






# **ME 203 MS Excel**

## **Lecture 4**



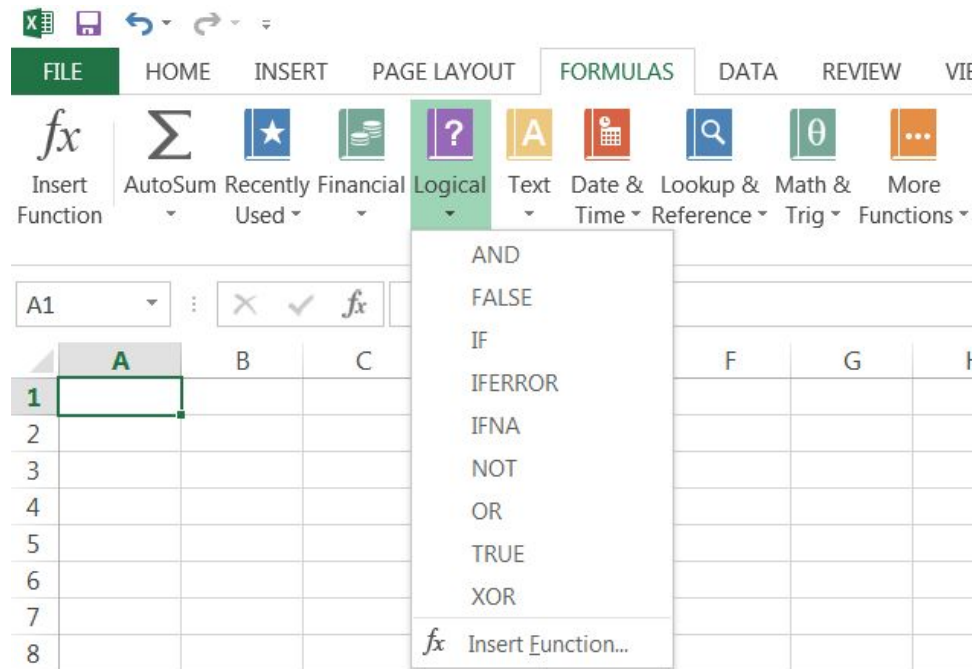
# Flowcharts

- Visual depiction of a program's operation using standard symbols
- Symbols are connected by arrows to indicate the order of steps

Symbol	Name	Used to indicate
	Terminator	Start or end of a program
	Operation	Computation step
	Data	Input or output step
	Decision	Decision point in a program
	Connector	Flowchart continues in another location

# Relational and Logical Operators

- Logical operators allow you to have multiple possible answers depending on the answer to a TRUE/FALSE question
- There are 9 logical operators in EXCEL



# Relational and Logical Operators

- Logical operators allow you to have multiple possible answers depending on the answer to a TRUE/FALSE question
- There are 11 logical operators in EXCEL
- They can be used in combination with relational operators
  - >
  - >=
  - =
  - <
  - <=
  - < > (not equal to)

# Relational and Logical Operators

**AND(logical1, logical2, ...)** – returns TRUE if all the logical conditions are true, else returns FALSE  
Excel will allow up to 255 test conditions

- Example:

=AND(A1>10,B1<=20,C1<>15)

The formula returns TRUE if the value in cell A1 is greater 10, and the value in B1 is less than or equal to 20, and the value in C1 is not equal to 15

The formula returns FALSE otherwise

# Relational and Logical Operators

**OR(logical1, logical2, ...)** – returns TRUE if at least one of the logical conditions is true, else returns FALSE  
Excel will allow up to 255 test conditions

- Example:

=OR(A1>10,B1<=20,C1<>15)

The formula returns TRUE if the value in cell A1 is greater 10, or the value in B1 is less than or equal to 20, or the value in C1 is not equal to 15

The formula returns FALSE otherwise

# Examples

	A	B	C
1	31	64	42
2			

Write an AND formula to check if the statement “ $A1 > B1$  and  $A1 > C1$ ” is true or false.

