

IT in Construction

Spreadsheet Lecture

Spreadsheet Applications in Construction (Software M.S. Excel)

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Construction Engineering and Management



Outline

2

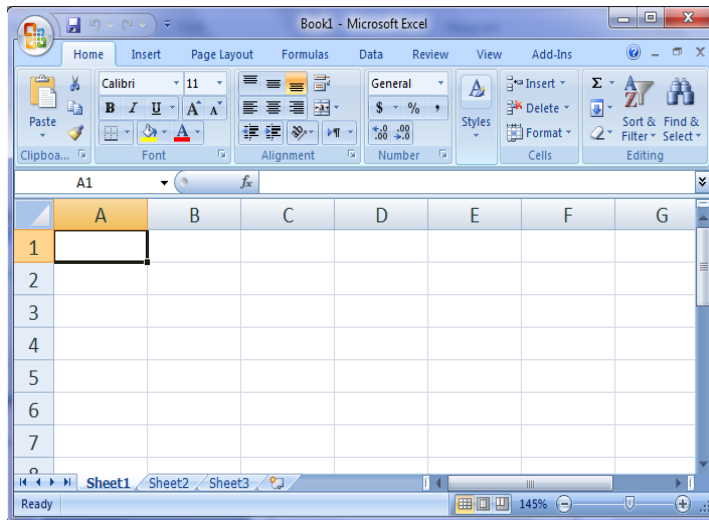
- Spreadsheet concept
- Aggregate report
- Charts
- Pivot tables and charts
- Macros
- Miscellaneous features

Spreadsheet concept

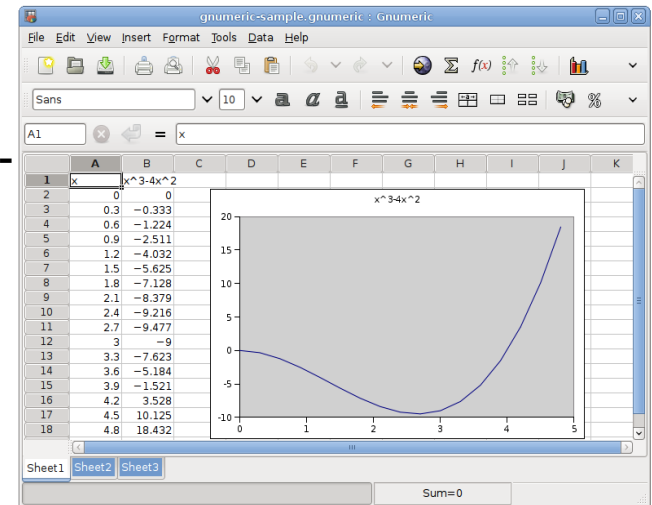
3

- **Definition:** A spreadsheet is an interactive computer application program for organization and analysis of information in tabular form. The program operates on data represented as cells of an array, organized in rows and columns. (en.wikipedia.org/wiki/Spreadsheet)
- Spreadsheet program examples:

M.S.
Excel



Gnumeric -
open
source

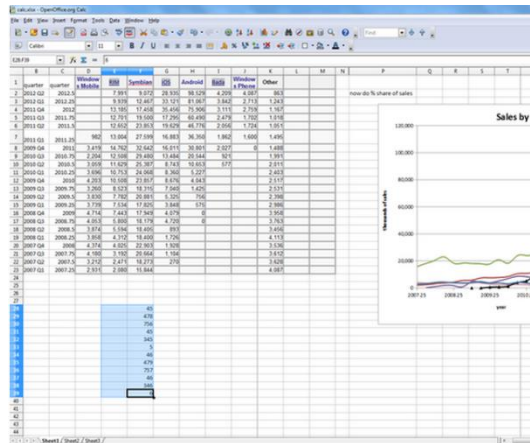


Spreadsheet concept

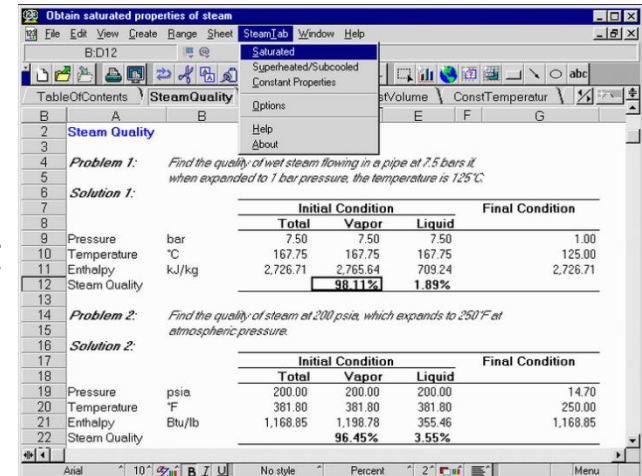
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Spreadsheet program examples (cont'd):

