

CSE 123

Introduction to Computing

Lecture 2

Creating Charts with Excel and Working with Formulas and Functions

SPRING 2012

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Course notes have been prepared using some of the information in;

- Walkenbach, J. Microsoft Excel 2010: Bible. 4th ed. Indiana. Wiley. 2010. ISBN: 978-0470474877
- Larsen, R.W. Engineering with Excel. 3rd ed. New Jersey. Prentice Hall. 2009. ISBN: 0-13-601775-4. (Textbook)

Excel's Built-In Functions

- Elementary math functions
- Trigonometric functions
- Advanced math functions
- Matrix function (Topic of the next lecture)
- Functions for financial calculations
- Functions for statistical calculations
- Date and time functions
- String functions
- Lookup and reference functions
- File handling functions
- Functions for working with databases

Operators used in Formulas

Operator	Name
+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Exponentiation
&	Concatenation

Operator	Name
=	Logical comparison (equal to)
>	Logical comparison (greater than)
<	Logical comparison (less than)
>=	Logical comparison (greater than or equal to)
<=	Logical comparison (less than or equal to)
<>	Logical comparison (not equal to)

Excel Formulas

Formula	What it does
= "CSE "&"123"	Joins (concatenates) two text strings to produce CSE123
=A1&A2	Concatenates the contents of cell A1 with cell A2. If cell A1 contains 12 and cell A2 contains 21, the formula would return 1221
=12^4	Fourth power of 12
=114^(1/2)	Raises 114 to 1/2 power. Mathematically equal to square root of 114
=A1<A2	Returns TRUE if the value in cell A1 is less than A2. If cell A1 contains Ali and cell A2 contains Can, the formula would return TRUE
=A1<=A2	Returns TRUE if the value in cell A1 is less than or equal to A2
=A1<>A2	Returns TRUE if the value in A1 is not equal to A2

Operator Precedence in Excel Formulas

Symbol	Operator	Precedence
^	Exponentiation	1
*	Multiplication	2
/	Division	2
+	Addition	3
-	Substraction	3
&	Concatenation	4
=	Equal to	5
<	Less than	5
>	Greater than	5

You can use paranthesis to override Excels built-in order of preference

Function Syntax

=SUM(A1:A15)



Function

Argument

Your data range.

Function Arguments

- No arguments
=NOW() → returns current time and day
- Cell reference
=SUM(A1:A35)
- Values
= SQRT(36)

- Text string

=PROPER(“maria callas”)

- proper function converts text to the proper case

- Other functions

=SQRT(SUM(B1:B45))

- Expressions

=SQRT(45+23)

Some Engineering Functions

- Functions → more functions → engineering

=BIN2DEC () : Converts binary numbers to decimal numbers

$$1010 \rightarrow 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0 = 10$$

=CONVERT(): Unit conversion

=CONVERT(value, from_units, to_units)

=CONVERT(10, “km”, “mi”)

Common unit abbreviations for the CONVERT function

Distance Units

Meter	"m"
Statute Mile	"mi"
Nautical Mile	"Nmi"
Inch	"in"
Foot	"ft"
Yard	"yd"
Angstrom	"ang"
Pica	"Pica"

Time Units

Year	"yr"
Day	"day"
Hour	"hr"
Minute	"mn"
Second	"sec"

Weight & Mass Units

Gram	"g"
Slug	"sg"
Pound Mass	"lbm"
U (Atomic Mass Unit)	"u"
Ounce Mass	"ozm"

Force Units

Newton	"N"
Dyne	"dyn" (or "dy")
Pound Force	"lbf"

Liquid Units

Teaspoon	"tsp"
Tablespoon	"tbs"
Fluid Ounce	"oz"
Cup	"cup"
U.S. Pint	"pt" (or "us_pt")
U.K. Pint	"uk_pt"
Quart	"qt"
Gallon	"gal"
Liter	"l" (or "lt")

Common unit abbreviations for the CONVERT function

Pressure Units

Pascal	"Pa" (or "p")
Atmosphere	"atm" (or "at")
mm of Mercury	"mmHg"

Energy Units

Joule	"J"
Erg	"e"
Thermodynamic Calorie	"c"
IT Calorie	"cal"
Electron Volt	"eV" (or "ev")
Horsepower-Hour	"HPH"
Watt-Hour	"Wh"
Foot-Pound	"flb"
BTU	"BTU" (or "btu")

Temperature Units

Degree Celsius	"C" (or "cel")
Degree Fahrenheit	"F" (or "fah")
Kelvin	"K" (or "kel")

Power Units

Horsepower	"HP" (or "h")
Watt	"W" (or "w")

Magnetism Units

Tesla	"T"
Gauss	"ga"

Logarithm, Exponential and Trigonometric Functions

Function Name	Operation
EXP(X)	Returns e raised to the power x
LN(X)	Returns the natural log of x
LOG10(X)	Returns the base-10 log of x
LOG(X, base)	Returns the logarithm of x to the specified base
SIN(X)	Returns the sine of x
COS(X)	Returns the cosine of x
TAN(X)	Returns the tangent of x

