# Spreadsheets

## Lecture 11 – COMPSCI 111/111G S2 2020

"Autosum aside, these numbers just don't add up."

# The 1st Killer App. VisiCalc

- The idea for the electronic spreadsheet came to me while I was a student at the Harvard Business School, working on my MBA degree, in the spring of 1978. Sitting in Aldrich Hall, room 108, I would daydream. "Imagine if my calculator had a ball in its back, like a mouse..." (I had seen a mouse previously, I think in a demonstration at a conference by Doug Engelbart, and maybe the Alto).

- And "..imagine if I had a heads-up display, like in a fighter plane, where I could see the virtual image hanging in the air in front of me. I could just move my mouse/keyboard calculator around, punch in a few numbers, circle them to get a sum, do some calculations, and answer '10% will be fine!'" (10% was always the answer in those days when we couldn't do very complicated calculations...)

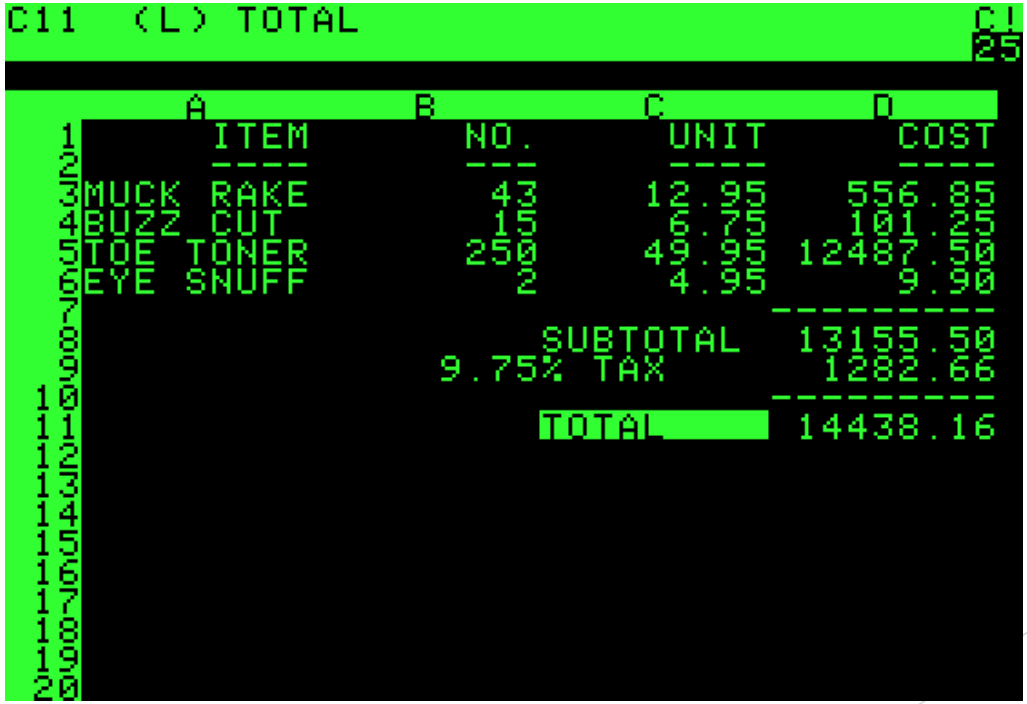
www.bricklin.com/history/intro.htm

# Development

- Background
  - Dan Bricklin and Bob Frankston
  - VisiCalc released in 1979.

