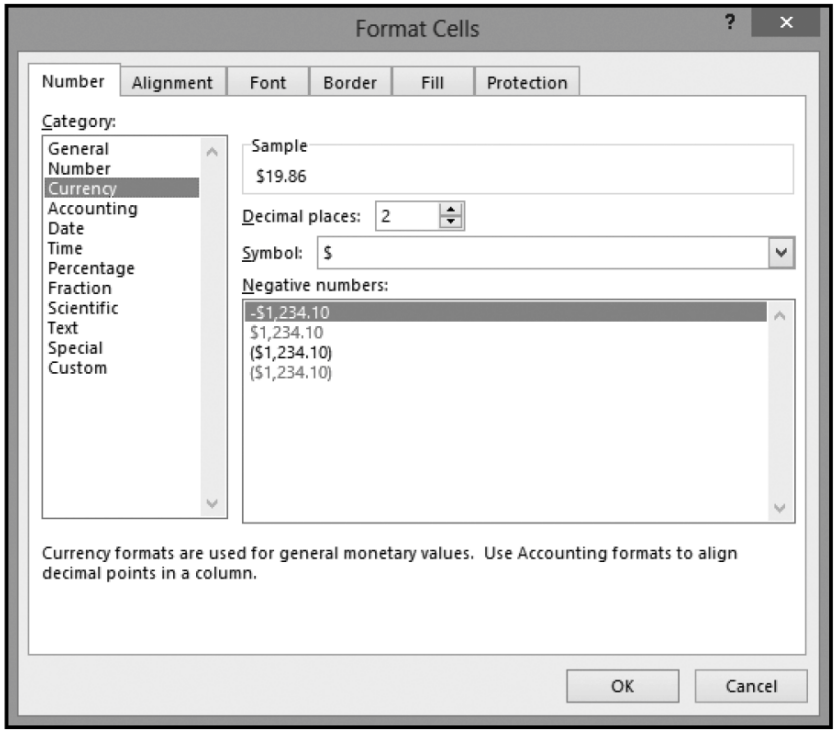
Error Message	Description
######	Column width of a cell is too narrow to display numeric data, or a formula in a cell results in a negative date, that is, a date prior to 1/1/1900 (dates will be discussed later in the chapter)
#NAME?	Unrecognized text in a formula
#N/A	No answer can be found
#REF!	Invalid cell reference
#VALUE!	Wrong argument type or operand
#NUM!	Invalid numeric values in a formula or function
#DIV/0!	Division by zero

Correcting Formatting Problems

- Modifying column width and row height
  - Double-click the column dividing line to make the column as wide as the longest entry
  - Drag the column dividing line to the desired width
  - Click the Format button in the Cells group on the HOME tab, click Column Width, and type the width in the Column width box
- Checking error messages (Error Alert button)
- Formatting numbers
- Inserting and aligning a title

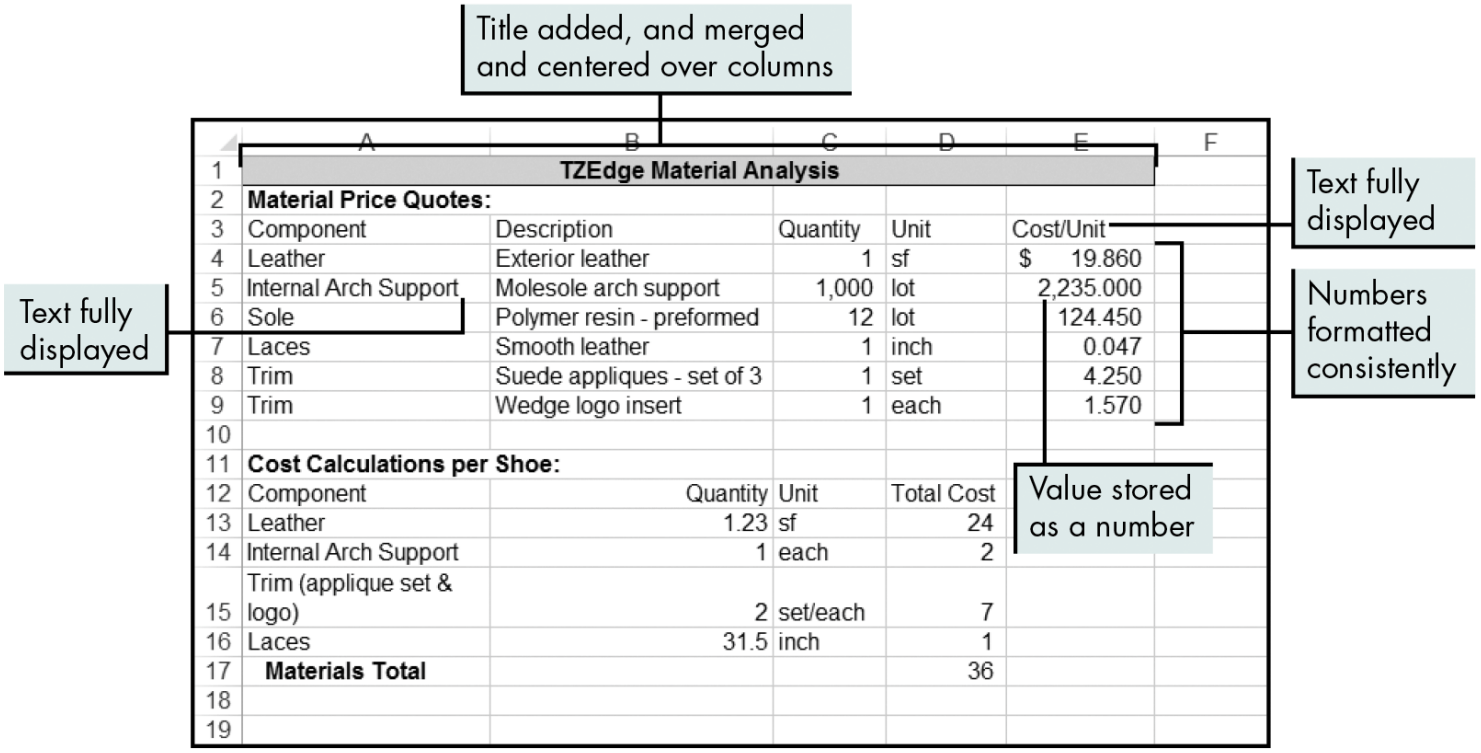
Correcting Formatting Problems (continued)

Figure 1.2: Format Cells dialog box



Correcting Formatting Problems (continued)