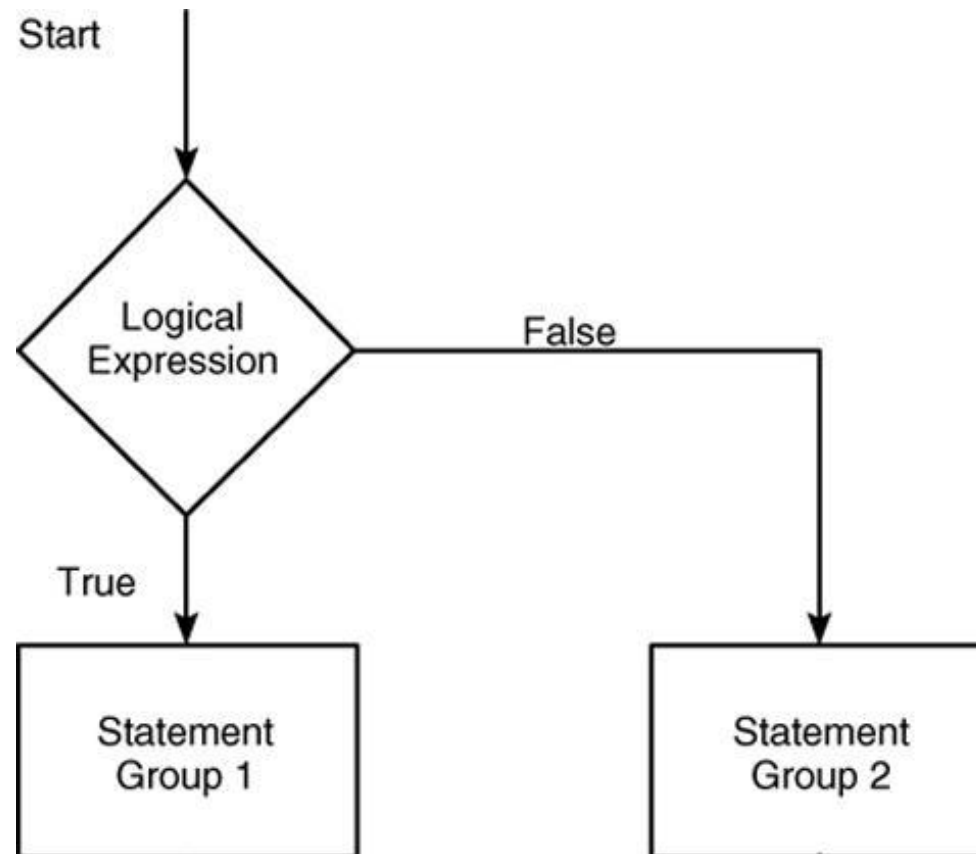
Write an OR formula to check if the statement “ $A1 > B1$  or  $A1 > C1$ ” is true or false.

# Conditional Statements

- We use conditional statements to describe our decision making process everyday
  - If I go to lab, I will get points
  - If I win Mega Bucks, I will buy a jet.
- Implied in the statements
  - If I don't come to class, I won't get points
  - If I don't win Mega Bucks, I won't buy a jet



# Flowchart



# Conditionals

Questions for your conditional statements must have true/false answers

For example:

- $B10=1$  is B10 exactly 1?
- $C12>(B9+10)$  is C12 greater than (B9+10)?
- $C12/B9\leq D10$  is C12/B9 less than or equal to D10?
- $A16=\text{"yes"}$  is A16 equal to the text "yes"?
- Absolute or relative referencing can be used in the questions.

# If Conditional

=if(test, true, false)

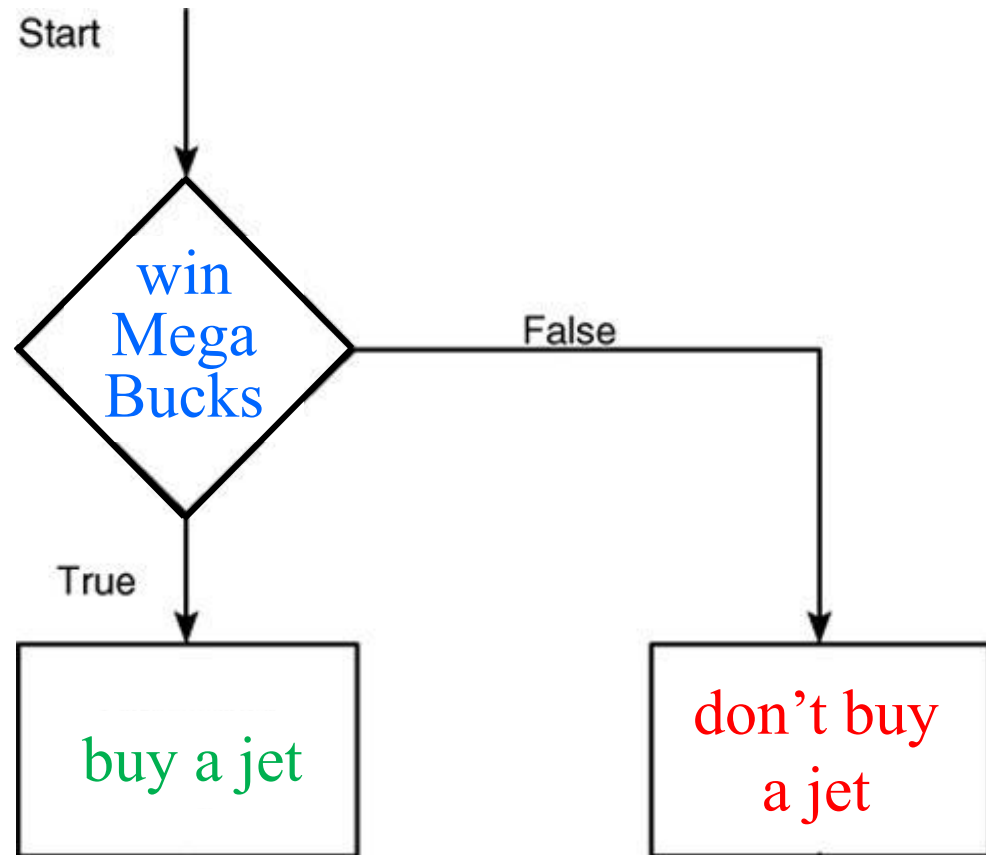
The test is a logical test (only true/false answers)

