COMP1022Q
Introduction to Computing with Excel VBA

# Making Decisions with Excel Formulas

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# Outcomes

- After completing this presentation, you are expected to be able to:
  1. Write cell formulas to display different results based on some conditions using the `IF` function

# Making Decisions

- You can make a decision in a cell (as long as you type it the correct way)
- In this presentation we will talk about doing that using the `IF` cell function

# Using the IF Function

- The `IF` cell function is written like this:

  `IF(` *condition* `,` *true part* `,` *false part* `)`

- It represents the following English sentence:

  If *condition* is true, do *true part*;
  otherwise do *false part*

- For example, an `IF` cell function can be used to do this:

  If you have at least one million in your account,
  show “You are rich!”;
  otherwise show “You are poor!”

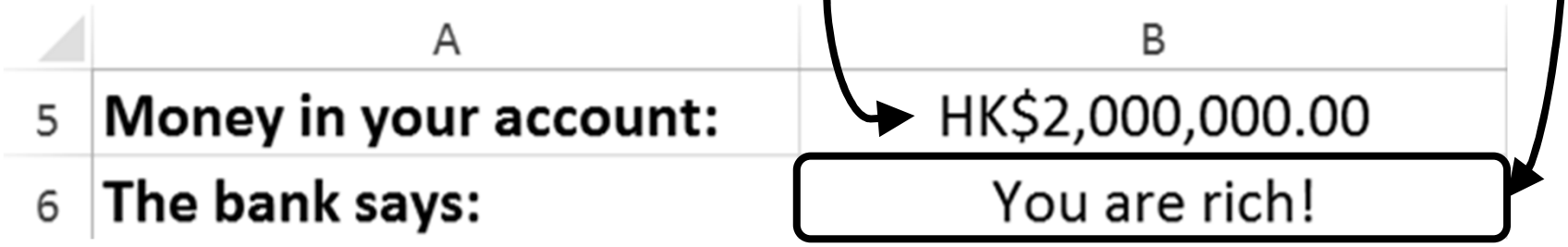
# The IF Example 1/2

- In this example, you enter the amount of money in your account in cell B5
- Cell B6 contains the following formula:

```
=IF(B5>=1000000, "You are rich!",
   "You are poor!")
```

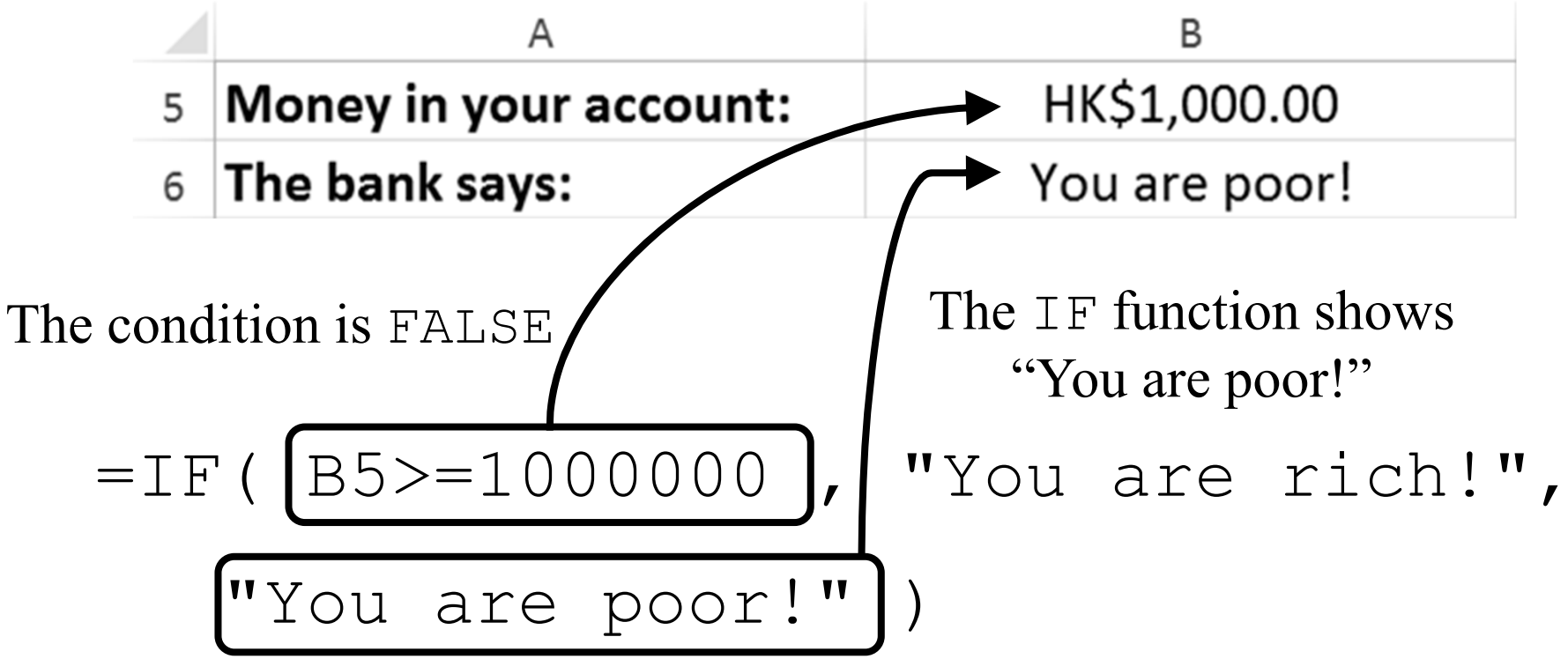
- The formula says that, if the value of cell B5 is bigger than or equal to 1000000, cell B6 will display "You are rich!"