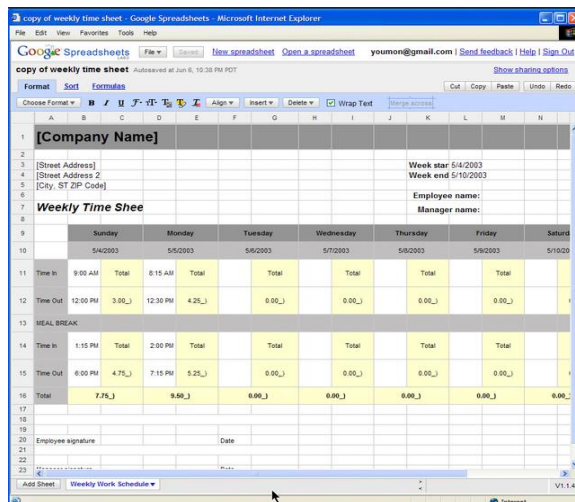
OpenOffice
Calc
- open
source



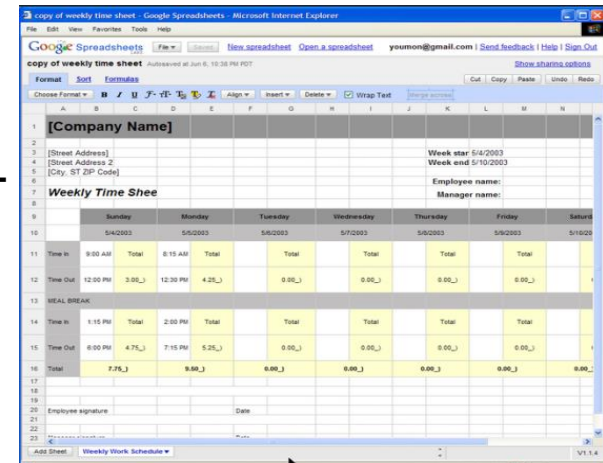
Lotus- 1st
spreadsheet



Google
spreadsheet-
online



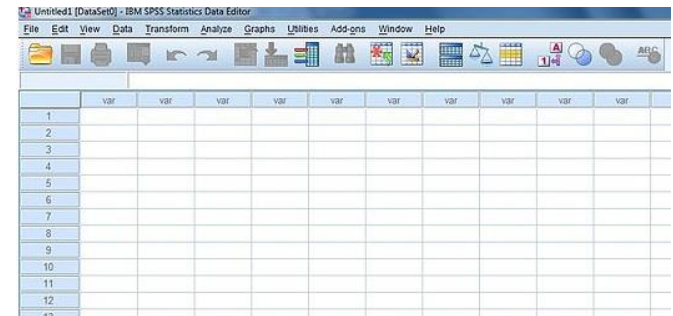
EditGrid
spreadsheet-
online



Spreadsheet concept

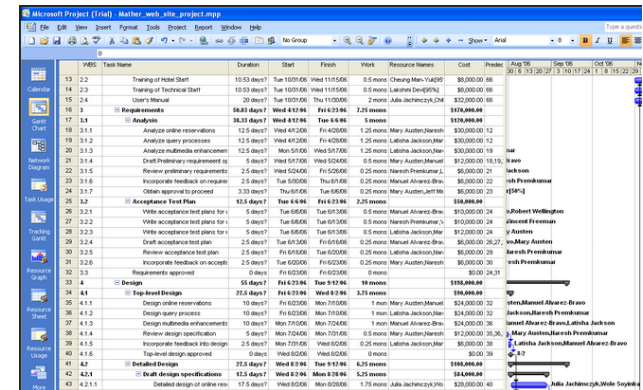
5

- Many software applications have based their technologies on spreadsheets.
- Examples:
 - Statistical analysis applications: SPSS
 - Project control and estimating software: M.S. Project, Primavera



IBM SPSS Statistics Data Editor

	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7	VAR8	VAR9	VAR10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										