True is the cell value if the test result is true

False is the cell value if the test result is false

=if(win Mega Bucks, buy a jet, don't buy a jet)

# Flowchart



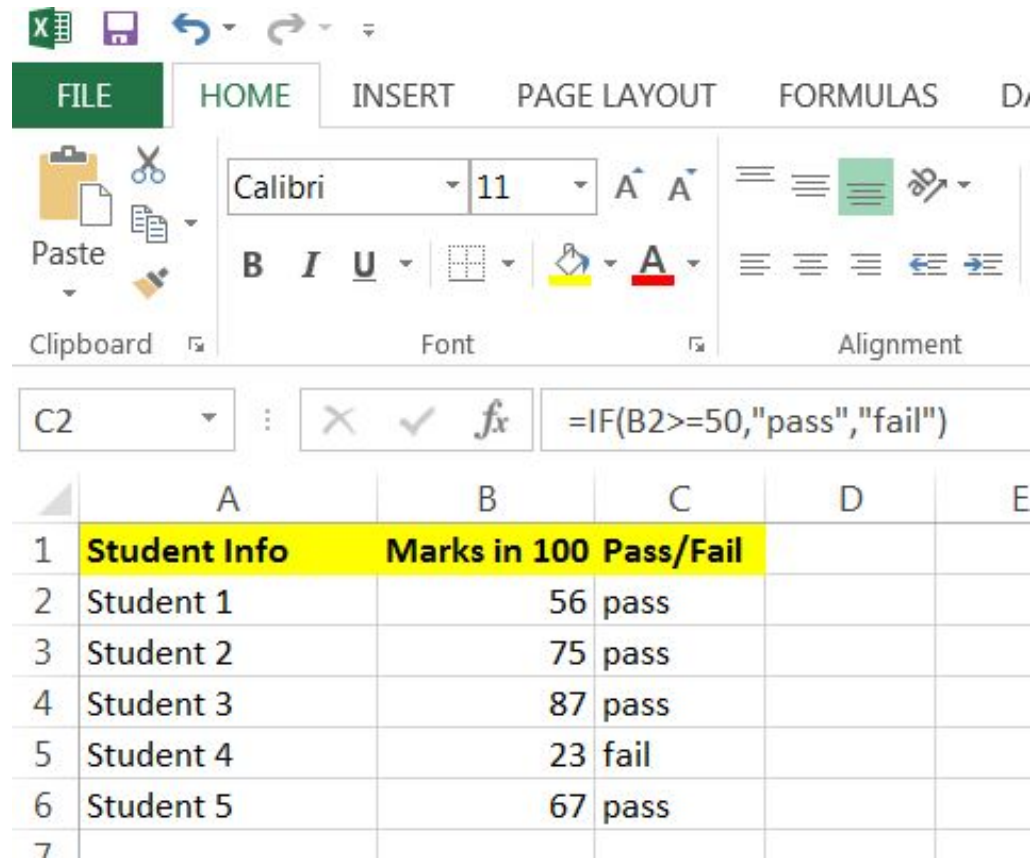
# Example

The pass mark in an exam is 50/100. Write an **if** conditional to check whether the students have passed or failed.