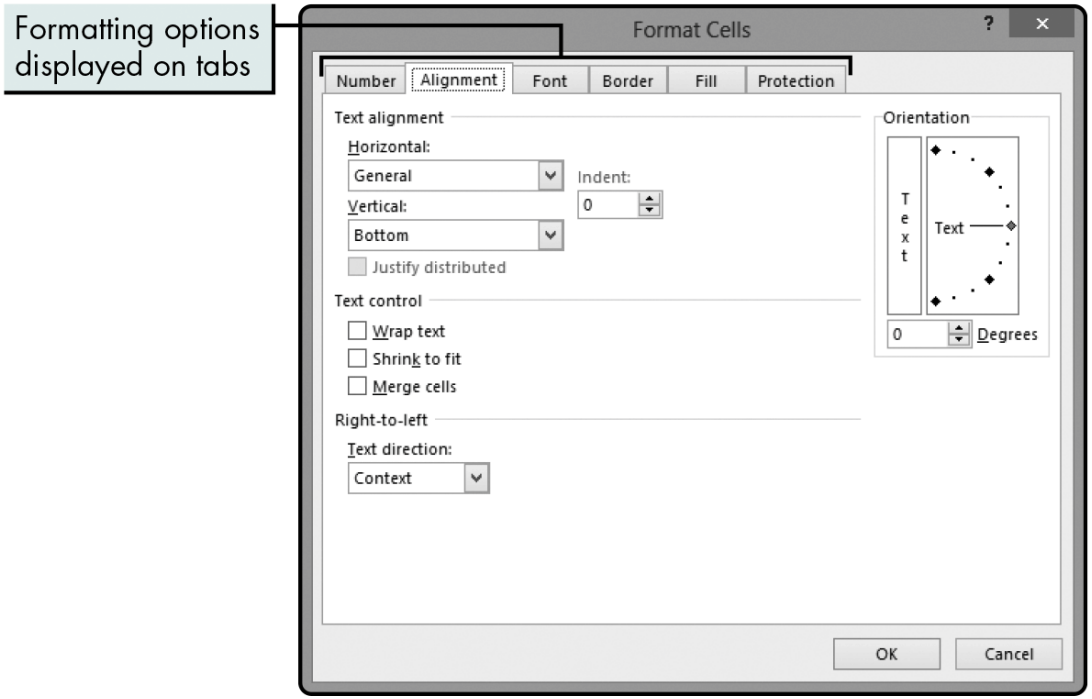
Figure 1.3: Worksheet after correcting formatting problems



	A	B	C	D	E	F
1	TZEdge Material Analysis					
2	**Material Price Quotes:**					
3	Component	Description	Quantity	Unit	Cost/Unit	
4	Leather	Exterior leather	1	sf	$ 19.860	
5	Internal Arch Support	Molesole arch support	1,000	lot	2,235.000	
6	Sole	Polymer resin - preformed	12	lot	124.450	
7	Laces	Smooth leather	1	inch	0.047	
8	Trim	Suede appliques - set of 3	1	set	4.250	
9	Trim	Wedge logo insert	1	each	1.570	
10						
11	**Cost Calculations per Shoe:**					
12	Component	Quantity	Unit	Total Cost		
13	Leather	1.23	sf	24		
14	Internal Arch Support	1	each	2		
15	Trim (applique set & logo)	2	set/each	7		
16	Laces	31.5	inch	1		
17	**Materials Total**			36		
18						
19						

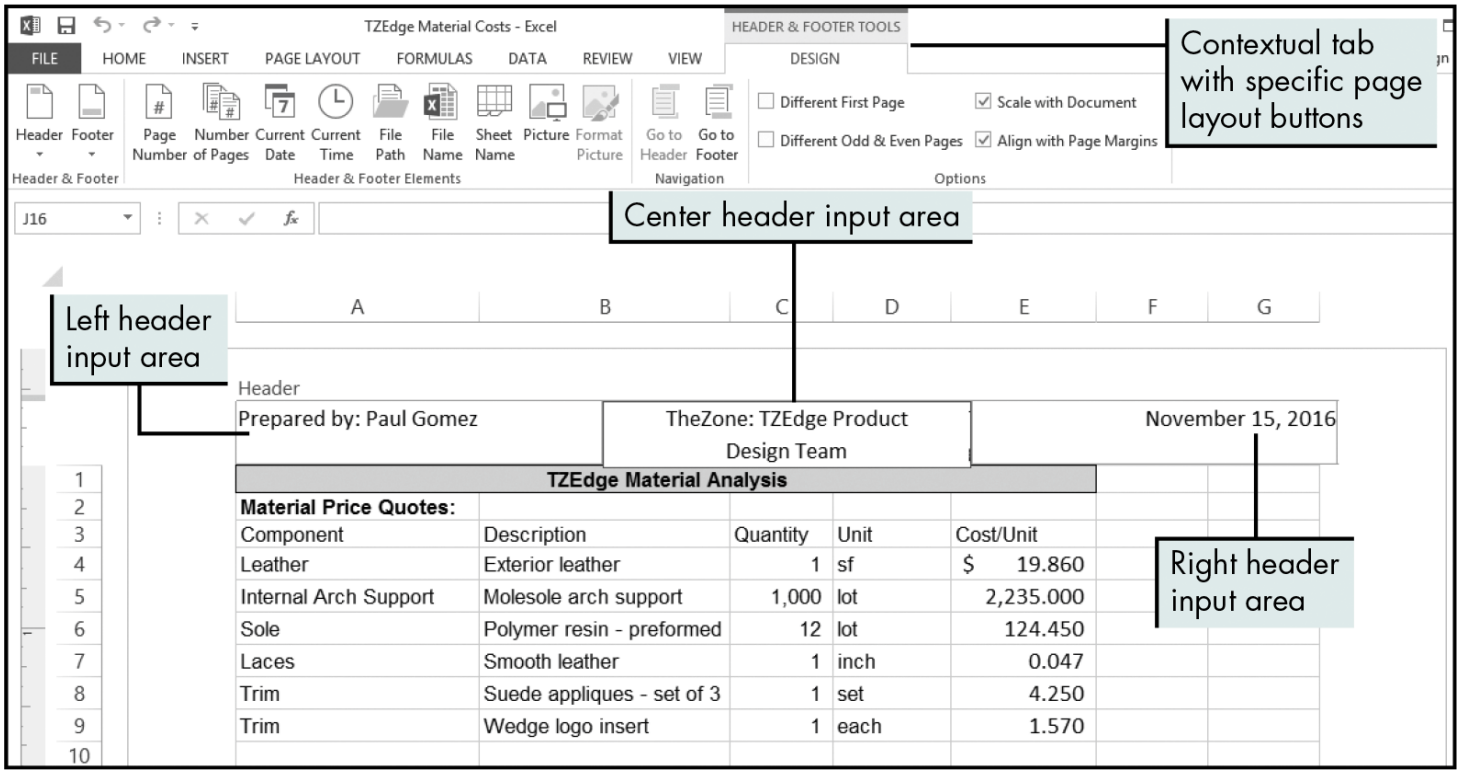
Correcting Formatting Problems (continued)

Figure 1.4: Alignment options in the Format Cells dialog box



Correcting Formatting Problems (continued)

Figure 1.5: Header in Page Layout view



Correcting Errors in Formulas

- Printing the worksheet in two different formats
  - Default format (displays values)
  - Format that displays **formulas**
- Checking simple formulas for accuracy
- Using formulas and cell references instead of values
- Determining order of precedence
- Understanding precision vs. display of cell values
- Checking accuracy in formula updates

Correcting Errors in Formulas (continued)

Table 1.2: Excel arithmetic operators

Calculation	Excel Operator	Example
Addition	+	=3+A1
Subtraction	–	=A1–A2
Multiplication	*	=A1*4
Division	/	=X4/Y4
Exponentiation	^	=2^8