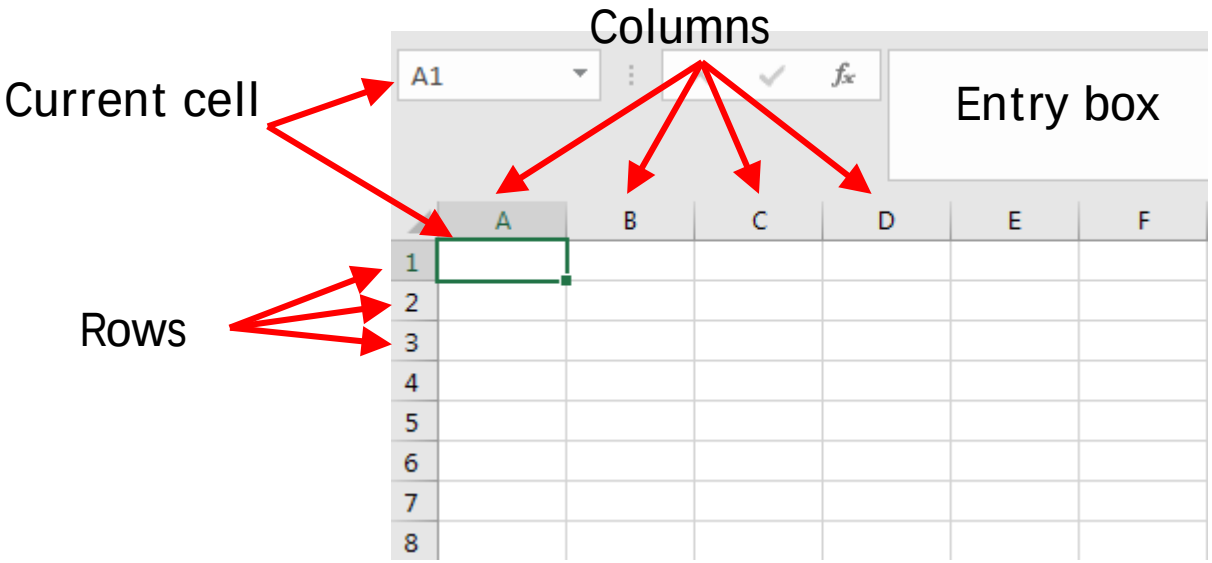
# Design

- Visible Calculator
  - Organize calculations as we would on paper - in columns and rows.
  - Supports automatic updating of calculations.
  - Copy formulas so we may apply these to large amounts of data.



# Microsoft Excel - Overview

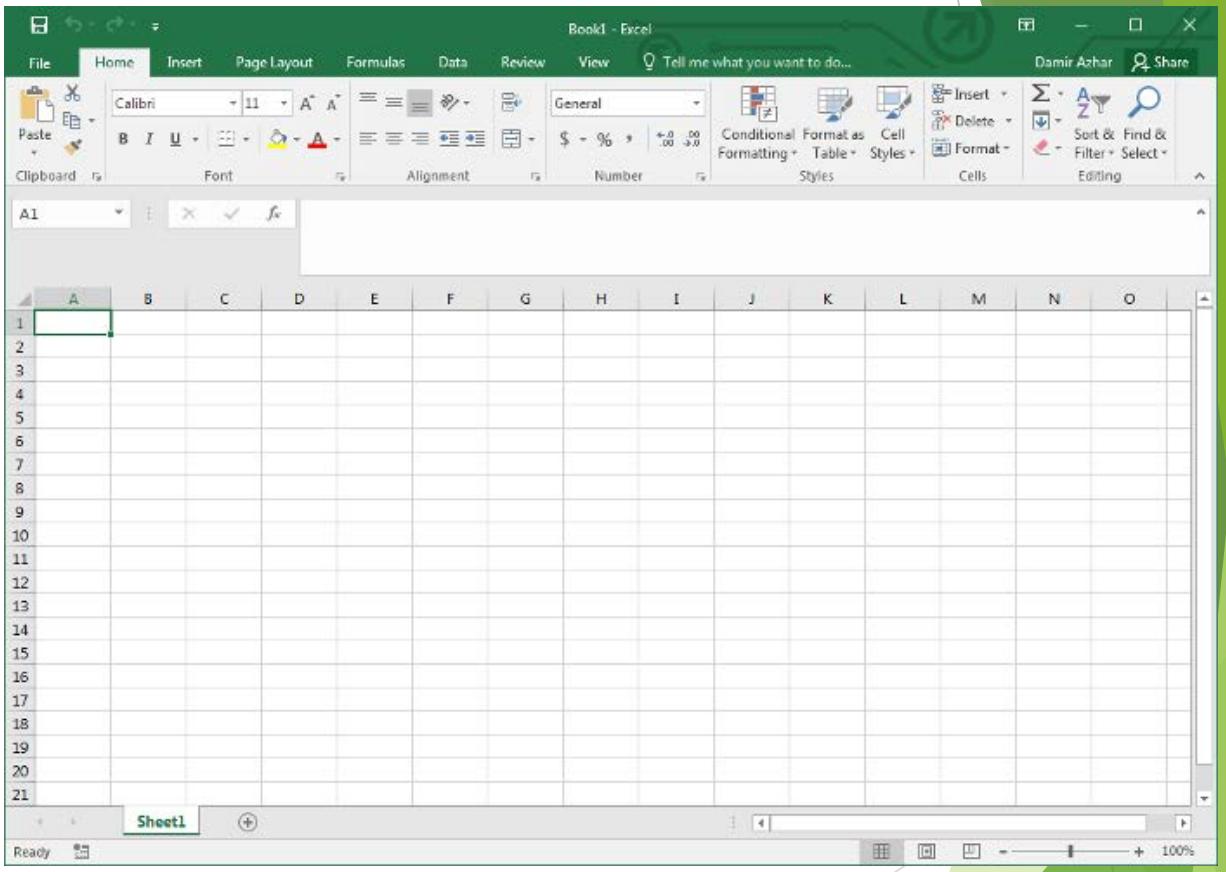
- Used to represent a table of data
  - Rows (labelled with numbers)
  - Columns (labelled with letters)
  - Cells