Referencing cells in other sheets/workbooks

- SheetName!CellAddress
- =Sheet2!D5
- [Workbookname]SheetName!CellAddress

Text Manipulation Functions

- ASCII Codes: American Standard Code for Information Interchange

Table ASCII -I

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	Null	32	20	Space	64	40	@	96	60	`
1	01	Start of heading	33	21	!	65	41	A	97	61	a
2	02	Start of text	34	22	"	66	42	B	98	62	b
3	03	End of text	35	23	#	67	43	C	99	63	c
4	04	End of transmit	36	24	\$	68	44	D	100	64	d
5	05	Enquiry	37	25	%	69	45	E	101	65	e
6	06	Acknowledge	38	26	&	70	46	F	102	66	f
7	07	Audible bell	39	27	'	71	47	G	103	67	g
8	08	Backspace	40	28	(	72	48	H	104	68	h
9	09	Horizontal tab	41	29	)	73	49	I	105	69	i
10	0A	Line feed	42	2A	*	74	4A	J	106	6A	j
11	0B	Vertical tab	43	2B	+	75	4B	K	107	6B	k
12	0C	Form feed	44	2C	,	76	4C	L	108	6C	l
13	0D	Carriage return	45	2D	-	77	4D	M	109	6D	m
14	0E	Shift out	46	2E	.	78	4E	N	110	6E	n
15	0F	Shift in	47	2F	/	79	4F	O	111	6F	o
16	10	Data link escape	48	30	0	80	50	P	112	70	p
17	11	Device control 1	49	31	1	81	51	Q	113	71	q
18	12	Device control 2	50	32	2	82	52	R	114	72	r
19	13	Device control 3	51	33	3	83	53	S	115	73	s
20	14	Device control 4	52	34	4	84	54	T	116	74	t
21	15	Neg. acknowledge	53	35	5	85	55	U	117	75	u
22	16	Synchronous idle	54	36	6	86	56	V	118	76	v
23	17	End trans. block	55	37	7	87	57	W	119	77	w
24	18	Cancel	56	38	8	88	58	X	120	78	x
25	19	End of medium	57	39	9	89	59	Y	121	79	y
26	1A	Substitution	58	3A	:	90	5A	Z	122	7A	z
27	1B	Escape	59	3B	;	91	5B	[	123	7B	{
28	1C	File separator	60	3C	<	92	5C	\	124	7C	|
29	1D	Group separator	61	3D	=	93	5D	]	125	7D	}
30	1E	Record separator	62	3E	>	94	5E	^	126	7E	~
31	1F	Unit separator	63	3F	?	95	5F	_	127	7F	□

<http://www.cdrummond.qc.ca/cegep/informat/Professeurs/Alain/files/ascii.htm>

Text Manipulation Functions

=CODE("A") Returns the ASCII Code for the character

=CHAR (number) Returns the character specified by the code number

=CHAR(CODE("A"))

Write below to an excel sheet, see what it returns

=CHAR(83)&CHAR(116)&CHAR(111)&CHAR(112)

Concatenate

Income	1500		
Expenses	780		
Net	720		The net profit is 720

- = "The net profit is "& O8

Repeating a Character or String and Creating a Text Histogram

- =REPT("a", 20)
- You can create a simple histogram by using REPT function
- =REPT("#", B3/100)

Months	Admission to hospitals		
January	900	#####	
February	1200	#####	
March	700	#####	
April	300	###	
May	550	#####	
June	760	#####	
July	980	#####	
August	1230	#####	
September	1430	#####	
October	780	#####	
November	1330	#####	
December	1420	#####	
			18

- Following formula displays the value in cell A1, along with enough asterisks to make total of 24 characters.
- $=(A1 \ \& \ \text{REPT}(" *", 24-\text{LEN}(A1)))$

Using a formula to pad a number with asterisks.

	A	B	C	D
1	\$198.34	\$198.34*****		
2	\$9.00	\$9.00*****		
3	\$0.98	\$0.98*****		
4	\$1,093.00	\$1,093.00*****		
5	\$0.00	\$0.00*****		
6				
7				
8				

