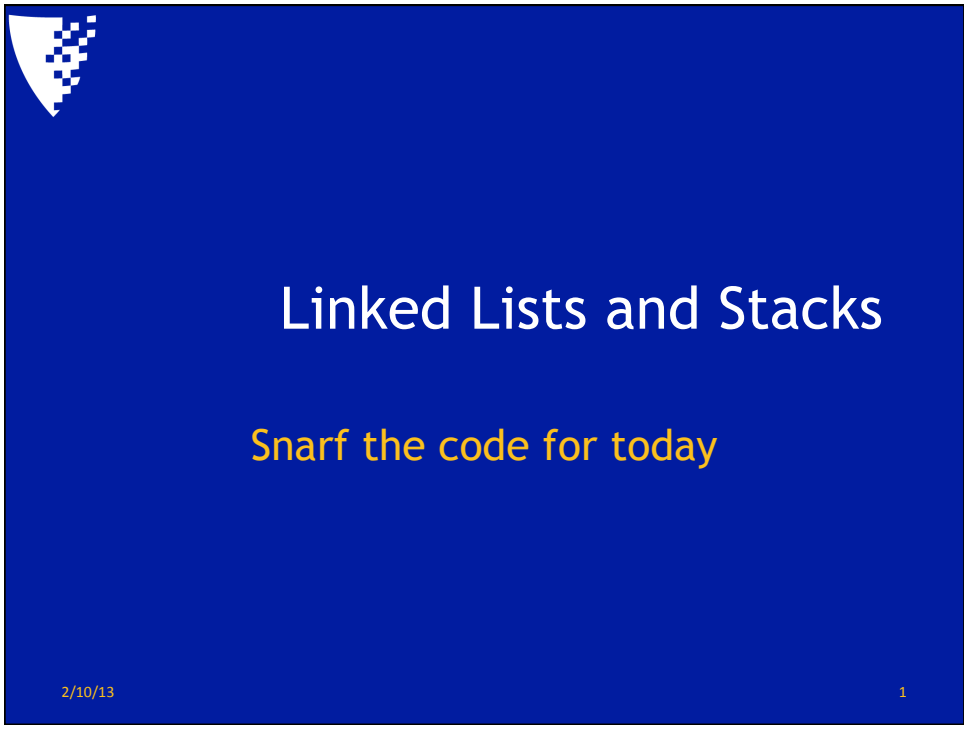
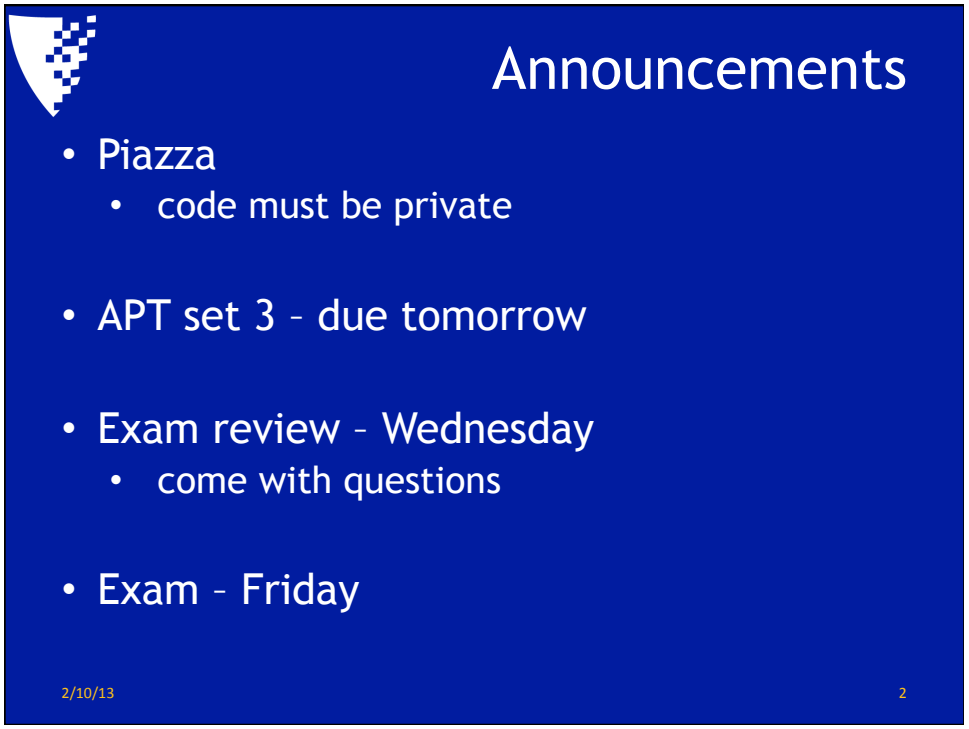
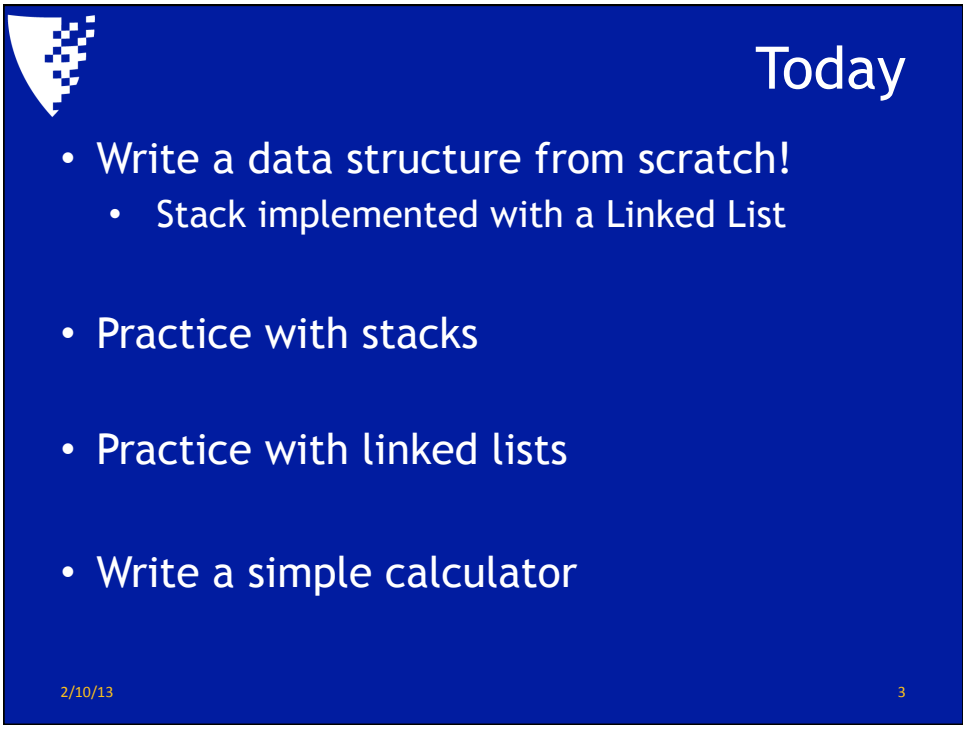