2000000 is bigger than or equal to 1000000

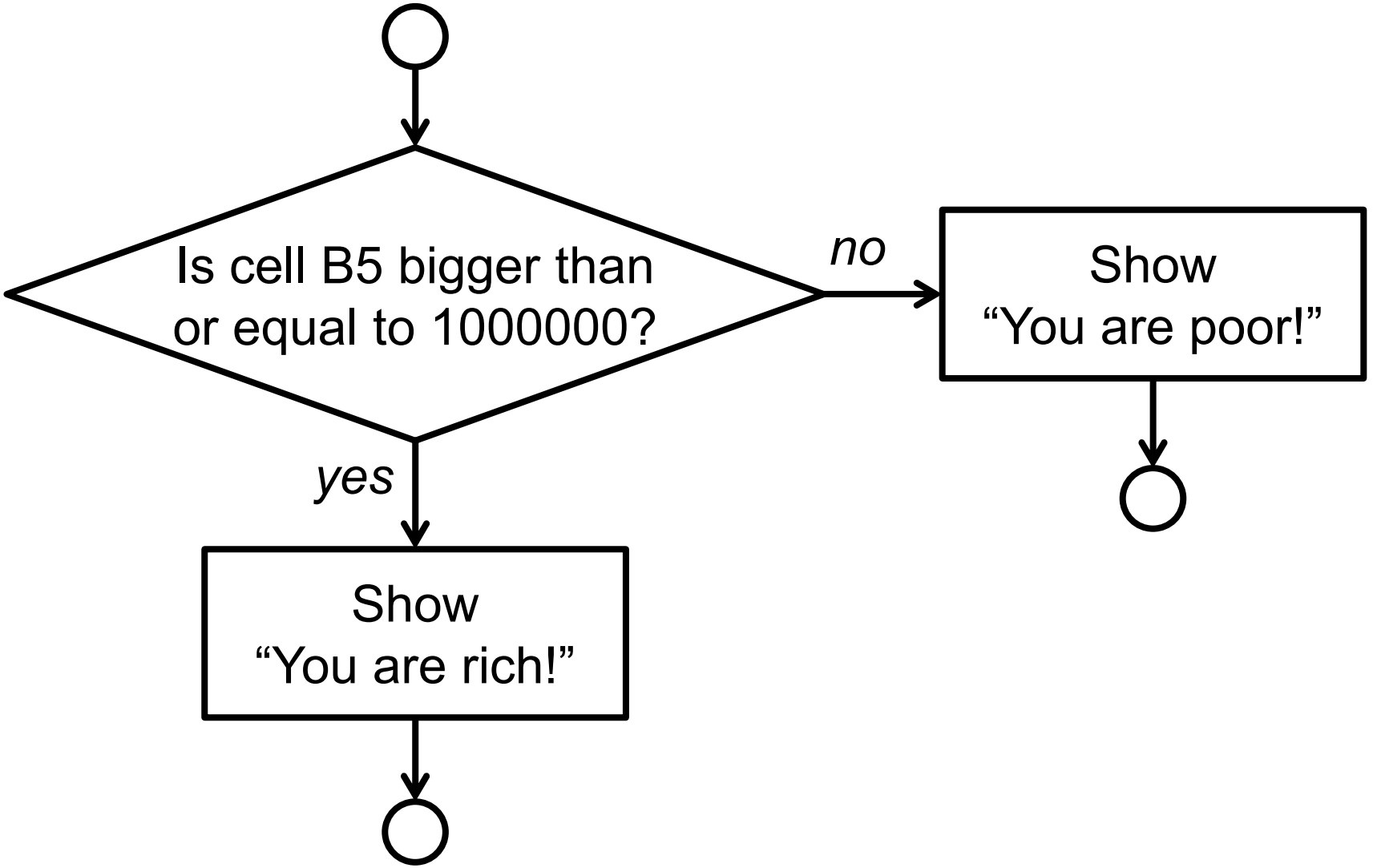


# The IF Example 2/2

- Otherwise, if the value in cell B5 is smaller than 1000000, the content of cell B6 will change to “You are poor!”



# The Flow of the IF Example



# Omitting the False Part

- The `IF` function allows you to omit the false part, for example:

```
IF(B5>=1000000, "You are rich!")
```

- If the condition is `FALSE`, the above `IF` function will show `FALSE` as a result

`B5>=1000000` is `FALSE`

| | A | B |
|---|---|---|
| 5 | **Money in your account:** | HK$1,000.00 |
| 6 | **The bank says:** | FALSE |

# Using Formulas Inside IF Functions

- The previous example puts two pieces of text as the results of the `IF` function
- In addition to text, you can put formulas inside an `IF` function
- Here is an example:

```
=IF(AVERAGE(A5:A14)>=40,
     AVERAGE(A5:A14), "<40")
```

- The formula will be explained in the next slide

# An Example of Using Formulas in an IF Function

```
=IF( AVERAGE(A5:A14)>=40 ,