http://en.wikipedia.org/wiki/Microsoft_Excel

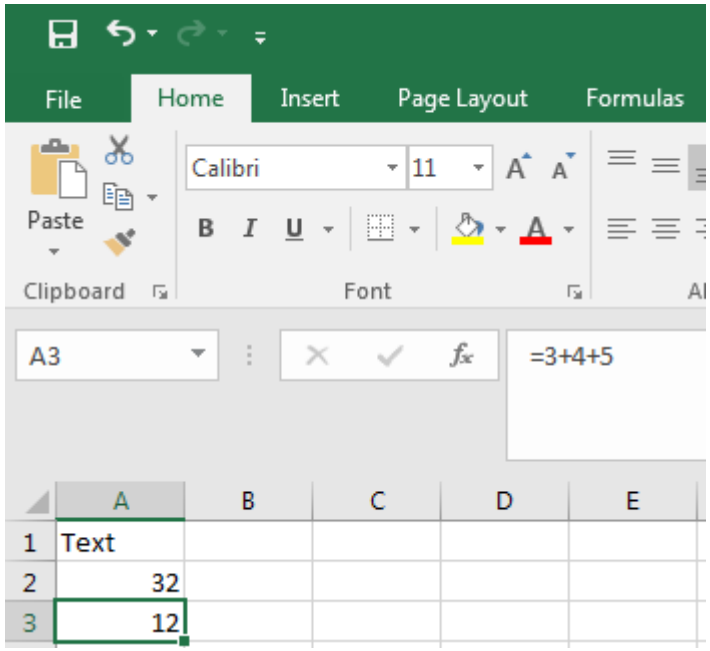
# Changing appearance of cells

- Alter Size
  - Click on cell separator and drag
- Add Borders
  - Format Cell
- Add Shading
  - Format Cell
- Font
  - Style
  - Size
  - Alignment
- Numbers
  - Decimal points



# Entering Data

- Cells contain
  - Text
  - Numbers
  - Formulae (start with “=“)



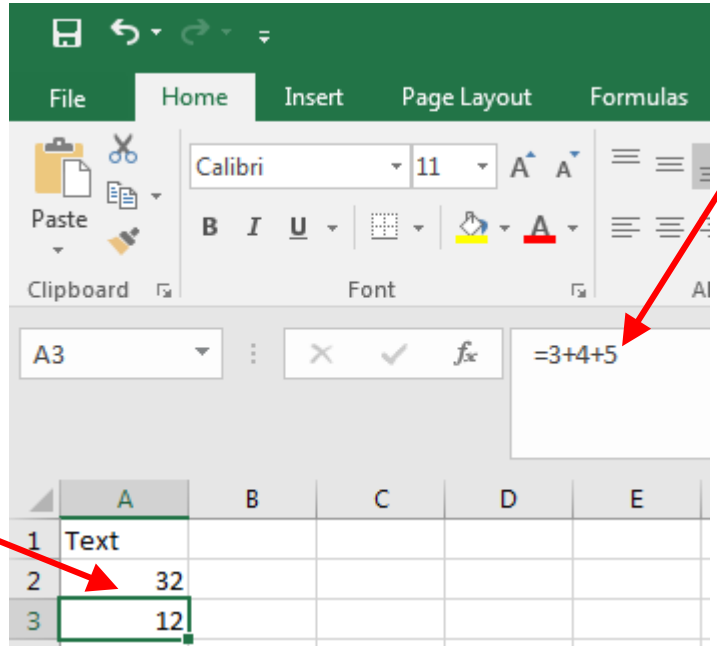

- Entry box
  - Type data in entry box
  - Hit Enter key to accept value
  - All formulae are calculated
  - Results shown in each cell