Microsoft Project (trial) Mother, web site, project.mpr

ID	Task Name	Duration	Start	Finish	Resource Names	Cost	Predecessors
13	2.2 Training of Peter Staff	10:00 days	Tue 10/01/06	Wed 11/01/06	0.5 more: Cheung Man-Yu (0.5)	\$0,000.00	66
14	2.3 Training of Technical Staff	10:00 days	Tue 10/01/06	Wed 11/01/06	0.5 more: Leung David (0.5)	\$0,000.00	66
15	2.4 User's Manual	20:00 days	Tue 10/01/06	Thu 11/02/06	2 more: Julia Jackson (2.0)	\$20,000.00	66
16	3 Requirements	58:00 days	Wed 4/1/06	Fri 8/1/06	2.0 more: Manual Alvarez (2.0)	\$10,000.00	
17	3.1 Analysis	38:00 days	Tue 4/1/06	Tue 8/1/06	5 more: Manual Alvarez (5.0)	\$10,000.00	
18	3.1.1 Analyse online reservations	12:00 days	Wed 4/1/06	Fri 4/2/06	1.25 more: Mary Austin (1.25)	\$30,000.00	12
19	3.1.2 Analyse query processing	12:00 days	Wed 4/1/06	Fri 4/2/06	1.25 more: Lillian Jackson (1.25)	\$30,000.00	12
20	3.1.3 Analyse multimedia enhancement	12:00 days	Mon 5/1/06	Wed 5/1/06	1.25 more: Lillian Jackson (1.25)	\$30,000.00	19
21	3.1.4 Draft Preliminary requirements	5:00 days	Wed 5/1/06	Wed 5/2/06	0.5 more: Mary Austin (0.5)	\$12,000.00	15,19
22	3.1.5 Review preliminary requirements	2:00 days	Wed 5/2/06	Fri 5/2/06	0.25 more: Hannah Preston (0.25)	\$6,000.00	21
23	3.1.6 Incorporate feedback on requirements	2:00 days	Tue 5/2/06	Thu 5/3/06	0.25 more: Manual Alvarez (0.25)	\$6,000.00	22
24	3.1.7 Obtain approval to proceed	3:00 days	Thu 5/3/06	Tue 5/4/06	0.25 more: Mary Austin (0.25)	\$6,000.00	23
25	3.2 Acceptance Test Plan	6:00 days	Tue 5/4/06	Fri 5/5/06	2.0 more: Manual Alvarez (2.0)	\$10,000.00	
26	3.2.1 Write acceptance test plans for...	5:00 days	Tue 5/4/06	Tue 5/5/06	0.5 more: Manual Alvarez (0.5)	\$10,000.00	24
27	3.2.2 Write acceptance test plans for...	5:00 days	Tue 5/4/06	Tue 5/5/06	0.5 more: Hannah Preston (0.5)	\$10,000.00	24
28	3.2.3 Write acceptance test plans for...	5:00 days	Tue 5/4/06	Tue 5/5/06	0.5 more: Lillian Jackson (0.5)	\$12,000.00	24
29	3.2.4 Draft acceptance test plan	2:00 days	Tue 5/5/06	Fri 5/5/06	0.25 more: Manual Alvarez (0.25)	\$6,000.00	25,27
30	3.2.5 Review acceptance test plan	2:00 days	Fri 5/5/06	Tue 5/6/06	0.25 more: Lillian Jackson (0.25)	\$6,000.00	29
31	3.2.6 Incorporate feedback on acceptance	2:00 days	Tue 5/6/06	Fri 5/6/06	0.25 more: Mary Austin (0.25)	\$6,000.00	30
32	3.3 Requirements approved	0:00 days	Fri 5/6/06	Fri 5/6/06	0 more: Manual Alvarez (0.0)	\$0.00	31,31
33	4 Design	54:00 days	Fri 5/6/06	Tue 9/1/06	18 more: Manual Alvarez (18.0)	\$100,000.00	
34	4.1 Top-level Design	21:00 days	Fri 5/6/06	Wed 8/2/06	3.75 more: Manual Alvarez (3.75)	\$10,000.00	
35	4.1.1 Design online reservations	10:00 days	Fri 5/6/06	Mon 7/1/06	1 more: Mary Austin (1.0)	\$24,000.00	32
36	4.1.2 Design query processing	10:00 days	Fri 5/6/06	Mon 7/1/06	1 more: Lillian Jackson (1.0)	\$24,000.00	32
37	4.1.3 Design multimedia enhancement	10:00 days	Mon 7/1/06	Mon 7/4/06	1 more: Manual Alvarez (1.0)	\$24,000.00	36
38	4.1.4 Review design specifications	5:00 days	Mon 7/4/06	Mon 7/1/06	0.5 more: Mary Austin (0.5)	\$12,000.00	35,36
39	4.1.5 Incorporate feedback into design	2:00 days	Mon 7/1/06	Wed 7/2/06	0.25 more: Lillian Jackson (0.25)	\$6,000.00	38
40	4.1.6 Top-level design approved	0:00 days	Wed 7/2/06	Wed 7/2/06	0 more: Manual Alvarez (0.0)	\$0.00	39
41	4.2 Detailed Design	21:00 days	Wed 7/2/06	Tue 8/1/06	3.75 more: Manual Alvarez (3.75)	\$10,000.00	
42	4.2.1 Draft design specifications	12:00 days	Wed 7/2/06	Mon 7/2/06	0.25 more: Manual Alvarez (0.25)	\$6,000.00	
43	4.2.1.1 Detailed design of online res...	17:00 days	Wed 7/2/06	Mon 7/2/06	1.75 more: Julia Jackson (1.75)	\$20,000.00	40

Spreadsheet concept

6

Examples (cont'd):

- Financial analysis software (LifeCycle Budget)

The screenshot displays a financial analysis software interface. The top window shows a multi-year budget spreadsheet with columns for months from January 2000 to September 2000. The bottom window shows a detailed transaction list with columns for Line, Date, Type, Account, Division, Center, Ingested, Quantity, Unit Price, and Amount. A red arrow points to a specific transaction in the bottom window.

Line	Date	Type	Account	Division	Center	Ingested	Quantity	Unit Price	Amount
1	6/1/2000	P	541	5	50	2	750.00	1.33	1000.00
2	6/1/2000	P	541	5	50	5	801.44	1.33	1066.88
3	6/1/2000	P	541	5	50	7	32280.43	1.33	42915.17
4	6/1/2000	P	541	5	50	8	238.76	1.33	317.55
5	6/1/2000	P	541	5	50	16	488.06	1.33	648.12
6	6/1/2000	P	541	5	50	43	4.17	1.33	5.54
7	6/1/2000	P	541	5	50	86	3.29	1.33	4.38
8	6/1/2000	P	541	5	50	67	40.57	1.33	53.96
9	6/1/2000	P	541	5	50	100	775.53	1.33	1022.35
10	6/1/2000	P	541	5	50	101	205.29	1.33	273.04
11	6/1/2000	P	541	5	50	102	18.06	1.33	23.92
12	6/1/2000	P	541	5	50	103	80.31	1.33	105.81
13	6/1/2000	P	541	5	50	104	493.08	1.33	645.80
14	6/1/2000	P	541	5	50	105	55.84	1.33	73.16
15	6/1/2000	P	541	5	50	106	4025	1.33	5252.65
16	6/1/2000	P	541	5	50	107	35.14	1.33	45.74
17	6/1/2000	P	541	5	50	108	52.70	1.33	69.09

- Nesting Programs (Plus 1D)

The screenshot displays a Nesting Programs software interface. The top window shows a list of parts with columns for Lfno, Stock, Qty, Wt %, Length, and Rest. The bottom window shows a detailed view of a part with columns for Part, Cut Position, Angle, Flipped, and Rotated (180). A red arrow points to a specific part in the bottom window.

