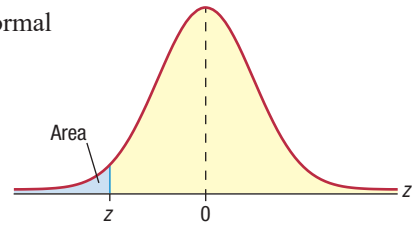
A Standard Normal Distribution

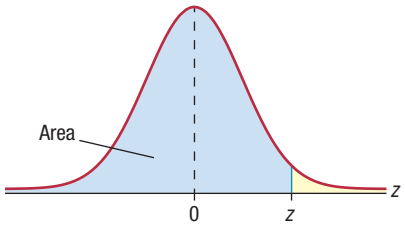
Numerical entries represent the probability that a standard normal random variable is between $-\infty$ and z, where $z = \frac{x-\mu}{\sigma}$.



z	0.09	0.08	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.00
–3.4	0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
–3.3	0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005
–3.2	0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007
–3.1	0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010
–3.0	0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013
–2.9	0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019
–2.8	0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026
–2.7	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035
–2.6	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047
–2.5	0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062
–2.4	0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082
–2.3	0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107
–2.2	0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139
–2.1	0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179
–2.0	0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228
–1.9	0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287
–1.8	0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359
–1.7	0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446
–1.6	0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548
–1.5	0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668
–1.4	0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808
–1.3	0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968
–1.2	0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151
–1.1	0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357
–1.0	0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587
–0.9	0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841
–0.8	0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119
–0.7	0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420
–0.6	0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743
–0.5	0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085
–0.4	0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446
–0.3	0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821
–0.2	0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207
–0.1	0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602
–0.0	0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000

B Standard Normal Distribution

Numerical entries represent the probability that a standard normal random variable is between $-\infty$ and z, where $z = \frac{x - \mu}{\sigma}$.



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

C Critical Values of the Pearson Correlation Coefficient

n	$\alpha = 0.05$	$\alpha = 0.01$
4	0.950	0.990
5	0.878	0.959
6	0.811	0.917
7	0.754	0.875
8	0.707	0.834
9	0.666	0.798
10	0.632	0.765
11	0.602	0.735
12	0.576	0.708
13	0.553	0.684
14	0.532	0.661
15	0.514	0.641
16	0.497	0.623
17	0.482	0.606
18	0.468	0.590
19	0.456	0.575
20	0.444	0.561
21	0.433	0.549
22	0.423	0.537
23	0.413	0.526
24	0.404	0.515
25	0.396	0.505
26	0.388	0.496
27	0.381	0.487
28	0.374	0.479
29	0.367	0.471
30	0.361	0.463
35	0.334	0.430
40	0.312	0.403
45	0.294	0.380
50	0.279	0.361
55	0.266	0.345
60	0.254	0.330
65	0.244	0.317
70	0.235	0.306
75	0.227	0.296
80	0.220	0.286
85	0.213	0.278
90	0.207	0.270
95	0.202	0.263
100	0.197	0.256

Note: r is statistically significant if $|r|$ is greater than or equal to the value given in the table.

Tax Forms

Form 1040 (2020)

Form **1040** Department of the Treasury—Internal Revenue Service (99) U.S. Individual Income Tax Return **2020** OMB No. 1545-0074 IRS Use Only—Do not write or staple in this space.

Filing Status Check only one box. ☐ Single ☐ Married filing jointly ☐ Married filing separately (MFS) ☐ Head of household (HOH) ☐ Qualifying widow(er) (QW)

If you checked the MFS box, enter the name of your spouse. If you checked the HOH or QW box, enter the child's name if the qualifying person is a child but not your dependent ►

Your first name and middle initial	Last name	**Your social security number**
If joint return, spouse's first name and middle initial	Last name	**Spouse's social security number**

Home address (number and street). If you have a P.O. box, see instructions.	Apt. no.	**Presidential Election Campaign** Check here if you, or your spouse if filing jointly, want $3 to go to this fund. Checking a box below will not change your tax or refund. ☐ **You** ☐ **Spouse**
City, town, or post office. If you have a foreign address, also complete spaces below. State ZIP code		
Foreign country name / Foreign province/state/county / Foreign postal code		

At any time during 2020, did you receive, sell, send, exchange, or otherwise acquire any financial interest in any virtual currency? ☐ **Yes** ☐ **No**

Standard Deduction **Someone can claim:** ☐ You as a dependent ☐ Your spouse as a dependent ☐ Spouse itemizes on a separate return or you were a dual-status alien

Age/Blindness **You:** ☐ Were born before January 2, 1956 ☐ Are blind **Spouse:** ☐ Was born before January 2, 1956 ☐ Is blind

Dependents (see instructions): If more than four dependents, see instructions and check here ► ☐

(1) First name Last name	(2) Social security number	(3) Relationship to you	(4) ✔ if qualifies for (see instructions): Child tax credit	Credit for other dependents
			☐	☐
			☐	☐
			☐	☐
			☐	☐

Attach Sch. B if required.

