MICROSOFT EXCEL



What-If Analysis

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3 Introduction

• Excel includes many powerful tools to perform complex mathematical calculations, including whatif analysis. This feature can help you experiment and answer questions with your data, even when the data is incomplete. In this lesson, you will learn how to use a what-if analysis tool called Goal Seek.

4 Goal Seek

Whenever you create a formula or function in Excel, you put various parts together to calculate a **result**. **Goal Seek** works in the opposite way: It lets you start with the **desired result**, and it calculates the **input value** that will give you that result. We'll use a few examples to show how to use Goal Seek.



Let's say you're enrolled in a class. You currently have a grade of 65, and you need at least a 70 to pass the class. Luckily, you have one final assignment that might be able to raise your average. You can use Goal Seek to find out what grade you need on the final assignment to pass the class.

In the image below, you can see that the grades on the first four assignments are **58**, **70**, **72**, and **60**. Even though we don't know what the fifth grade will be, we can write a formula—or function—that calculates the final grade. In this case, each assignment is weighted equally, so all we have to do is average all five grades by typing **=AVERAGE(B2:B6)**. Once we use Goal Seek, cell **B6** will show us the minimum grade we'll need to make on that assignment.

⁶ Using Goal Seek – Example 1

 Select the cell with the value you want to change. Whenever you use Goal Seek, you'll need to select a cell that already contains a formula or function. In our example, we'll select cell B7 because it contains the formula =AVERAGE(B2:B6).

B	7 🝷 : 🔿	≺ √ <i>f</i> ∞ =AVERAG	E(B2:B6)
	А	В	C D
1	Assignment	Grade	
2	Paper 1	58	
3	Paper 2	70	
4	Quiz	72	
5	Lab	60	
6	Final Exam		
7	Final Grade	65 ф	
8			

2. From the **Data** tab, click the **What-If Analysis** command, then select **Goal Seek** from the drop-down menu.

		Grades - Excel						F	-		×
Formulas Da	ata Rev	iew View	♀ Tell	me what yo	ou wan	t to do			Sign in	∕₽ Sh	are
Connections Properties Content Content Conte	2↓ ZAZ	Filter	Clear Reapply Advanced	Text to Columns	₩ ••• • ≈ ≈	⊪ ⊮	What-If Analysis *	Forecast Sheet	Outline •		
onnections		Sort & Filter		Data	a Tools		Scer	ario Man	ager		^
VERAGE(B2:B6)							<u>G</u> oal	Seek			~
с	D	E	F	G	н			J	N	L	-

3. A dialog box will appear with three fields. The first field, **Set cell:**, will contain the desired result. In our example, cell **B7** is already selected.

The second field, **To value:**, is the desired result. In our example, we'll enter **70** because we need to earn at least that to pass the class.

The third field, **By changing cell:**, is the cell where Goal Seek will place its answer. In our example, we'll select cell **B6** because we want to determine the grade we need to earn on the final assignment.

4. When you're done, click OK.

B6	; • ·)	≺ √ <i>f</i> ∞ =AVE	RAGE(B2	2:B6)			
	А	В		С	D	E	F
1	Assignment	Grade					
2	Paper 1	58		_			_
3	Paper 2	70		Goal	Seek	?	×
4	Quiz	72		To <u>v</u> al	ue:	70	
5	Lab	60		By <u>c</u> h	anging cell:	\$B\$6	ancel
6	Final Exam	¢			U.K.		
7	Final Grade	65					
8							

- 5. The dialog box will tell you if Goal Seek was able to find a solution. Click **OK**.
- 6. The result will appear in the specified cell. In our example, Goal Seek calculated that we will need to score at least a 90 on the final assignment to earn a passing grade.

B6

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 f_{x}

В

Grade

58

70

72

60

90

70

Ф

90

С

D

	/				А
1	/			1	Assignment
/	Goal Seek Status	?	\times	2	Paper 1
	Goal Seeking with Cell B7 found a solution.	S	tep	3	Paper 2
	Target value: 70 Current value: 70	P	ause	4	Quiz
	ок	Ca	ancel	5	Lab
				6	Final Exam
				7	Final Grade
				8	

¹⁰ Using Goal Seek – Example 2

Let's say you're planning an event and want to invite as many people as you can without exceeding a budget of \$500. We can use Goal Seek to figure out how many people to invite. In our example below, cell **B5** contains the formula **=B2+B3*B4** to calculate the total cost of a room reservation, plus the cost per person.

- Select the cell with the value you want to change. In our example, we'll select cell B5.
- 2. From the **Data** tab, click the **What-If Analysis** command, then select **Goal Seek** from the drop-down menu.