Lfno	Stock	Qty	Wt %	Length	Rest
1	S2	1	95.84	6100	250
2	S2	1	95.72	6100	125
3	S2	1	95.90	6100	100
4	S2	1	93.69	6100	310
5	S2	1	95.36	6100	100
6	S2	1	99.59	6100	25
7	S2	1	93.44	6100	325
8	S2	1	100.00	6100	5075

7

- [illegible]

Spreadsheet concept - basic features

8



Hands on software (Excel):

- Values
- Simple calculations
- Lock cells
- Data type
- Formatting
- Cell Referencing

Aggregate report

9

- **Definition:** a report that summarizes different aspects of data into single values.
- Aggregation operation examples: Summation, Average, Count, Standard deviation, Minimum, Maximum
- Aggregate reports are one of the most used types of reports in construction.



Question: Name some aggregate reports that might be used on construction sites!



Hands on software (Excel), aggregate report for accident on site.

Chart - Introduction

10

"A picture is worth a thousand words."

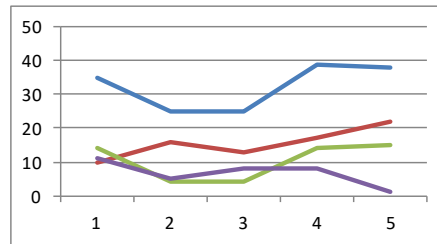
- Chart/ graph is usually a good tool for:
 - ▣ High level reports (for top management)
 - ▣ Demonstrating/ discovering data trends, relationships and distributions
 - ▣ Visual comparison between different indicators
- Chart/ graph is NOT usually a good tool when:
 - ▣ Exact value of every single item is important
 - ▣ We have too few data items to show

Chart - Introduction

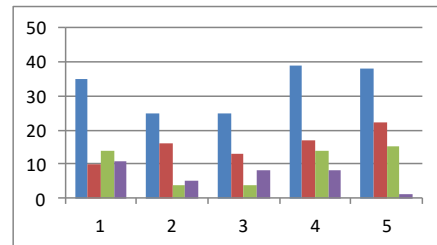
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Common graph types:

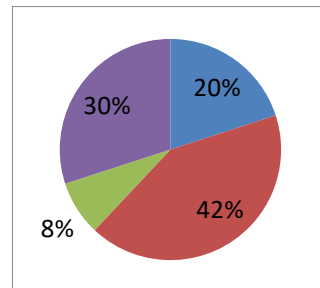
Line graph



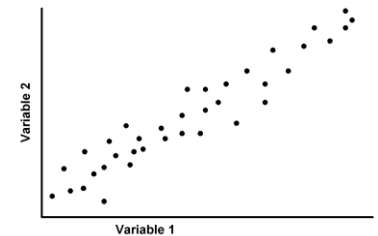
Bar chart



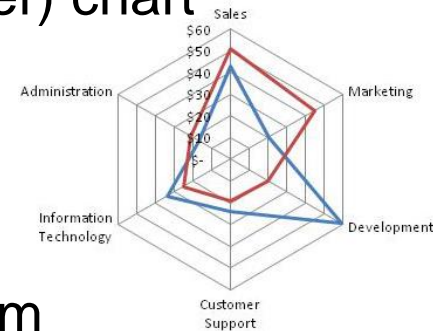
Pie chart



Scatter plot/ graph



Radar (spider) chart



Venn diagram

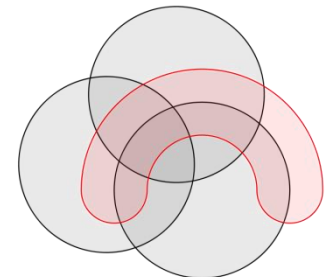
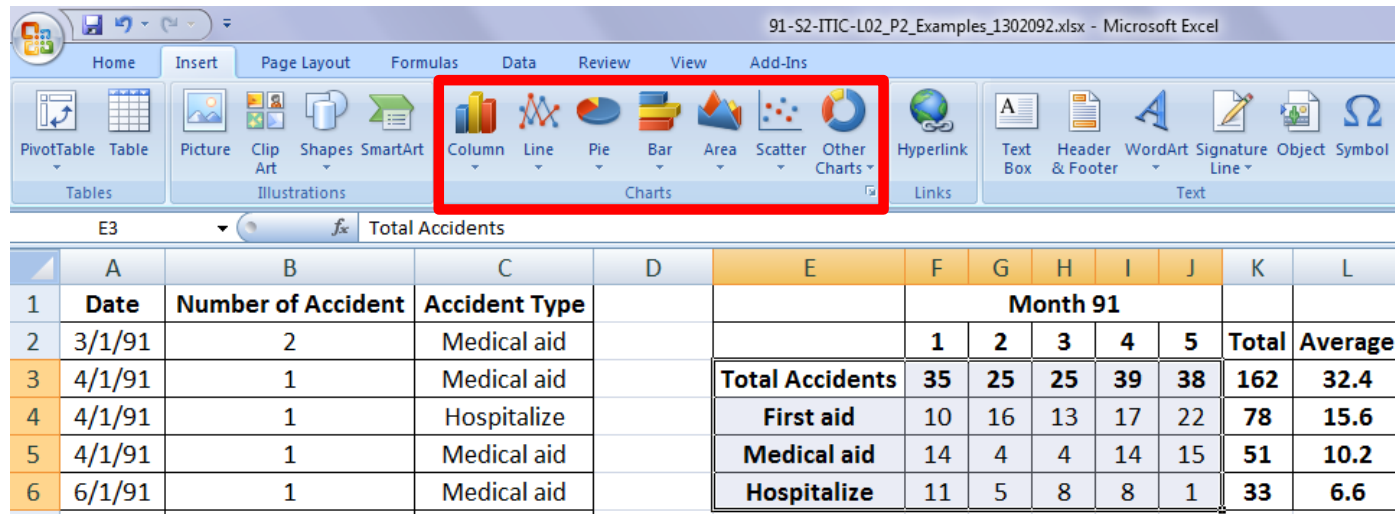