1	Wages, salaries, tips, etc. Attach Form(s) W-2				1	
2a	Tax-exempt interest	2a		b Taxable interest	2b	
3a	Qualified dividends	3a		b Ordinary dividends	3b	
4a	IRA distributions	4a		b Taxable amount	4b	
5a	Pensions and annuities	5a		b Taxable amount	5b	
6a	Social security benefits	6a		b Taxable amount	6b	
7	Capital gain or (loss). Attach Schedule D if required. If not required, check here ► ☐				7	
8	Other income from Schedule 1, line 9				8	
9	Add lines 1, 2b, 3b, 4b, 5b, 6b, 7, and 8. This is your **total income** ►				9	
10	Adjustments to income:					
a	From Schedule 1, line 22	10a				
b	Charitable contributions if you take the standard deduction. See instructions	10b				
c	Add lines 10a and 10b. These are your **total adjustments to income** ►				10c	
11	Subtract line 10c from line 9. This is your **adjusted gross income** ►				11	
12	**Standard deduction or itemized deductions** (from Schedule A)				12	
13	Qualified business income deduction. Attach Form 8995 or Form 8995-A				13	
14	Add lines 12 and 13				14	
15	**Taxable income.** Subtract line 14 from line 11. If zero or less, enter -0-				15	

Standard Deduction for—
- Single or Married filing separately, $12,400
- Married filing jointly or Qualifying widow(er), $24,800
- Head of household, $18,650
- If you checked any box under *Standard Deduction*, see instructions.

For Disclosure, Privacy Act, and Paperwork Reduction Act Notice, see separate instructions. Cat. No. 11320B Form **1040** (2020)

Form 1040 (2020) Page **2**

	16	**Tax** (see instructions). Check if any from Form(s): **1** ☐ 8814 **2** ☐ 4972 **3** ☐ _____	**16**	
	17	Amount from Schedule 2, line 3	**17**	
	18	Add lines 16 and 17	**18**	
	19	Child tax credit or credit for other dependents	**19**	
	20	Amount from Schedule 3, line 7	**20**	
	21	Add lines 19 and 20	**21**	
	22	Subtract line 21 from line 18. If zero or less, enter -0-	**22**	
	23	Other taxes, including self-employment tax, from Schedule 2, line 10	**23**	
	24	Add lines 22 and 23. This is your **total tax** ▶	**24**	
	25	Federal income tax withheld from:		
	a	Form(s) W-2 — **25a**		
	b	Form(s) 1099 — **25b**		
	c	Other forms (see instructions) — **25c**		
	d	Add lines 25a through 25c	**25d**	
• If you have a qualifying child, attach Sch. EIC. • If you have nontaxable combat pay, see instructions.	**26**	2020 estimated tax payments and amount applied from 2019 return	**26**	
	27	Earned income credit (EIC) — **27**		
	28	Additional child tax credit. Attach Schedule 8812 — **28**		
	29	American opportunity credit from Form 8863, line 8 — **29**		
	30	Recovery rebate credit. See instructions — **30**		
	31	Amount from Schedule 3, line 13 — **31**		
	32	Add lines 27 through 31. These are your **total other payments and refundable credits** ▶	**32**	
	33	Add lines 25d, 26, and 32. These are your **total payments** ▶	**33**	
Refund	**34**	If line 33 is more than line 24, subtract line 24 from line 33. This is the amount you **overpaid**	**34**	
	35a	Amount of line 34 you want **refunded to you.** If Form 8888 is attached, check here ▶ ☐	**35a**	
Direct deposit? See instructions.	▶ **b**	Routing number ▶ **c** Type: ☐ Checking ☐ Savings		
	▶ **d**	Account number		
	36	Amount of line 34 you want **applied to your 2021 estimated tax** ▶ — **36**		
Amount You Owe For details on how to pay, see instructions.	**37**	Subtract line 33 from line 24. This is the **amount you owe now** ▶	**37**	
		Note: Schedule H and Schedule SE filers, line 37 may not represent all of the taxes you owe for 2020. See Schedule 3, line 12e, and its instructions for details.		
	38	Estimated tax penalty (see instructions) ▶ — **38**		

Third Party Designee

Do you want to allow another person to discuss this return with the IRS? See instructions ▶ ☐ **Yes.** Complete below. ☐ **No**

Designee's name ▶ | Phone no. ▶ | Personal identification number (PIN) ▶

Sign Here

Under penalties of perjury, I declare that I have examined this return and accompanying schedules and statements, and to the best of my knowledge and belief, they are true, correct, and complete. Declaration of preparer (other than taxpayer) is based on all information of which preparer has any knowledge.

Your signature	Date	Your occupation	If the IRS sent you an Identity Protection PIN, enter it here (see inst.) ▶
Spouse's signature. If a joint return, **both** must sign.	Date	Spouse's occupation	If the IRS sent your spouse an Identity Protection PIN, enter it here (see inst.) ▶
Phone no.	Email address		

Joint return? See instructions. Keep a copy for your records.