Changing the case of a text

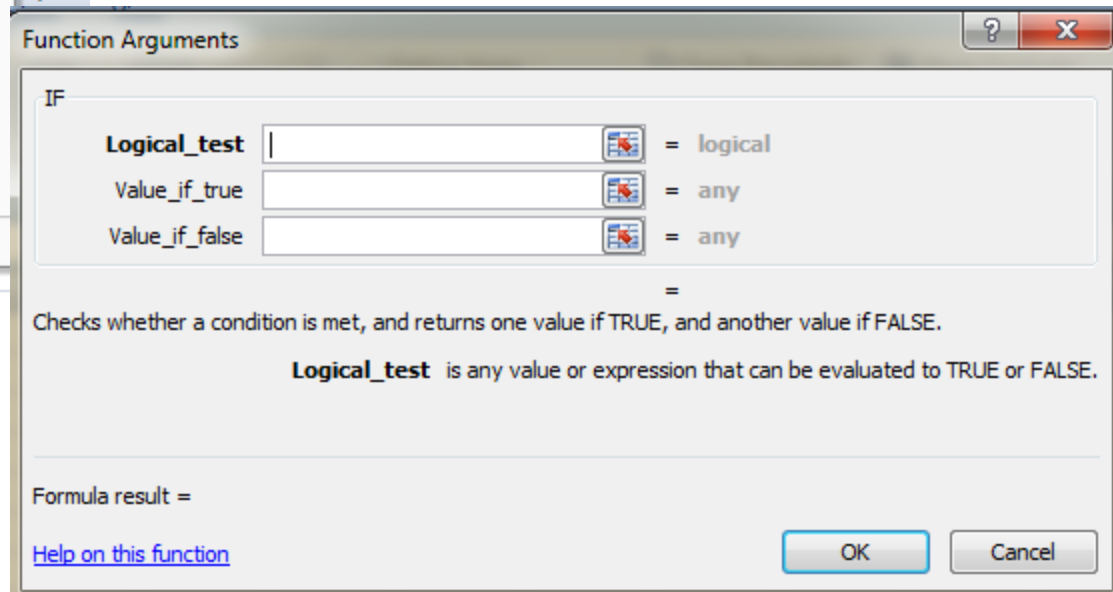
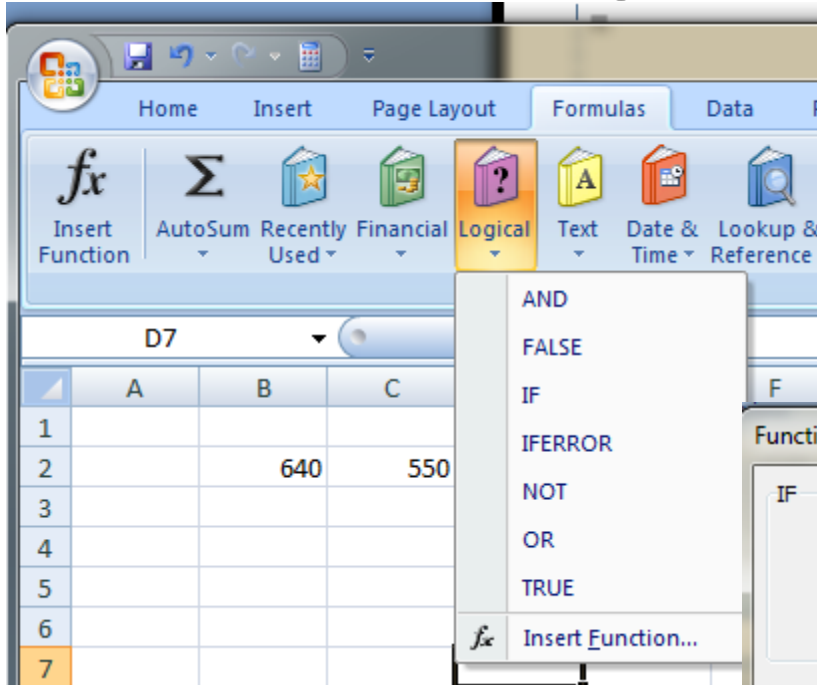
- `UPPER()`: Converts the text to all uppercase
- `LOWER()`: Converts the text to all lowercase
- `PROPER()`:

IF Statements in Worksheet

- The IF statement is used to analyse data and make a decision
- Formula can be entered by typing or can be selected by using the “Function Library” at the ribbon
- To enter by typing,
`=IF(logical_test, value_if_true, value_if_false)`

IF Statements in Worksheet

- To enter using the “Function Library”



IF Statements in Worksheet

- =IF(logical_test, value_if_true, value_if_false)

If sales is higher than the target,

The salesman should get 2% of the target sale as bonus

If sales is lower than the target

The salesman does not get any bonus

=IF(A2>B2, B2*2%, 0)

= IF(A2>B2, B2*2%, “No Bonus”)