Chart - Excel

12



With the same range of data selected, different charts created will demonstrate them differently with different meaning!

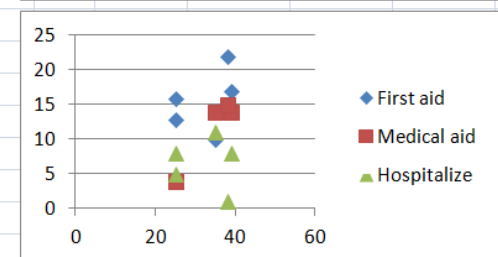
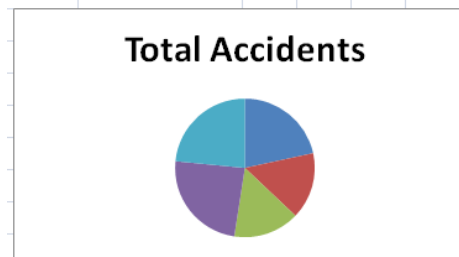
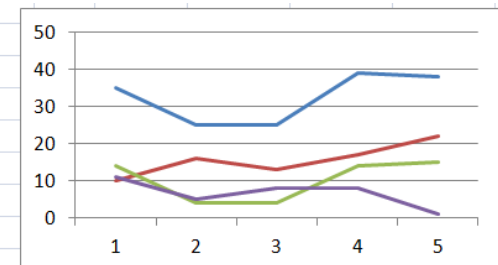
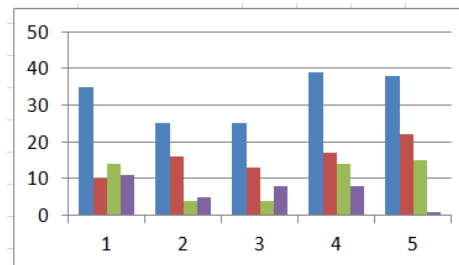


Chart – Excel – Axis

13

- Use 2 axes in the chart if you have 2 complementary set of data with different measure units, e.g., man-hours spent Vs progress percent, # of accidents Vs time lost, delay Vs cost suffered, etc.

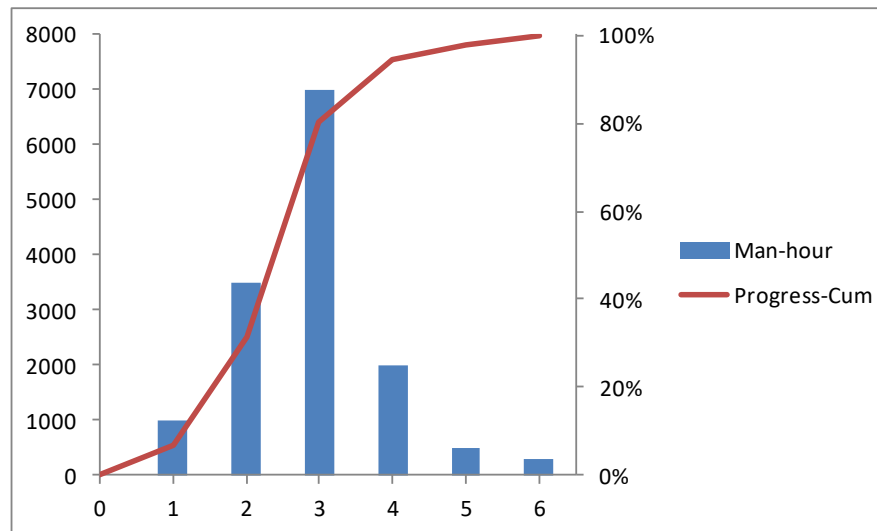
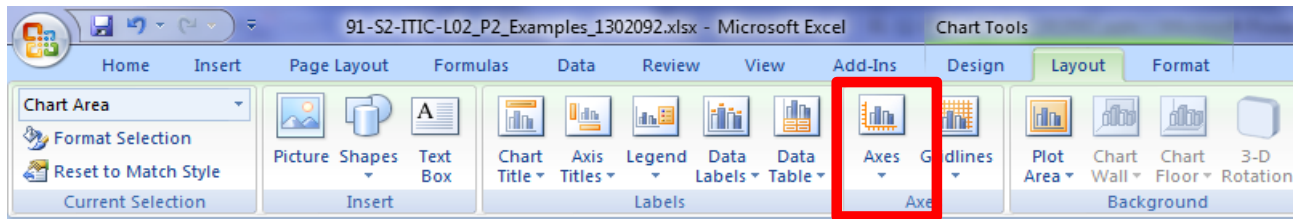
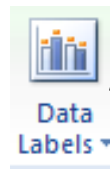
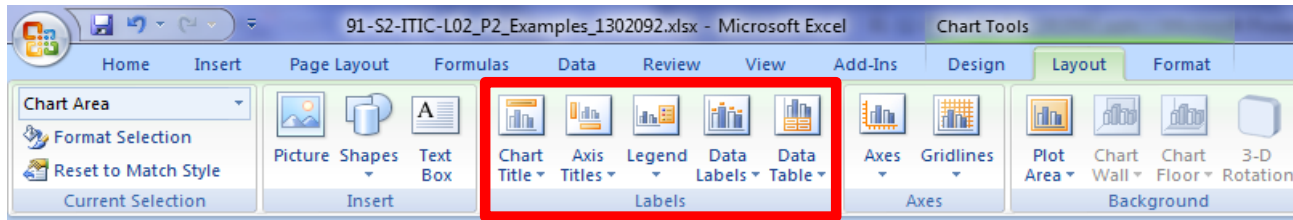


