Northeastern University
College *of* Computer and Information Science

CS1100: Computer Science and Its Applications

Table Lookup and Error Processing

Excel Basics

LOOKUP AND MAPPING

LOOKUP Tables

- LOOKUP Tables help you use a worksheet table as a source of information to be used elsewhere in formulas.
- Used to store data you want to refer to frequently.
- Use a LOOKUP formula from other cells to look up data
- Lookup formulas can work vertically, looking for values down a column, or they can work horizontally, looking for values across a row

Consider This Example

- Grades

Score	Grade
0	F
60	D
65	D+
70	C-
73	C
77	C+
80	B-
83	B
87	B+
90	A-
95	A

Table Lookup

- Given a score, we wish to look up the letter grade in this table.
- **VLOOKUP**
  - Table is arranged as columns

Score	Grade
0	F
60	D
65	D+
70	C-
73	C
77	C+
80	B-
83	B
87	B+
90	A-
95	A

Lookup value in column 1

Result value in column 2

VLOOKUP Table Setup Rules

- The lookup value (key value) must be in the first column.
- The key values can appear in any order

Table Lookup

- There are two Excel functions for looking up values in a table:
  - **VLOOKUP**
    - Table is arranged as columns
  - **HLOOKUP**
    - Table is arranged as rows

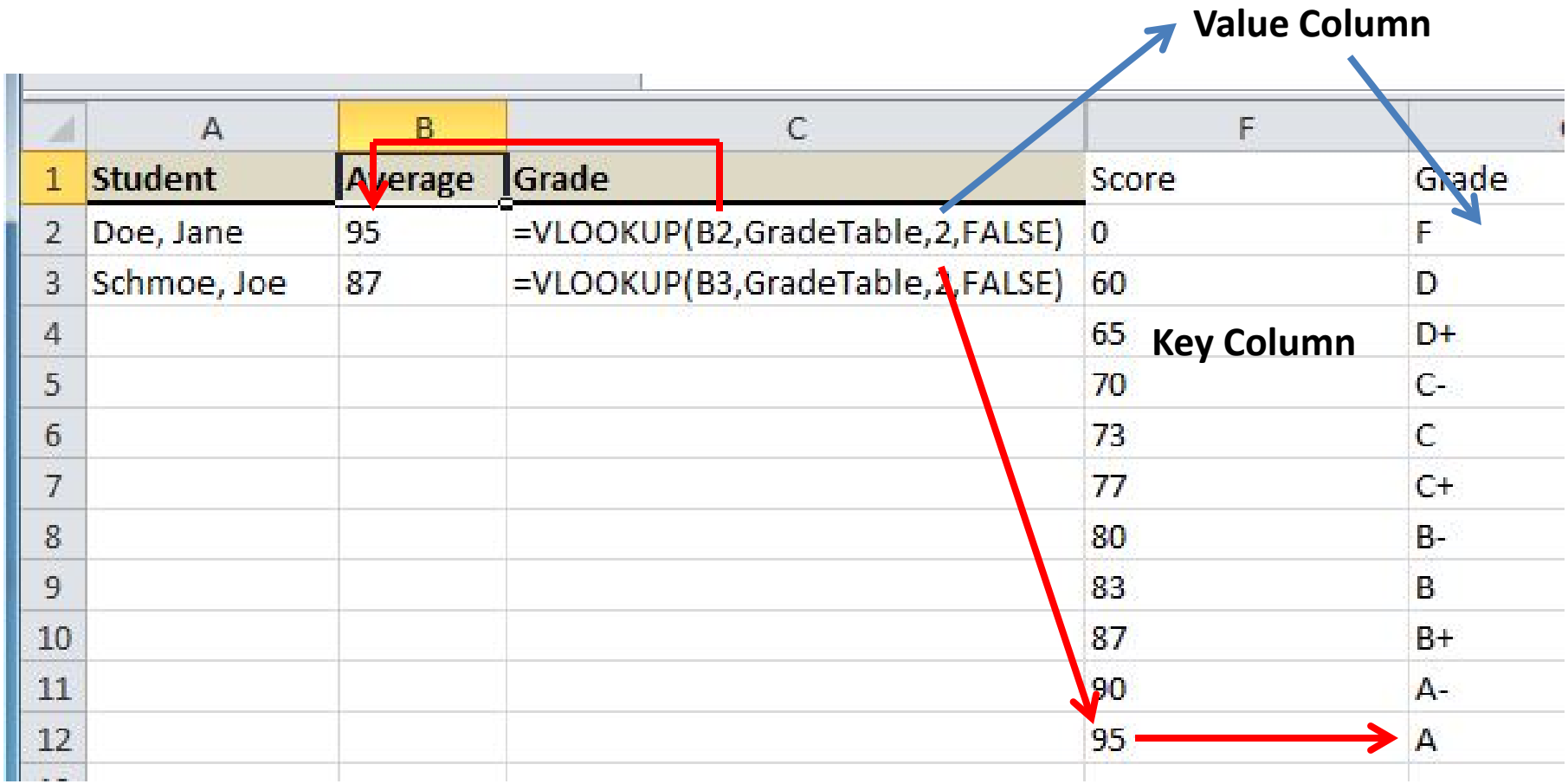
VLOOKUP Parameters

- General form of **VLOOKUP**:

  VLOOKUP (lookup_value, table_array, col, [option])

- Definitions of the **VLOOKUP** parameters:
  - **lookup_value**: value to be used as a key into the table_array
  - **table_array**: table of values where first column is key
  - **col**: column to be returned as value of VLOOKUP
  - **option**: FALSE (for now)

Using **VLOOKUP**



	A	B	C	F	
1	**Student**	**Average**	**Grade**	Score	Grade
2	Doe, Jane	95	=VLOOKUP(B2,GradeTable,2,FALSE)	0	F
3	Schmoe, Joe	87	=VLOOKUP(B3,GradeTable,2,FALSE)	60	D
4				65	D+
5				70	C-
6				73	C
7				77	C+
8				80	B-
9				83	B
10				87	B+
11				90	A-
12				95	A

Consider This Example

- Employee payroll data:

Employee	Job Status	Salary	Years Service	Life Ins	Health Plan	Life Premium	Health Premium	Total Comp
Smith	FT	$ 85,000	6	Y	HMOF			
Wechsler	FT	$ 92,000	2	Y	HMOF			
Jones	PT	$ 22,000	3	N	None			
Rutti	FT	$ 65,000	8	N	HMOI			
Miller	PT	$ 19,000	0	N	PPOF			
Ryder	FT	$ 37,000	1	Y	PPOI			

Job Status: full-time (FT) or part-time (PT)
Salary: annual compensation
Years Service: number of years employee has been with company
Life Ins: Y = employee wants life insurance, N = no life insurance
Health Plan: type of health plan employee participates in
Life Premium: amount of life insurance premium paid by employer
Health Premium: amount of health insurance premium paid by employer
Total Comp: total compensation paid to employee (salary + insurance)

Calculations

- We need to calculate:
  - Life Insurance Premium
  - Health Insurance Premium
  - Total Compensation

Health Insurance Rules
(an exact lookup)

- The health insurance premium is based on the type of plan selected:

Plan Type	Premium
HMOF	$2,300 per month
HMOI	$1,040 per month
PPOF	$1,755 per month
PPOI	$897 per month
DISF	$457 per month

VLOOKUP Table Setup Rules

- The lookup value (key value) must be in the first column.
- For an exact match lookup, the key values can appear in any order.

VLOOKUP Table Setup

- Let's start by building a lookup table to get the health insurance premium.

	A	B
1	**Plan**	**Premium**
2	HMOF	$ 2,300.00
3	HMOI	$ 1,040.00
4	PPOF	$ 1,755.00
5	PPOI	$ 897.00
6	DISF	$ 457.00

Lookup value in column 1

Result value in column 2

This table can optionally be turned into a named range for easier referencing.

Assignment: Turn range A2:B6 into the named range *HealthRates*

Using **VLOOKUP**

F	G	H
Health Plan	**Life Premium**	**Health Premium**
HMOF		=**VLOOKUP** (F2, HealthRates, 2, FALSE)

	A	B
1	**Plan**	**Premium**
2	HMOF	$ 2,300.00
3	HMOI	$ 1,040.00
4	PPOF	$ 1,755.00
5	PPOI	$ 897.00
6	DISF	$ 457.00

HLOOKUP Table Setup

- **HLOOKUP** is similar to **VLOOKUP** except that the table is set up horizontally:

	A	B	C	D	E	F
1	**Plan**	HMOF	HMOI	PPOF	PPOI	DISF
2	**Premium**	$ 2,300.00	$ 1,040.00	$ 1,755.00	$ 897.00	$ 457.00

HLOOKUP Parameters

- General form of **HLOOKUP**:

  HLOOKUP (lookup_value, table_array, row, [option])

- Definitions of the **HLOOKUP** parameters:
  - **lookup_value**: value to be used as a key into the table_array
  - **table_array**: table of values where first row is key
  - **row**: row to be returned as value of HLOOKUP
  - **option**: FALSE (for now)

Using **HLOOKUP**

- Using **HLOOKUP** is very similar to **VLOOKUP**:

F	G	H
Health Plan	**Life Premium**	**Health Premium**
HMOF		=**HLOOKUP** (F2, HealthRates, 2, FALSE)

	A	B	C	D	E	F
1	**Plan**	HMOF	HMOI	PPOF	PPOI	DISF
2	**Premium**	$ 2,300.00	$ 1,040.00	$ 1,755.00	$ 897.00	$ 457.00

Range or Interval Lookups

- So far we have looked up values that are either found in the lookup table or not.
- Some applications require numeric intervals or ranges.
- For example, in a grading model, grades are assigned to ranges of scores.
  - 93 – 100 = A
  - 90 – 92 = A-

  and so forth

VLOOKUP Parameters

- General form of **VLOOKUP**:

  VLOOKUP (lookup_value, table_array, col, [option])

- Definitions of the **VLOOKUP** parameters:
  - **lookup_value**: value to be used as a key into the table_array
  - **table_array**: table of values where first column is key
  - **col**: column to be returned as value of VLOOKUP
  - **option**: FALSE = exact match, TRUE = approximate (or interval/range) match

VLOOKUP Table Setup Rules

- The lookup value (key value) must be in the first column.
- For an exact match lookup, the key values can appear in any order
- For an approximate (or range) lookup, the values must start with the smallest value

Setting up **VLOOKUP** Intervals

	E	F	G	H
		Score	Grade	
	From: >=	0	F	Equals
	To: <	60	D	
		65	D+	
		70	C-	
		73	C	
		77	C+	
		80	B-	
		83	B	
		87	B+	
		90	A-	
		95	A	

Setting up **VLOOKUP** Intervals

	E	F	G	H
		Score	Grade	
		0	F	
	From: >=	60	D	Equals
	To: <	65	D+	
		70	C-	
		73	C	
		77	C+	
		80	B-	
		83	B	
		87	B+	
		90	A-	
		95	A	

Setting up **VLOOKUP** Intervals

	Score	Grade	
	0	F	
	60	D	
From: >=	65	D+	Equals
To: <	70	C-	
	73	C	
	77	C+	
	80	B-	
	83	B	
	87	B+	
	90	A-	
	95	A	

Life Insurance Rules
(A range or interval lookup)

- If the employee wants life insurance, then the premium is calculated as follows:
  - Insurance Rate is based on salary:
    - Under $50,000, premium is $250 per year
    - From $50,000 to under $70,000, premium is $350 per year
    - From $70,000 to under $90,000, premium is $475 per year
    - From $90,000 to under $110,000, premium is $545 per year

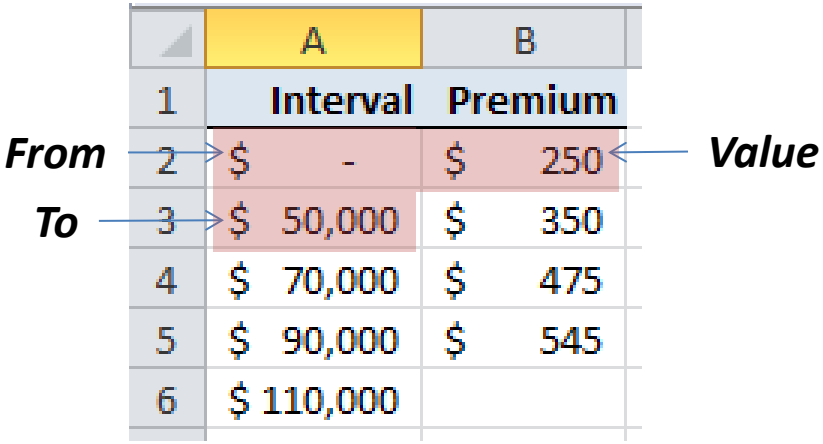
Setting up **VLOOKUP** Intervals

- Insurance Rate is based on salary:
  - Under $50,000, premium is $250 per year
  - From $50,000 to $69,999, premium is $350 per year
  - From $70,000 to $89,999, premium is $475 per year
  - From $90,000 to $109,999, premium is $545 per year

	A	B
1	**Interval**	**Premium**
2	$ -	$ 250
3	$ 50,000	$ 350
4	$ 70,000	$ 475
5	$ 90,000	$ 545
6	$ 110,000	

Reading the **VLOOKUP** Table

- An interval lookup table doesn't need to contain both ends.



- The table **MUST** start with the smallest value because the search stops once the value fits the range.

Using **VLOOKUP** with Intervals

C	D	E	F	G
Salary	Years Service	Life Ins	Health Plan	Life Premium
$ 85,000	6	Y	HMOF	=IF(E2="Y", **VLOOKUP** (C2, LifeRates, 2, TRUE), 0)

	A	B
1	Interval	Premium
2	$ -	$ 250
3	$ 50,000	$ 350
4	$ 70,000	$ 475
5	$ 90,000	$ 545
6	$ 110,000	

Excel Basics

MANAGING ERRORS

Lookup Errors

- What happens when **VLOOKUP** cannot find the value?
  - Returns error **#N/A**
- Use **IFERROR** to detect errors and provide an alternative.

Catching Errors

- Models can contain errors, such as:
  - Divide by 0
  - Lookup value not found
  - Substring not found
- To test if a function returns an error, use **IFERROR**.

Using **IFERROR**

- **IFERROR** works almost like **IF**, except that there's no condition to test:

  =**IFERROR** (value, value_if_error)

- Using IFERROR with VLOOKUP:

  =**IFERROR** (*VLOOKUP(F2,HealthRates,2,FALSE)*, 0)