     AVERAGE(A5:A14) , "<40")
```

- In the above formula, the condition is `TRUE` if the average of cells A5:A14 is at least 40
- If the condition is `TRUE`, the `IF` function calculates (again) and shows the average of cells A5:A14
- Otherwise, the function shows “<40”

– The general idea of this example is that the average is too small to be worth calculating, so just show “<40” instead

# The Results of Using the Formula

- The formula has been put in cell B5 in the worksheet
  - If the average of the exam score is bigger than or equal to 40
  - If the average of the exam score is smaller than 40

| | A | B |
|---|---|---|
| 4 | **Exam Score** | **Average** |
| 5 | 93 | 83.3 |
| 6 | 88 | |
| 7 | 87 | |
| 8 | 90 | |
| 9 | 74 | |
| 10 | 74 | |
| 11 | 81 | |
| 12 | 100 | |
| 13 | 74 | |
| 14 | 72 | |

| | A | B |
|---|---|---|
| 4 | **Exam Score** | **Average** |
| 5 | 49 | <40 |
| 6 | 33 | |
| 7 | 28 | |
| 8 | 34 | |
| 9 | 25 | |
| 10 | 19 | |
| 11 | 28 | |
| 12 | 39 | |
| 13 | 43 | |
| 14 | 35 | |

