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**CS443 -- Lab 5**

**Question 1:**

A PARTS file with Part# as hash key includes records with the following Part# values: 2369, 3760, 4692, 4871, 5659, 1821, 1074, 7115, 1620, 2428, 3943, 4750, 6975, 4981, 9208. The file uses 8 buckets, numbered 0 to 7. Each bucket is one disk block and holds two records. Load these records into the file in the given order using the hash function h(K)=K mod 8. Calculate the average number of block accesses for a random retrieval on Part#.

2369 mod 8 = 1

3760 mod 8 = 0

4692 mod 8 = 4

4871 mod 8 = 7

5659 mod 8 = 3

1821 mod 8 = 5

1074 mod 8 = 2

7115 mod 8 = 3

1620 mod 8 = 4

2428 mod 8 = 4 ---> overflow, since each bucket only holds 2 records. This is the 3rd record of 4.

3943 mod 8 = 7

4750 mod 8 = 6

6975 mod 8 = 7 ---> overflow, since each bucket only holds 2 records. This is the 3rd record of 7.

4981 mod 8 = 5

9208 mod 8 = 0

Average time = (1 \* (13/15)) + (2 \* (2/15))

= .867 + .266 = 1.133 block accesses

|  |
| --- |
| Bucket = 1 |
| 2369 |
|  |

|  |
| --- |
| Bucket = 0 |
| 3760 |
| 9208 |

|  |
| --- |
| Bucket = 2 |
| 1074 |
|  |

|  |
| --- |
| Bucket = 3 |
| 5659 |
| 7115 |

|  |
| --- |
| Bucket = 4 |
| 4692 |
| 1620 |

|  |
| --- |
| Bucket = 5 |
| 1821 |
| 4981 |

|  |
| --- |
| Bucket = 6 |
| 4750 |
|  |

|  |
| --- |
| Bucket = 7 |
| 4871 |
| 3943 |

|  |
| --- |
| Overflow |
| 2428 |
| 6975 |

**Question 2:**

Consider the following records of question 1:

2369, 3760, 4692, 4871, 5659, 1821, 1074, 7151, 1620

Load the records into expandable hash files based on extendible hashing. You can put two records per block. Show the directory at each step, and the global and local depths. Use the hash function h(k) = K mod 32 to find the bucket number. For example,