	A	B	C
1	Sales	Target	Bonus
2	640	550	12.8
3	550	600	0

A	B	C	
Sales	Target	Bonus	
640	550	12.8	
550	600	No bonus	

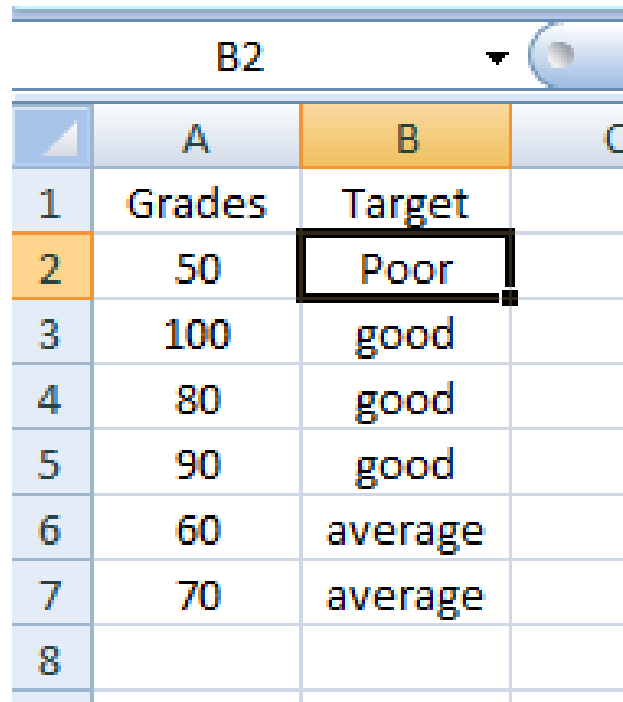
Nested IF Statements in Worksheet

- When you have one condition and more than two possible outcomes, you need to use NESTED IF
- =IF(1st logic test, 1st true value, IF(2nd logic test, 2nd true value, false value))

Nested IF Statements in Worksheet

=IF(1st logic test, 1st true value, IF(2nd logic test, 2nd true value, false value))

=IF(A2<=50,"Poor",IF(A2>=80,"good","average"))



	A	B	C
1	Grades	Target	
2	50	Poor	
3	100	good	
4	80	good	
5	90	good	
6	60	average	
7	70	average	
8			

SUMIF Statement

=SUMIF(range, criteria, sum_range)

=SUMIF(B2:B7,"Environmental Eng.",C2:C7)

	A	B	C	
			2011	
1	Date	Parameter	Graduates	
2	X University	Environmental Eng.	50	
3	X University	Industrial Eng.	60	
4	Y University	Environmental Eng.	67	
5	Y University	Industrial Eng.	54	
6	Z University	Environmental Eng.	45	
7	W University	Environmental Eng.	38	
8				
9		Environmental Eng. Grad	200	
10				

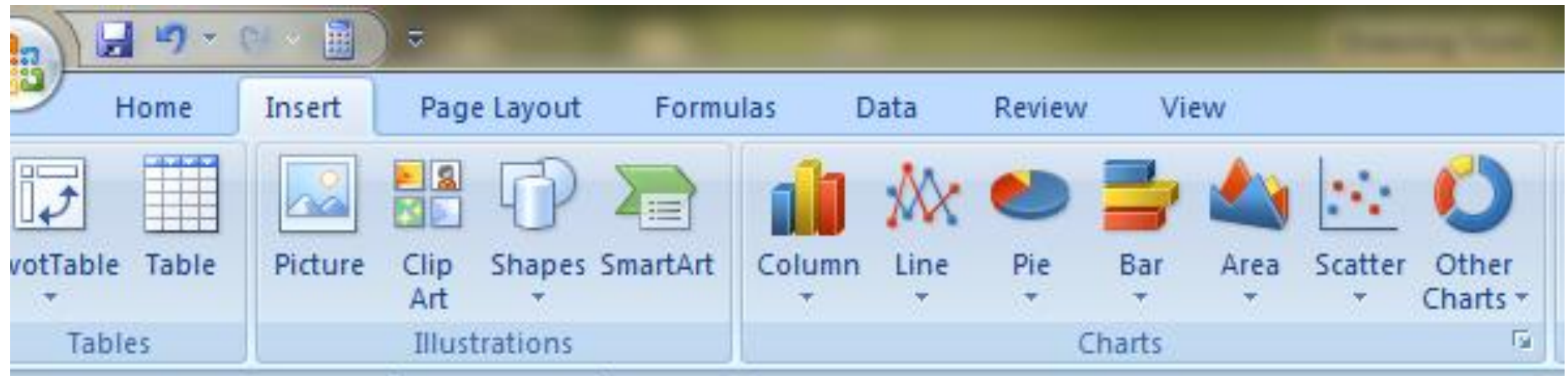
AVERAGEIF Statement

- `AVERAGEIF(Range, Criteria, [Average Range])`
- `=AVERAGEIF(B2:B7, "BOD",C2:C7)`

	A	B	C	D
1	Date	Parameter	Concentration (mg/L)	
2	01-02-11	BOD	50	
3	04-02-11	Nitrate	5	
4	08-02-11	BOD	67	
5	14-02-11	Nitrate	10	
6	25-02-11	BOD	87	
7	28-02-11	BOD	100	
8				
9		Avg. BOD	76	
10				
11				