Correcting Errors in Formulas (continued)

Table 1.3: Order of precedence rules

Order of Precedence	Example	Resulting Value	Explanation
1. Operations in parentheses	=A1*(3+5)	If A1=2, the resulting value is 2*(3+5) → 2*8 → 16	Excel first performs the addition of 3+5 even though multiplication has a higher precedence than addition, because the addition operation is enclosed in parentheses.
2. Exponentiation	=3*A1^3	If A1=2, the resulting value is 3*2^3 → 3*8 → 24	Excel first performs the exponential operation of cubing A1, and then performs the multiplication.
3. Multiplication and division from left to right	=A1+B2*C3	If A1=2, B2=3, and C3=10, the resulting value is 2+3*10 → 2+30 → 32	Excel first multiplies cell B2 by cell C3, and then adds the result to cell A1.
4. Addition and subtraction from left to right	=A1–B2+C3/10	If A1=2, B2=3, and C3=10, the resulting value is 2–3+10/10 → 2–3+1 → –1+1 → 0	Excel first divides cell C3 by 10, then subtracts B2 from cell A1, and finally adds this value to the quotient.

Correcting Errors in Formulas (continued)

- Excel can display values in several different formats without changing the **precise value** stored in the program

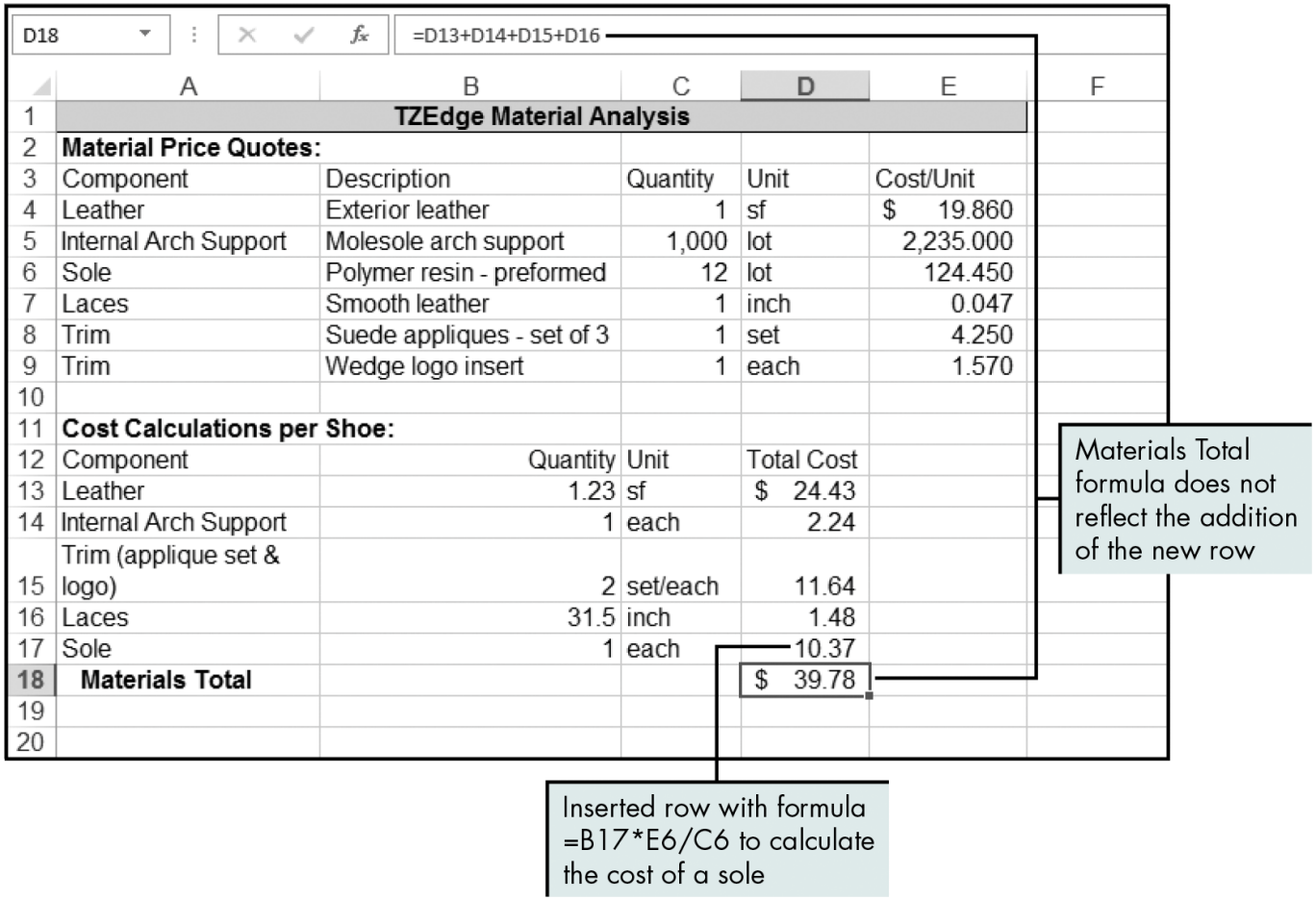
Correcting Errors in Formulas (continued)

Table 1.4: Formats for displaying values

Description	Display	Actual Value Stored	Example
Display varying number of decimal places	2	2.201 (stored in cell B2)	=100*B2 results in the value 220.1
Display using percent	5%	0.05 (stored in cell B3)	=100*B3 results in the value 5
Date display	12/31/2016	42735 (stored in cell B4)	=B4+1 results in the value 42736, or if formatted as a date, displays 1/1/2017

Correcting Errors in Formulas (continued)