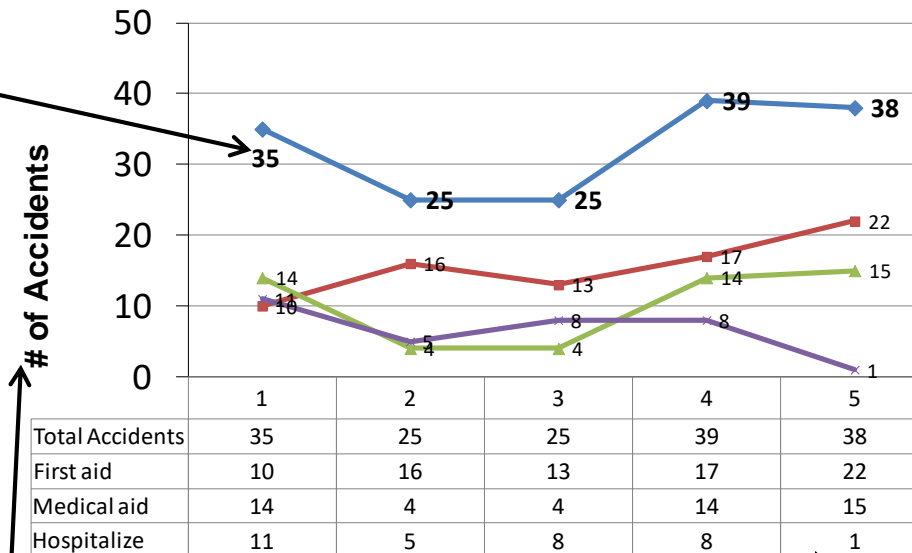
Chart – Excel – Labels

14



Data Labels

◆ Total Accidents ◆ First aid ◆ Medical aid ◆ Hospitalize



of Accidents

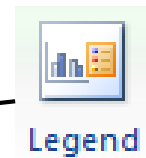
Month of 1391



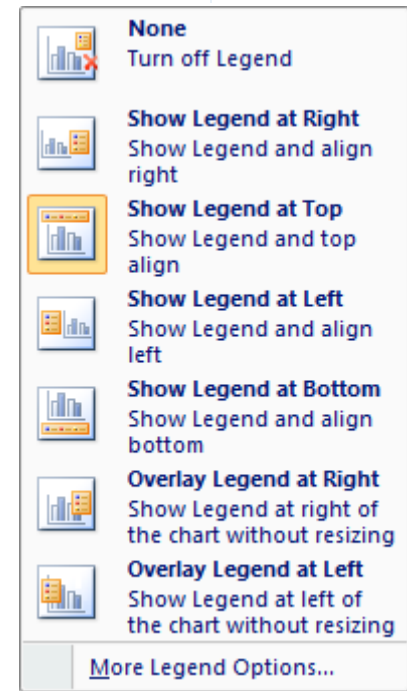
Axis Titles

Primary Horizontal Axis Title

Primary Vertical Axis Title



Legend



Data Table

Chart – Excel

15



Hands on software (Excel):