Student	Marks in 100
Student 1	56
Student 2	75
Student 3	87
Student 4	23
Student 5	67

# Example

## Solution



The screenshot shows the Microsoft Excel interface. The 'HOME' tab is selected in the ribbon. The 'Font' group shows 'Calibri' font and '11' size. The 'Alignment' group shows text alignment options. The formula bar shows the formula `=IF(B2>=50,"pass","fail")` being entered into cell C2. The worksheet contains a table with 5 columns (A-E) and 7 rows. Row 1 is a header with 'Student Info' in column A, 'Marks in 100' in column B, and 'Pass/Fail' in column C. Rows 2-6 contain student data: Student 1 (56 marks, pass), Student 2 (75 marks, pass), Student 3 (87 marks, pass), Student 4 (23 marks, fail), and Student 5 (67 marks, pass). Row 7 is empty.

	A	B	C	D	E
1	<b>Student Info</b>	<b>Marks in 100</b>	<b>Pass/Fail</b>		
2	Student 1	56	pass		
3	Student 2	75	pass		
4	Student 3	87	pass		
5	Student 4	23	fail		
6	Student 5	67	pass		
7					

# Conditional Statements

- If statements only allow a single condition to be tested for each **if** used
- Adding to our conditional
  - **If** I win Mega Bucks **and** my friend wins Mega Bucks, we will buy a jet
- To test multiple conditions other logical operators must be used

# Conditional Statements

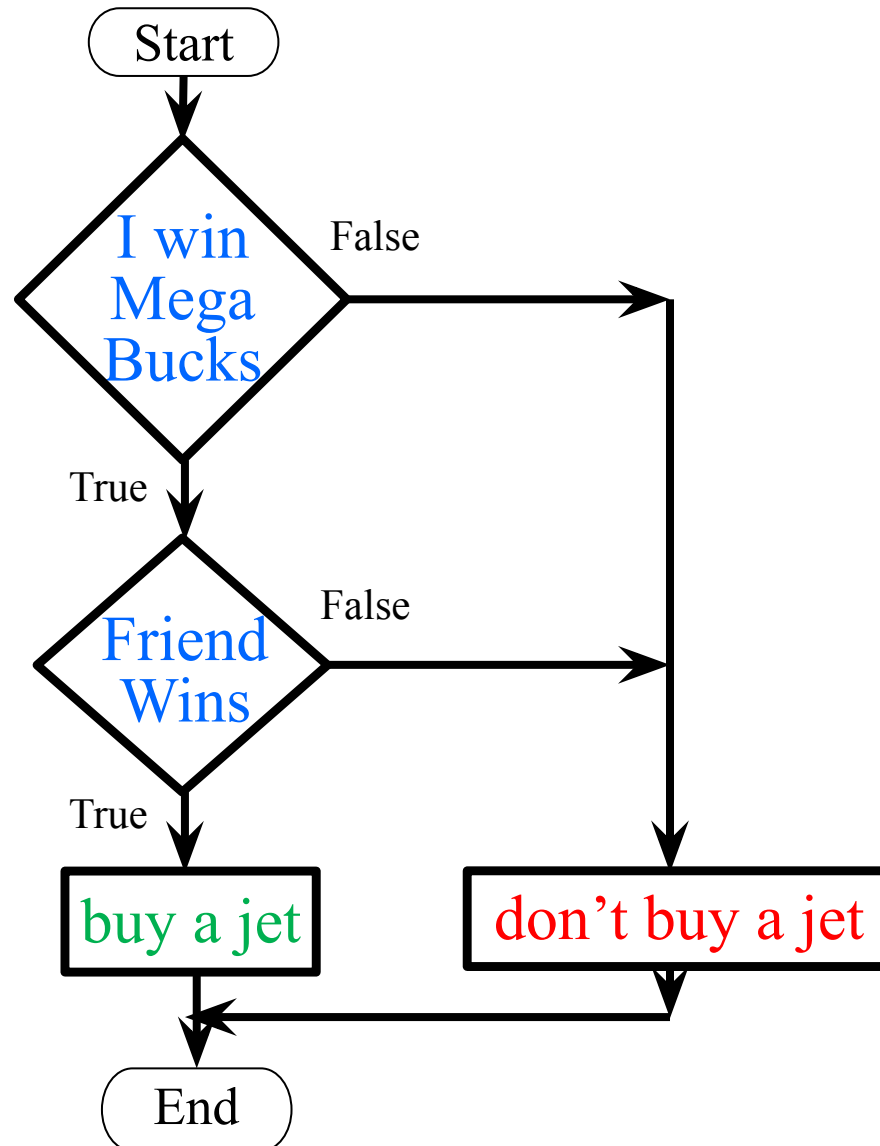
- **And** statements only result in true/false answers
- For answers other than true/false use **and** and **if** together

=if(and(I win Mega Bucks, My friend wins Mega Bucks), buy a jet, don't buy a jet)



# Flowchart

**AND**



# Example

To pass a course students must have at least 50/100 in exam 1 **AND** at least 25/50 in exam 2. Write an **if** conditional to check whether the students have passed or failed.