# Nested IF Functions

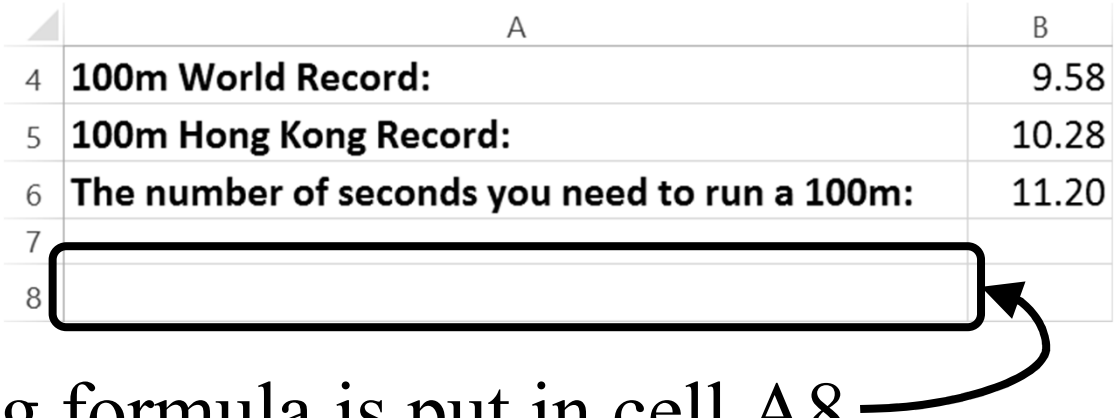
- You can put any formula inside an `IF` function
- That means you can even put an `IF` function inside another `IF` function, like this:

```
IF( condition1 , result1 ,
   IF( condition2 , result2 , result3 ))
```

- The `IF` function inside another `IF` function is called a nested `IF`
- Using a nested `IF`, a formula can decide to give one of the three results based on two conditions

# A Nested IF Example

- Given this worksheet:



| | A | B |
|---|---|---|
| 4 | **100m World Record:** | 9.58 |
| 5 | **100m Hong Kong Record:** | 10.28 |
| 6 | **The number of seconds you need to run a 100m:** | 11.20 |
| 7 | | |
| 8 | | |

- The following formula is put in cell A8

```
=IF(B6<B4,
    "You are the fastest in the world!",
    IF(B6<B5,
       "You are the fastest in HK!",
       "Train harder to beat the records!"))
```

- In the next few slides we will see the result of the formula given different values in cell B6

# The First Condition is True

- If your time (cell B6) is smaller than the world record (cell B4), show “fastest in the world!”

| | A | B |
|---|---|---|
| 4 | **100m World Record:** | 9.58 |
| 5 | **100m Hong Kong Record:** | 10.28 |
| 6 | **The number of seconds you need to run a 100m:** | 9.48 |
| 7 | | |
| 8 | You are the fastest in the world! | |

```
=IF( B6<B4 , TRUE
     "You are the fastest in the world!" ,
     IF(B6<B5,
        "You are the fastest in HK!",
        "Train harder to beat the records!"))
```

# Otherwise, the Second Condition is True

- Otherwise, if your time (cell B6) is smaller than the HK record (cell B5), show “fastest in HK!”

| | A | B |
|---|---|---|
| 4 | **100m World Record:** | 9.58 |
| 5 | **100m Hong Kong Record:** | 10.28 |
| 6 | **The number of seconds you need to run a 100m:** | 9.60 |
| 7 | | |
| 8 | You are the fastest in HK! | |

```
=IF( B6<B4 , FALSE
     "You are the fastest in the world!" ,
     IF( B6<B5 , TRUE
          "You are the fastest in HK!" ,
          "Train harder to beat the records!"))
```