- Select data
- Move chart
- Adding shapes
- Adjusting sizes

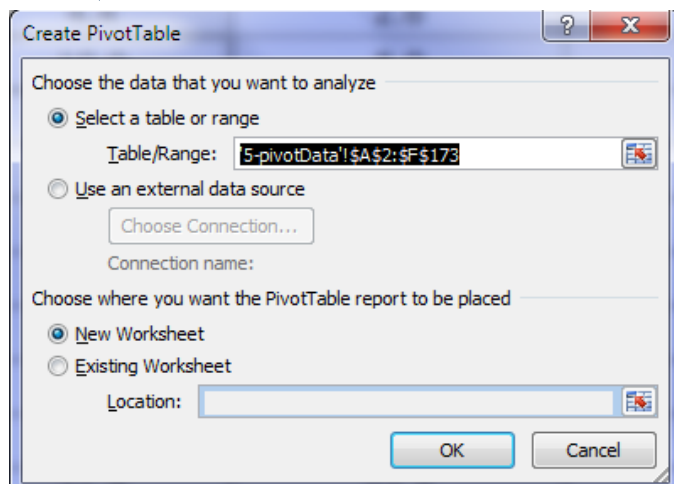
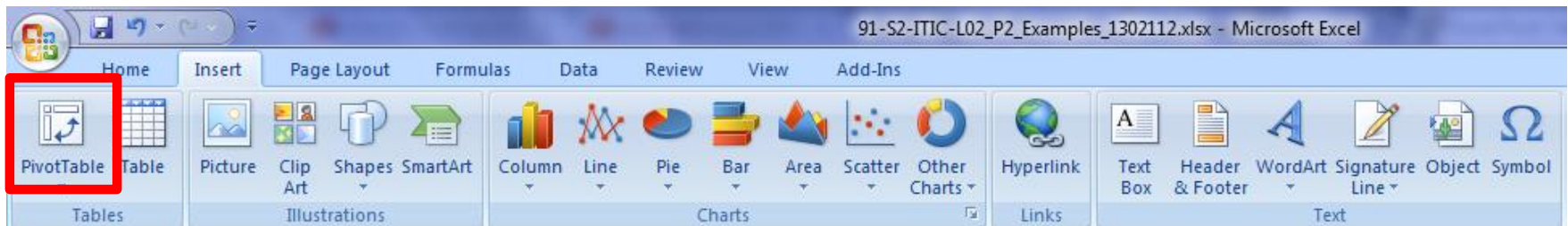


Any other features!

Pivot tables

16

- Pivot tables are useful tools to summarize, categorize, analyze, explore and present data.



The screenshot shows a PivotTable report and the 'PivotTable Field List' task pane. The PivotTable has 'Row Labels' in column A, 'Sum of Day Shift Manhour' in column B, and 'Sum of Night Shift Manhour' in column C. The 'PivotTable Field List' task pane is on the right, showing the fields to be added to the report.

Row Labels	Sum of Day Shift Manhour	Sum of Night Shift Manhour
1	195.2	64.2
2	711	209.9
3	637.1	194.73
4	266.9	73.94
Grand Total	1810.2	542.77

The 'PivotTable Field List' task pane shows the following fields:

- Choose fields to add to report:
 - ☐ Date
 - ☐ Operation
 - ☒ Site #
 - ☐ Total Manhours
 - ☐ Day Shift Manhour
 - ☐ Night Shift Manhour
- Drag fields between areas below:
 - Report Filter: ☒ Site #
 - Column Labels: ☐ Total Manhours
 - Row Labels: ☐ Day Shift Manhour
 - Values: ☒ Sum of Night Shift Manhour
- Defer Layout Update: ☐ Update

Pivot tables

17



Hands on software (Excel):