# Formulae

- Entering formulae
  - Always begin with an equals sign
  - Calculation typed into cell/entry box
  - Result displayed in the cell
  - Formula displayed in the entry box

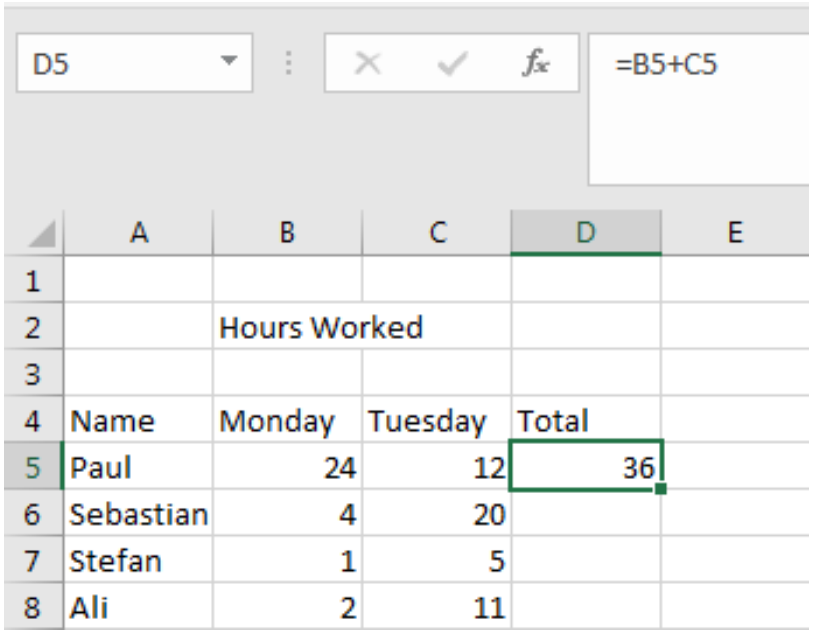
Formula

Result



# Using Cell References

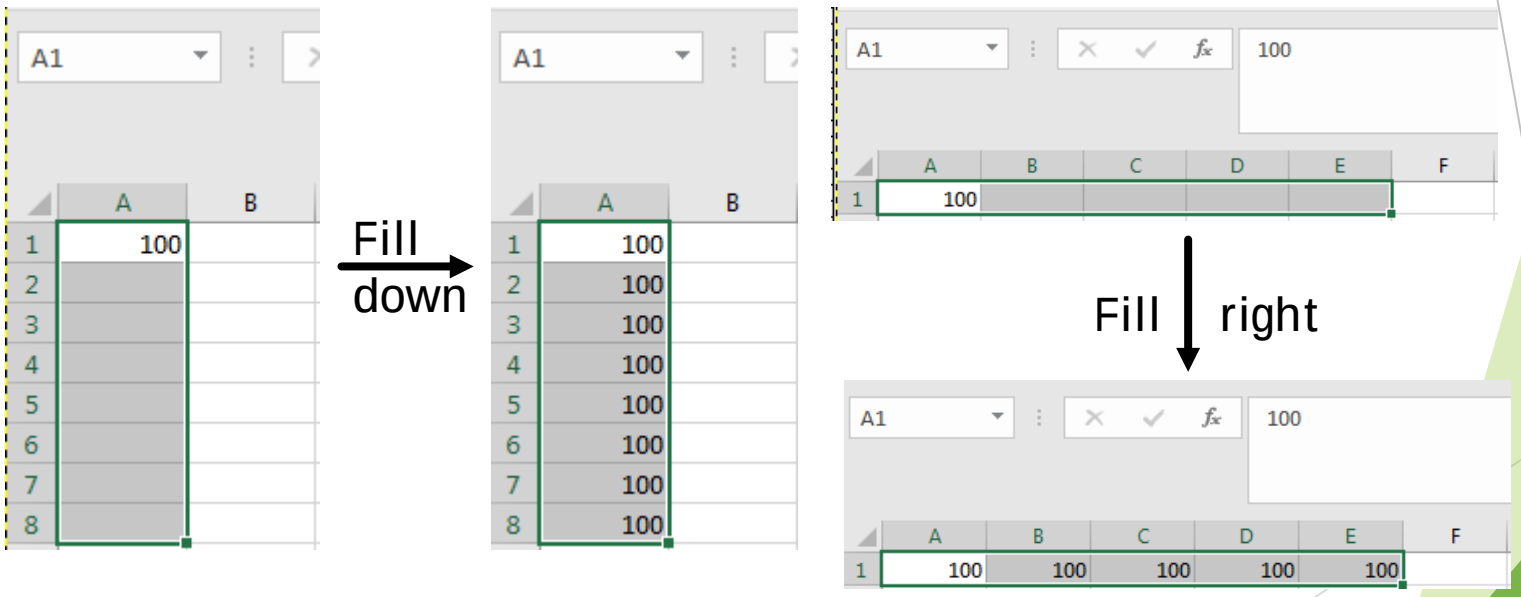
- Cell Reference
  - Formulae refer to other cells
  - Specify cell location using Row and Column IDs




| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | Hours Worked | | | |
| 3 | | | | | |
| 4 | Name | Monday | Tuesday | Total | |
| 5 | Paul | 24 | 12 | 36 | |
| 6 | Sebastian | 4 | 20 | | |
| 7 | Stefan | 1 | 5 | | |
| 8 | Ali | 2 | 11 | | |

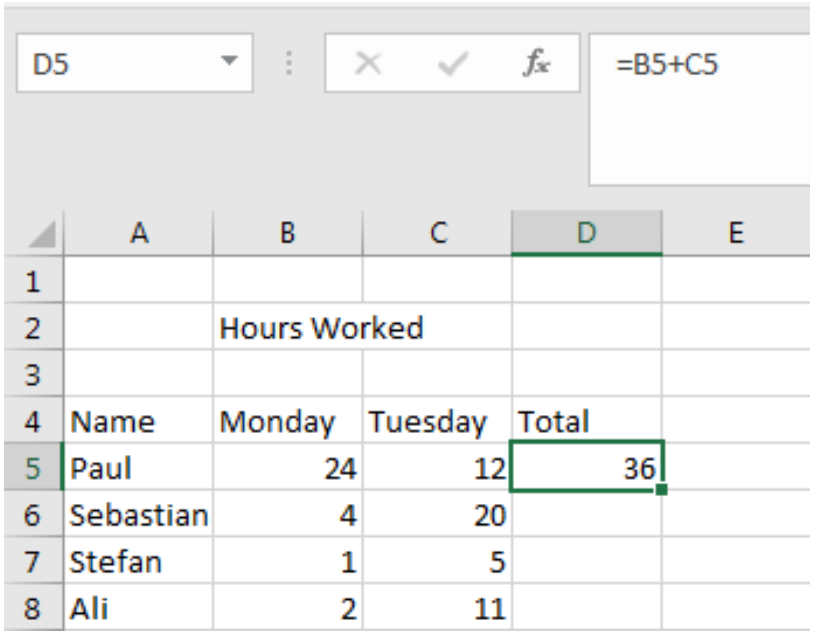
# Filling Down and Filling Right

- Save time
  - Fill many cells with same contents
  - Select a group of cells
  - Fill Right
  - Fill Down



# Filling Cells with Formulae

- Use Fill Down/ Fill Right on formulae
  - Saves us entering new formula for each row