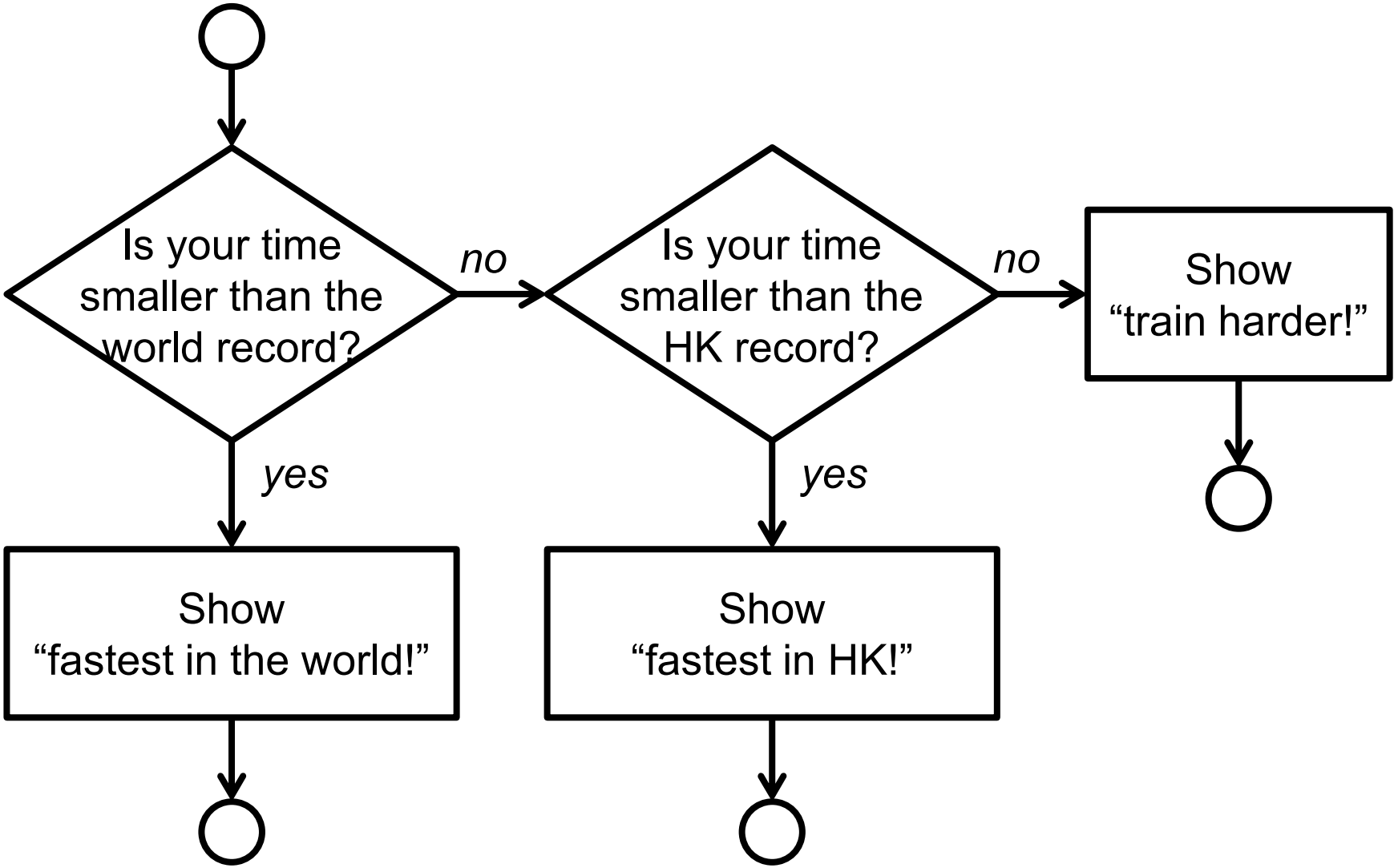
# Finally, Both Conditions are False

- Finally, if both conditions are `FALSE`, show "train harder!"

| | A | B |
|---|---|---|
| 4 | **100m World Record:** | 9.58 |
| 5 | **100m Hong Kong Record:** | 10.28 |
| 6 | **The number of seconds you need to run a 100m:** | 14.55 |
| 7 | | |
| 8 | Train harder to beat the records! | |