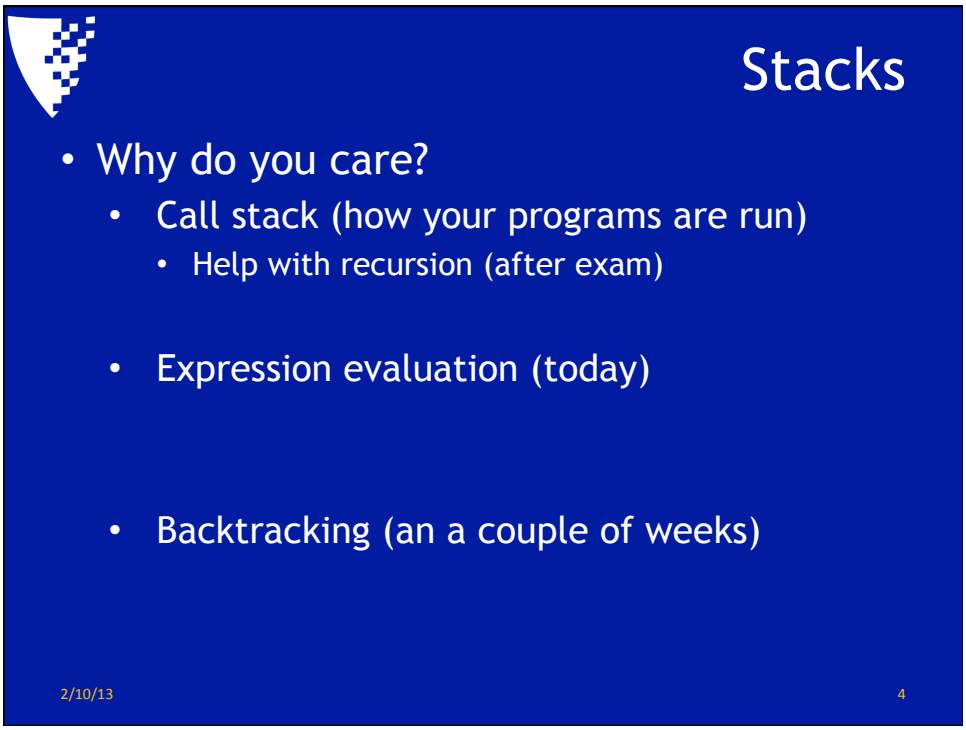
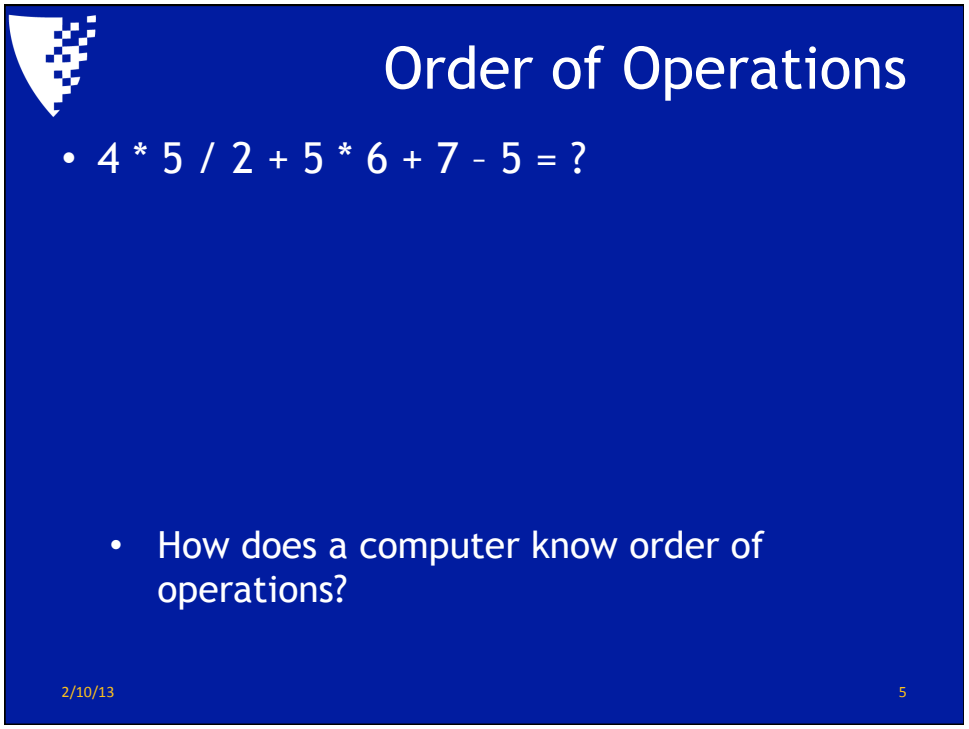
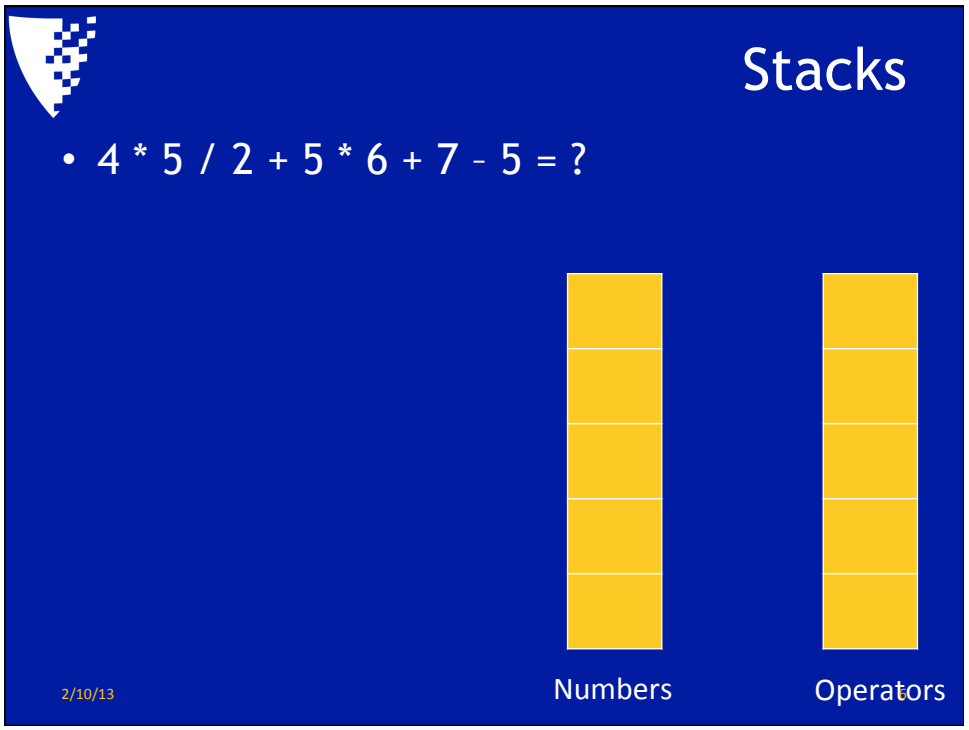

