

Worksheet 11

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Course: COMP 47160

Q7. Create a hash map using an array of size 13, the separate chaining collision handling strategy and the following hash function:

$$h(k) = (k + 5) \% 13$$

*Note: Values corresponding to keys are not shown as per question specification.

$$h(k) = (k + 5) \% 13$$

1. Store entry: (Key = 353, Value = 'Ireland')

$$h(k) = (353 + 5) \% 13 = 7$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353					

2. Store entry: (Key = 44, Value = United Kingdom)

$$h(k) = (44 + 5) \% 13 = 10$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353			44		

3. Store entry: (Key = 33, Value = France)

$$h(k) = (33 + 5) \% 13 = 12$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353			44		33

4. Store entry: (Key = 1, Value = United States of America)

$$h(k) = (1 + 5) \% 13 = 6$$

0	1	2	3	4	5	6	7	8	9	10	11	12
						1	353			44		33

5. Store entry: (Key = 49, Value = Germany)

$$h(k) = (49 + 5) \% 13 = 2$$

0	1	2	3	4	5	6	7	8	9	10	11	12
		49				1	353			44		33


$$h(k) = (679 + 5) \% 13 = 8$$

7. Store entry: (Key = 253, Value = Djibouti)

8. Store entry: (Key = 269, Value = Comoros)

9. Store entry: (Key = 61, Value = Christmas Island)

10. Store entry: (Key = 86, Value = China)

0	1	2	3	4	5	6	7	8	9	10	11	12
86	269  61	49				1	353	679		44	253	33

Q8. Create a hash map using an array of size 13, the linear probing collision handling strategy and the following hash function:

$$h(k) = (k + 5) \% 13$$

$$h(k) = (k + 5) \% 13$$

1. Store entry: (Key = 353, Value = 'Ireland')

$$h(k) = (353 + 5) \% 13 = 7$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353					

2. Store entry: (Key = 44, Value = United Kingdom)

$$h(k) = (44 + 5) \% 13 = 10$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353			44		

3. Store entry: (Key = 33, Value = France)

$$h(k) = (33 + 5) \% 13 = 12$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353			44		33

4. Store entry: (Key = 1, Value = United States of America)

$$h(k) = (1 + 5) \% 13 = 6$$

0	1	2	3	4	5	6	7	8	9	10	11	12
						1	353			44		33

5. Store entry: (Key = 49, Value = Germany)

$$h(k) = (49 + 5) \% 13 = 2$$

0	1	2	3	4	5	6	7	8	9	10	11	12
		49				1	353			44		33

6. Store entry: (Key = 679, Value = Fiji)

$$h(k) = (679 + 5) \% 13 = 8$$

0	1	2	3	4	5	6	7	8	9	10	11	12
		49				1	353	679		44		33

7. Store entry: (Key = 253, Value = Djibouti)

$$h(k) = (253 + 5) \% 13 = 11$$

0	1	2	3	4	5	6	7	8	9	10	11	12
		49				1	353	679		44	253	33

8. Store entry: (Key = 269, Value = Comoros)

$$h(k) = (269 + 5) \% 13 = 1$$

0	1	2	3	4	5	6	7	8	9	10	11	12
	269	49				1	353	679		44	253	33

9. Store entry: (Key = 61, Value = Christmas Island)

$$h(k) = (61 + 5) \% 13 = 1 \quad // \text{ Collision}$$

0	1	2	3	4	5	6	7	8	9	10	11	12
	269	49	61			1	353	679		44	253	33

10. Store entry: (Key = 86, Value = China)

$$h(k) = (86 + 5) \% 13 = 0$$

0	1	2	3	4	5	6	7	8	9	10	11	12
86	269	49	61			1	353	679		44	253	33

$$d(k) = 5 - k \% 5$$

$$\underline{d(k) = 5 - (k \% 5)}$$

$$[d(k) = 5 - (353 \% 5) = 2]$$

<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>
							353					

$$[d(k) = 5 - (44 \% 5) = 1]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353			44		

$$[d(k) = 5 - (33 \% 5) = 2]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
							353			44		33

$$[d(k) = 5 - (1 \% 5) = 4]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
						1	353			44		33

$$[d(k) = 5 - (49 \% 5) = 1]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
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		49				1	353			44		33
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6. Store entry: (Key = 679, Value = Fiji)

$$h(k) = (679 + 5) \% 13 = 8$$

$$[d(k) = 5 - (679 \% 5) = 1]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
		49				1	353	679		44		33

7. Store entry: (Key = 253, Value = Djibouti)

$$h(k) = (253 + 5) \% 13 = 11$$

$$[d(k) = 5 - (253 \% 5) = 2]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
		49				1	353	679		44	253	33

8. Store entry: (Key = 269, Value = Comoros)

$$h(k) = (269 + 5) \% 13 = 1$$

$$[d(k) = 5 - (269 \% 5) = 1]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
	269	49				1	353	679		44	253	33

9. Store entry: (Key = 61, Value = Christmas Island)

$$h(k) = (61 + 5) \% 13 = 1$$

$$d(k) = 5 - (61 \% 5) = 4 // \text{Collision}$$

0	1	2	3	4	5	6	7	8	9	10	11	12
	269	49			61	1	353	679		44	253	33

10. Store entry: (Key = 86, Value = China)

$$h(k) = (86 + 5) \% 13 = 0$$

$$[d(k) = 5 - (86 \% 5) = 4]$$

0	1	2	3	4	5	6	7	8	9	10	11	12
86	269	49			61	1	353	679		44	253	33