Paid Preparer Use Only

Preparer's name	Preparer's signature	Date	PTIN	Check if: ☐ Self-employed
Firm's name ▶			Phone no.	
Firm's address ▶			Firm's EIN ▶	

Go to *www.irs.gov/Form1040* for instructions and the latest information. Form **1040** (2020)

Schedule 1 (Form 1040)

SCHEDULE 1 (Form 1040)

Department of the Treasury
Internal Revenue Service

Additional Income and Adjustments to Income

▶ **Attach to Form 1040, 1040-SR, or 1040-NR.**
▶ **Go to *www.irs.gov/Form1040* for instructions and the latest information.**

OMB No. 1545-0074

2020

Attachment Sequence No. **01**

Name(s) shown on Form 1040, 1040-SR, or 1040-NR | **Your social security number**

Part I Additional Income

1	Taxable refunds, credits, or offsets of state and local income taxes	**1**	
2a	Alimony received	**2a**	
b	Date of original divorce or separation agreement (see instructions) ▶		
3	Business income or (loss). Attach Schedule C	**3**	
4	Other gains or (losses). Attach Form 4797	**4**	
5	Rental real estate, royalties, partnerships, S corporations, trusts, etc. Attach Schedule E	**5**	
6	Farm income or (loss). Attach Schedule F	**6**	
7	Unemployment compensation	**7**	
8	Other income. List type and amount ▶	**8**	
9	Combine lines 1 through 8. Enter here and on Form 1040, 1040-SR, or 1040-NR, line 8	**9**	

Part II Adjustments to Income

10	Educator expenses	**10**	
11	Certain business expenses of reservists, performing artists, and fee-basis government officials. Attach Form 2106	**11**	
12	Health savings account deduction. Attach Form 8889	**12**	
13	Moving expenses for members of the Armed Forces. Attach Form 3903	**13**	
14	Deductible part of self-employment tax. Attach Schedule SE	**14**	
15	Self-employed SEP, SIMPLE, and qualified plans	**15**	
16	Self-employed health insurance deduction	**16**	
17	Penalty on early withdrawal of savings	**17**	
18a	Alimony paid	**18a**	
b	Recipient's SSN ▶		
c	Date of original divorce or separation agreement (see instructions) ▶		
19	IRA deduction	**19**	
20	Student loan interest deduction	**20**	
21	Tuition and fees deduction. Attach Form 8917	**21**	
22	Add lines 10 through 21. These are your **adjustments to income.** Enter here and on Form 1040, 1040-SR, or 1040-NR, line 10a	**22**	

For Paperwork Reduction Act Notice, see your tax return instructions. Cat. No. 71479F **Schedule 1 (Form 1040) 2020**

Getting Started with Microsoft Excel (Desktop)

The Basics of Microsoft Office Excel 365

Microsoft Excel is a spreadsheet program that allows users to track and analyze data. Spreadsheets such as those created with Microsoft Excel are widely used in the business world to perform various tasks such as accounting, budgeting, billing, reporting, planning, and tracking. The instructions provided in this Appendix are intended for non-mobile users.

When you open Excel, you will see various tabs along the top such as File, Home, Insert, Page Layout, Formulas, Data, etc. The numerous commands and options available when working within Excel can be found under these tabs. At the bottom, there is a tab labeled Sheet1. The icon to the right of the Sheet1 tab creates a new tab with a blank spreadsheet. Tabs can be renamed by double-clicking on them and entering new text. Figure C.1 shows what a new workbook looks like when Excel is first opened.

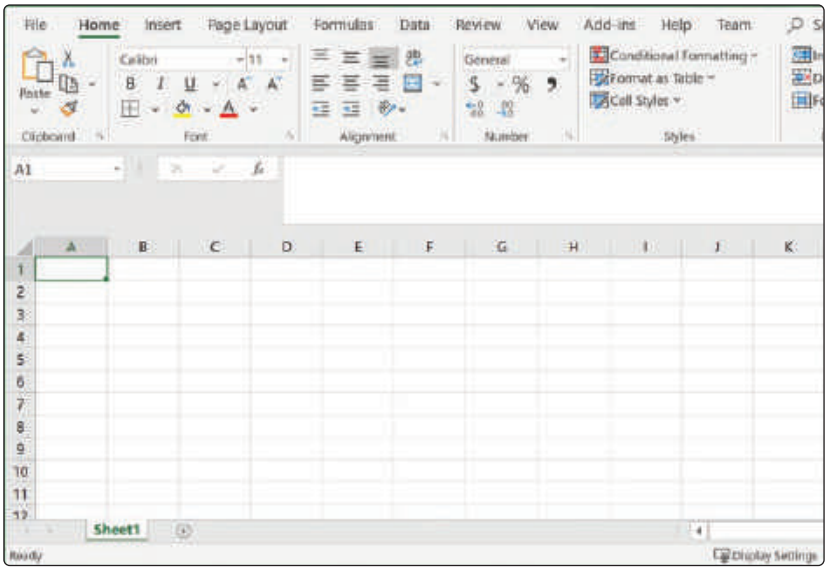


Figure C.1

Cells

Cells in Microsoft Excel may contain numerical data and/or text. The cells' locations are described by their positions in terms of columns and rows. Columns are listed from left to right across the top of the worksheet and are labeled with letters. Rows are listed from top to bottom along the left side of the worksheet and are labeled with numbers. A column letter followed by a row number describes the active cell position. For example, **B2** would be referring to the cell found in the second row of Column B (see Figure C.2). A thick solid border will outline the active cell. To help you identify the cell address, the column and row headers are also highlighted. Another way to identify the active cell's address is to look at the window just above the header for Column A.