Linked Lists and Stacks
Snarf the code for today
2/10/13
1

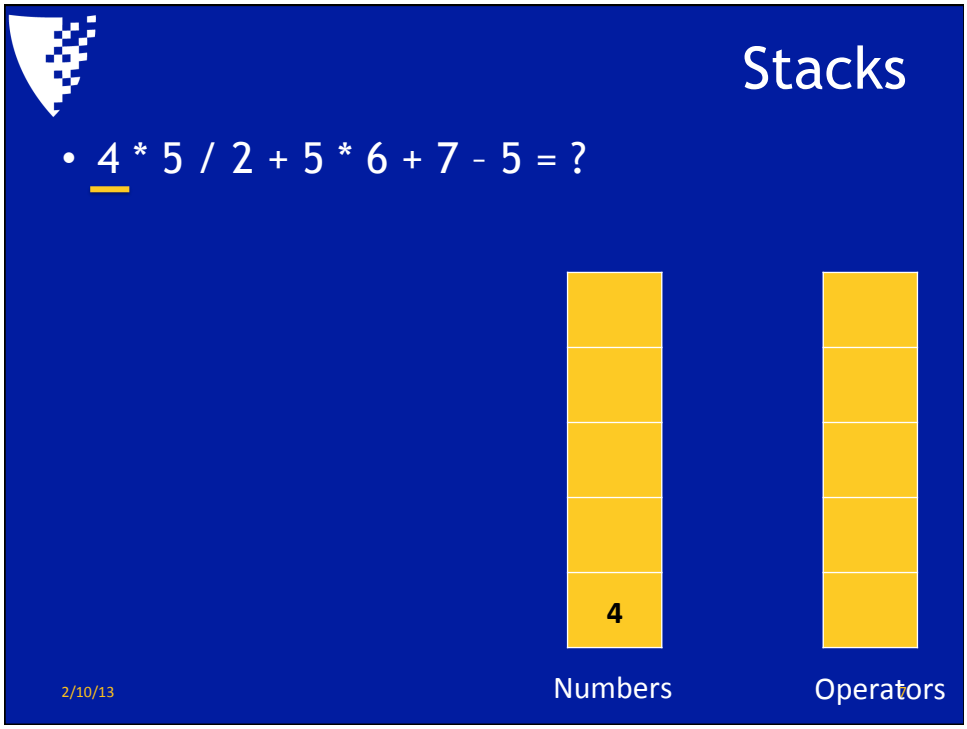

Announcements
• Piazza
• code must be private
• APT set 3 – due tomorrow
• Exam review – Wednesday
• come with questions
• Exam – Friday
2/10/13
2

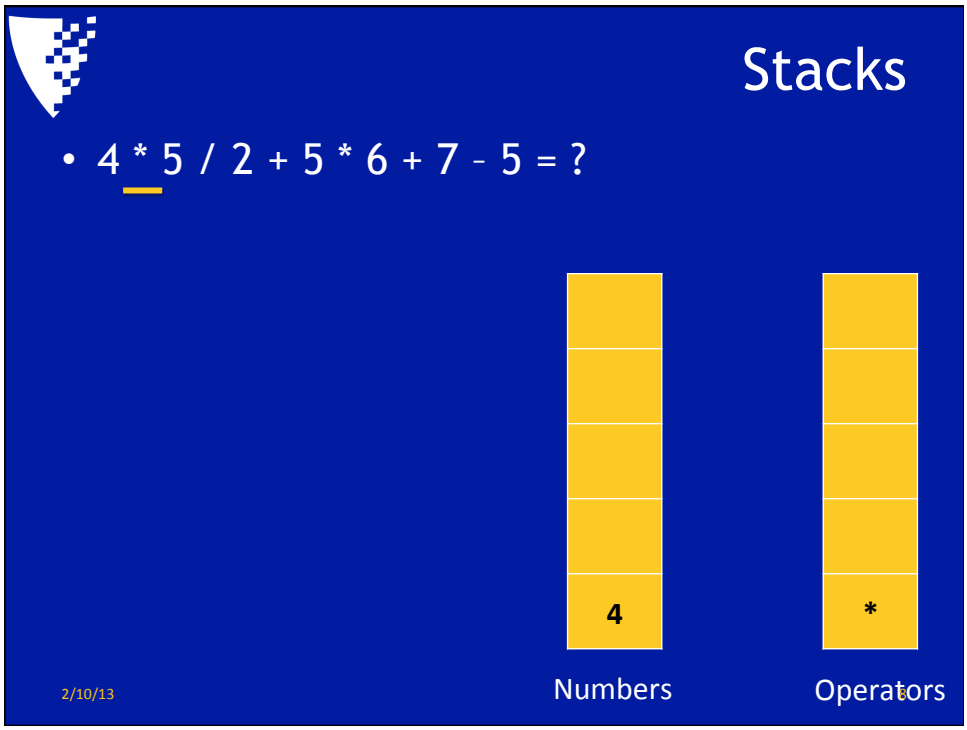

Today
• Write a data structure from scratch!
• Stack implemented with a Linked List
• Practice with stacks
• Practice with linked lists
• Write a simple calculator
2/10/13
3


Stacks
• Why do you care?
• Call stack (how your programs are run)
• Help with recursion (after exam)
• Expression evaluation (today)
• Backtracking (an a couple of weeks)
2/10/13
4