Creating Graphs with Excel

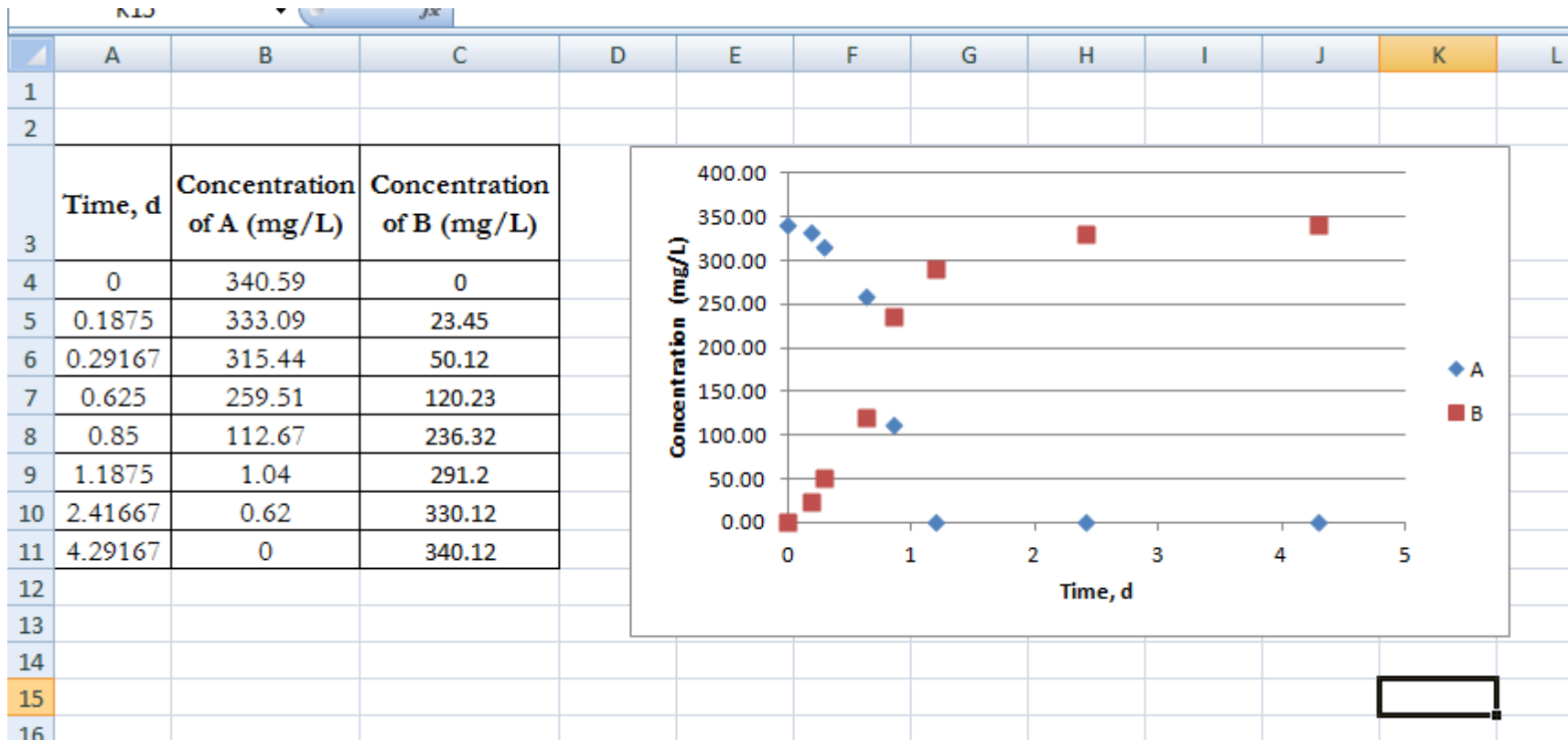
- You need to have data



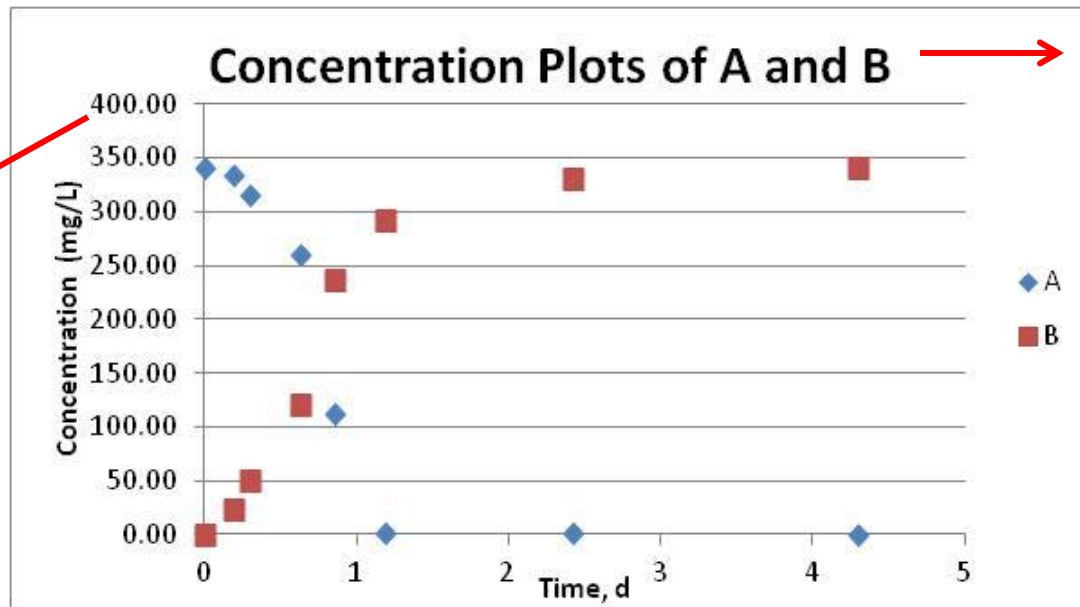
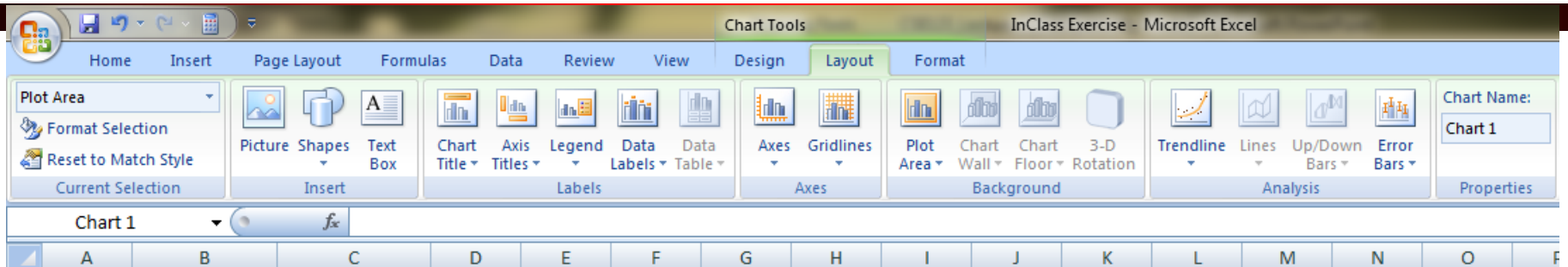
EXERCISE