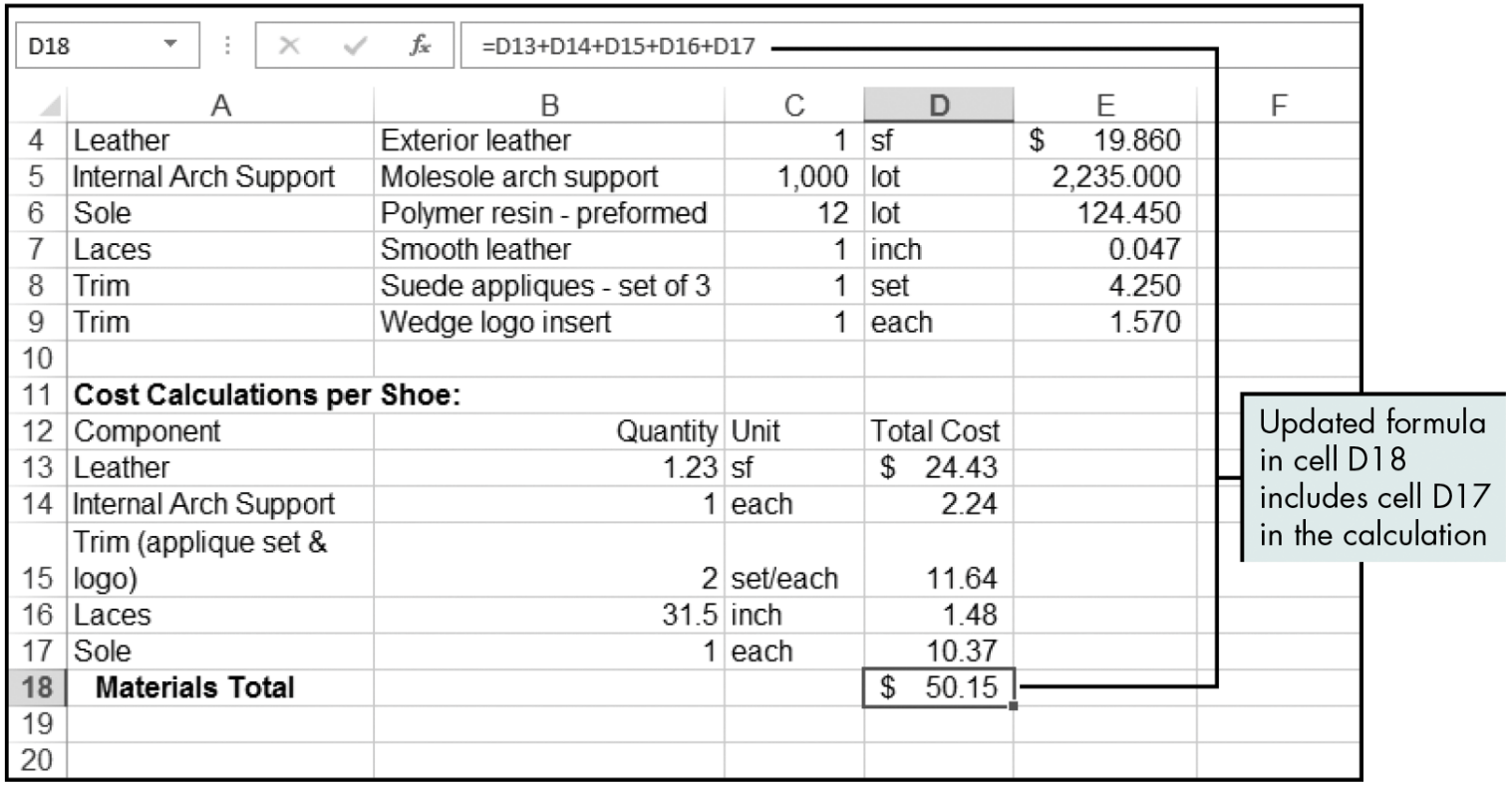
Figure 1.9: Worksheet with inserted row for sole costs



	A	B	C	D	E	F
1	TZEdge Material Analysis					
2	**Material Price Quotes:**					
3	Component	Description	Quantity	Unit	Cost/Unit	
4	Leather	Exterior leather	1	sf	$ 19.860	
5	Internal Arch Support	Molesole arch support	1,000	lot	2,235.000	
6	Sole	Polymer resin - preformed	12	lot	124.450	
7	Laces	Smooth leather	1	inch	0.047	
8	Trim	Suede appliques - set of 3	1	set	4.250	
9	Trim	Wedge logo insert	1	each	1.570	
10						
11	**Cost Calculations per Shoe:**					
12	Component	Quantity	Unit	Total Cost		
13	Leather	1.23	sf	$ 24.43		
14	Internal Arch Support	1	each	2.24		
15	Trim (applique set & logo)	2	set/each	11.64		
16	Laces	31.5	inch	1.48		
17	Sole	1	each	10.37		
18	**Materials Total**			$ 39.78		
19						
20						

Correcting Errors in Formulas (continued)

Figure 1.10: Formula modified to include new cost



	A	B	C	D	E	F
4	Leather	Exterior leather	1	sf	$ 19.860	
5	Internal Arch Support	Molesole arch support	1,000	lot	2,235.000	
6	Sole	Polymer resin - preformed	12	lot	124.450	
7	Laces	Smooth leather	1	inch	0.047	
8	Trim	Suede appliques - set of 3	1	set	4.250	
9	Trim	Wedge logo insert	1	each	1.570	
10						
11	**Cost Calculations per Shoe:**					
12	Component	Quantity	Unit	Total Cost		
13	Leather	1.23	sf	$ 24.43		
14	Internal Arch Support	1	each	2.24		
15	Trim (applique set & logo)	2	set/each	11.64		
16	Laces	31.5	inch	1.48		
17	Sole	1	each	10.37		
18	**Materials Total**			$ 50.15		
19						
20						

Level 1 Summary

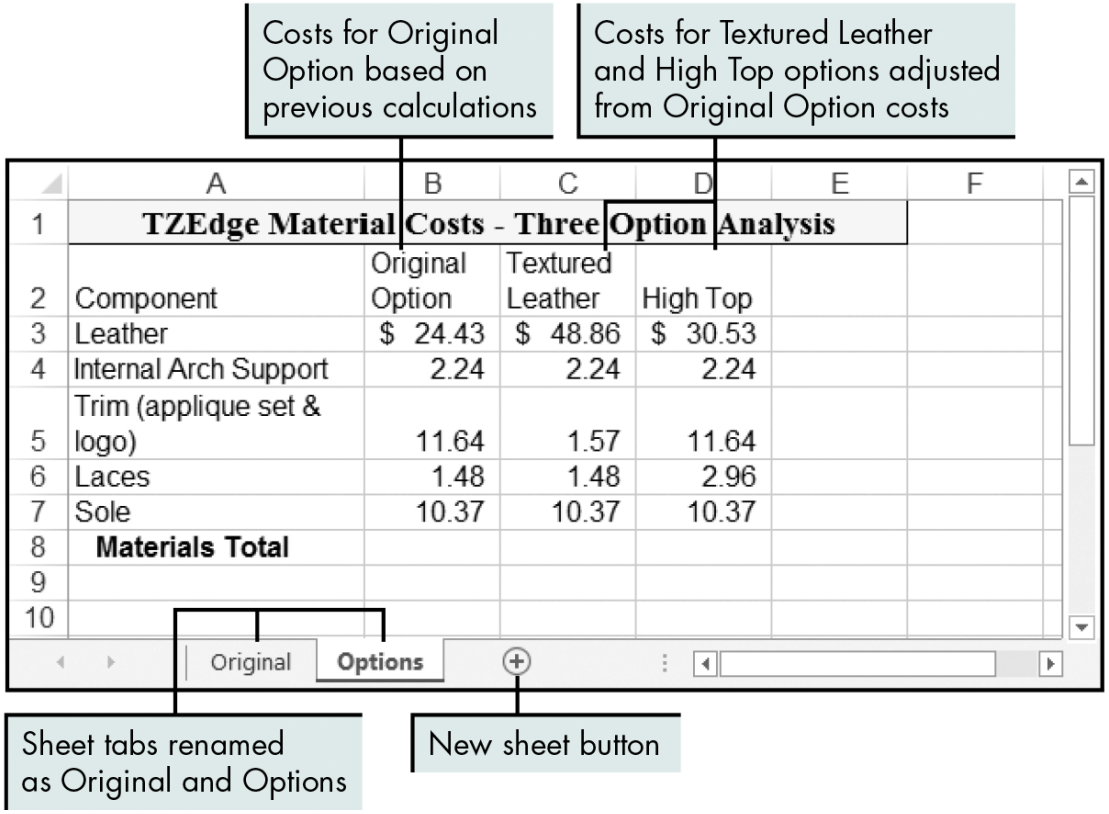
- Locating and correcting common errors in formatting or formulas to make the worksheet readable and functional