***Record# K h(K) bucket number binary h(K)***

record1 2369 1 00001

record2 3760 16 10000

record3 4692 20 10100

record4 4871 7 00111

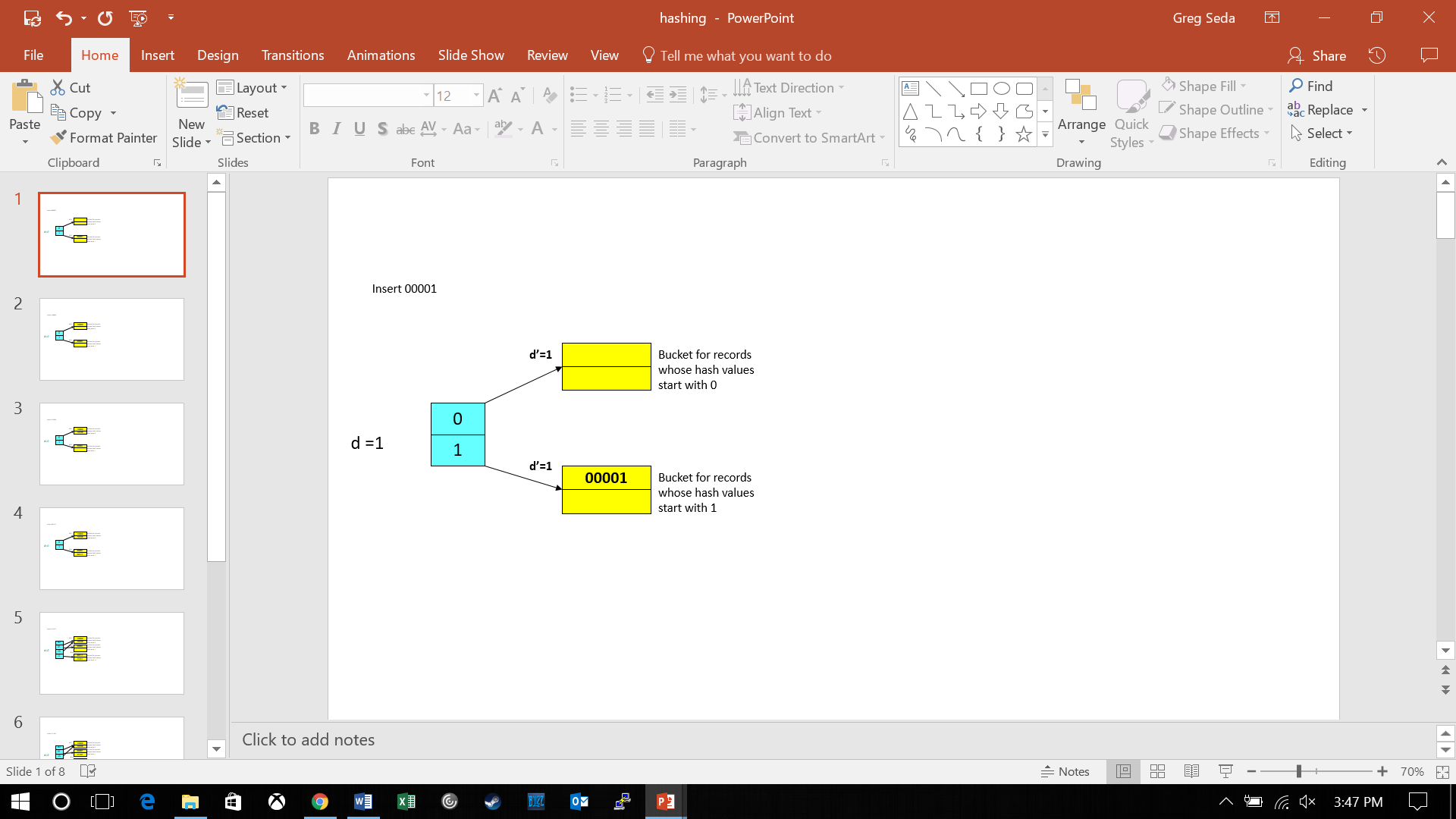
record5 5659 27 11011

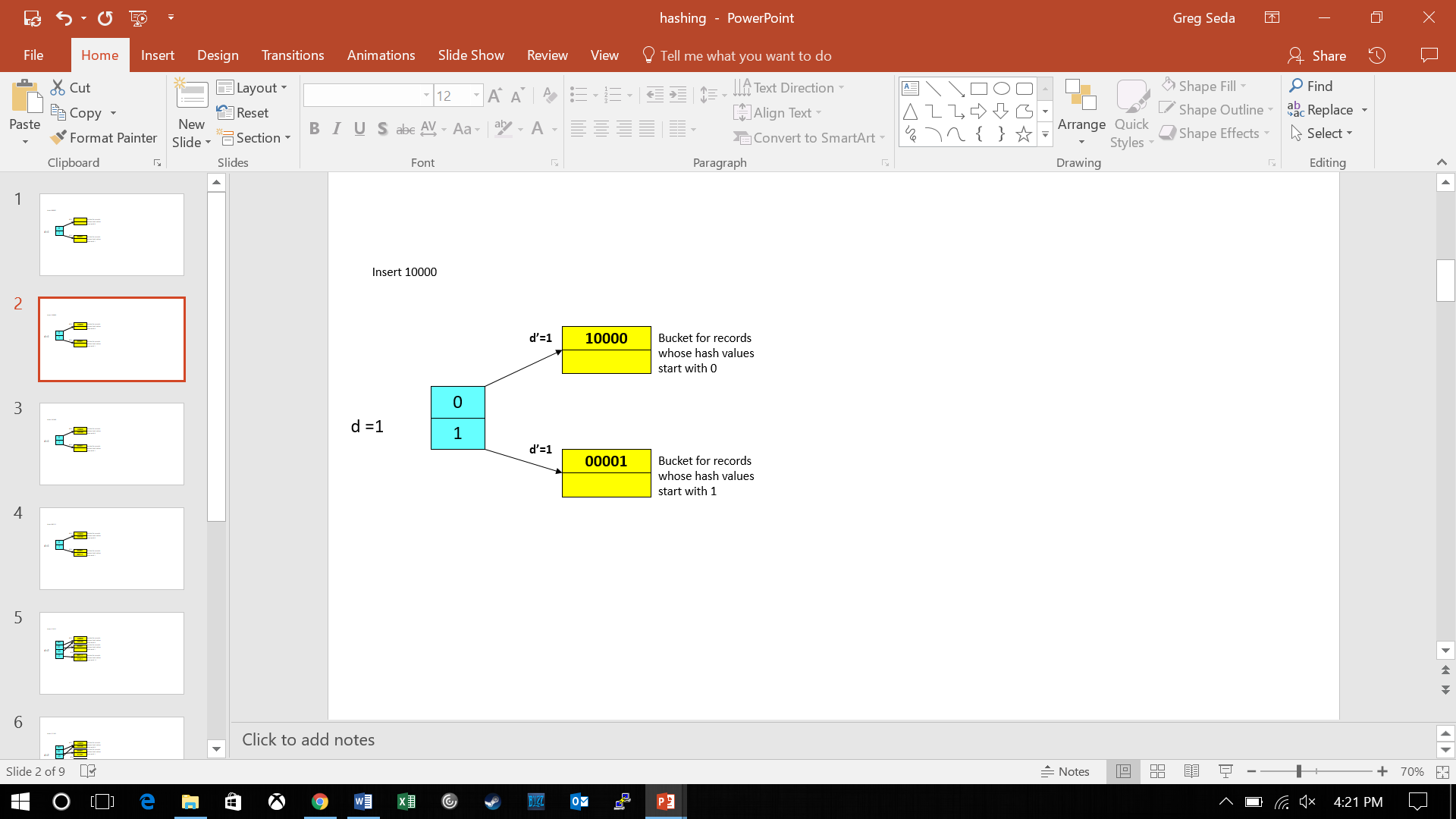
record6 1821 29 11101

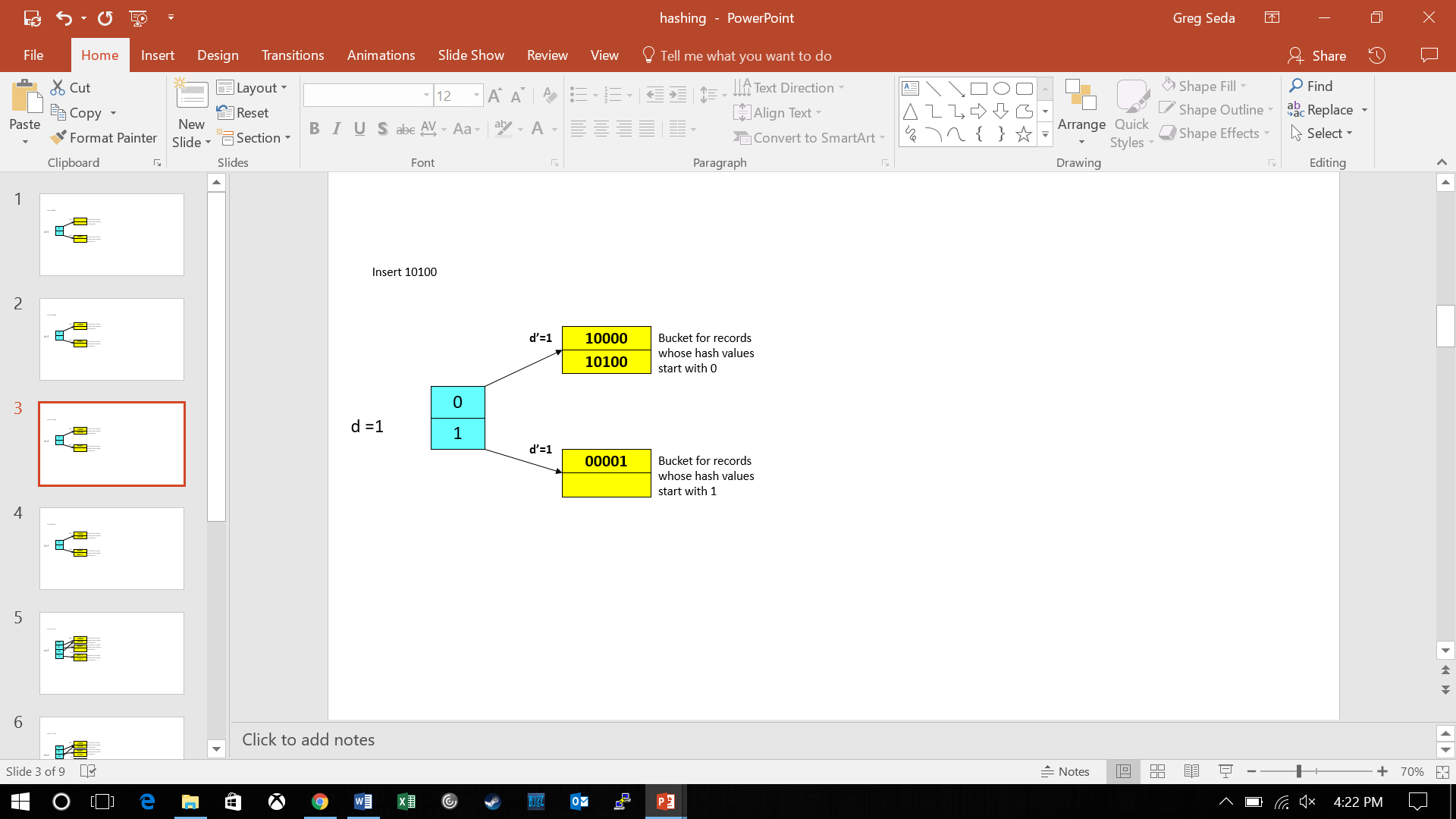
record7 1074 18 10010

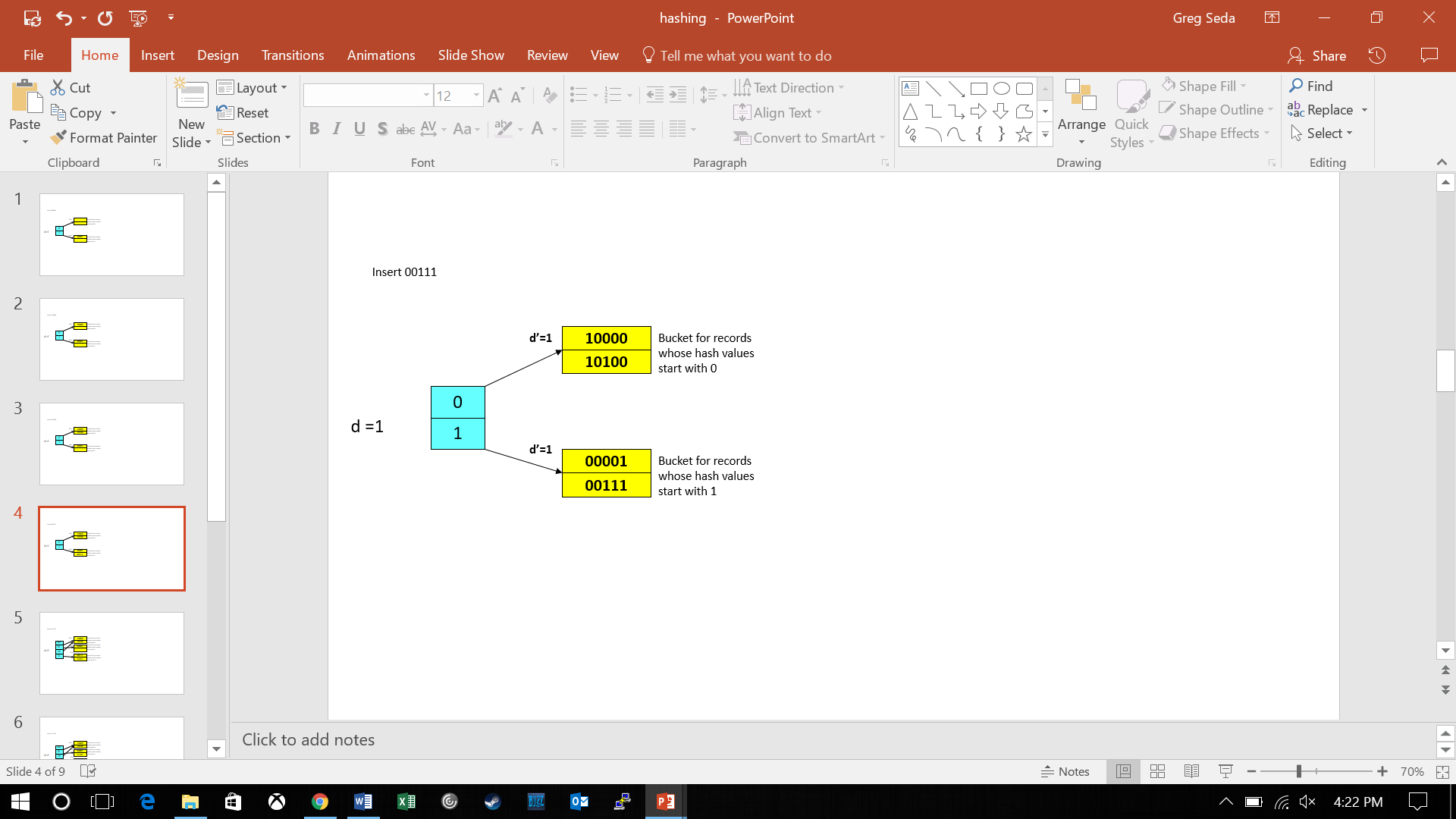
record8 7151 15 01111