Student	Exam 1 in 100	Exam 2 in 50
Student 1	56	23
Student 2	75	34
Student 3	87	40
Student 4	23	32
Student 5	67	30

# Example

To pass a course students must have at least 50/100 in exam 1 **AND** at least 25/50 in exam 2. Write an **if** conditional to check whether the students have passed or failed.

D2	:	X	✓	<i>fx</i>	=IF(AND(B2>=50,C2>=25),"pass","fail")
	A	B	C	D	E
1	Student Info	Exam 1 in 100	Exam 2 in 50	Pass/Fail	
2	Student 1	56	23	fail	
3	Student 2	75	34	pass	
4	Student 3	87	40	pass	
5	Student 4	23	32	fail	
6	Student 5	67	30	pass	
7					

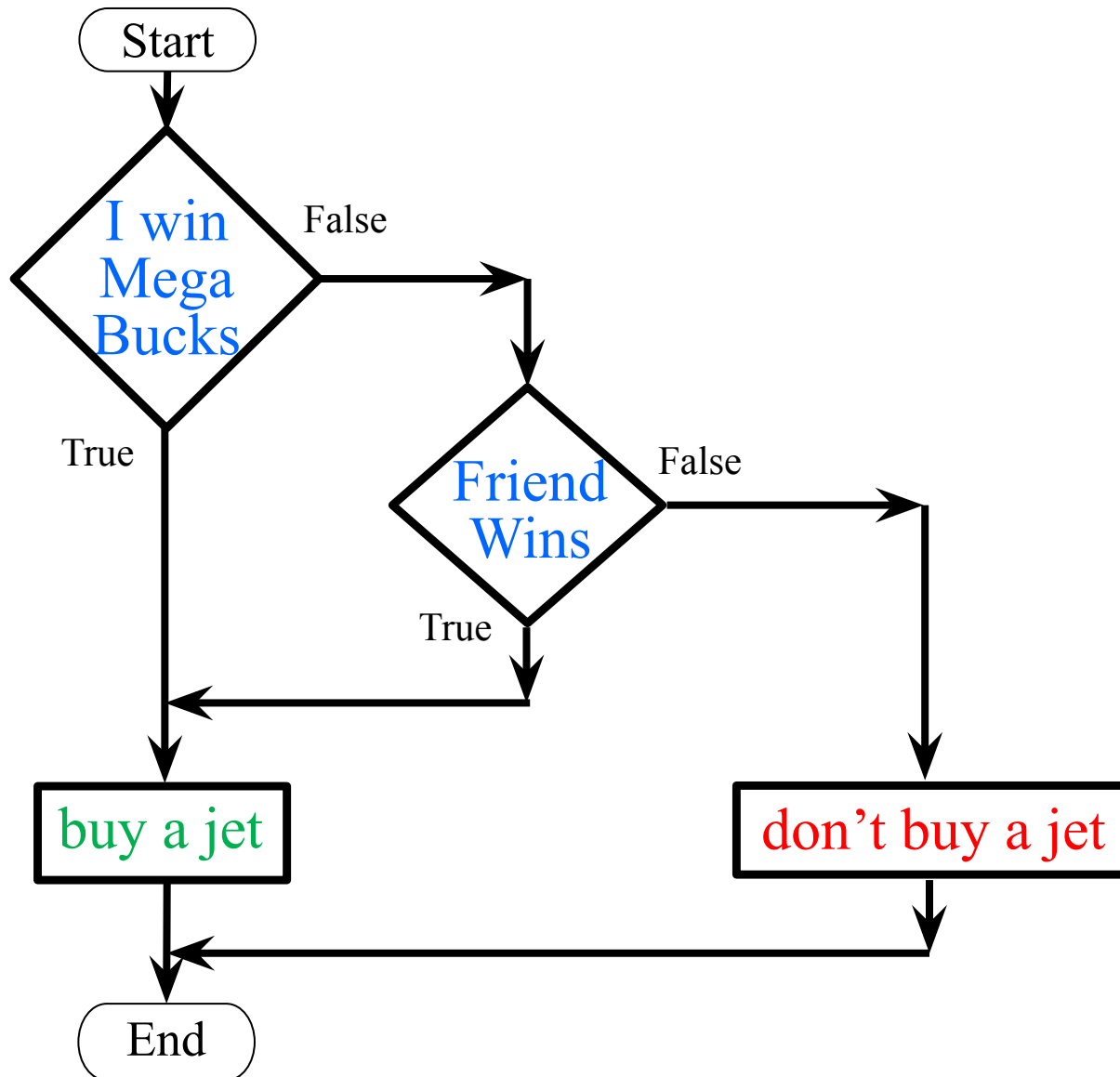
# Conditional Statements

- **Or** statements only result in true/false answers
- For answers other than true/false use **or** and **if** together