Level 2 Objectives:
Calculating and Comparing Data Using Simple Functions

- Work with multiple worksheets
- Calculate total, average, minimum, and maximum values with functions
- Understand how functions work: syntax, arguments, and algorithms
- Use the AutoSum feature to perform calculations quickly
- Calculate the number of values using both COUNT and COUNTA

Working with Multiple Worksheets

Figure 1.12: Worksheet with additional design options



Calculating Totals Using the SUM Function

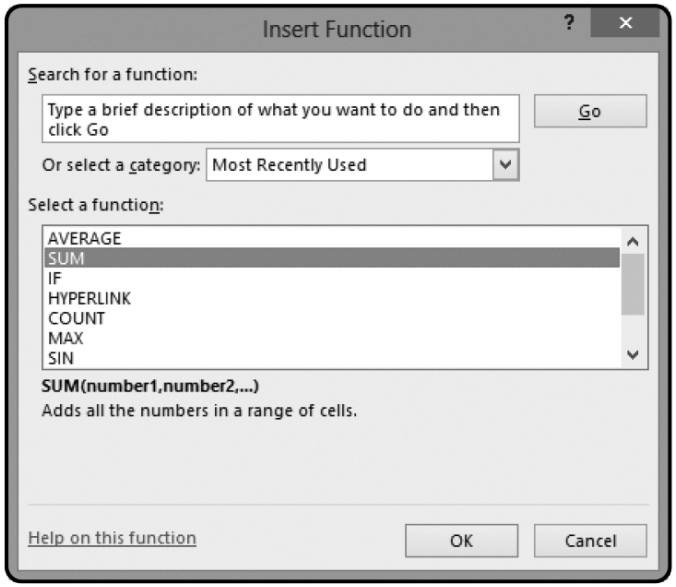
- **Function**
  - A predefined formula that performs calculations
  - Structure
    - Function name and open parenthesis mark
    - **Arguments** (list of inputs in a specific order, separated by commas)
    - Closing parenthesis mark
  - Has its own **syntax** (specifies function name and order of arguments)
  - Behaves according to its **algorithm** (rules programmed into the function)

Calculating Totals Using the SUM Function (continued)

- **SUM function**
  - Adds a list of values and/or **cell ranges**
- Excel has an **AutoSum** feature for quick calculation

Calculating Totals Using the SUM Function (continued)

Figure 1.13: Insert Function dialog box



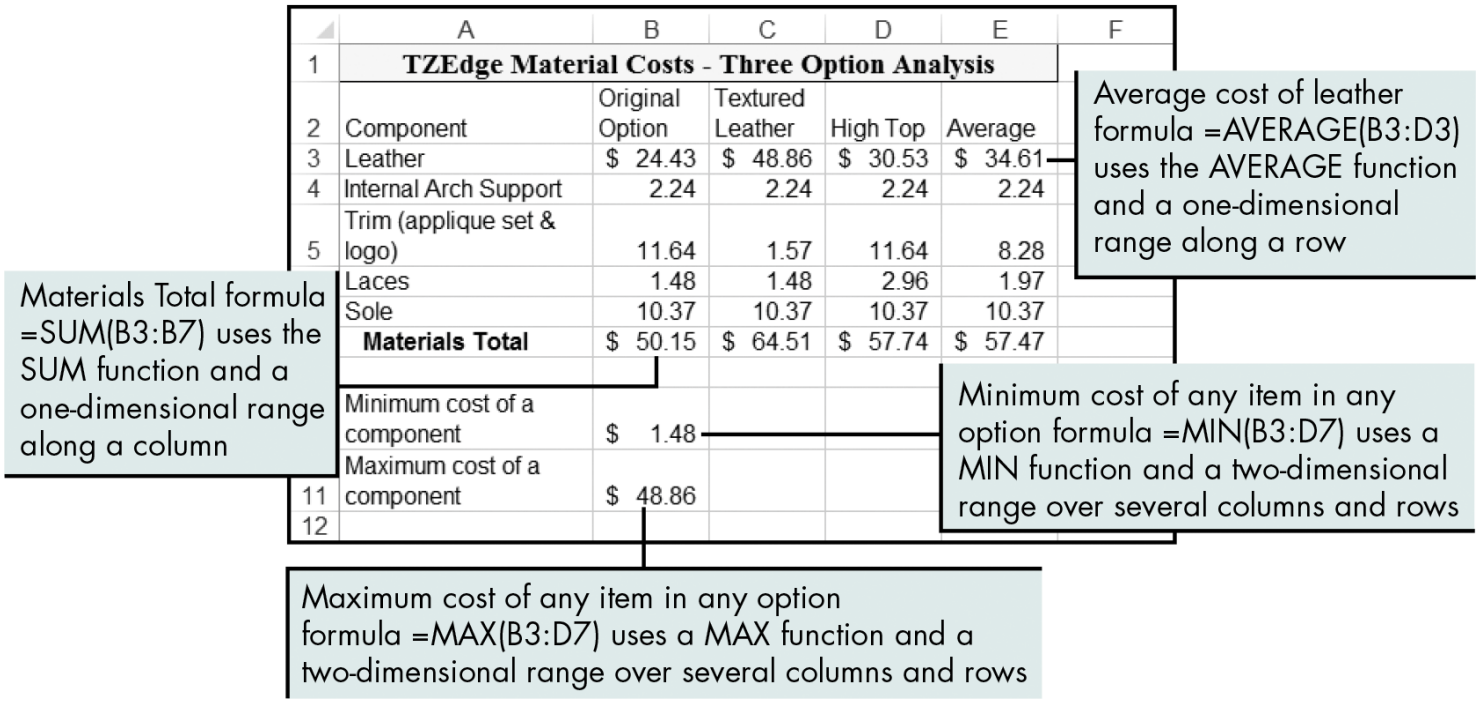
Calculating Totals Using the SUM Function (continued)

Table 1.5: Commonly used Excel functions

Function (arguments)	Description
SUM(number1,[number2],…)	Calculates the sum of a list of values
AVERAGE(number1, [number2],…)	Calculates the average value of a list of values
MIN(number1, [number2],…)	Calculates the minimum value in a list of values
MAX(number1, [number2],…)	Calculates the maximum value in a list of values
COUNT(number1, [number2],…)	Determines the number of values in a list

Calculating Average, Minimum, and Maximum Values

Figure 1.14: Worksheet revised to include sum, average, minimum, and maximum costs