Order of Operations
• 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
• How does a computer know order of operations?
2/10/13
5


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
Numbers
Operators
2/10/13
6


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
4
Numbers
Operators
2/10/13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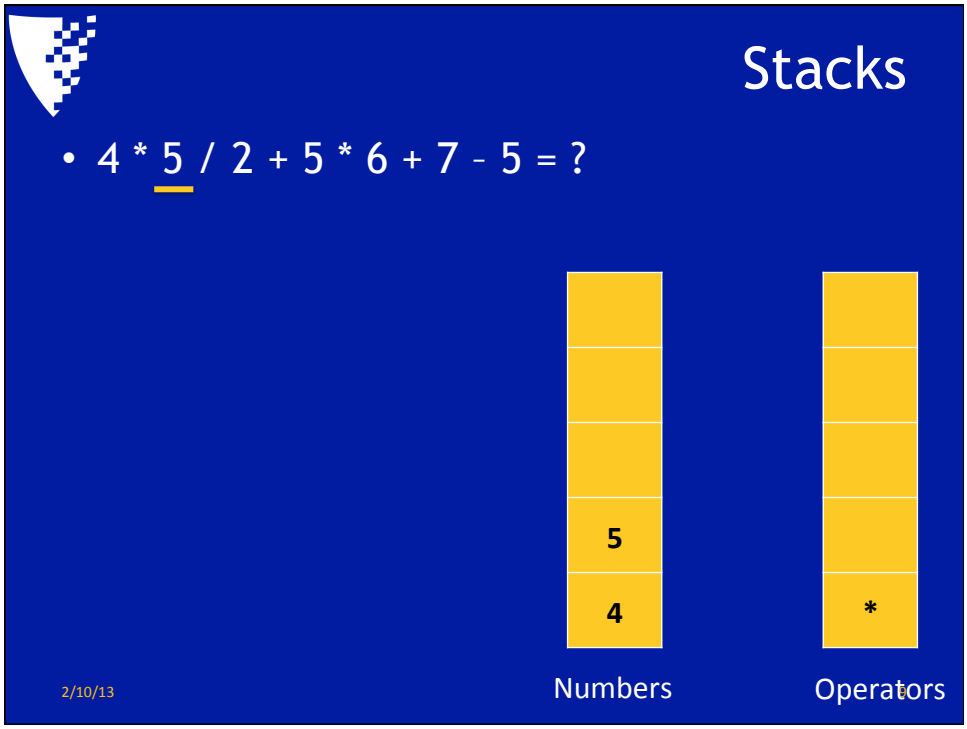
4
*
Numbers
Operators
2/10/13


Stacks
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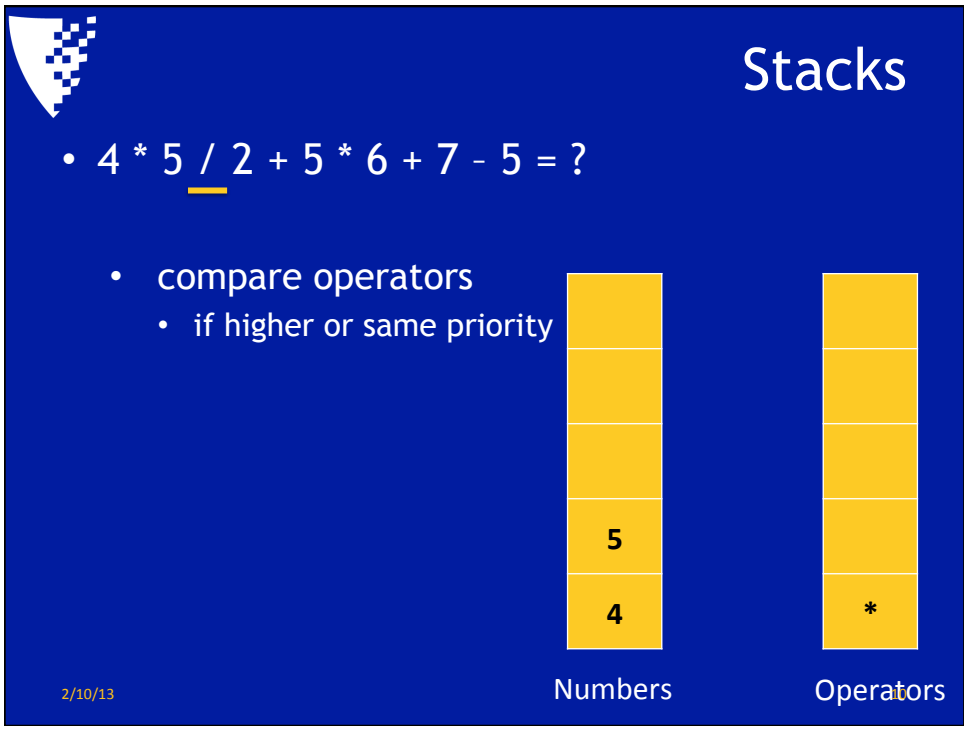
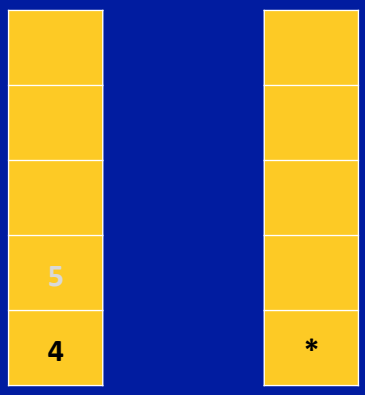
5
4
*
2/10/13
Numbers
Operators


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
• compare operators
• if higher or same priority
5
4
*
2/10/13
Numbers
Operators

Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
  - compare operators
    - if higher or same priority
      - pop #

5



Stacks

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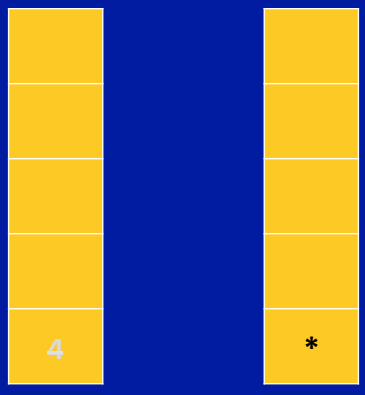
      - pop #
      - pop #