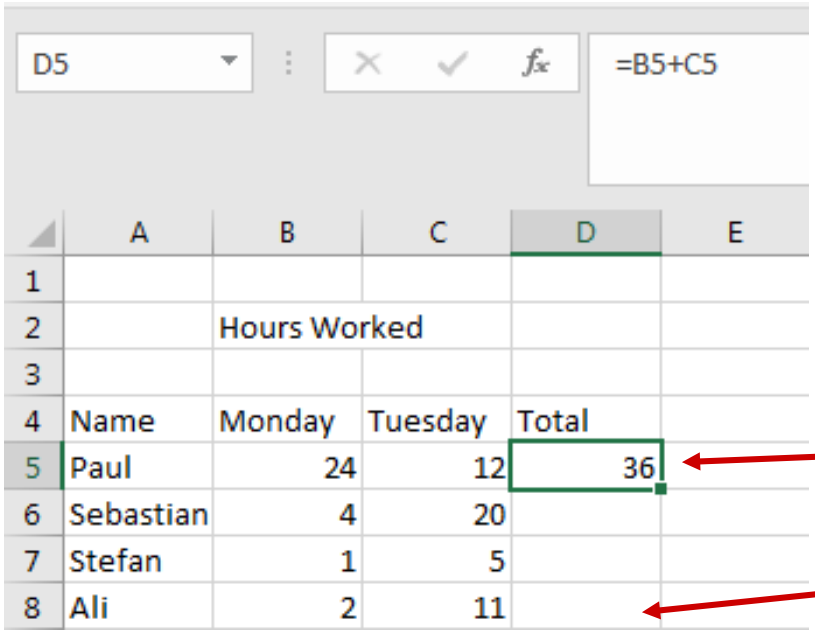



| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | Hours Worked | | | |
| 3 | | | | | |
| 4 | Name | Monday | Tuesday | Total | |
| 5 | Paul | 24 | 12 | 36 | |
| 6 | Sebastian | 4 | 20 | | |
| 7 | Stefan | 1 | 5 | | |
| 8 | Ali | 2 | 11 | | |

  - D5 should contain =B5 + C5
  - D6 should contain =B6 + C6
  - D7 should contain =B7 + C7
  - D8 should contain =B8 + C8

# Relative References

- Cell reference in formula
  - Use same formula, different cell references
  - Cell reference is relative to position of formula
  - Spreadsheets adjust formula automatically during fill operation

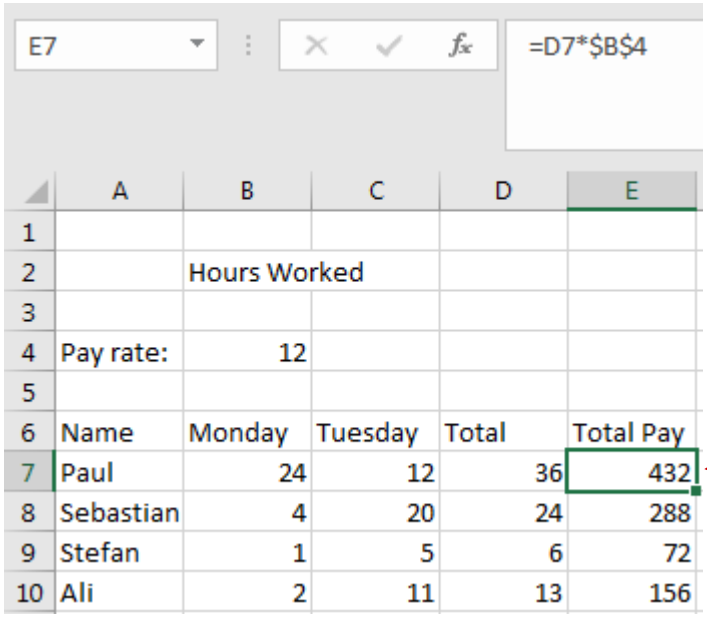



=B5 + C5

=B8 + C8

# Absolute references

- Absolute references
  - Sometimes the cell reference should not change
    - Eg. for constants
  - Use a dollar sign $ before the row or column




= D7 * $B$4

# Exercises

Exercise 1: Is the reference to cell D6 in the formula =$D$6*2 a relative or an absolute reference?

Imagine that you are keeping track of the sales for tickets at the Olympic games. A number of different sports are located in different venues. Each venue has a number of seats available. Your spreadsheet will keep track of the number of tickets available and the number actually sold.

Exercise 2: Given the following spreadsheet, what formula would you use in cell D6 to calculate the number of tickets remaining?

| | A | B | C | D |
|---|---|---|---|---|
| 1 | | **Ticket Sales** | | |
| 2 | | | | |
| 3 | **Price** | $10.00 | | |
| 4 | | | | |
| 5 | **Event** | **Tickets Available** | **Tickets Sold** | **Remaining** |
| 6 | Cycling | 4000 | 2000 | 2000 |
| 7 | Weightlifting | 2000 | 750 | 1250 |
| 8 | Triathlon | 1000 | 100 | 900 |
| 9 | Football | 3000 | 3000 | 0 |
| 10 | Badminton | 5000 | 4500 | 500 |
| 11 | | 15000 | 10350 | 4650 |

# Exercises

Exercise 3: What formula would you use in cell E8 to calculate the money made from ticket sales?