Creating Graphs with Excel

- You can change the chart type etc.



Creating Graphs with Excel



Value axis

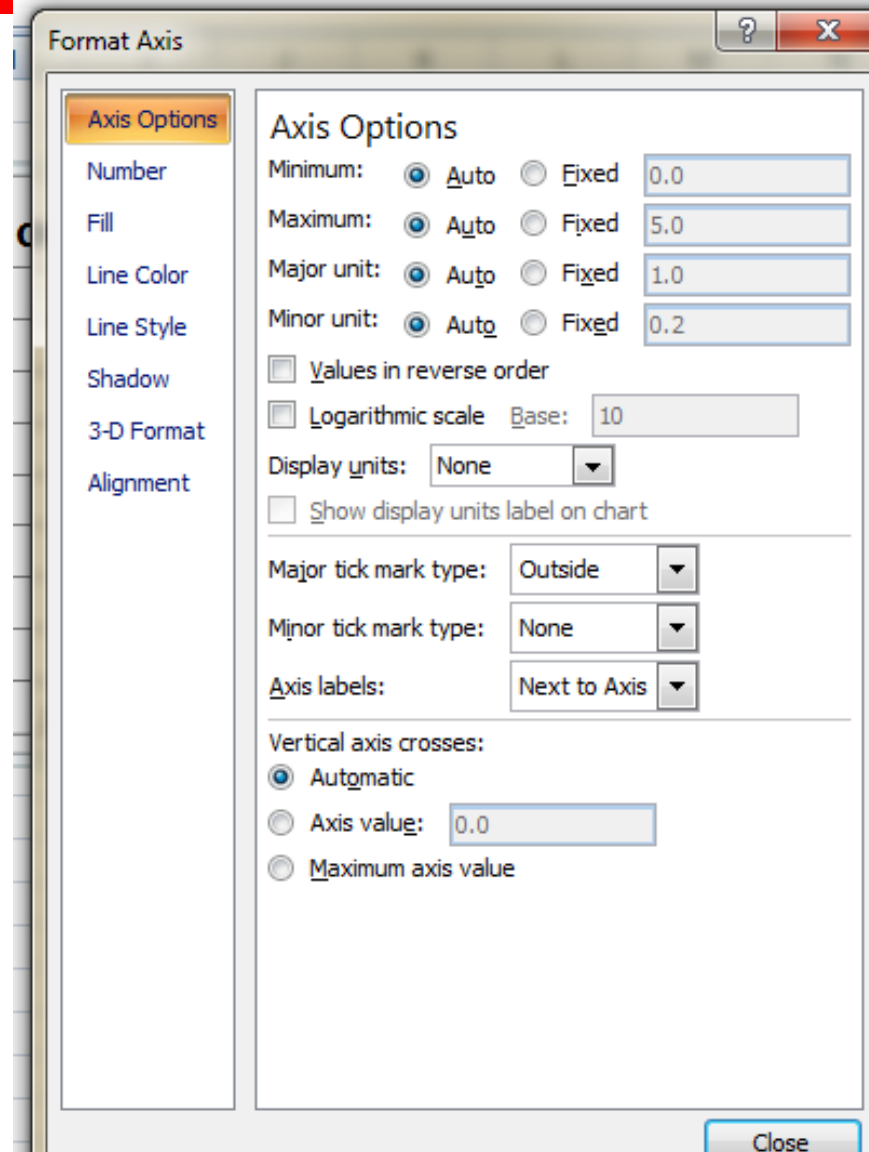
Chart title

Legend

Axis title

Creating Graphs with Excel – Formatting the axis

- Right click on axis
- Select format axis

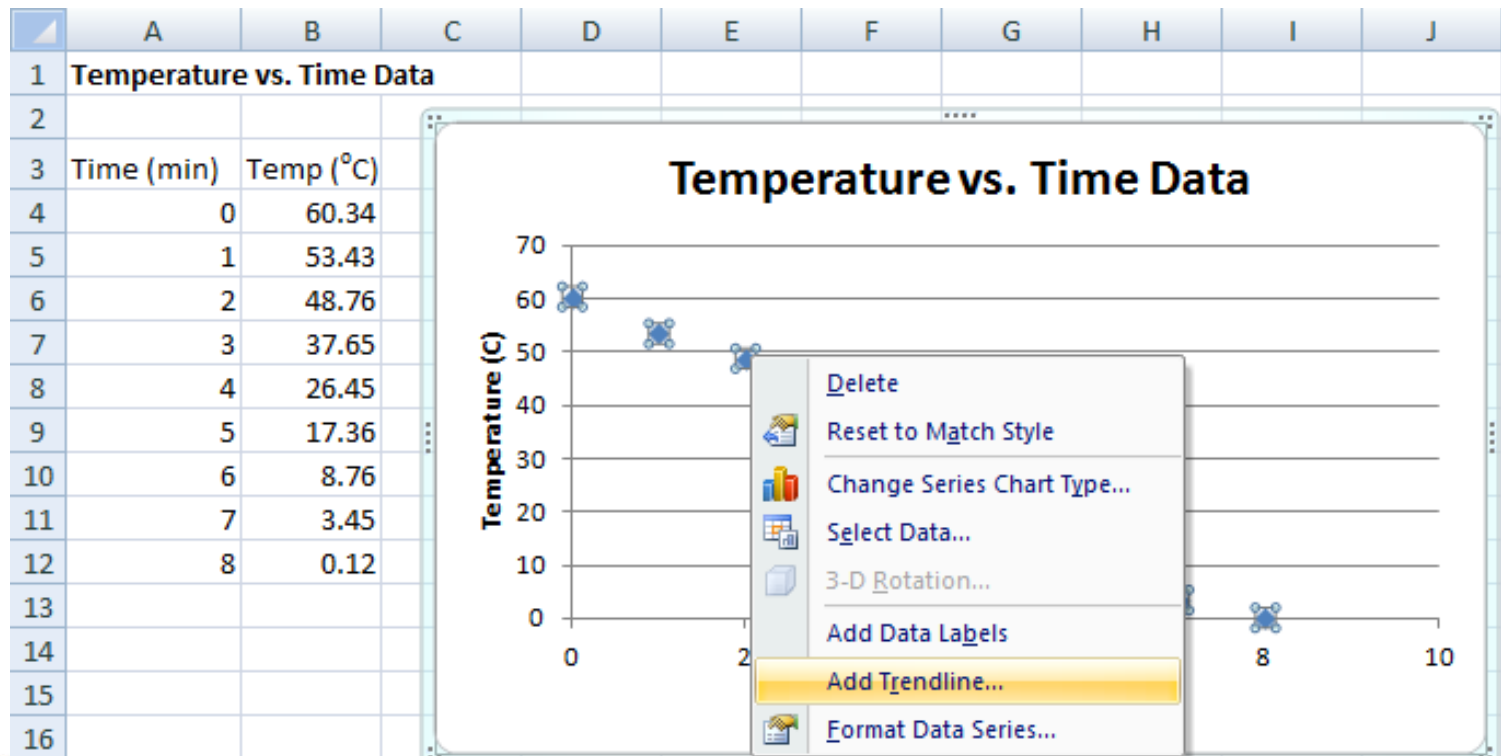


Adding a Trendline to a Graph

- Trendlines are best-fit regression lines of various forms
 - Linear (straight line)
 - Exponential
 - Logarithmic
 - Polynomial
 - Power
 - Moving average (nonregression trendline)

Adding a Trendline to a Graph

- Because the trendlines are best-fit regression lines, the equations of the trendlines and the R^2 values are available and can be displayed on the graph.