- ☐ Select data
- ☐ Values, Row, Column
- ☐ Value field setting
- ☐ Filtering

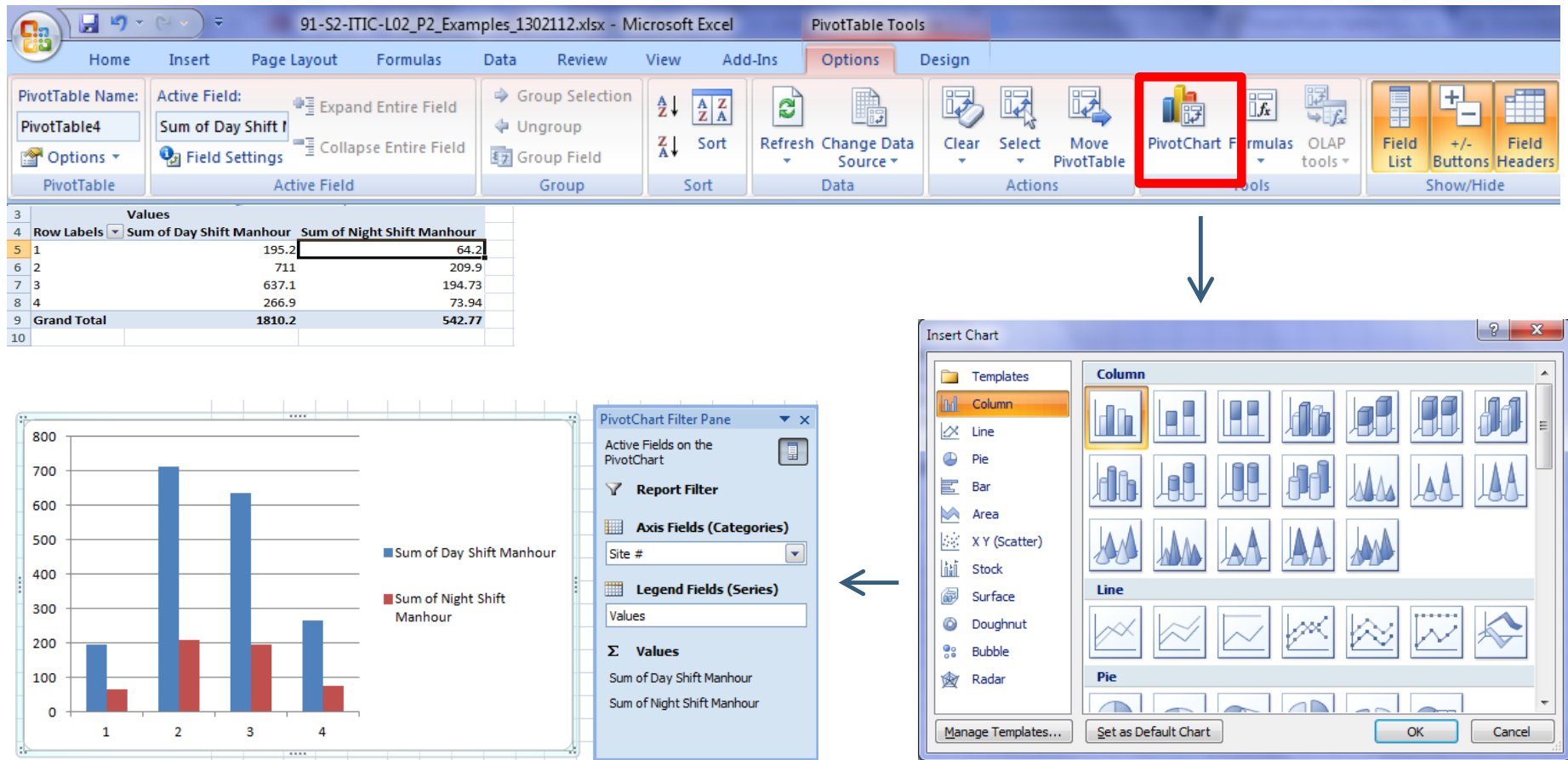


Any other features!

Pivot charts

18

- Pivot charts are charts linked to pivot tables and have a filtering feature.



Pivot charts

19



Hands on software (Excel):

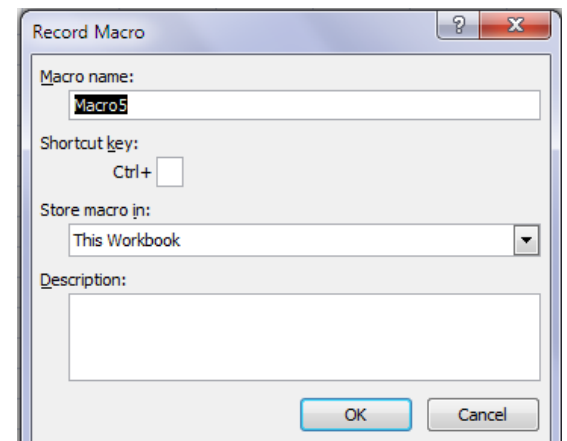
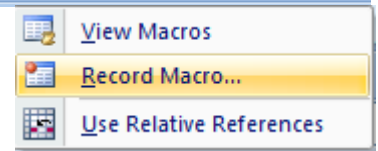
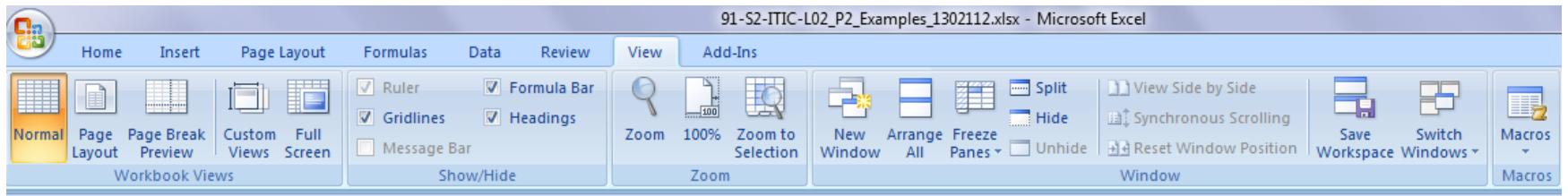
- Create pivot chart
- Move chart
- Filtering
- Dynamic changes



Any other features!

Macros

20



Hands on software (Excel):

- Record a macro
- Relative reference
- Managing macros

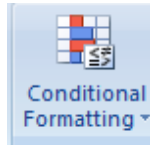
Miscellaneous features

21



Hands on software (Excel):

- Vlookup: `VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])`
- Conditional formatting



Any other features!

Spreadsheet assignment 1-P1

22



Assignment 1-P1-Spreadsheet:



A constructor company has done a construction phase of a project with following operations:

- 1) erection
- 2) bolting
- 3) welding
- 4) painting

Daily man hours spent by different workers on site is presented in "Daily man hour" sheet. You, as project manager, need to prepare an aggregate report to present to the board of the company. Headings of the aggregate table have been prepared at this stage and you are going to fill in the cells on the table. After completing the table you also need to add two new aggregate headings to it to enhance the report. ([Download the excel file of the assignment from the website](#))

Spreadsheet assignment 1-P2

23



Assignment 1-P2-Spreadsheet:



Download excel file ([IT-L02_Ass1_P2_Spreadsheet](#)) posted for the assignment on the course webpage. Daily man hours spent by different workers on site is presented in "Daily_Man hour" sheet. You, as project manager, need to prepare two aggregate reports to present to the board of the company:

- 1) Monthly man-hours used in different operations (100h)
- 2) Number of days with man-hours more than 5 (100h) in every month

Use pivot table to prepare the reports. Present the result in an appropriate form of graph (linked to the pivot table).



Thank you!