4 5



Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
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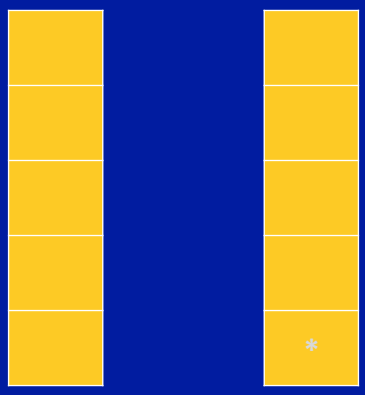
      - pop #
      - pop #
      - pop operation

4 * 5



Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
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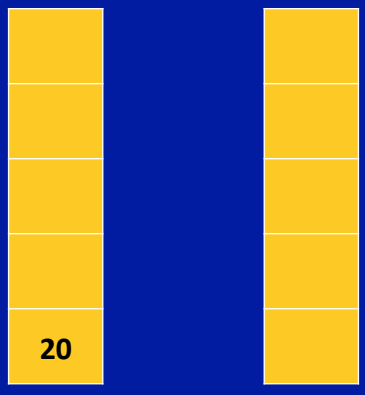
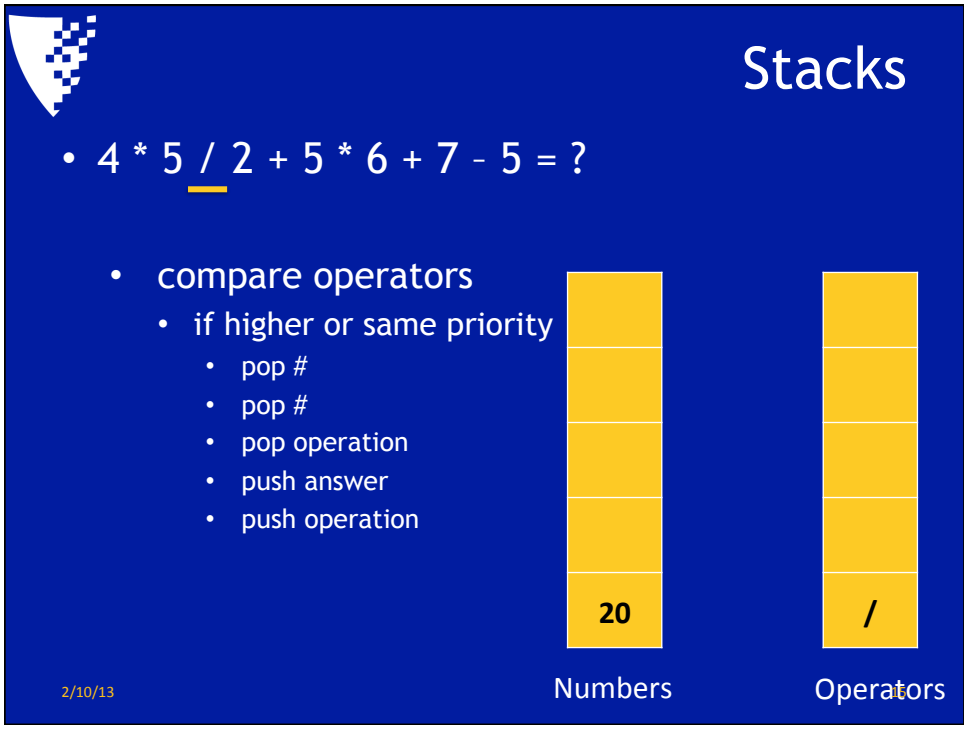
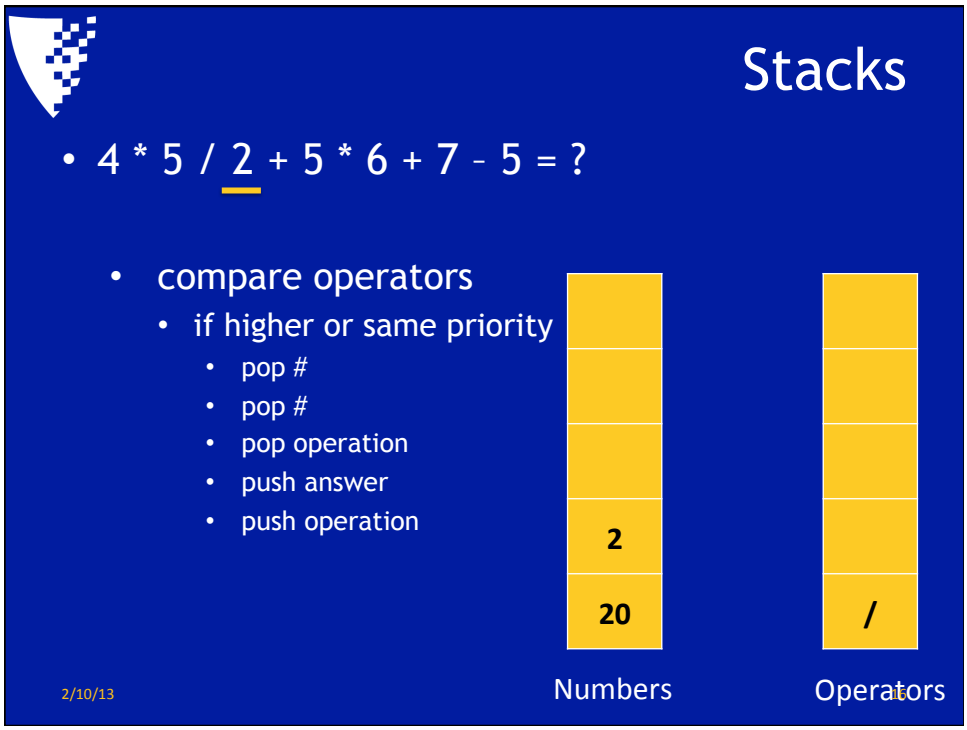
      - pop #
      - pop #
      - pop operation
      - push answer

4 * 5




Stacks
• 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
• compare operators
• if higher or same priority
• pop #
• pop #
• pop operation
• push answer
• push operation
20
/
Numbers
Operators
2/10/13


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
• compare operators
• if higher or same priority
• pop #
• pop #
• pop operation
• push answer
• push operation
2
20
/
Numbers
Operators
2/10/13

Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
  - compare operators
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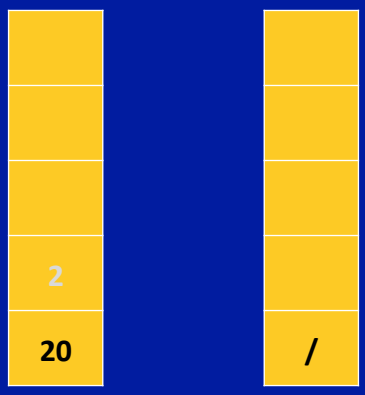
      - pop #
      - pop operation
      - push answer
      - push operation

2



Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
  - compare operators
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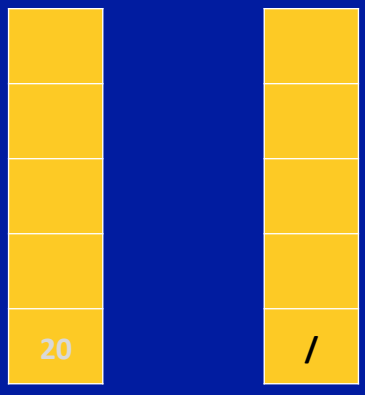
      - pop #
      - pop #
      - pop operation
      - push answer
      - push operation

20 2



Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?