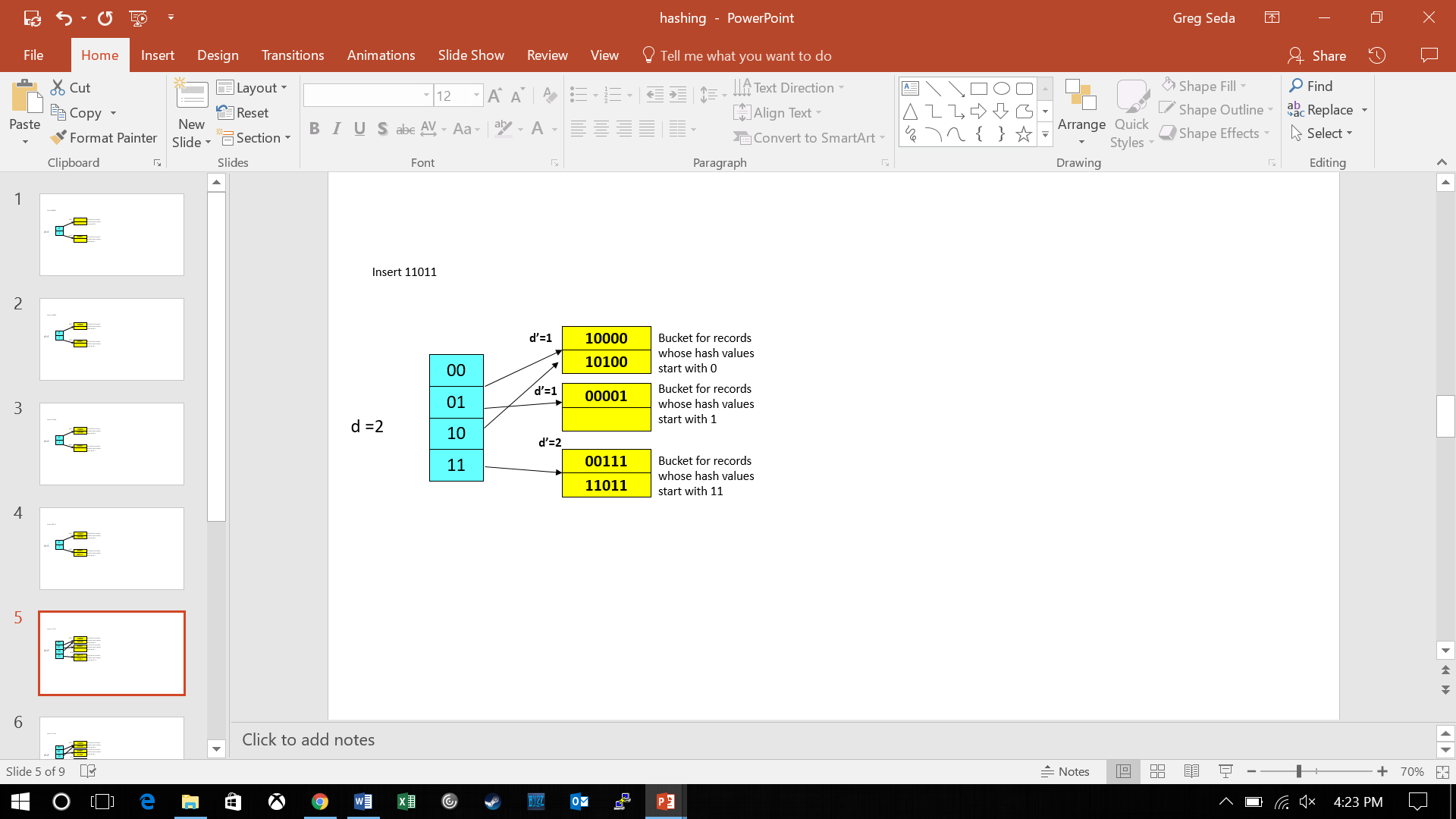
record9 1620 20 10100

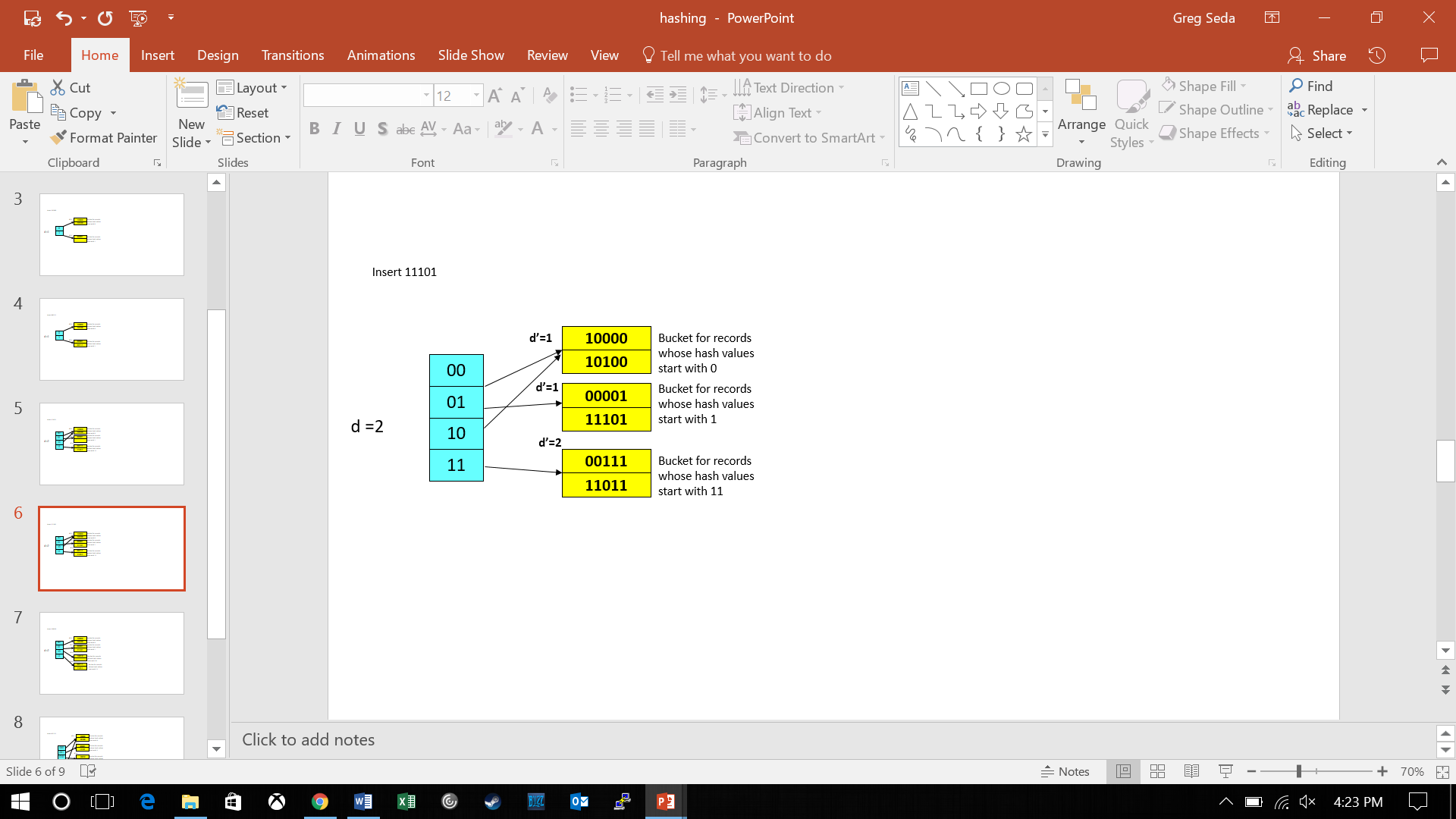


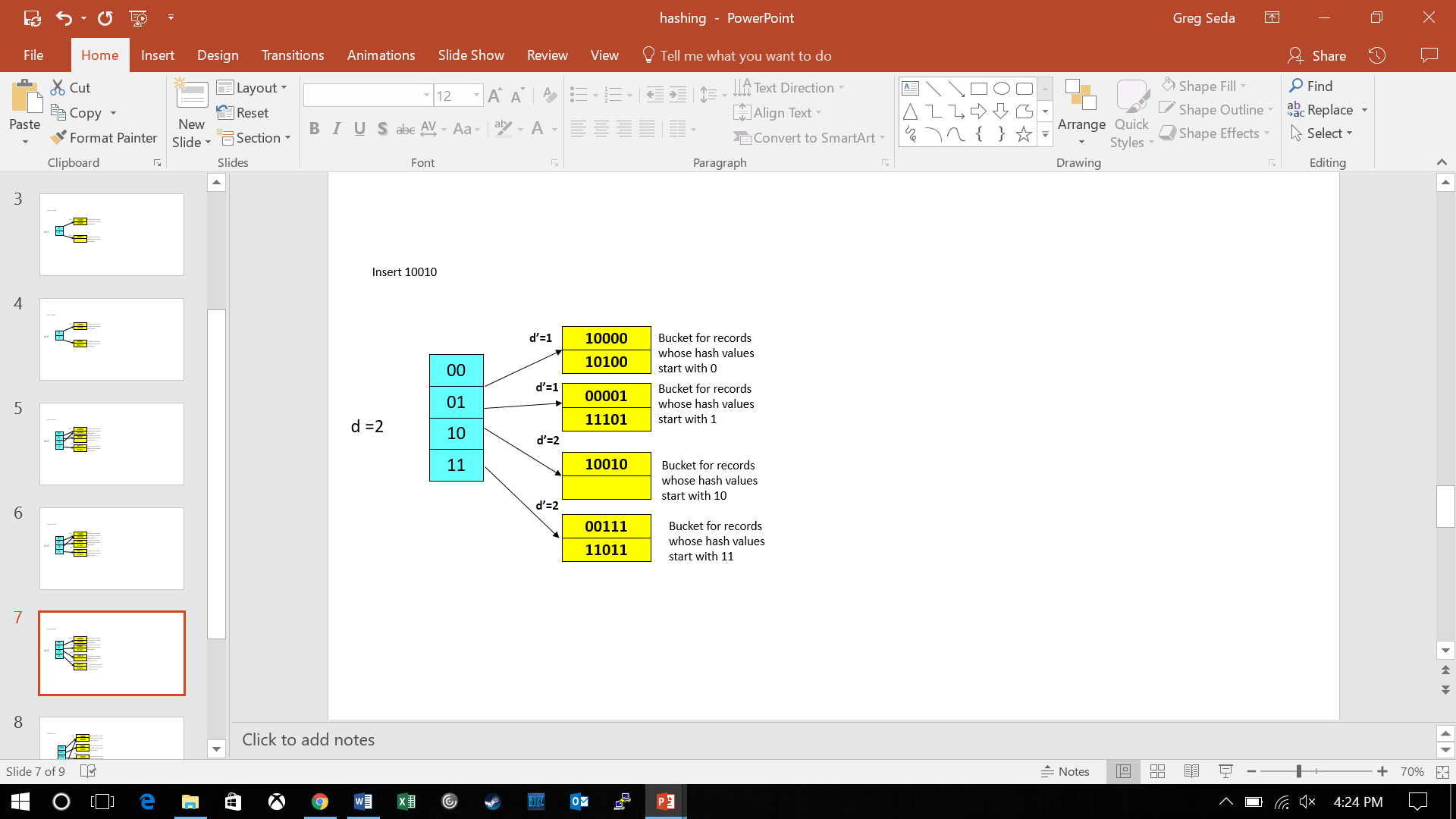


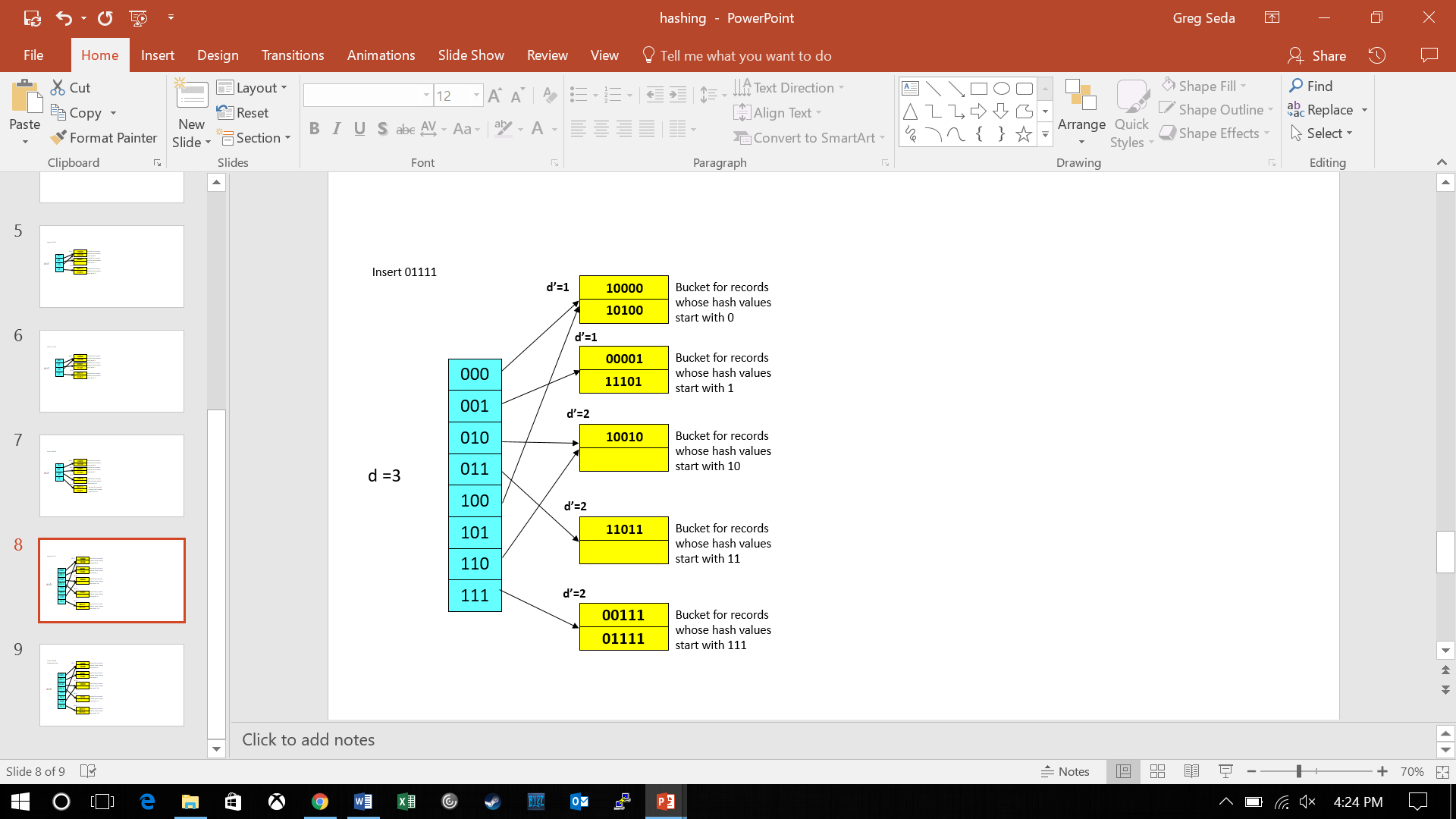












**Question 3:**

Insert the following into B-tree of order **4**. Show your work step by step with proper illustration of pointers as shown in pages 20-29 in multi-way trees lecture

**8, 2, 80, 25, 26, 27, 28, 55, 71, 15, 51, 20, 21, 22, 23, 24, 63, 90, 35**

I turned in a hard copy.

**Question 4:**

Insert the following into B+ tree of order **3**. Show your work step by step with proper illustration of pointers as shown in pages 47-54 in multi-way trees lecture

**90, 22, 27, 24, 28, 20, 51, 63, 8, 80, 15, 71, 35, 55**

I turned in a hard copy.