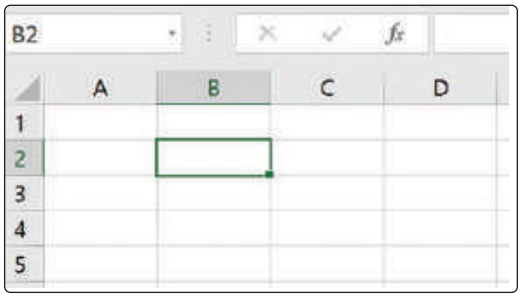


Figure C.2

The column width can be altered by placing your cursor between two column labels; when it turns into a vertical line with arrows pointing to the left and right, you can then click and drag to the left or right to make the column width larger or smaller. The same can be done with row heights. Alternatively, double-clicking between two column or row labels will autofit the row height or column width to the data it contains.

To change the active cell, move the mouse to the desired cell and click. The border will now be surrounding the new cell and the address will have changed in the active cell address window. The arrow keys can also control navigation of the active cell.

To the right of the cell address window is the formula window (labeled with f_x). This displays the contents of the active cell. The contents of the cell can be edited either within the formula window or the cell itself. Thus, as you enter data in the active cell, it is displayed within the cell and in the formula window at the top of the worksheet.

Suppose you wanted to sum the numbers 15, 10, and 3. To do this, enter the formula **=15+10+3** into cell **A1**. The equal sign, "=", is the command to start a formula in Excel. Notice that the formula is seen within in the cell as well as in the formula window (see Figure C.3a). When you press **Enter**, you will see that the active cell moves to cell **A2**, and the solution of 28 is now displayed in cell **A1** (see Figure C.3b).

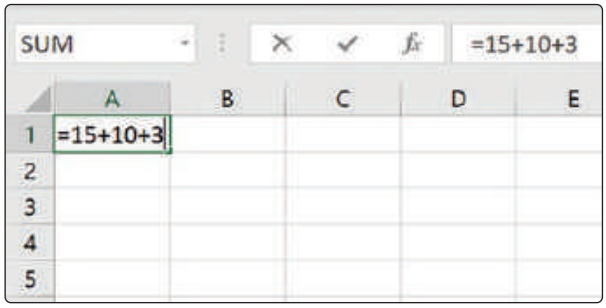


Figure C.3a

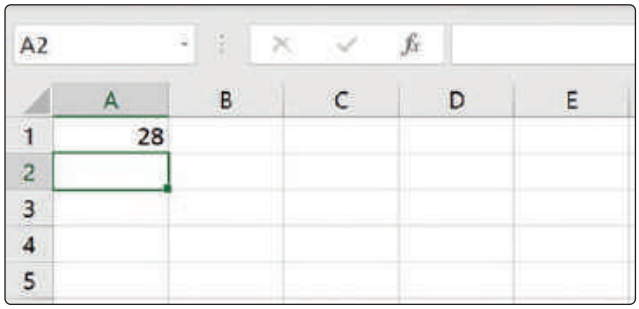


Figure C.3b

When you finish entering a formula in a cell, press **Enter**. The active cell will now move one row down. The answer to the formula, rather than the formula itself, will be displayed in the cell. Cells or data can be added, subtracted, multiplied, divided, and manipulated in any combination through formulas.

Filling Cells

Excel will try to anticipate a reoccurring word or phrase within a column. After you have entered some text in a column, if you type the first letter of a previous cell again, Excel will fill in the rest of the word or phrase. To accept the automatic completion of the word, just hit the **Enter** key or click in a new cell. If you do not want to use the automatic completion of the word, simply keep typing in the cell and the new word or phrase will appear. Under the Review tab, there is an option for Excel to spell check your spreadsheet.

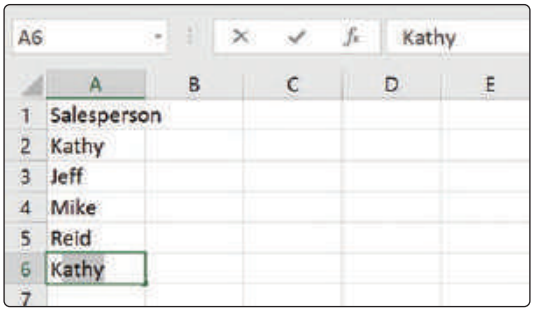


Figure C.4

Excel has a helpful tool when entering a series of data. Try entering 1 into cell **A1** and 2 into cell **A2**. Then highlight both of the cells. You will see a small square at the bottom right of the highlighted section.

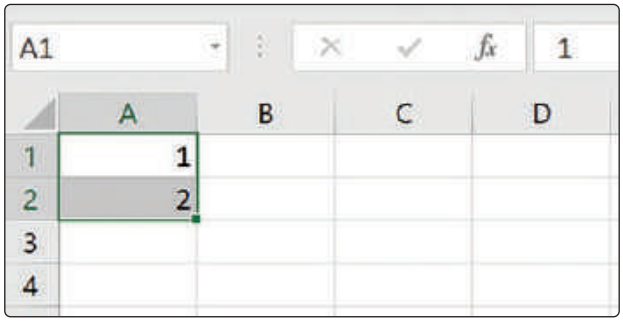


Figure C.5

If you move your cursor over this square, the cursor should change into a narrow plus sign. Now, click the left mouse button and drag the mouse down to include cells **A3** through **A10**. When you release the mouse button, the cells should now be filled with values from 1 to 10. We will refer to this as *filling cells*. Also notice that at the bottom of the screen, Excel gives some summary statistics about the highlighted cells. The average, count of the number of values, and sum are displayed for any highlighted cells.