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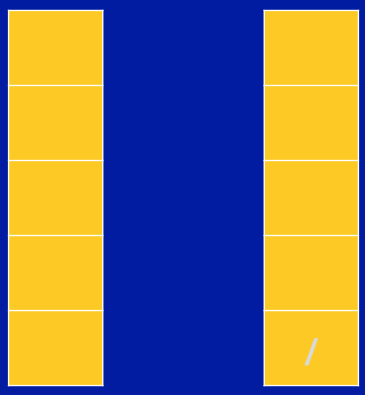
    - pop #
    - pop #
    - pop operation
    - push answer
    - push operation

20 / 2



Stacks

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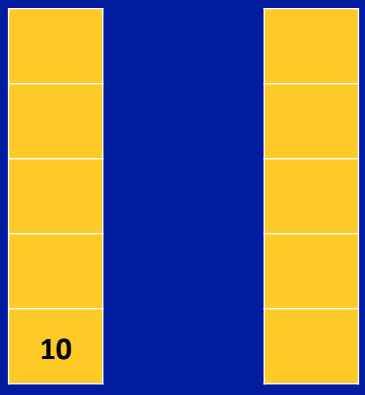
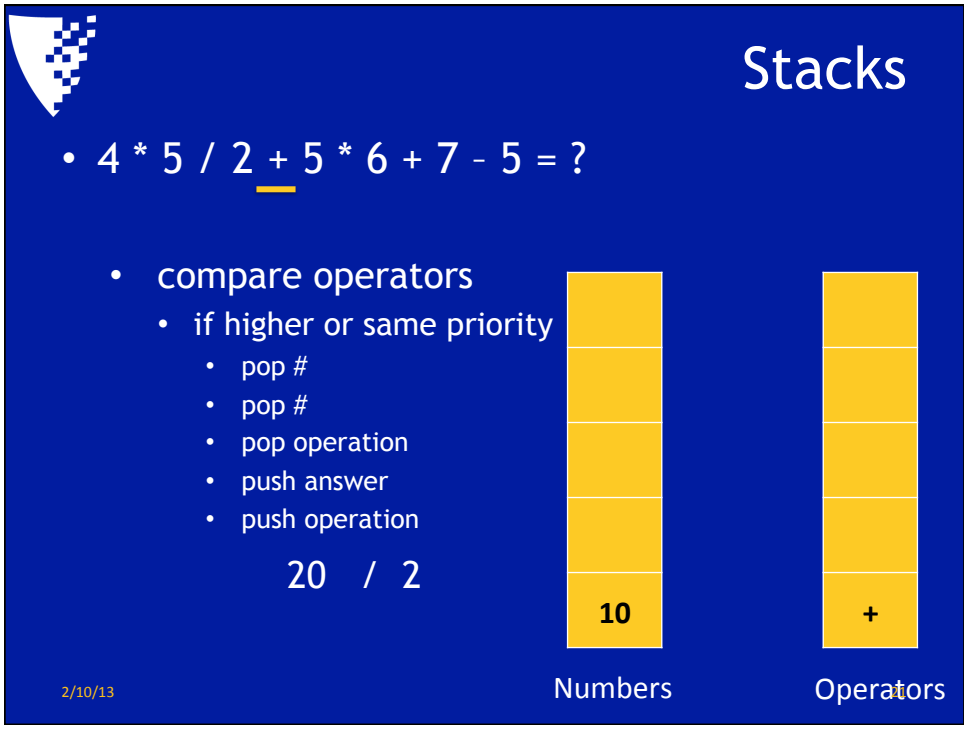
20 / 2




Stacks
• 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
• compare operators
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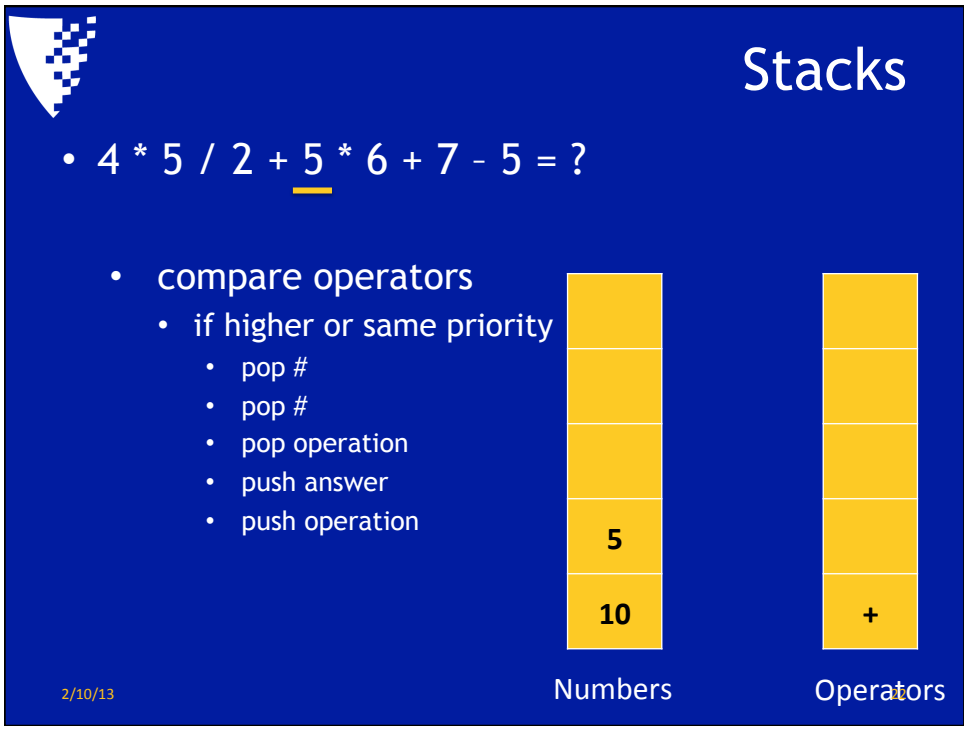
• pop #
• pop #
• pop operation
• push answer
• push operation
20 / 2
10
+
Numbers
Operators
2/10/13