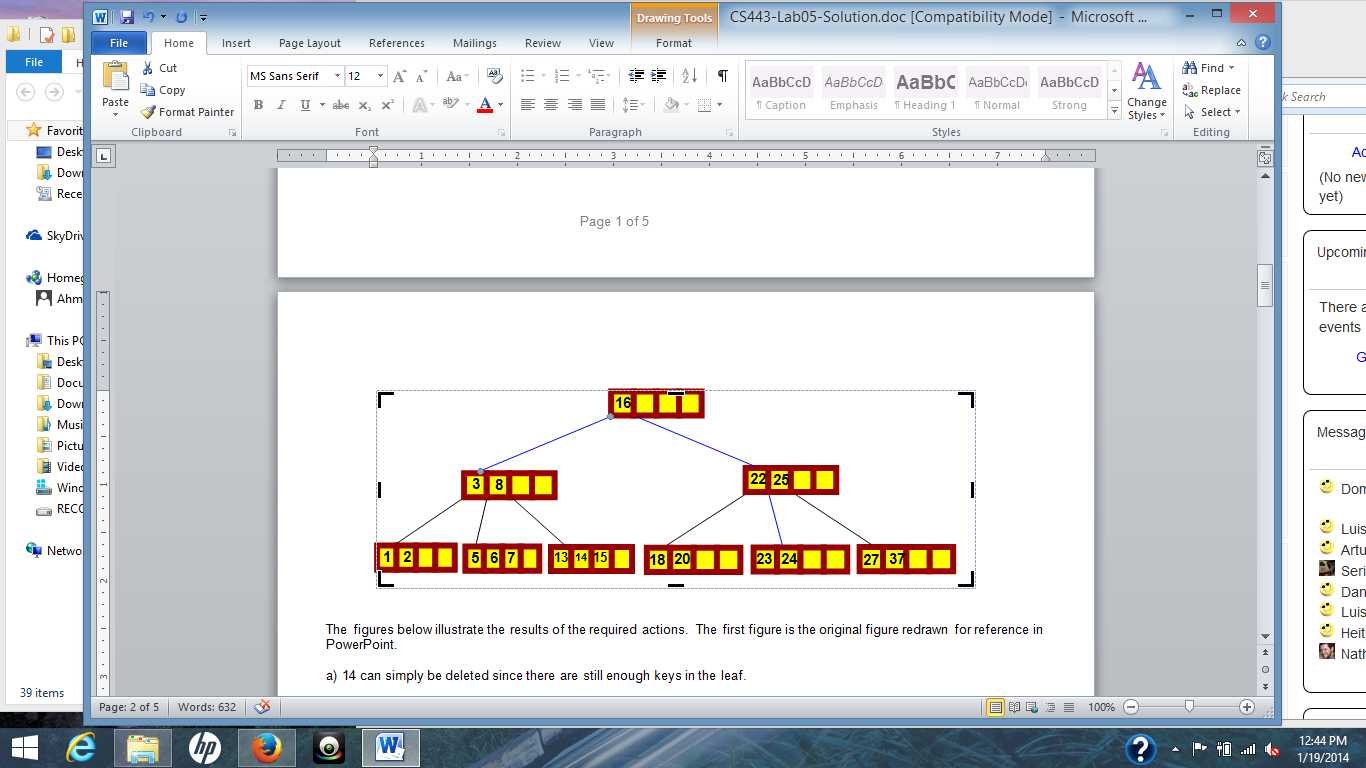
**Question 5:**

Consider the following B-tree.

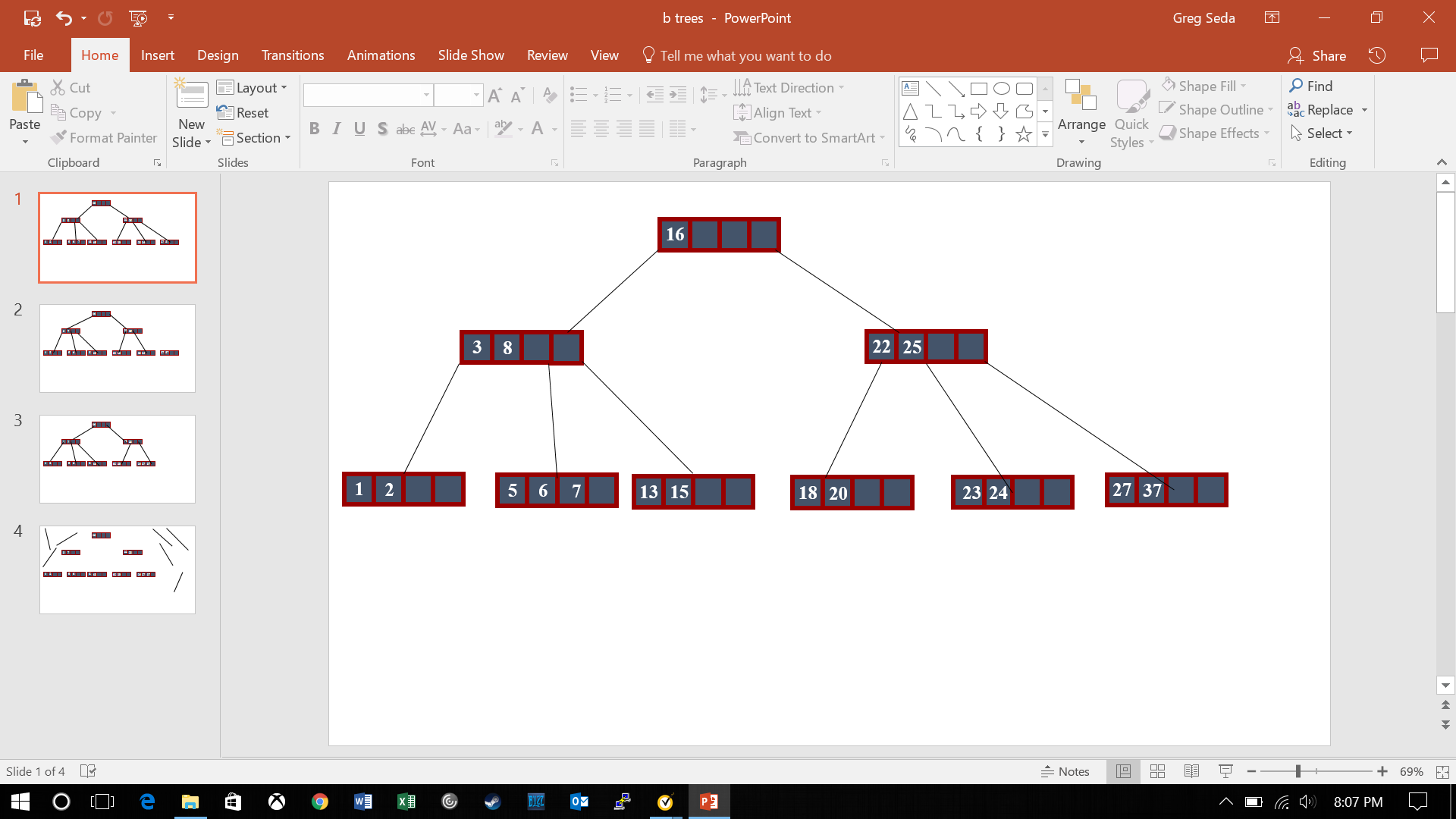
a) Redraw the tree after deleting 14.

b) Again, redraw the tree after deleting 15.