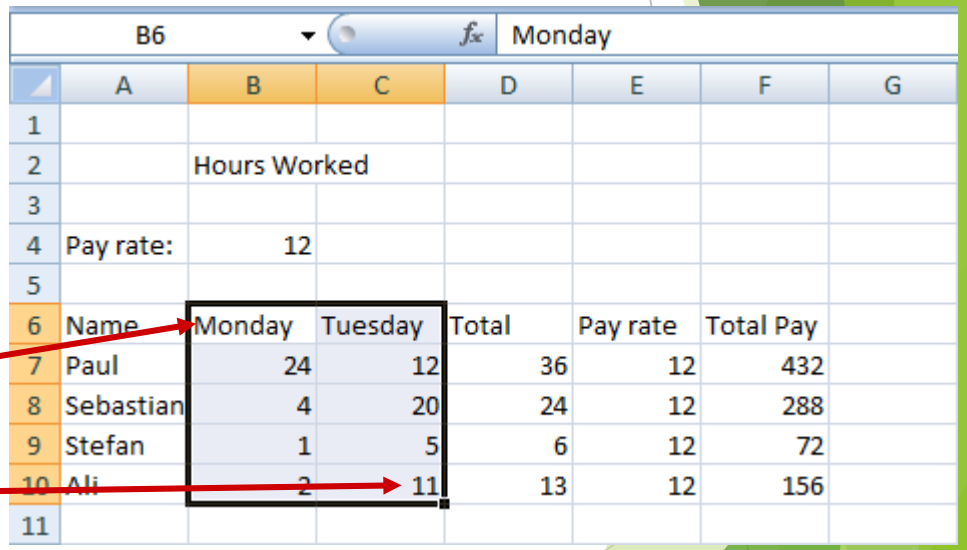
| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | **Ticket Sales** | | | |
| 2 | | | | | |
| 3 | **Price** | $10.00 | | | |
| 4 | | | | | |
| 5 | **Event** | **Tickets Available** | **Tickets Sold** | **Remaining** | **Sales** |
| 6 | Cycling | 4000 | 2000 | 2000 | $20,000.00 |
| 7 | Weightlifting | 2000 | 750 | 1250 | $7,500.00 |
| 8 | Triathlon | 1000 | 100 | 900 | $1,000.00 |
| 9 | Football | 3000 | 3000 | 0 | $30,000.00 |
| 10 | Badminton | 5000 | 4500 | 500 | $45,000.00 |

Exercise 4: What formula would you use in cell B11 to calculate the total number of tickets available?

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | | **Ticket Sales** | | | |
| 2 | | | | | |
| 3 | **Price** | $10.00 | | | |
| 4 | | | | | |
| 5 | **Event** | **Tickets Available** | **Tickets Sold** | **Remaining** | **Sales** |
| 6 | Cycling | 4000 | 2000 | 2000 | $20,000.00 |
| 7 | Weightlifting | 2000 | 750 | 1250 | $7,500.00 |
| 8 | Triathlon | 1000 | 100 | 900 | $1,000.00 |
| 9 | Football | 3000 | 3000 | 0 | $30,000.00 |
| 10 | Badminton | 5000 | 4500 | 500 | $45,000.00 |
| 11 | | 15000 | 10350 | 4650 | $103,500.00 |