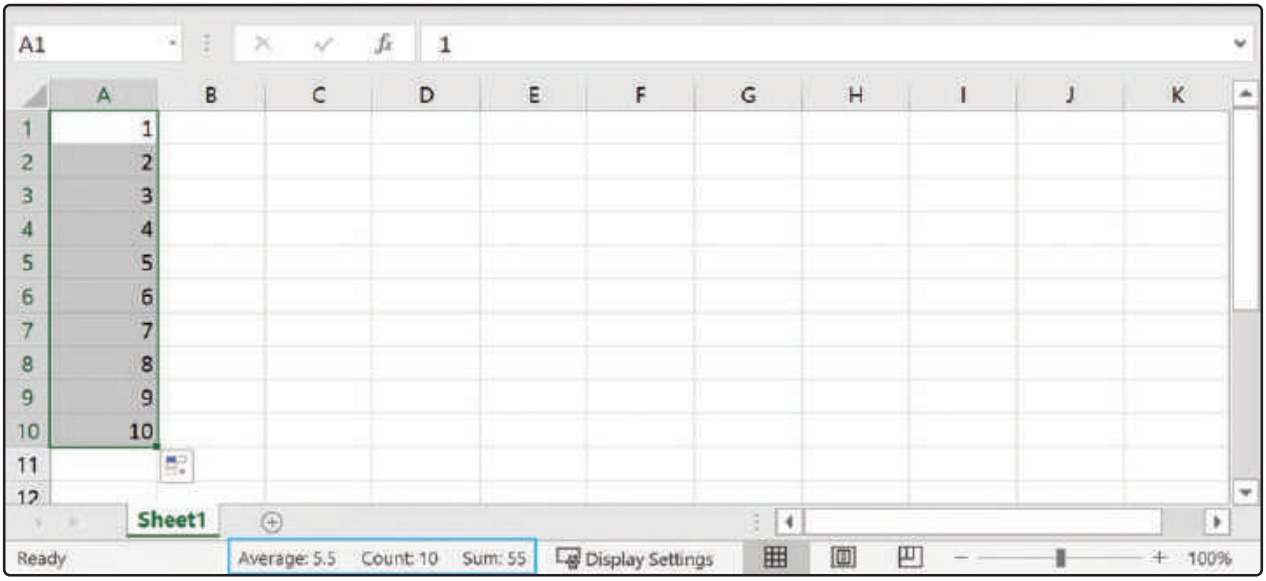


Figure C.6

The fill tool will work for other (nonsequential) values as well. Excel finds the relationship between two data points and replicates this when the tool is used. As an example, try this with multiples of 5. Enter 5 in cell **A1** and 10 in cell **A2**. Highlight cells **A1** and **A2** again and put your cursor over the square in the bottom right of the highlighted section. Click the left mouse button and drag down to cell **A10**. Release the button. Now the values should have changed to 5 through 50, in increments of 5.