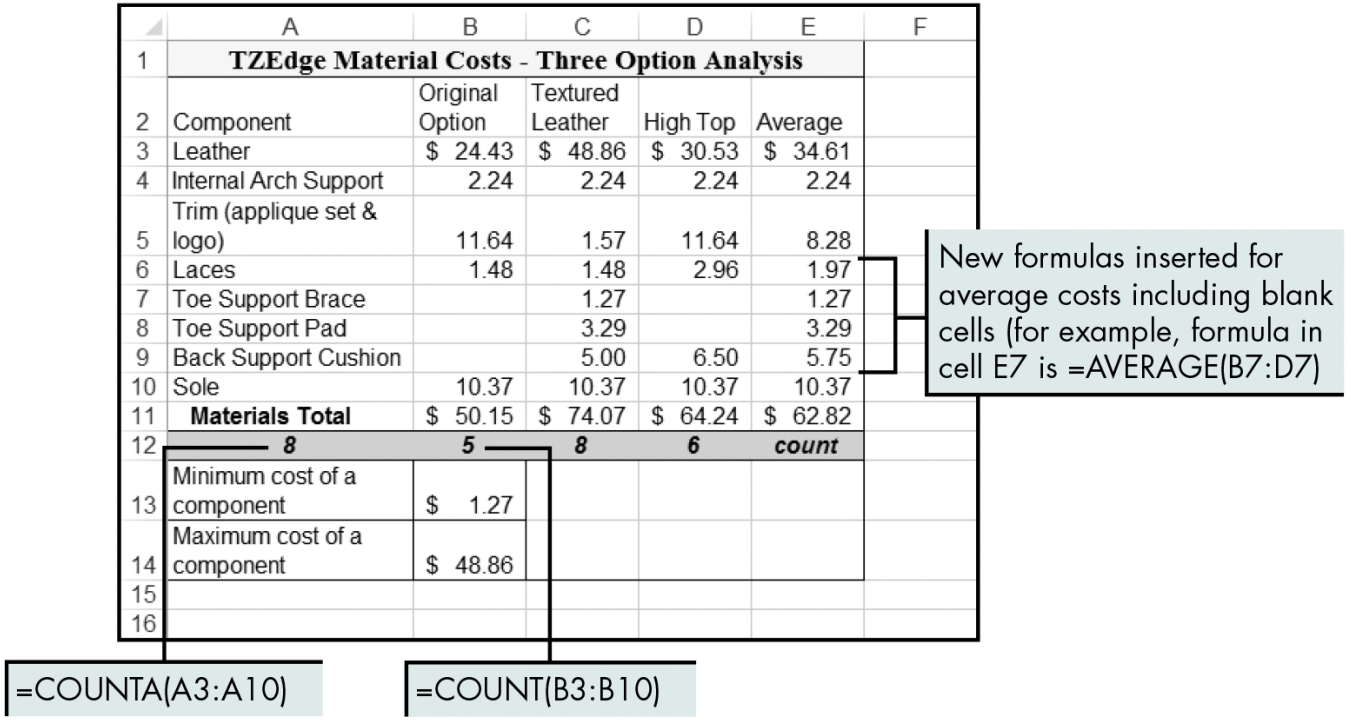


	A	B	C	D	E	F
1	**TZEdge Material Costs - Three Option Analysis**					
2	Component	Original Option	Textured Leather	High Top	Average	
3	Leather	$ 24.43	$ 48.86	$ 30.53	$ 34.61	
4	Internal Arch Support	2.24	2.24	2.24	2.24	
5	Trim (applique set & logo)	11.64	1.57	11.64	8.28	
	Laces	1.48	1.48	2.96	1.97	
	Sole	10.37	10.37	10.37	10.37	
	Materials Total	$ 50.15	$ 64.51	$ 57.74	$ 57.47	
	Minimum cost of a component	$ 1.48				
11	Maximum cost of a component	$ 48.86				
12						

The AVERAGE function ignores blank cells and cells with text.

Calculating the Number of Values Using the COUNT and COUNTA Functions

Figure 1.16: Final worksheet with formatting



The COUNT function ignores blank cells and cells with text; the COUNTA function does not ignore text cells.

Level 2 Summary

- Simple functions (SUM, AVERAGE) and how to use them in formulas
- Syntax of functions and their underlying algorithms
- AutoSum tool

Level 3 Objectives: Analyzing Cell References When Writing and Copying Formulas

- Organize a workbook
- Understand relative, absolute, and mixed cell referencing
- Write formulas with different types of cell references
- Copy formulas with different types of cell references
- Name a cell or cell range

Creating a Budget Workbook

Table 1.6: Shoe prices and estimated sales volumes

		1stQTR	2ndQTR	3rdQTR	4thQTR
Alternative:	$/Pair	#Pairs	#Pairs	#Pairs	#Pairs
Low Priced	200	1000	1500	1700	2500
Medium Priced	225	750	1000	1100	1600
High Priced	250	350	450	480	750

Setting up a preliminary budget

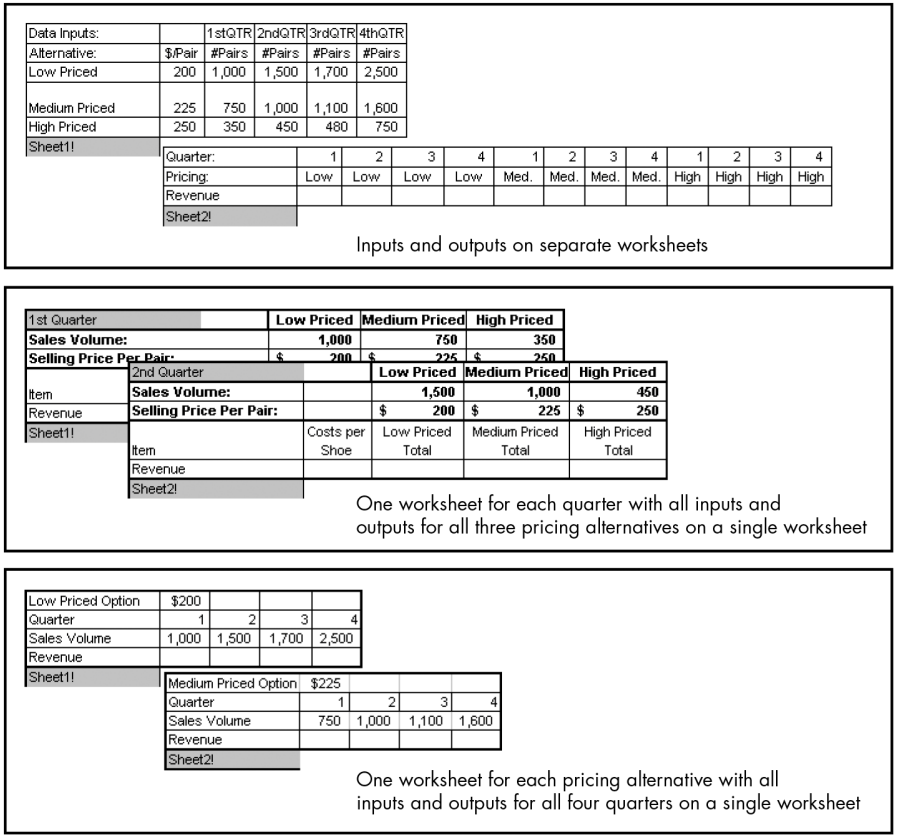
Creating a Budget Workbook (continued)

Inputs and outputs on separate worksheets

One worksheet for each quarter with all inputs and outputs for all three pricing alternatives on a single worksheet

One worksheet for each pricing alternative with all inputs and outputs for all four quarters on a single worksheet

Figure 1.18: Possible workbook designs



Data Inputs:		1stQTR	2ndQTR	3rdQTR	4thQTR
Alternative:	$/Pair	#Pairs	#Pairs	#Pairs	#Pairs
Low Priced	200	1,000	1,500	1,700	2,500
Medium Priced	225	750	1,000	1,100	1,600
High Priced	250	350	450	480	750
Sheet1!					