=if(or(I win Mega Bucks, My friend wins Mega Bucks), buy a jet, don't buy a jet)

# Flowchart

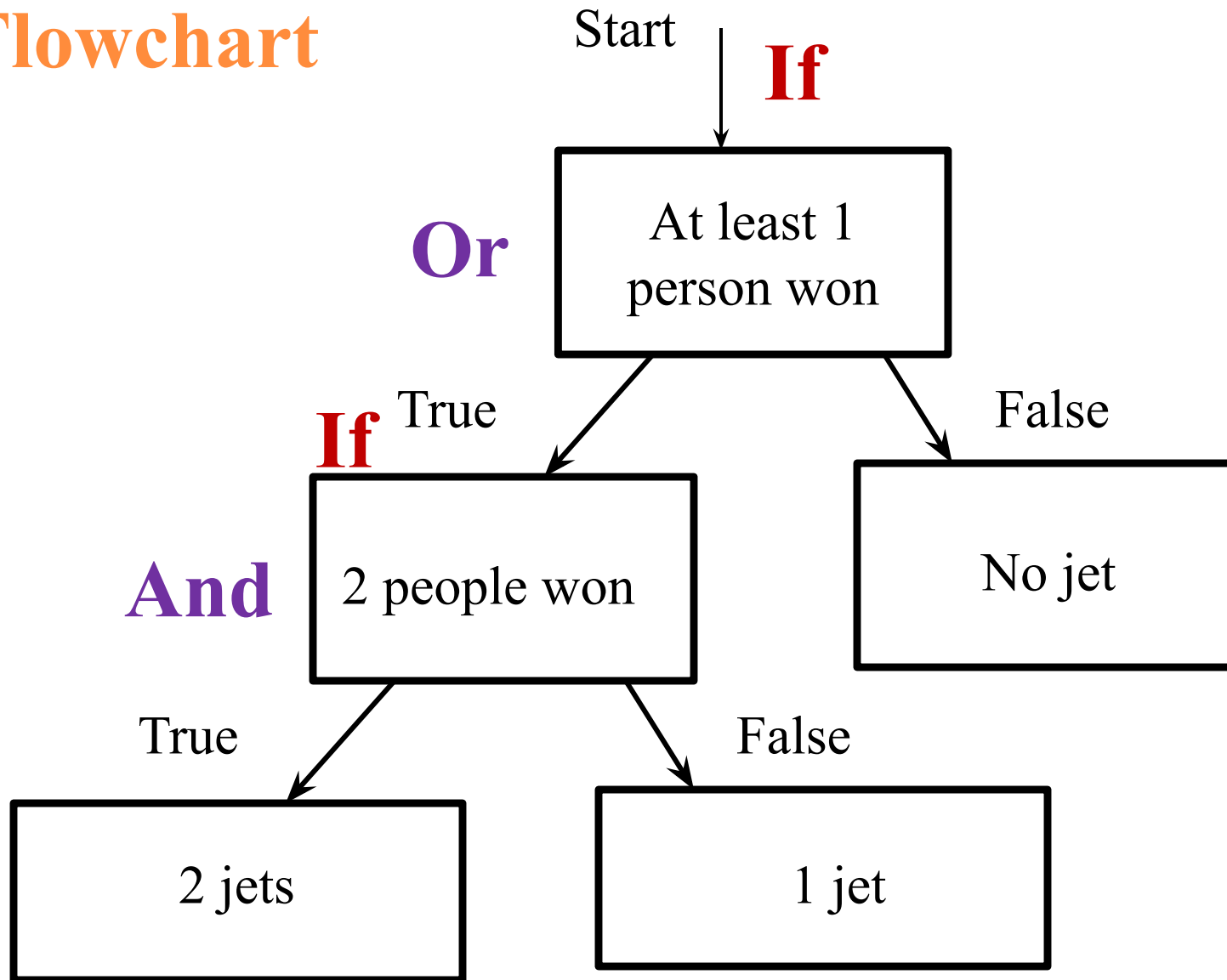
OR



# Conditional Statements

- What if you want to know if you will be buying 1 or 2 jets
- Adding to our conditional
  - **If** I win Mega Bucks **or** my friend wins Mega Bucks, we will buy 1 jet; **if** I win **and** my friend wins we will buy 2 jets
- This requires all multiple logical operators