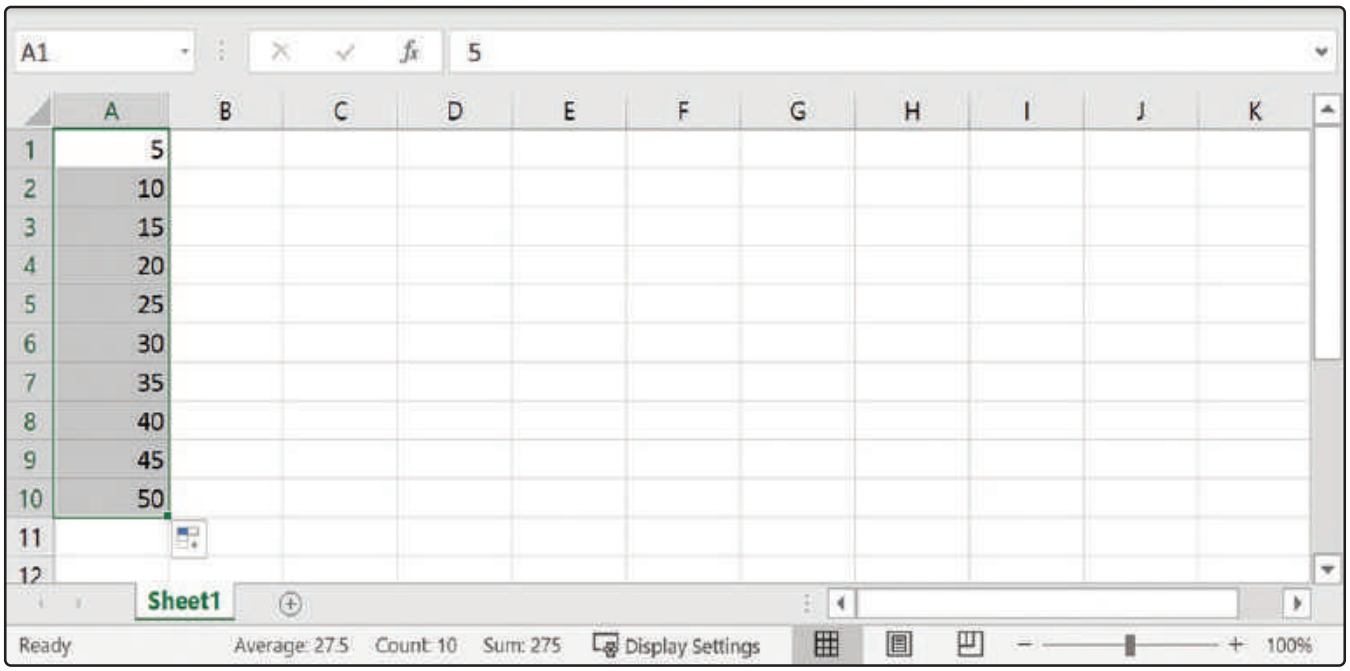


Figure C.7

You can also use this feature with sequential labels such as days of the week or months of the year. For example, if you type Monday into cell **A1** and use the fill tool to drag to cell **G1**, the intermediate cells will populate with all of the days of the week.

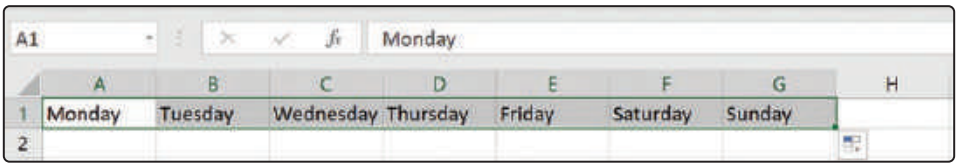


Figure C.8

Under the Home tab, you can change the appearance of text by altering the font, size, color, or alignment of the text within the cells. You also can use Microsoft Excel to sort a long list of items alphabetically or numerically or to find a particular item you are looking for. The sort and find features can be found under the Home tab as well.

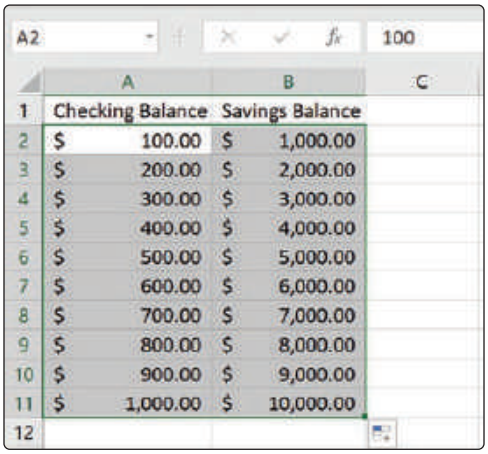
Now that you have the basic skills to work with Excel, start a new worksheet and we will try some examples.

Formulas and Addressing Using Excel

Enter the labels Checking Balance and Savings Balance in cells **A1** and **B1**, respectively. You will notice that the label you typed in cell **A1** is cut off. We need to resize the columns to allow for the entire label. Move your cursor to the line that separates the column labels for A and B. Your cursor will change to an arrow pointing off to the left and right. You can click and drag the cursor to the right to increase the column width, or simply double-click to have the width autofit the label. Repeat this for Column B.

Next, select the column labels A and B and you should see both columns highlighted. Under the Home tab there is an area labeled Number. The buttons in this area format any numbers you enter in the selected cells. With columns A and B highlighted, click on the **$** button. Now all of the values put in these columns will be formatted as currency.

Next, we will use the fill tool to get some values to work with. Start by entering 100 in cell **A2** and 200 in cell **A3**. Now move to cell **B2**, enter 1000, and enter 2000 in cell **B3**. Highlight cells **A2** through **B3** by clicking in **A2** and dragging down and to the right to include **B3**. With those cells highlighted, put your cursor over the square in the bottom right of the highlighted section. When your mouse changes to a narrow plus sign, click and drag down to row 11. When you release the mouse button, the cells should fill with data and end with $10,000.00 in cell **B11**. You should have a screen that looks like the following.



A2 — 100

	A	B	C
1	Checking Balance	Savings Balance	
2	$ 100.00	$ 1,000.00	
3	$ 200.00	$ 2,000.00	
4	$ 300.00	$ 3,000.00	
5	$ 400.00	$ 4,000.00	
6	$ 500.00	$ 5,000.00	
7	$ 600.00	$ 6,000.00	
8	$ 700.00	$ 7,000.00	
9	$ 800.00	$ 8,000.00	
10	$ 900.00	$ 9,000.00	
11	$ 1,000.00	$ 10,000.00	
12			

Figure C.9

Formulas can be applied to manipulate data between cells. We will see, however, that special attention needs to be paid to the copying of formulas. We will continue working with the above worksheet with the checking and savings balances while we try some formulas.