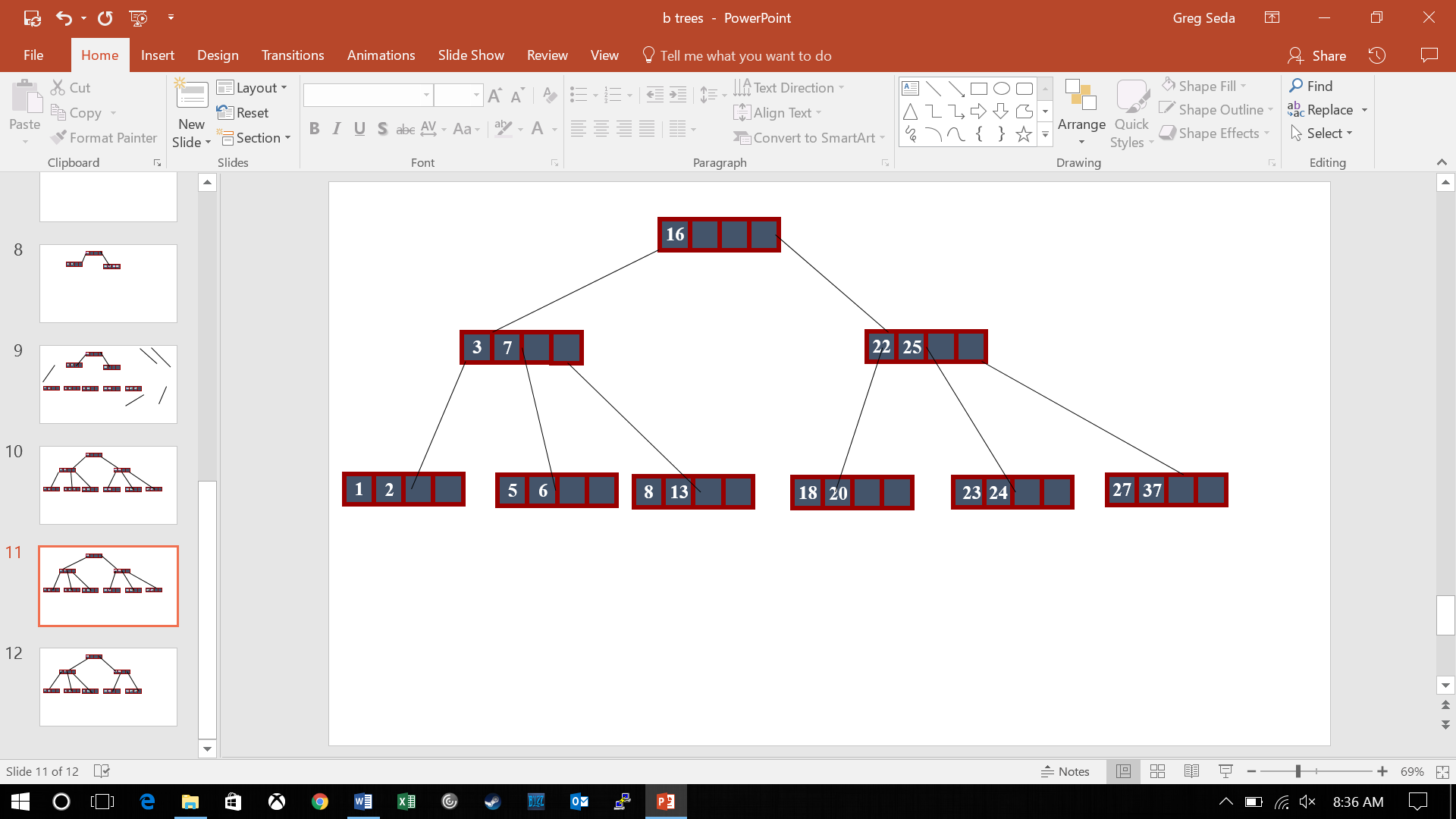
c) Again, redraw the tree after deleting 25.