Quarter:	1	2	3	4	1	2	3	4	1	2	3	4
Pricing:	Low	Low	Low	Low	Med.	Med.	Med.	Med.	High	High	High	High
Revenue												
Sheet2!												

Inputs and outputs on separate worksheets

1st Quarter	Low Priced	Medium Priced	High Priced
Sales Volume:	1,000	750	350
Selling Price Per Pair:	$ 200	$ 225	$ 250

2nd Quarter		Low Priced	Medium Priced	High Priced
Sales Volume:		1,500	1,000	450
Selling Price Per Pair:		$ 200	$ 225	$ 250
Item	Costs per Shoe	Low Priced Total	Medium Priced Total	High Priced Total
Revenue				
Sheet2!				

Item	Revenue	Sheet1!

One worksheet for each quarter with all inputs and outputs for all three pricing alternatives on a single worksheet

Low Priced Option	$200			
Quarter	1	2	3	4
Sales Volume	1,000	1,500	1,700	2,500
Revenue				
Sheet1!				

Medium Priced Option	$225			
Quarter	1	2	3	4
Sales Volume	750	1,000	1,100	1,600
Revenue				
Sheet2!				

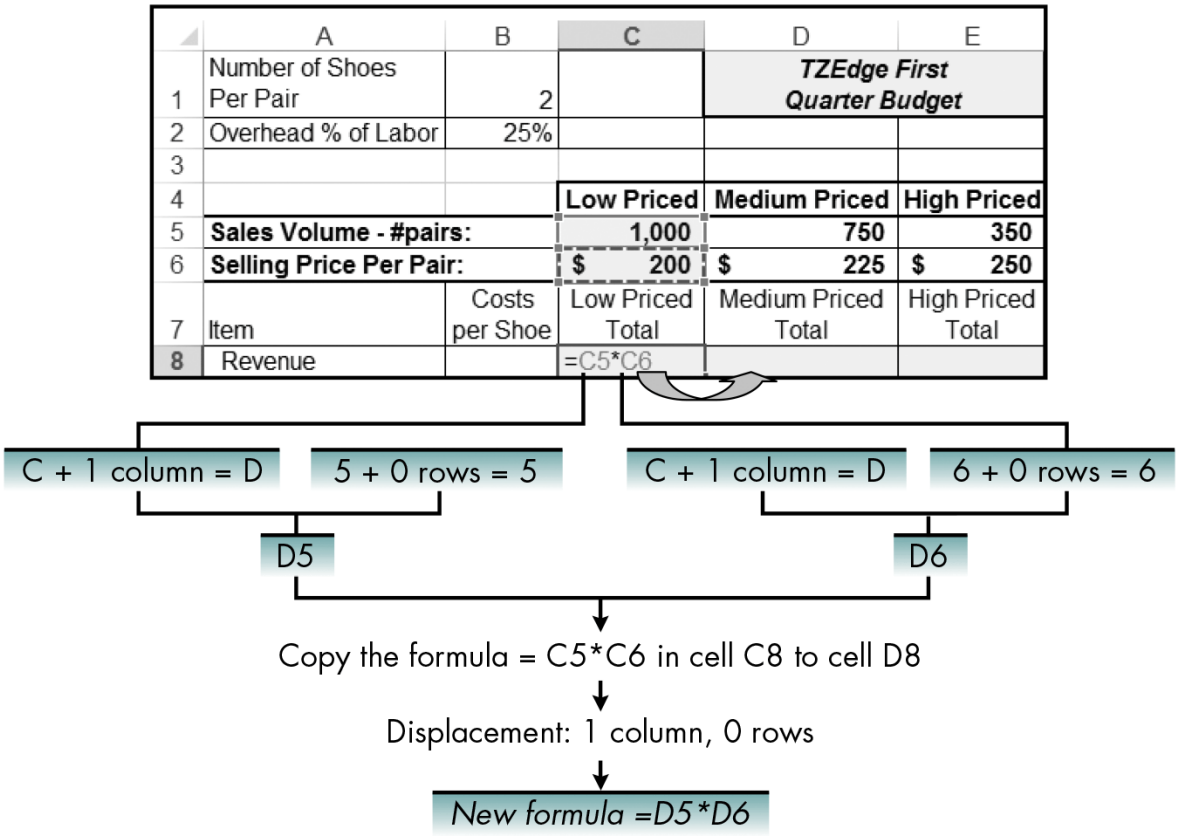
One worksheet for each pricing alternative with all inputs and outputs for all four quarters on a single worksheet

Understanding Relative Cell Referencing

- **Relative cell referencing**
  - Allows use of a "general" formula over and over again, but with a different set of numbers
  - Can also copy formulas using the **fill handle**

Understanding Relative Cell Referencing (continued)

Figure 1.20: Copying formulas with relative cell references



Excel automatically alters the new formula relative to the location of the original formula.

Understanding Absolute and Mixed Cell Referencing

- **Absolute cell referencing**
  - Indicates that a cell reference (both column and row)—or even a part of a cell reference—should remain unchanged when copying
  - Syntax: $ before column letter, before reference number, or both
- **Mixed cell reference**
  - A cell reference that has only one $
  - Common when you need to copy a formula both down a column and across a row at the same time

Understanding Absolute and Mixed Cell Referencing (continued)

The formula entered in cell C11 applies absolute and mixed cell referencing.

Figure 1.22: Using absolute and mixed cell referencing

=B1*B11*C5 ⟶ B1*$B11*C$5

	A	B	C	D	E	F
1	Number of Shoes Per Pair	2		*TZEdge First Quarter Budget*		
2	Overhead % of Labor	25%				
3						
4			**Low Priced**	**Medium Priced**	**High Priced**	
5	**Sales Volume - #pairs:**		**1,000**	**750**	**350**	
6	**Selling Price Per Pair:**		**$ 200**	**$ 225**	**$ 250**	
7	Item	Costs per Shoe	Low Priced Total	Medium Priced Total	High Priced Total	
8	Revenue		$ 200,000	$ 168,750	$ 87,500	
9						
10	Cost of Goods Sold:					
11	Materials	$ 50.15	=B1*$B11*C$5			
12	Direct Labor	7.33				
13	Overhead	1.83				
14	COGS Subtotal					
15						
16	Selling Expense	5.00				
17						
18	*Projected Earnings*					
19						
20						

=Number of Shoes Per Pair * Materials costs per shoe * Low Priced Sales Volume

This number of shoes per pair is always constant. It will not vary when copied across the row or down the column.

B1

The Materials costs per shoe will not vary when copied across the row; however, when copying the formula down the column, the other costs (Direct Labor, Direct Overhead) should be substituted for the Materials value. The column will not change, but the row will.