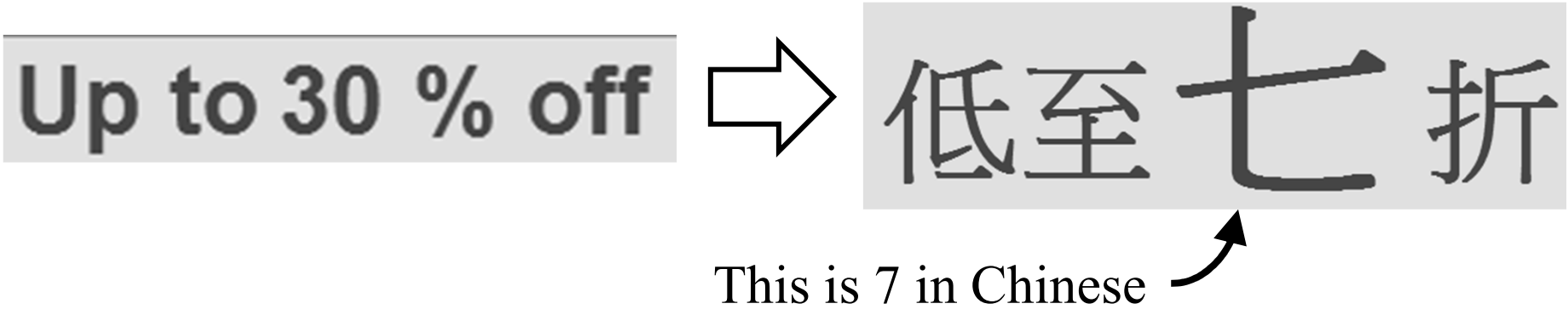
```
=IF( B6<B4 , FALSE
     "You are the fastest in the world!" ,
     IF( B6<B5 , FALSE
          "You are the fastest in HK!",
          "Train harder to beat the records!" ))
```

# The Flow of the Nested IF Example



# Using Many Nested IFs

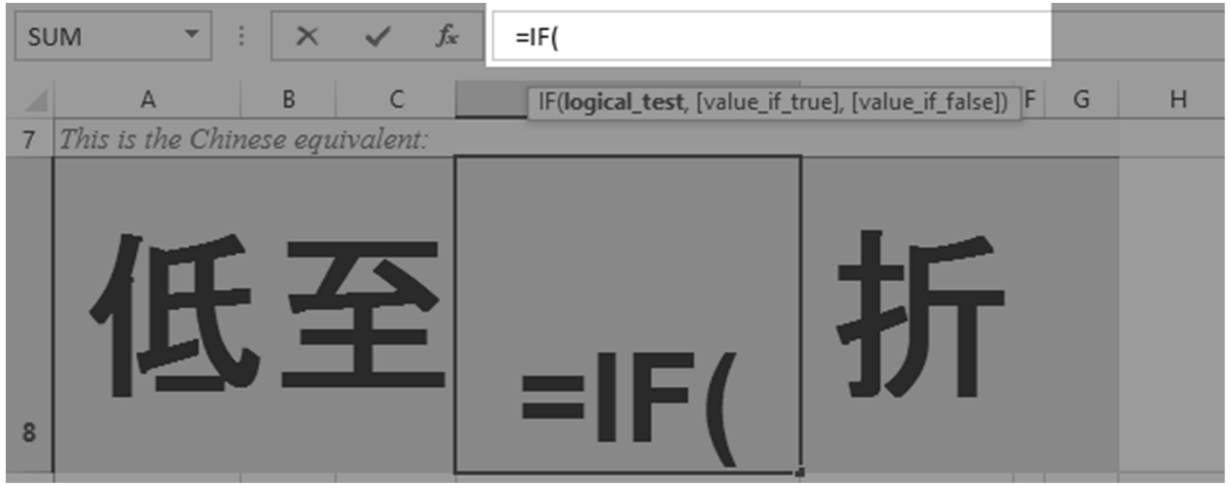
- Now we will make an example using many nested IFs which converts an English discount sign into a Chinese discount sign
- This particular example only works correctly when the input number in the English sign is a multiple of ten between 10 to 90