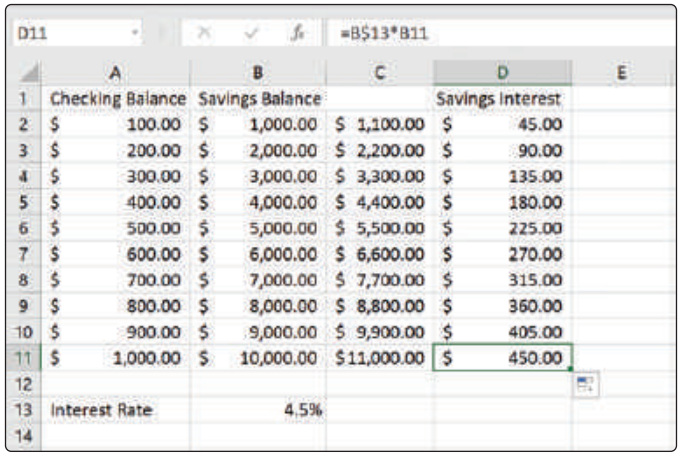
We want to see what your total bank balance would be if you had the amount listed in a particular row in your checking and savings accounts. In cell **C2**, type = to indicate you are entering a formula, and then click in cell **A2**, type +, and click in cell **B2**. Press **Enter**. You have just added cells **A2** and **B2** together, and the sum ($1,100.00) is displayed in cell **C2**. Under the Home tab, the Clipboard section contains buttons allowing you to cut, copy, and paste cells. With cell **C2** selected, either click on the **copy** button or use the keyboard shortcut **Ctrl+c** to copy the formula. Highlight cells **C3** through **C11**. Under the Home tab, press the **Paste** button or use the keyboard shortcut **Ctrl+v** to paste the formula into these cells. Notice that the value $1,100.00 that was displayed in **C2** was not copied, but the formula that made up that value. The formula changed for each of the rows and substituted the new row value in the formula. This is called *relative addressing*. The formula changes relative to its cell address. The last cell should show the value $11,000.00. If the value is not visible, the column needs to be resized.

Suppose we wanted to see what the annual interest would be on our savings account at the levels listed in Column B. Create a new label in cell **A13** called Interest Rate. Now in cell **B13**, input the interest rate 0.045. We will need to format the cell for percentages rather than currency. To do this, highlight cell **B13**, and under the Home tab in the Number area, select the **%** button next to the **$** button that we used to originally format the cells. The number will most likely be displayed as 5%. We can adjust the number of decimals displayed by clicking on the  button, also located in the Number section under the Home tab. This button increases the number of decimal places displayed by one decimal place each time it is clicked. (Notice that there is a similar button next to the one mentioned that decreases the number of places displayed.) The value should now display as 4.5%.

Now we want to use this value to compute interest for each level of savings. Label cell **D1** Savings Interest. Resize the cell to fit the label. In cell **D2**, we will put our formula. Type = to start the formula, and then select cell **B13** to get the percentage rate. Type * to indicate multiplication, and select cell **B2**. Upon pressing **Enter**, the resulting value will be displayed ($45.00). Thus, the annual interest gained on $1,000.00 in savings at 4.5% APR is $45.00.

Since we have the formula, we can copy it to the rest of the column and get the interest income for each of the savings levels. With cell **D2** selected, click in the lower right-hand corner of the cell and drag down to **D3**. Is this the result you expected? Probably not. Remember the rules of relative addressing. As you copy the formula down one row, the formula values change by one row. So in cell **D3**, the formula is pulling from cell **B14** for the interest rate and cell **B3** for the principal amount. You will notice that cell **B14** is empty. Thus, Excel computes this formula as being equal to zero. However, want to use cell B13 for each of these formulas in Column D. So how do we lock in the address of cell **B13**? We use *absolute addressing*. The **$** symbol is the key to locking the position in the formula. If the $ is in front of the column indicator of a cell reference, it will lock the column ($B13), and if it is in front of the row indicator, it will lock the row (B$13). These can be used together to lock a cell reference to a specific cell. In cell **D2**, we need to change the formula to read **=B13*B2**. This will "lock" cell B13 into the formula when it is copied throughout Column D.

Go back and copy the new formula into cells **D3** through **D11** using the fill tool. The results should now look like Figure C.10.



D11 =B$13*B11

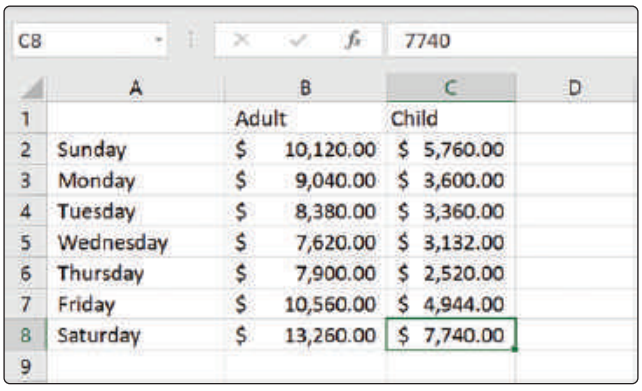
	A	B	C	D	E
1	Checking Balance	Savings Balance		Savings Interest	
2	$ 100.00	$ 1,000.00	$ 1,100.00	$ 45.00	
3	$ 200.00	$ 2,000.00	$ 2,200.00	$ 90.00	
4	$ 300.00	$ 3,000.00	$ 3,300.00	$ 135.00	
5	$ 400.00	$ 4,000.00	$ 4,400.00	$ 180.00	
6	$ 500.00	$ 5,000.00	$ 5,500.00	$ 225.00	
7	$ 600.00	$ 6,000.00	$ 6,600.00	$ 270.00	
8	$ 700.00	$ 7,000.00	$ 7,700.00	$ 315.00	
9	$ 800.00	$ 8,000.00	$ 8,800.00	$ 360.00	
10	$ 900.00	$ 9,000.00	$ 9,900.00	$ 405.00	
11	$ 1,000.00	$ 10,000.00	$11,000.00	$ 450.00	
12					
13	Interest Rate	4.5%			
14					