B	5 🔻 E 🗙 🕔	√ <i>f</i> _x =B2+E	33*B4		and the state of the	and free			and an and the set	Sugar Boundary	in the state of	and the second second	al month	80	-odinat	Support -
	A	В	C D				G	rades - Ex	cel				Ŧ	-		×
	Guest Bud	get		F	ormulas	Data	Revie	w Vi	iew 🛛 Tell	me what you wa	nt to do)		Sign in	Яs	hare
1	Reservation fee	\$230.00			Connectio	ns A		Filter	Clear		∦+ ∎ ⊂(⊡	What If	Formerart			
3	Price per person	\$14.50			, Edit Links	Ā	↓ Soft	Filter	Ty Advanced	Columns 🗟	- 😥	Analysis •	Sheet	*		
4	Number of guests			onr	nections	6)		Sort & Fi	ilter	Data loo	5	<u>S</u> cer <u>G</u> oa	ario Mana I Seek	ager		~
5	Budget	\$230.00 ក្		VEI	KAGE(B2:E		D	F	F	G H		Data	i <u>T</u> able			Ť
								-		5 II	120			K		

3. A dialog box will appear with three fields. The first field, **Set cell:**, will contain the desired result. In our example, cell **B5** is already selected.

The second field, **To value:**, is the desired result. In our example, we'll enter **500** because we only want to spend \$500.

The third field, **By changing cell:**, is the cell where Goal Seek will place its answer. In our example, we'll select cell **B4** because we want to know how many guests we can invite without spending more than \$500.

4. When/you're done, click **OK**.



¹² Using Goal Seek – Example 2

- 5. The dialog box will tell you if Goal Seek was able to find a solution. Click **OK**.
- 6. The result will appear in the specified cell. In our example, Goal Seek calculated the answer to be approximately 18.62. In this case, our final answer needs to be a whole number, so we'll need to round the answer up or down. Because rounding up would cause us to exceed our budget, we'll round down to 18 guests.

	B 4	• E × 4	<i>f</i> _x 18.62	068965517	24
		А	В	с	D
1	1	Guest Bud	get		
	2	Reservation fee	\$230.00		
	3	Price per person	\$14.50		
	4	Number of guests	18.6207 ₀		
	5	Budget	\$500.00		
	6				

As you can see in the example above, some situations will require the answer to be a whole number. If Goal Seek gives you a decimal, you'll need to **round up or down**, depending on the situation.

13 Other types what-if analysis

For more advanced projects, you may want to consider the other types of what-if analysis: scenarios and data tables. Instead of starting from the desired result and working backward, like with Goal Seek, these options allow you to test multiple values and see how the results change.

14 Other types what-if analysis

 Scenarios let you substitute values for multiple cells (up to 32) at the same time. You can create as many scenarios as you want and then compare them without changing the values manually. In the example below, we're using scenarios to compare different venues for an upcoming event.

BS	5 • I × •	<i>f</i> _x =B2+E	33*B4						
	А	В	с	D	Е	F	G	Н	1
1	Guest Bud	get		Scenario Ma	nager			?	×
2	Reservation fee	\$0.00		S <u>c</u> enarios:	(12 Currents 1	()			
3	Price per person	\$30.00		Luella's BBC Casa Lloma ((No deposit (No deposit (Hourly Rate)	nax))		d lete	
4	Number of guests	21					Ed	it	
5	Budget	\$630.00					Mer	ge	
6							∨ S <u>u</u> mr	nary	
7				Changing ce Comment:	lls: \$B\$2:\$E	3\$3			
8									
9							<u>S</u> how	Close	
10							ЬĞ		_

15 Other types what-if analysis

• Data tables allow you to take one or two variables in a formula and replace them with as many different values as you want, then view the results in a table. This option is especially powerful because it shows multiple results at the same time, unlike scenarios or Goal Seek. In the example below, we can view 24 possible results for a car loan.

Loan Amount	20000					
Term (months)	60					
Interest Rate						
Payment	(\$333.33)	36	48	60	72	
	5.5%	-\$603.92	-\$465.13	-\$382.02	-\$326.76	
	6.0%	-\$608.44	-\$469.70	-\$386.66	-\$331.46	
	6.5%	-\$612.98	-\$474.30	-\$391.32	-\$336.20	
	7.0%	-\$617.54	-\$478.92	-\$396.02	-\$340.98	
	7.5%	-\$622.12	-\$483.58	-\$400.76	-\$345.80	
	8.0%	-\$626.73	-\$488.26	-\$405.53	-\$350.66	
				A REPORT OF THE OWNER.		

¹⁶ Practice

- Open our practice workbook.
- Click the Challenge tab in the bottom-left of the workbook.
- In cell B8, create a function that calculates the average of the sales in B2:B7.
- The workbook shows Dave's monthly sales amounts for the first half of the year. If he reaches a \$200,000 mid-year average, he will receive a 5% bonus. Use **Goal Seek** to find how much he needs to sell in June in order to make the \$200,000 average.

17 Solution

	А	В
1	Month	Sales
2	January	\$157,274.00
3	February	\$187,349.00
4	March	\$179,291.00
5	April	\$202,025.00
6	May	\$212,685.00
7	June	\$261,376.00
8	Mid-Year Average	\$200,000.00