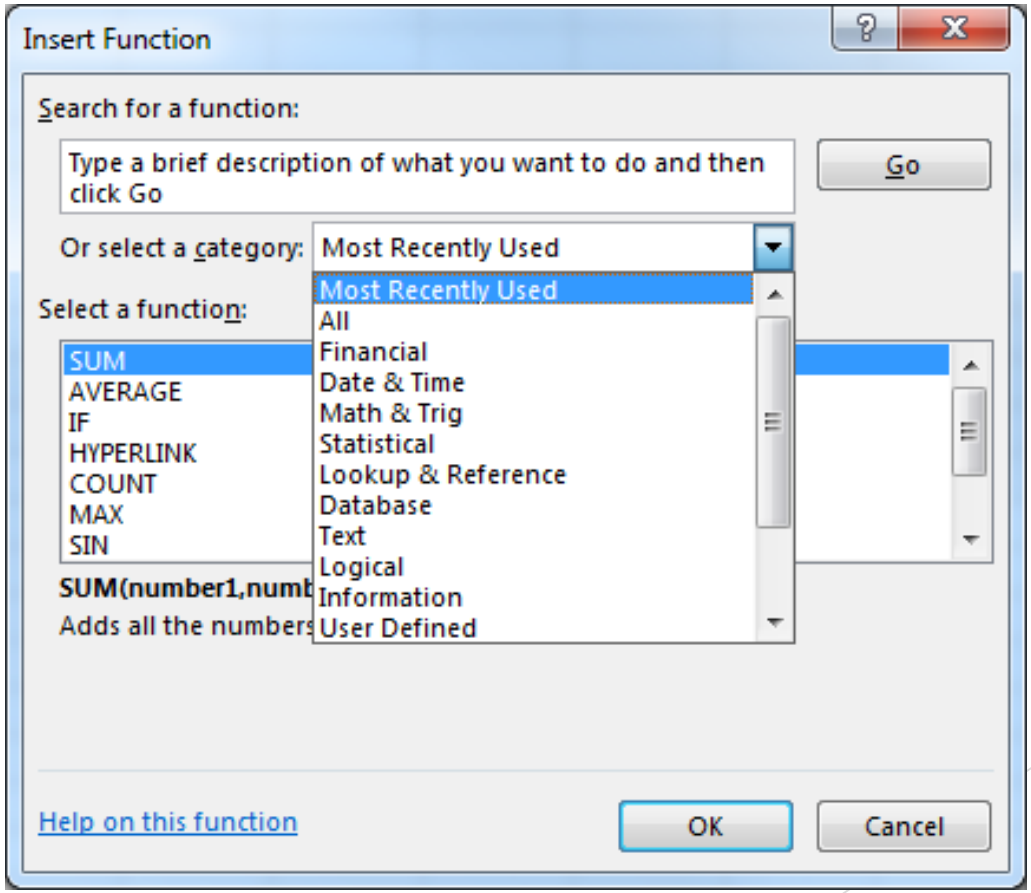
# Functions

- Many functions exist
  - Allow us to make more complicated formulae
  - Examples
    - SUM
    - MAX
    - MIN
    - AVERAGE
- Specifying a range of cells
  - Top Left cell
  - Bottom Right cell
  - B6:C10



# Using built-in functions

- Insert a Function
  - Many categories
  - Help is useful



# Functions

- Format of Excel functions:

```
=nameOfFunction(comma separated list of parameters)
```

- Examples:

```
=SUM(5,6,7)
=AVERAGE(A2:D2)
```

# Boolean Logic

- Boolean value
  - True or False
  - 2-valued logic
- Compare two different values
  - =
  - >
  - <
  - >=
  - <=
- Example. Are the following true or false?
  - =(3 = 4)
  - =(4 < 6)
  - =(MAX(5, 6) = 5)
  - =(SUM(1,2,3) = 6)

# Boolean Functions

- AND( a, b )
  - True only when a and b are both true
- OR( a, b )
  - True if either a is true or b is true
- NOT( a )
  - True only when a is false
- Are the following formulae TRUE or FALSE?
  - =AND( 3 = 4, 2 = 2 )
  - =OR( 7 < 5, 3 > 3 )
  - =NOT( 3 = 2 )
  - =OR( AND( 2 = 3, 4 > 3 ), NOT( 2 = 3 ) )

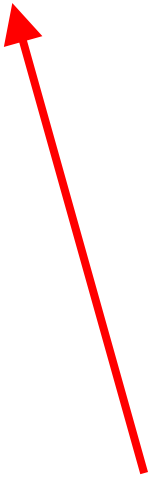
# IF functions

- Makes a decision
  - Different values used in the cell depending on the logical test

- IF( logical_test , value_if_true, value_if_false )

Must be either true or false
- value
- condition (test)
- boolean function

This value appears in the cell if the boolean is true



This value appears in the cell if the boolean is false