Figure C.10

Excel can compute a multitude of calculations on data values in the spreadsheet. If you press the f_x button next to the formula window, you can explore all of the functions and formulas that Excel has to offer.

Charts

Suppose you have the following data about ticket sales from your county fair. Adult tickets are $20 and child tickets are $12. Ticket sales for the week are listed in Figure C.11.



C8 7740

	A	B	C	D
1		Adult	Child	
2	Sunday	$ 10,120.00	$ 5,760.00	
3	Monday	$ 9,040.00	$ 3,600.00	
4	Tuesday	$ 8,380.00	$ 3,360.00	
5	Wednesday	$ 7,620.00	$ 3,132.00	
6	Thursday	$ 7,900.00	$ 2,520.00	
7	Friday	$ 10,560.00	$ 4,944.00	
8	Saturday	$ 13,260.00	$ 7,740.00	
9				

Figure C.11

From these data, you might see how the ticket sales change daily and wish to compare child and adult ticket sales. This information might be easier to understand if it were graphically displayed on a chart. Enter the data as seen above in a new worksheet and use a bar chart for this particular example.

To create a chart, we need to select the data to be graphed. We want to chart the ticket sales for both the adults and children. In a bar chart, the dollar amount will determine the height of the bar. The days of the week should also be included since they are the labels for the bars.

Highlight the data in Columns A, B, and C from rows 1 to 8. (Note that Excel can interpret the first row or column in a set of data as labels and not part of the data.) Under the Insert tab, there is a Charts group of icons.

Figure C.12

Choose Column (in the upper left corner), and then select the top-left graph (the first one listed under the 2-D column heading). This is a clustered column graph. Excel creates a side-by-side bar graph based on the highlighted data. After the chart is created, a set of tabs labeled Chart Design and Format appear. Additionally, three icons appear to the right of the chart: Chart Elements, Chart Styles, and Chart Filters. These tabs and icons can be used to edit the chart that has been made.

Click on the chart title, type a new title of "Ticket Sales", and press **Enter**. Using the Chart Elements icon, you can edit the chart appearance by adding axis titles, data labels, or gridlines. Microsoft Excel makes it easy to create the chart you want.

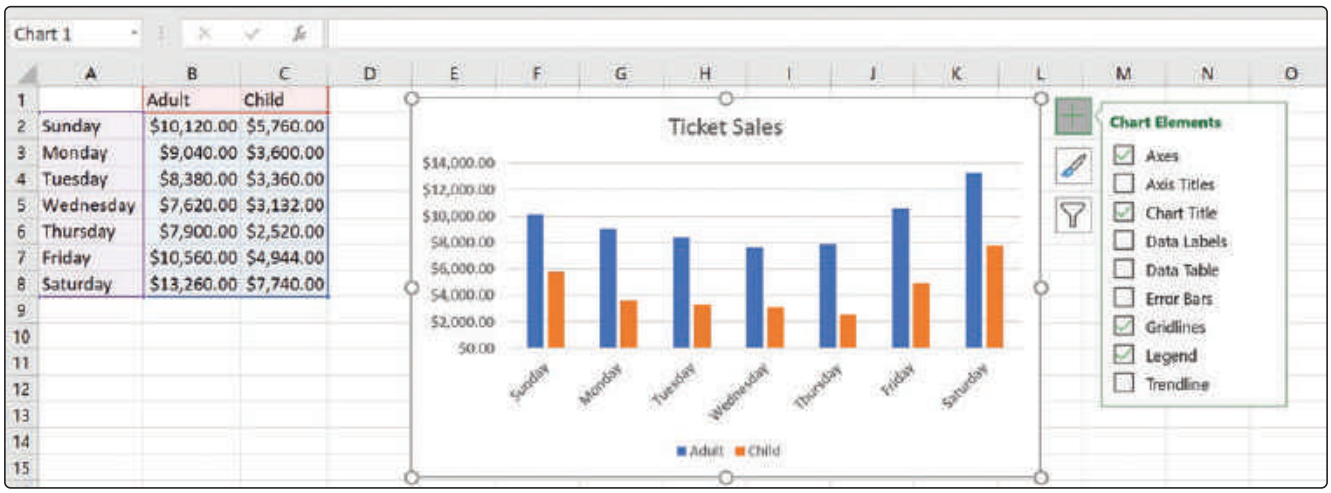


Figure C.13

Excel can create most types of charts, ranging from pie charts to line graphs to scatter plots. These types of charts are indicated by the menus seen when an icon in the Charts group is clicked on.