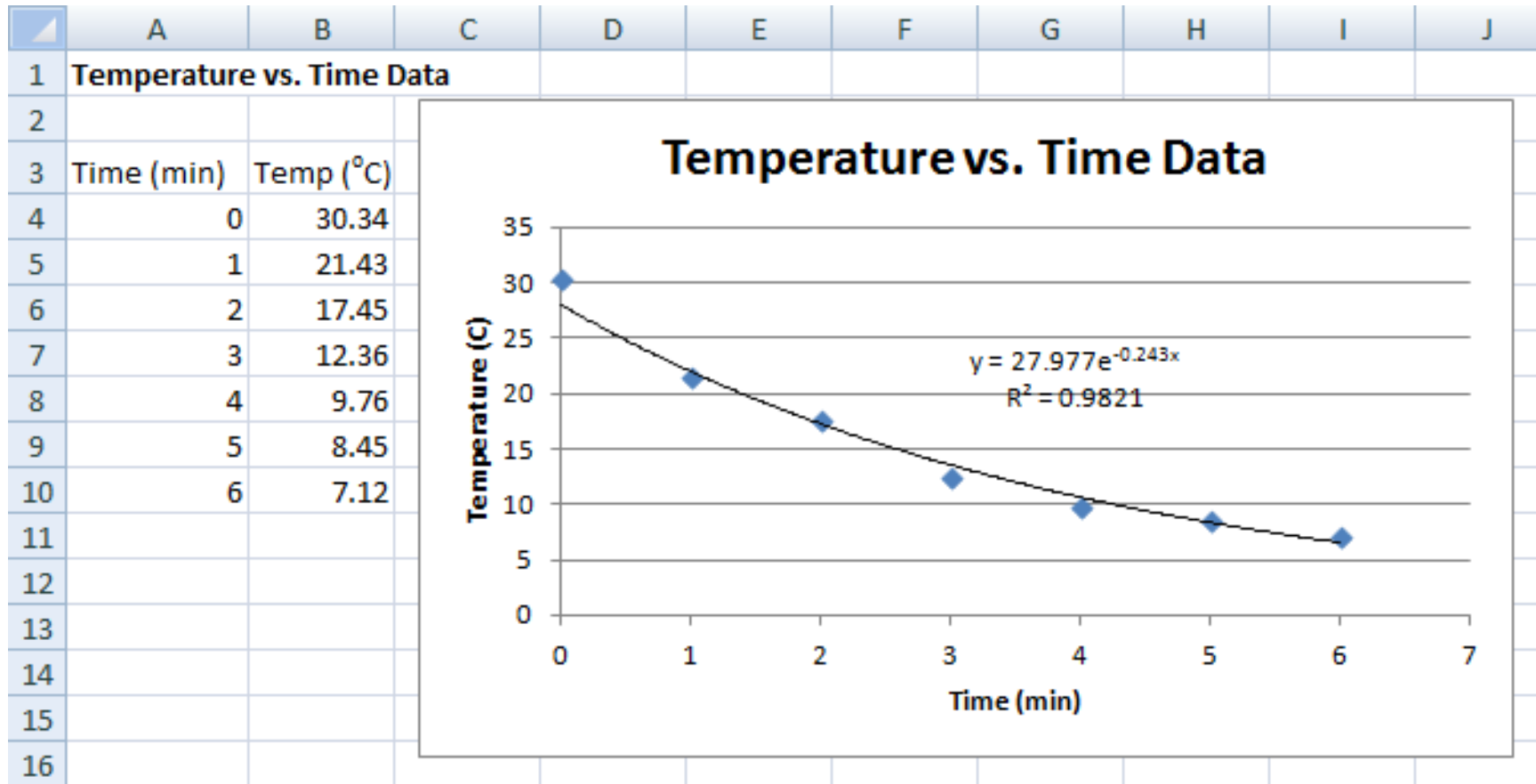
Adding a Trendline to a Graph

The image shows a Microsoft Excel spreadsheet with a scatter plot titled "Temperature vs. Time Data". The x-axis is labeled "Time (min)" and ranges from 0 to 8. The y-axis is labeled "Temperature (C)" and ranges from -10 to 70. A linear trendline is fitted to the data points, with the equation $y = -8.1852x + 61.221$ and $R^2 = 0.9852$ displayed on the chart.

The "Format Trendline" task pane is open, showing the "Trendline Options" section. The "Trend/Regression Type" is set to "Linear". The "Trendline Name" is set to "Automatic: Linear (Temp (oC))". The "Forecast" section shows "Forward: 0.0 periods" and "Backward: 0.0 periods". The "Set Intercept" is set to 0.0. The "Display Equation on chart" and "Display R-squared value on chart" options are checked.

Time (min)	Temperature (C)
0	61.221
1	53.0358
2	44.8506
3	36.6654
4	28.4802
5	20.295
6	12.1098
7	3.9246
8	-4.2606

Adding a Trendline to a Graph



Error Bars

Chart Tools InClass Exercise - Microsoft Excel

Formulas Data Review View Design Layout Format

Chart Title Axis Titles Legend Data Labels Data Table Axes Gridlines Plot Area Chart Wall Chart Floor Rotation Trendline Lines Up/Down Bars Error Bars

Chart Name: Chart 1

None
Removes the Error Bars for the selected series or all Error Bars in none is selected

Error Bars with Standard Error
Displays Error Bars for the selected chart series using Standard Error

Error Bars with Percentage
Displays Error Bars for the selected chart series with 5% value

Error Bars with Standard Deviation
Displays Error Bars for the selected chart series with 1 standard deviation

[More Error Bars Options...](#)

=SERIES('Sheet3 (2)'!\$B\$3,'Sheet3 (2)'!\$A\$4:\$A\$19,'Sheet3 (2)'!\$B\$4:\$B\$19,1)

D E F G H I J K L M N

Temperature vs. Time Data

Error Bars