- Here are two examples showing what the complete display looks like:

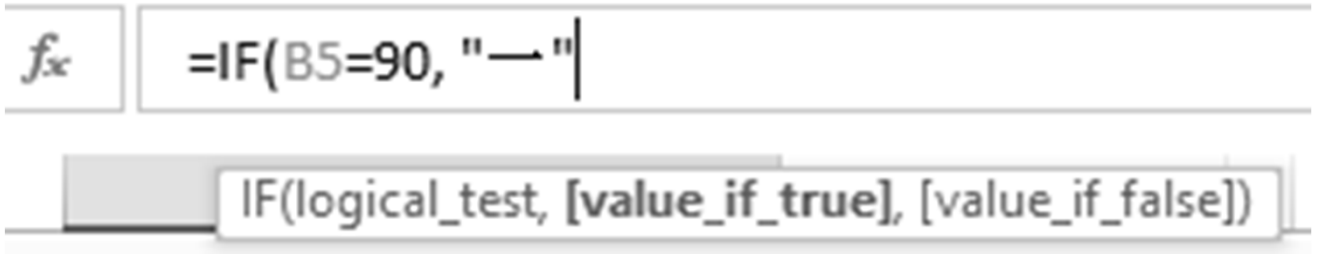
# Example of Using Many Nested IFs 1/4

- In the result cell D8, we modify the Excel formula and type `=IF(` but we do not press Enter yet



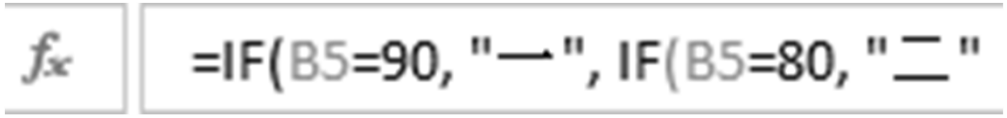

- We continue like this: `=IF(B5=90,"一"` but we do not press Enter yet, as shown below:

The input cell

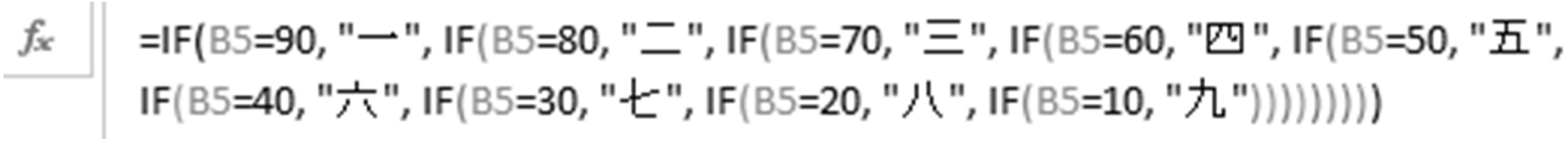


# Example of Using Many Nested IFs 2/4

- `=IF(B5=90,"一"` means if the cell B5 is equal to 90, then the cell D8 shows the Chinese character for one, "一"
- For handling the false part, we enter the following (but we don't press Enter yet):