$B11

Sales Volume will vary when copied across the row for the medium- or high- priced alternatives; however, when copying the formulas down the column, the Sales Volume will remain constant when calculating Materials, Direct Labor, or Overhead costs. The column will change, but the row will not.

C$5

Understanding Absolute and Mixed Cell Referencing (continued)

- Other cell referencing techniques:
  - Naming a cell or cell range
  - Writing a formula to subtotal the cost of goods sold
  - Writing a formula to calculate selling expense
  - Writing a formula to calculate projected earnings

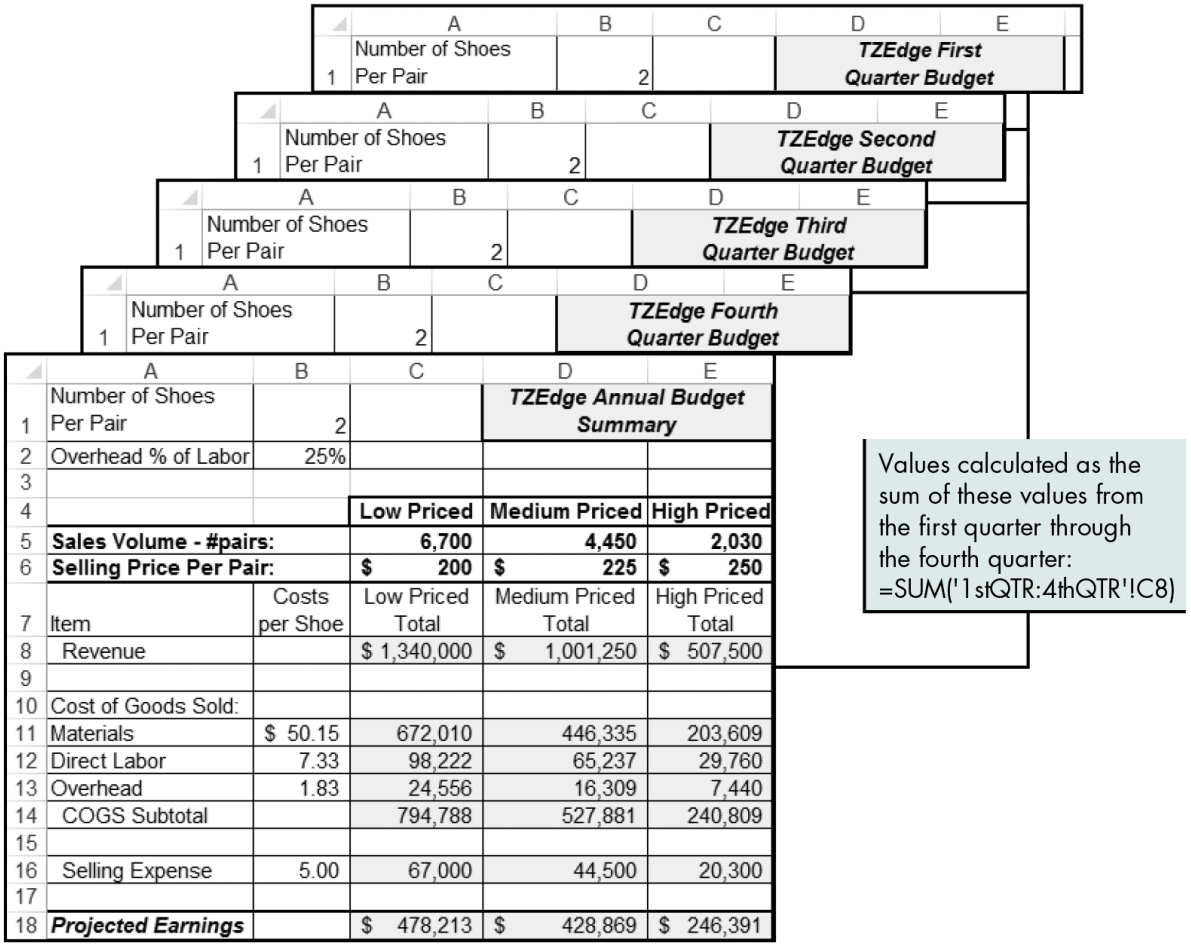
Understanding Absolute and Mixed Cell Referencing (continued)

Figure 1.24: Finished first quarter budget

	A	B	C	D	E	F
1	Number of Shoes Per Pair	2		*TZEdge First Quarter Budget*		
2	Overhead % of Labor	25%				
3						
4			**Low Priced**	**Medium Priced**	**High Priced**	
5	**Sales Volume - #pairs:**		**1,000**	**750**	**350**	
6	**Selling Price Per Pair:**		**$ 200**	**$ 225**	**$ 250**	
7	Item	Costs per Shoe	Low Priced Total	Medium Priced Total	High Priced Total	
8	Revenue		$ 200,000	$ 168,750	$ 87,500	
9						
10	Cost of Goods Sold:					
11	Materials	$ 50.15	100,300	75,225	35,105	
12	Direct Labor	7.33	14,660	10,995	5,131	
13	Overhead	1.83	3,665	2,749	1,283	
14	COGS Subtotal		118,625	88,969	41,519	
15						
16	Selling Expense	5.00	10,000	7,500	3,500	
17						
18	***Projected Earnings***		$ 71,375	$ 72,281	$ 42,481	
19						
20						

Understanding Absolute and Mixed Cell Referencing (continued)

Figure 1.25: Annual budget summary



	A	B	C	D	E
1	Number of Shoes Per Pair	2		*TZEdge First Quarter Budget*	

	A	B	C	D	E
1	Number of Shoes Per Pair	2		*TZEdge Second Quarter Budget*	

	A	B	C	D	E
1	Number of Shoes Per Pair	2		*TZEdge Third Quarter Budget*	

	A	B	C	D	E
1	Number of Shoes Per Pair	2		*TZEdge Fourth Quarter Budget*	

	A	B	C	D	E
1	Number of Shoes Per Pair	2		*TZEdge Annual Budget Summary*	
2	Overhead % of Labor	25%			
3					
4			**Low Priced**	**Medium Priced**	**High Priced**
5	**Sales Volume - #pairs:**		**6,700**	**4,450**	**2,030**
6	**Selling Price Per Pair:**		**$ 200**	**$ 225**	**$ 250**
7	Item	Costs per Shoe	Low Priced Total	Medium Priced Total	High Priced Total
8	Revenue		$ 1,340,000	$ 1,001,250	$ 507,500
9					
10	Cost of Goods Sold:				
11	Materials	$ 50.15	672,010	446,335	203,609
12	Direct Labor	7.33	98,222	65,237	29,760
13	Overhead	1.83	24,556	16,309	7,440
14	COGS Subtotal		794,788	527,881	240,809
15					
16	Selling Expense	5.00	67,000	44,500	20,300
17					
18	***Projected Earnings***		$ 478,213	$ 428,869	$ 246,391

Values calculated as the sum of these values from the first quarter through the fourth quarter: =SUM('1stQTR:4thQTR'!C8)

Level 3 Summary

- Writing and copying formulas
- Relative, absolute, and mixed cell references

Chapter Summary

- Identifying and correcting common errors in formatting and formulas
- Calculating and comparing data using simple functions
- Analyzing cell references when writing and copying formulas