# Flowchart



# Not Conditional

=not(test)

Changes FALSE to TRUE and TRUE to FALSE

- For answers other than true/false use **not** and **if** together

=if(not(I win Mega Bucks), don't buy a jet, buy a jet)



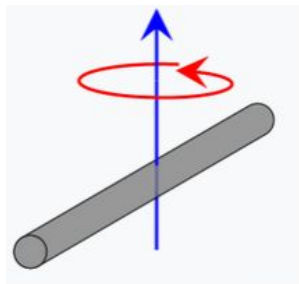
# True/False and Iferror

- TRUE( ) - provides a logical that you can use with other functions
- FALSE( ) - provides a logical that you can use with other functions
- IFERROR – This is how error statements are generated in EXCEL (i.e. #REF!)

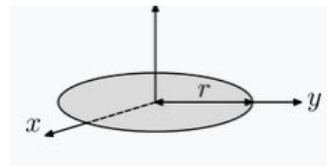
# Nested IF conditionals: Example

Create an Excel worksheet that calculates the moment of inertia of an object if you input the type of object, its mass and dimension

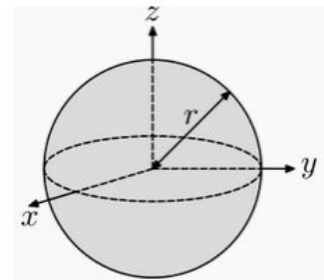
- Object: Rod, disk, sphere, cylinder
- Mass
- Radius or length