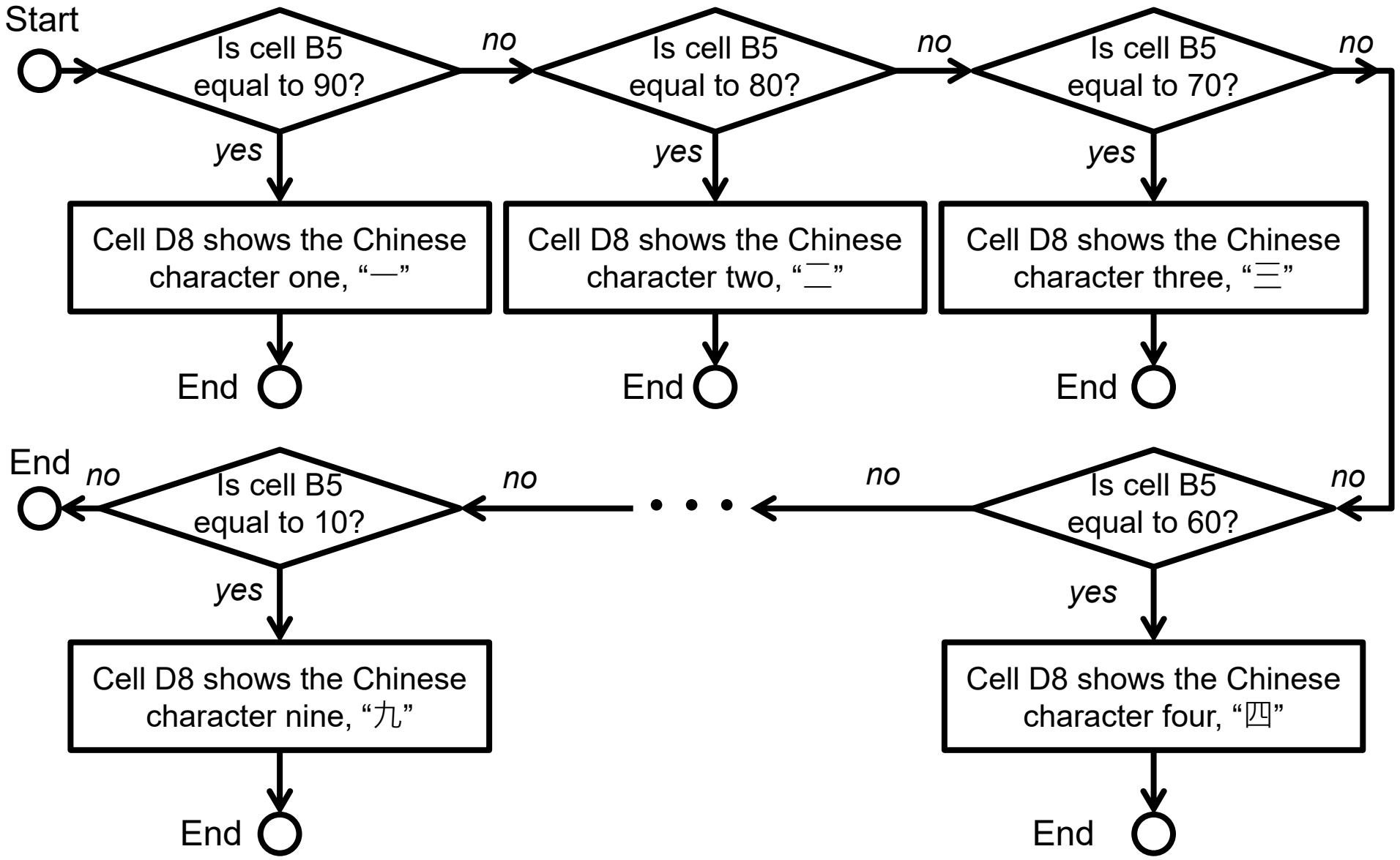



- Similarly, we complete the `IF` formula up to the Chinese character nine "九", as shown below:




- In the next slide we show this nested IF structure using a flowchart

# Example of Using Many Nested IFs 3/4



# Example of Using Many Nested IFs 4/4

- To test the formula, change the number in cell B5
- Cell D8 will be immediately changed to the corresponding Chinese number, for example:

# Combining Conditions

- So far, the conditions we have used in the examples have only a single comparison, i.e. `B5>=1000000`
- Sometimes, you may need more than one comparisons
  - For example, you may need to check if a cell is within a certain range, e.g. checking if `B1` is between 1 to 10 by combining `B1>=1` and `B1<=10`
- You will need to combine multiple comparisons using `AND`, `OR`, and `NOT`, which are covered in another presentation