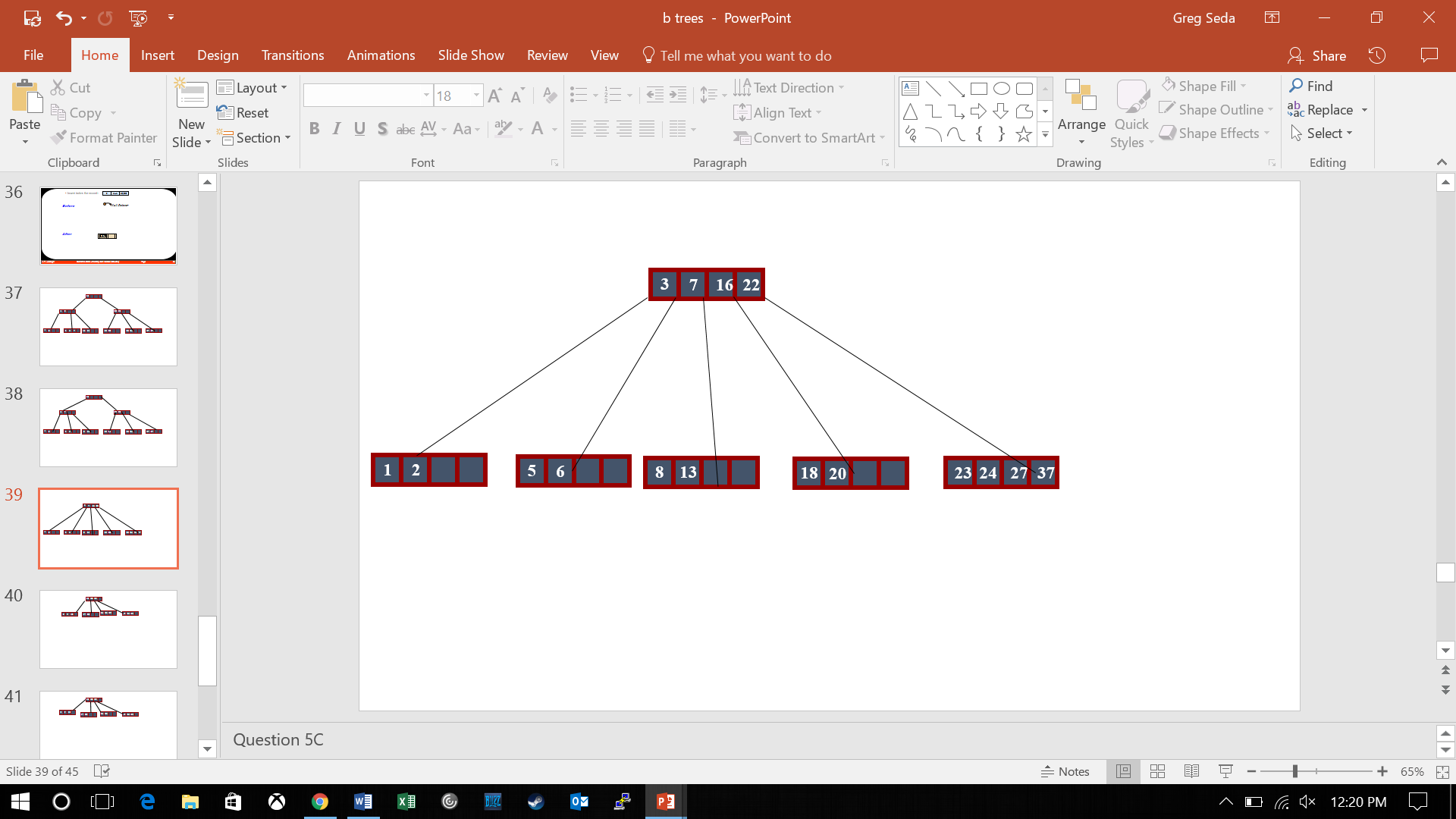
1. **Delete 14**



1. **Delete 15**

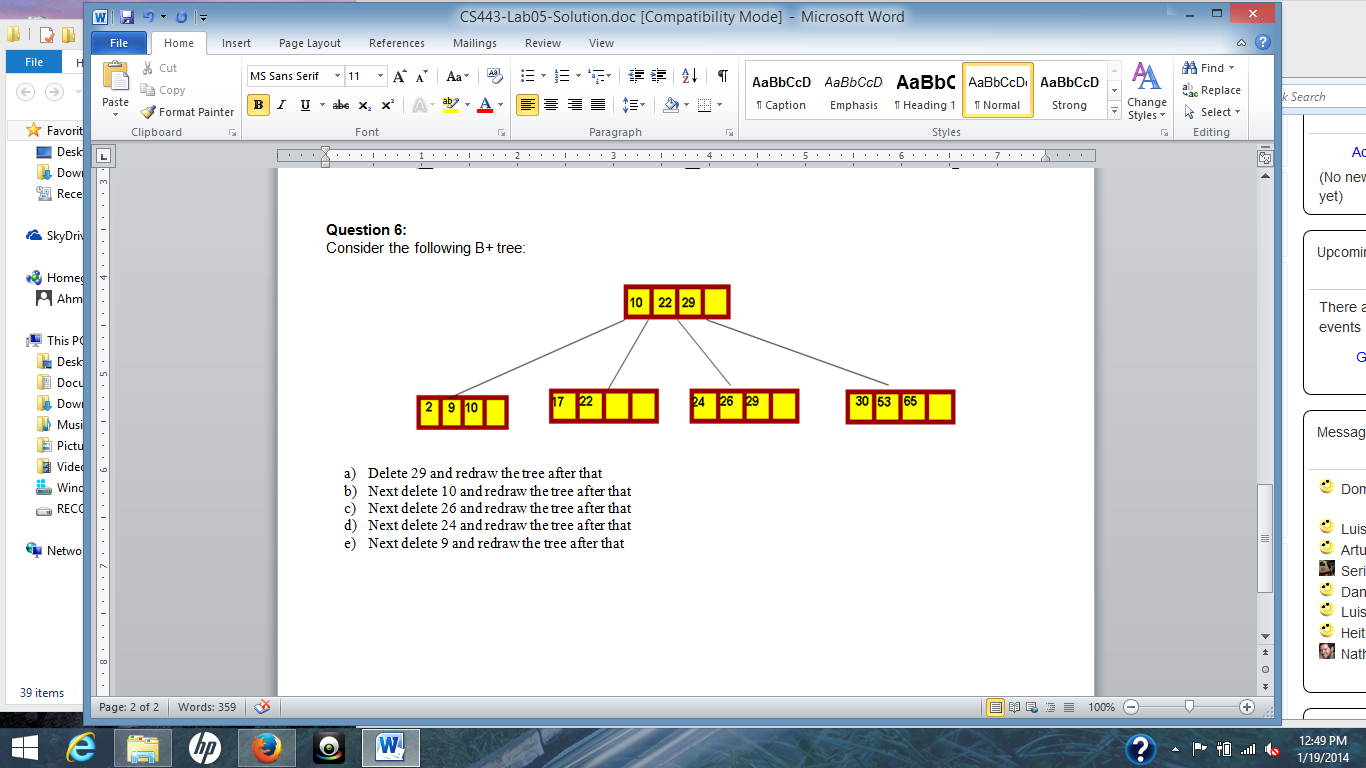


1. **Delete 25**

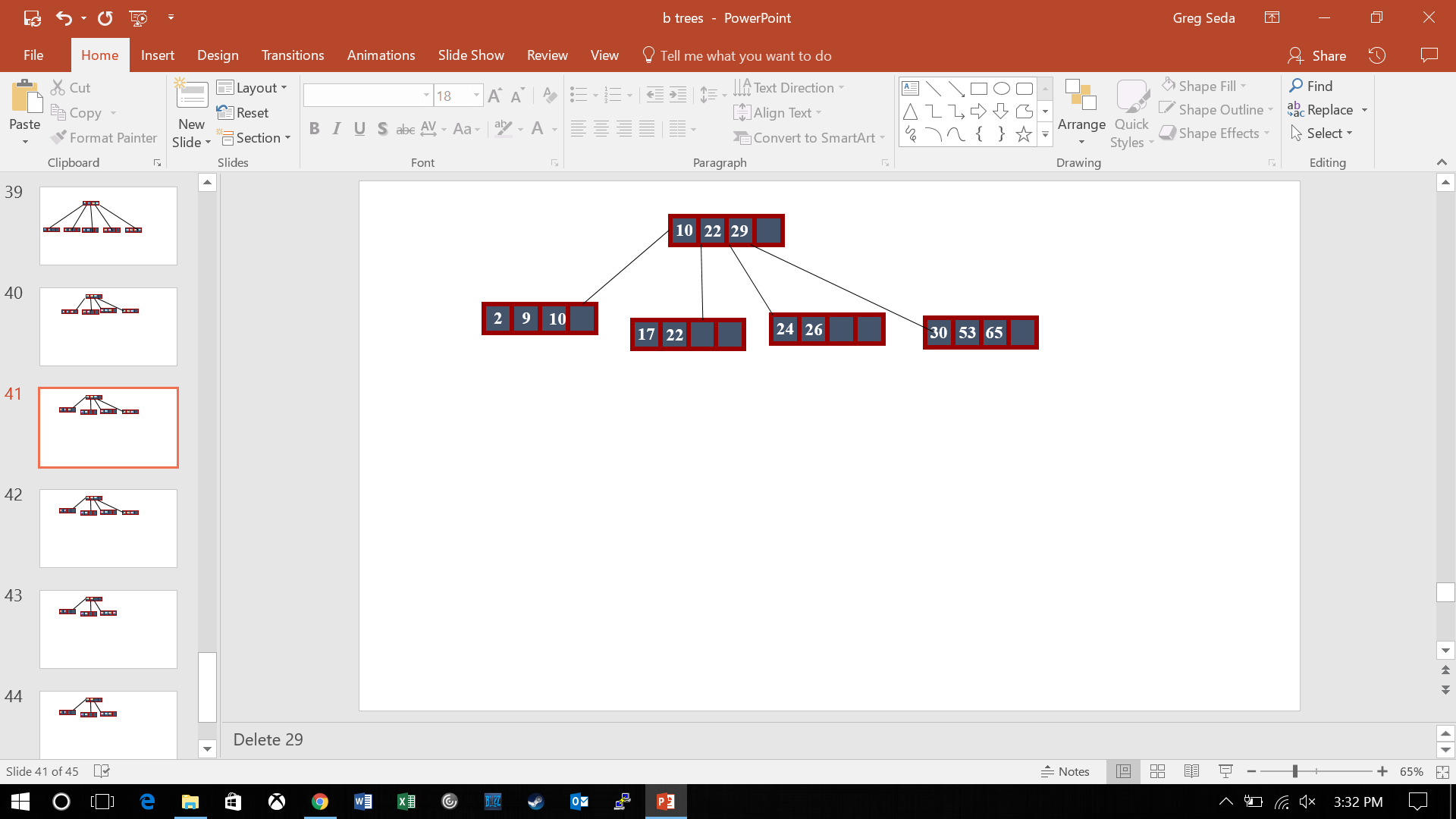


**Question 6:**

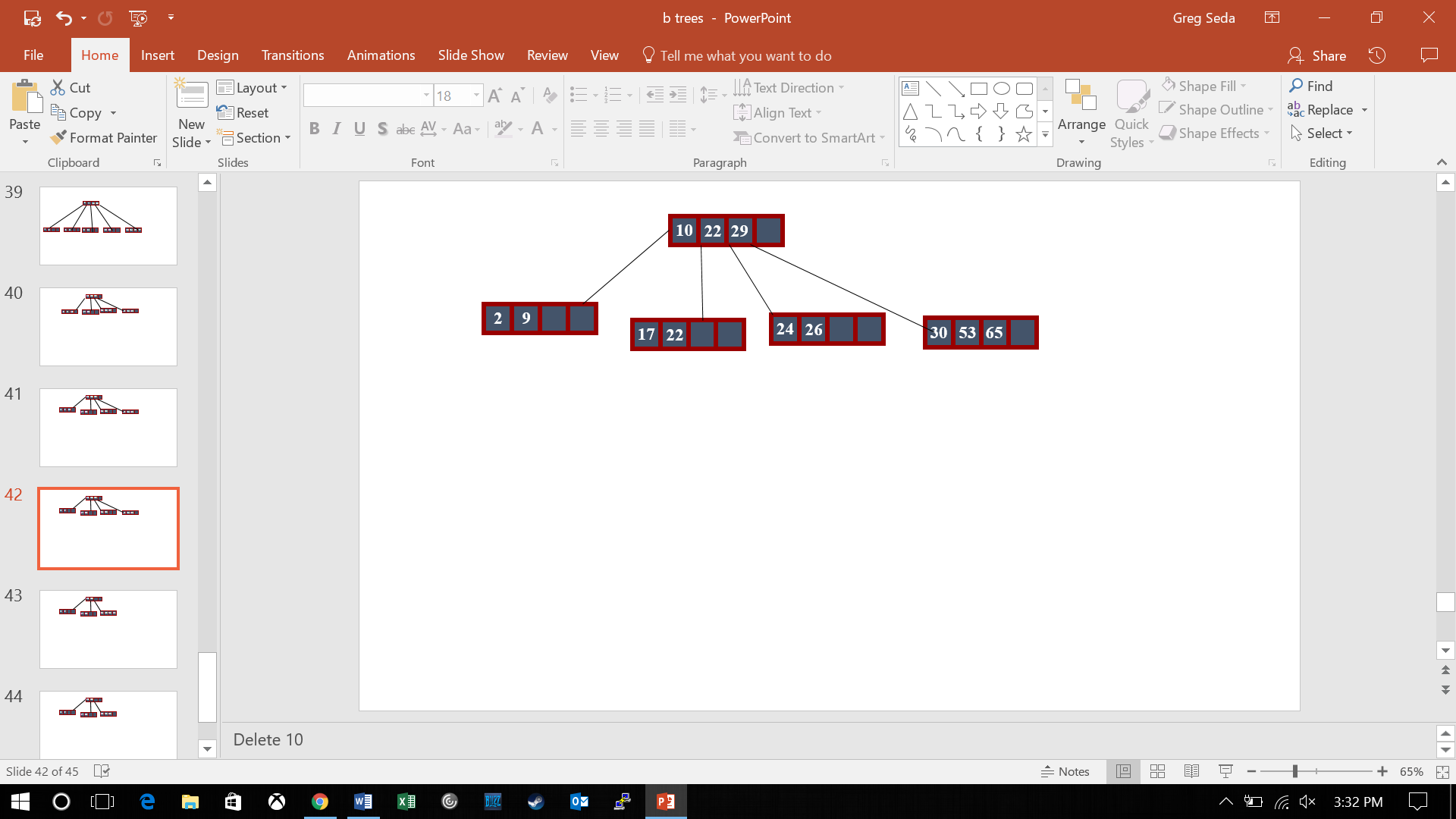
Consider the following B+ tree:



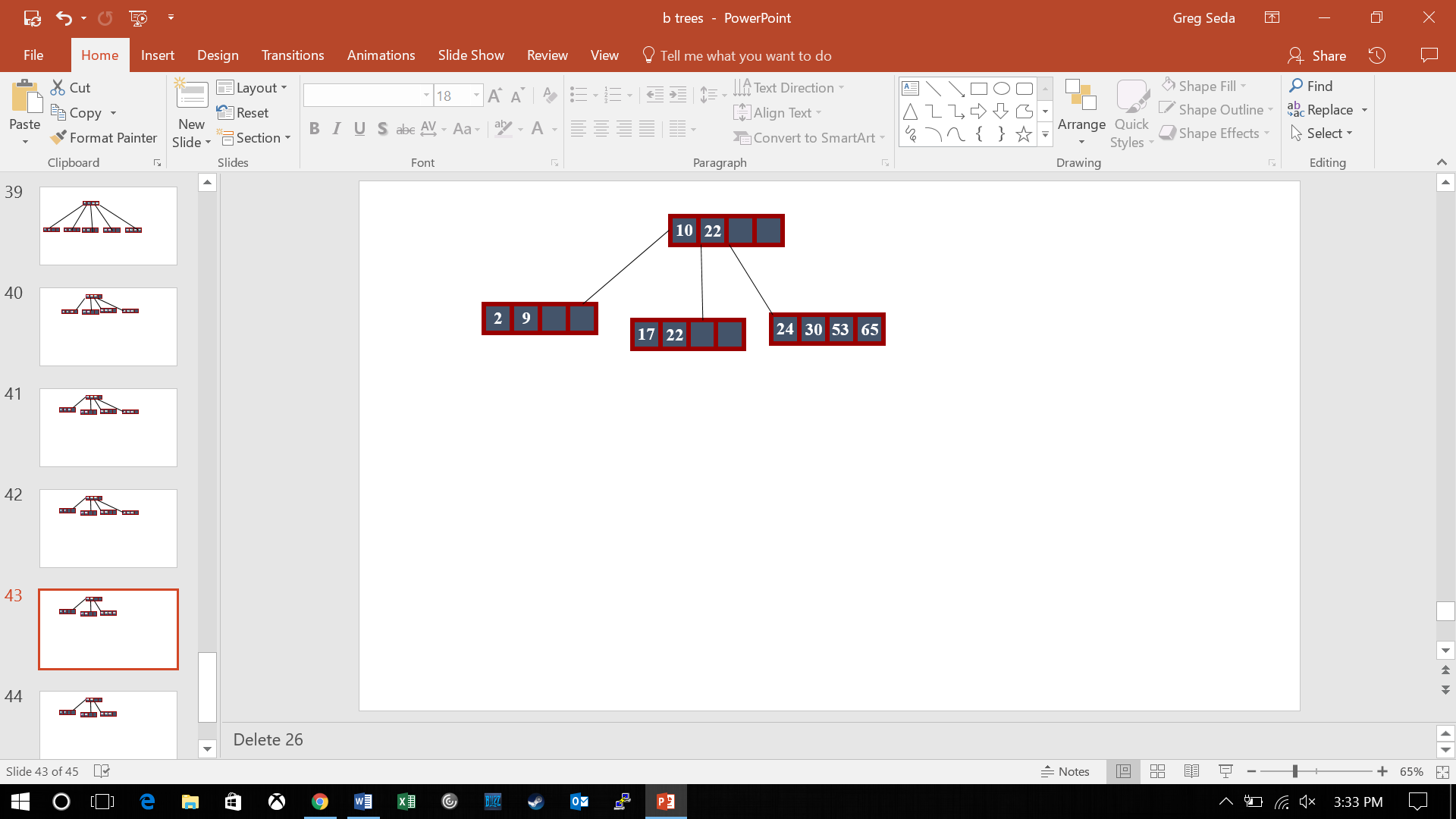
1. Delete 29 and redraw the tree after that



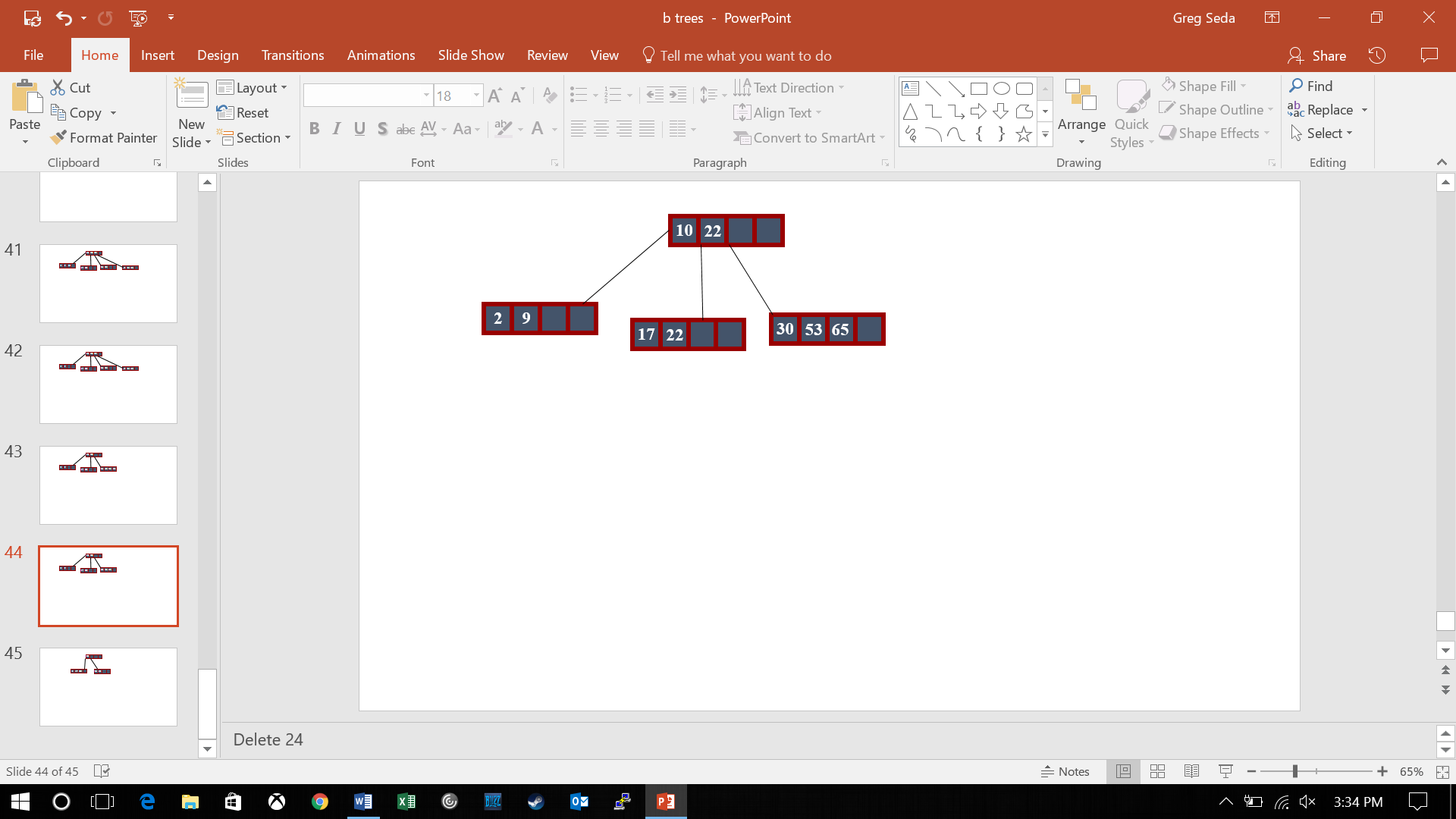
1. Next delete 10 and redraw the tree after that



1. Next delete 26 and redraw the tree after that



1. Next delete 24 and redraw the tree after that



1. Next delete 9 and redraw the tree after that