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
• compare operators
• if higher or same priority
• pop #
• pop #
• pop operation
• push answer
• push operation
5
10
+
Numbers
Operators
2/10/13

Stacks

- 4 * 5 / 2 + 5 * 6 + 7 – 5 = ?
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    - if higher or same priority
      - pop #
      - pop #
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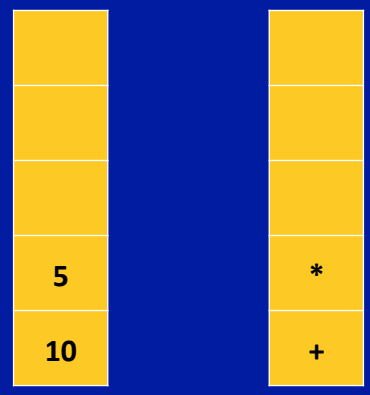
      - push answer
      - push operation



Stacks

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      - pop #
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      - push answer
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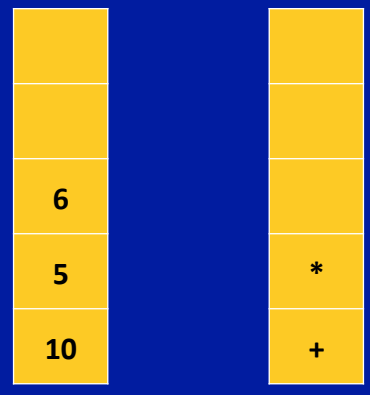

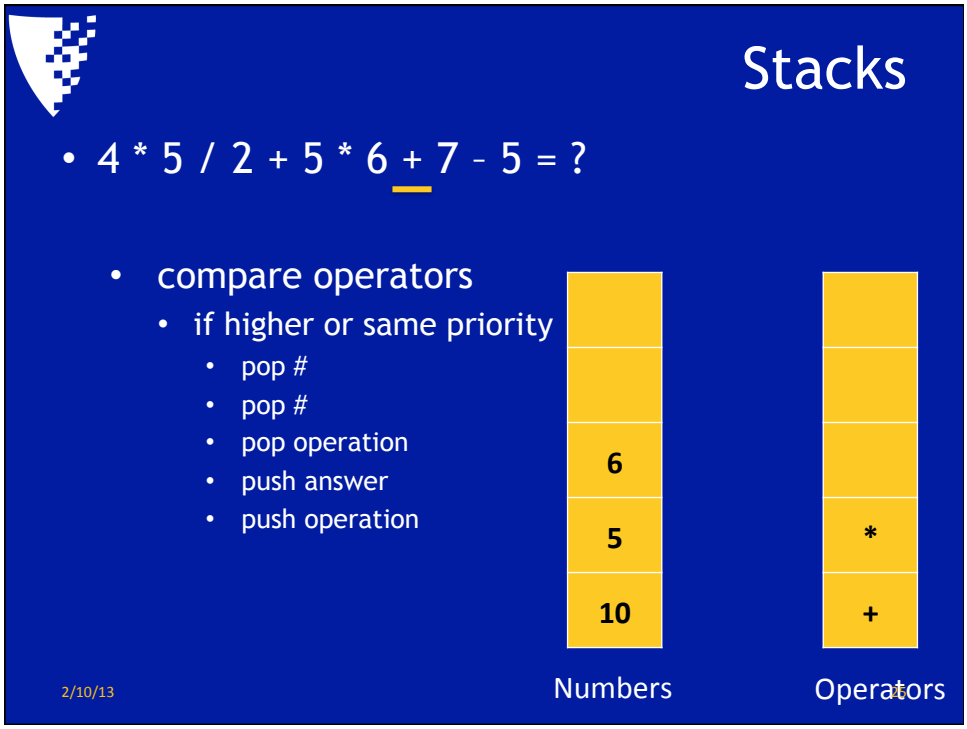
Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
• compare operators
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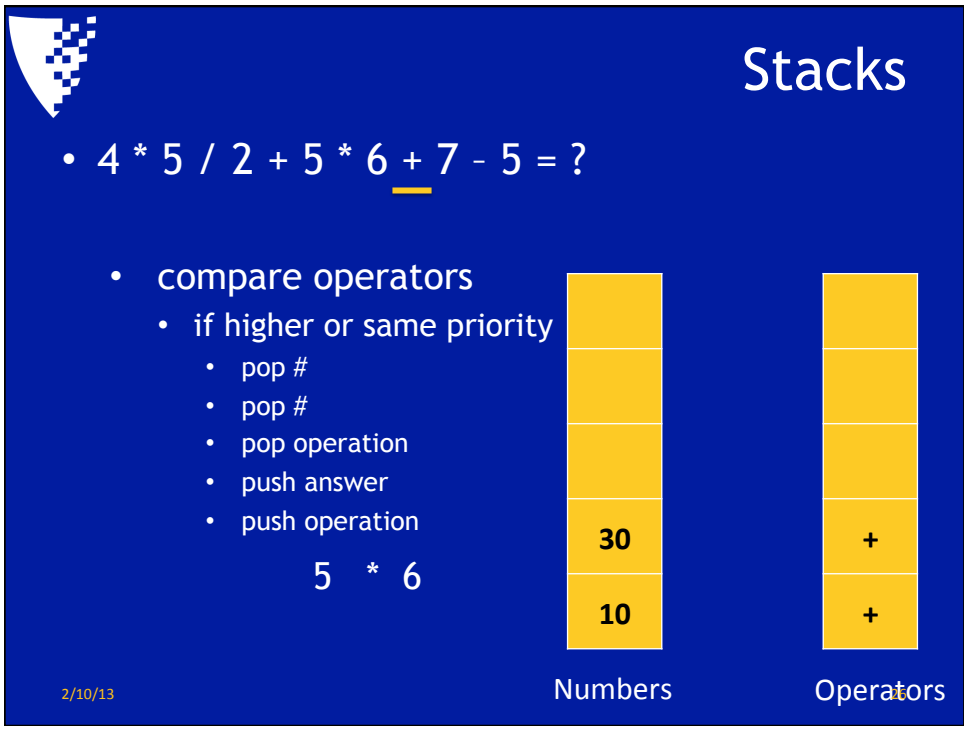
• pop #
• pop #
• pop operation
• push answer
• push operation
6
5
10
*
+
Numbers
Operators
2/10/13