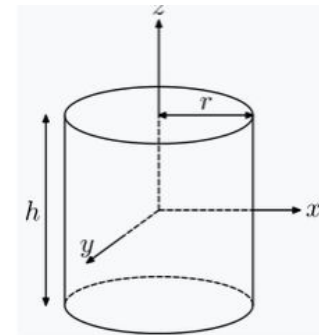
$$I_{\text{center}} = \frac{mL^2}{12}$$



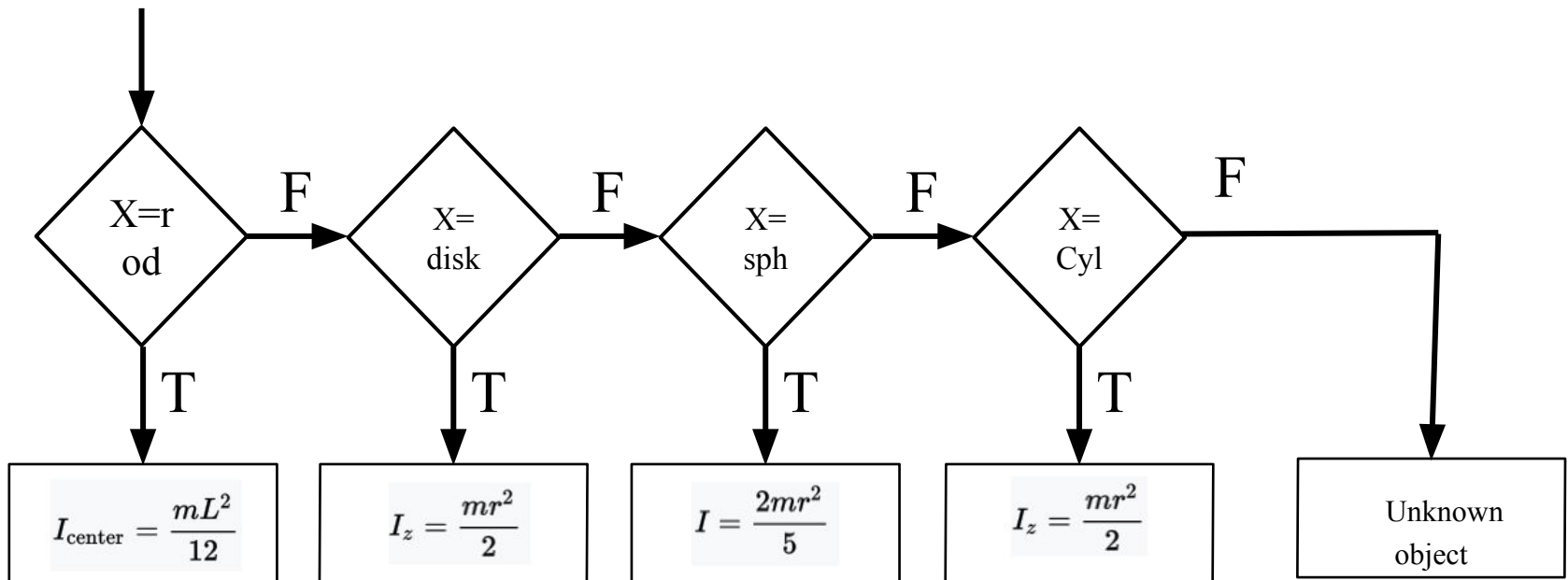
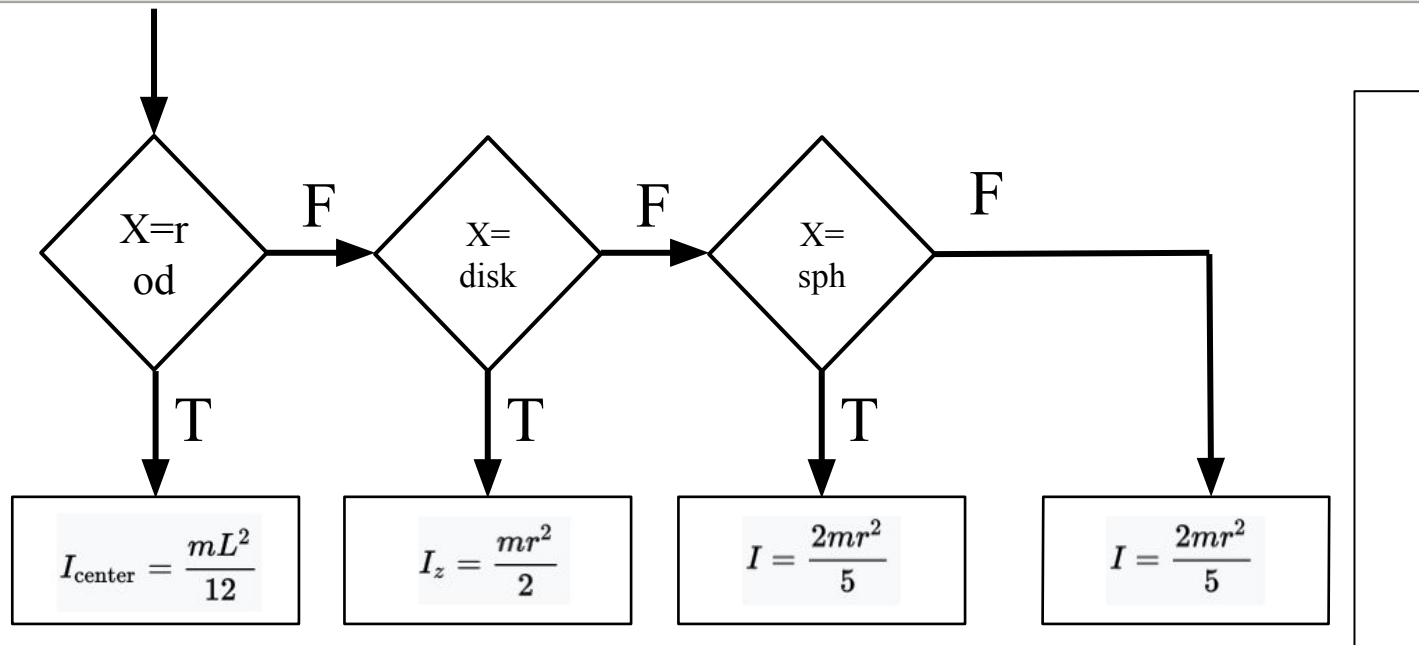
$$I_z = \frac{mr^2}{2}$$



$$I = \frac{2mr^2}{5}$$



$$I_z = \frac{mr^2}{2}$$



# Nested IF conditionals: Example

Solution:

	A	B
1	Calculate moment of inertia	
2	List of objects:	cylinder, sphere, rod, disk
3	Choose object	disk
4	mass (kg)	1
5	dimension: radius or length (m)	1
6		
7	moment of inertia (kg.m <sup>2</sup> )	0.5

Entry in cell B7

```
=IF(B3="cylinder",B4*B5*B5/2,IF(B3="sphere",2*B4*B5*B5/5,IF(B3="rod",B4*B5*B5/12,IF(B3="disk",B4*B5*B5/2,"unidentified object"))))
```