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
• compare operators
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• pop #
• pop #
• pop operation
• push answer
• push operation
5 * 6
30
10
+
+
Numbers
Operators
2/10/13

Stacks

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      - pop #
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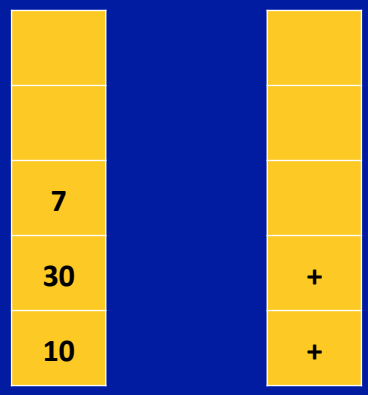
      - push answer
      - push operation



Stacks

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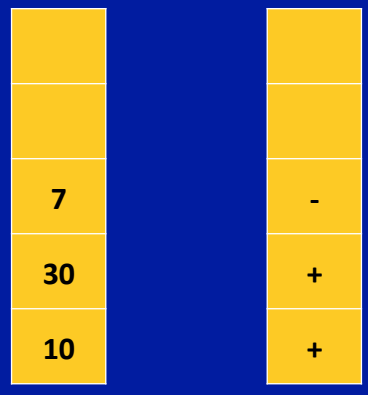

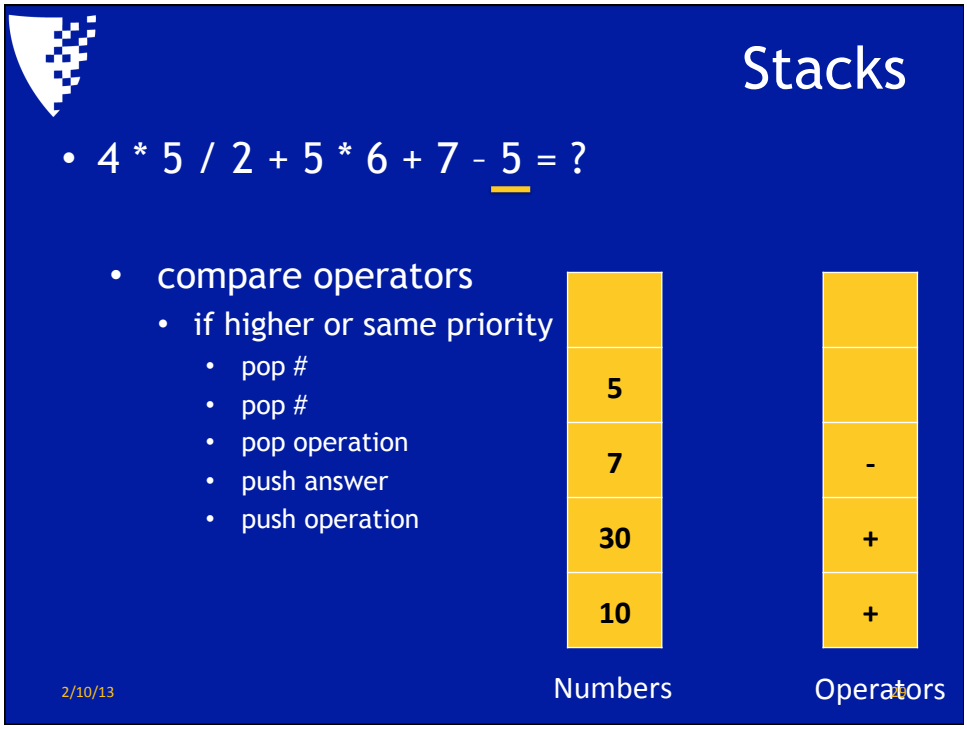
Stacks
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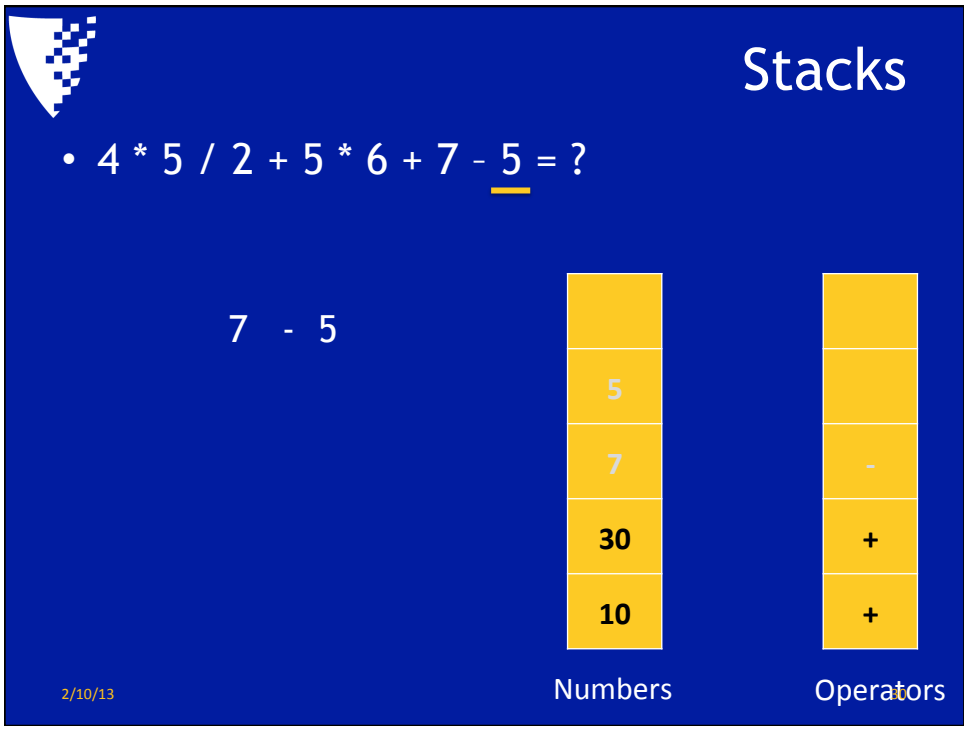
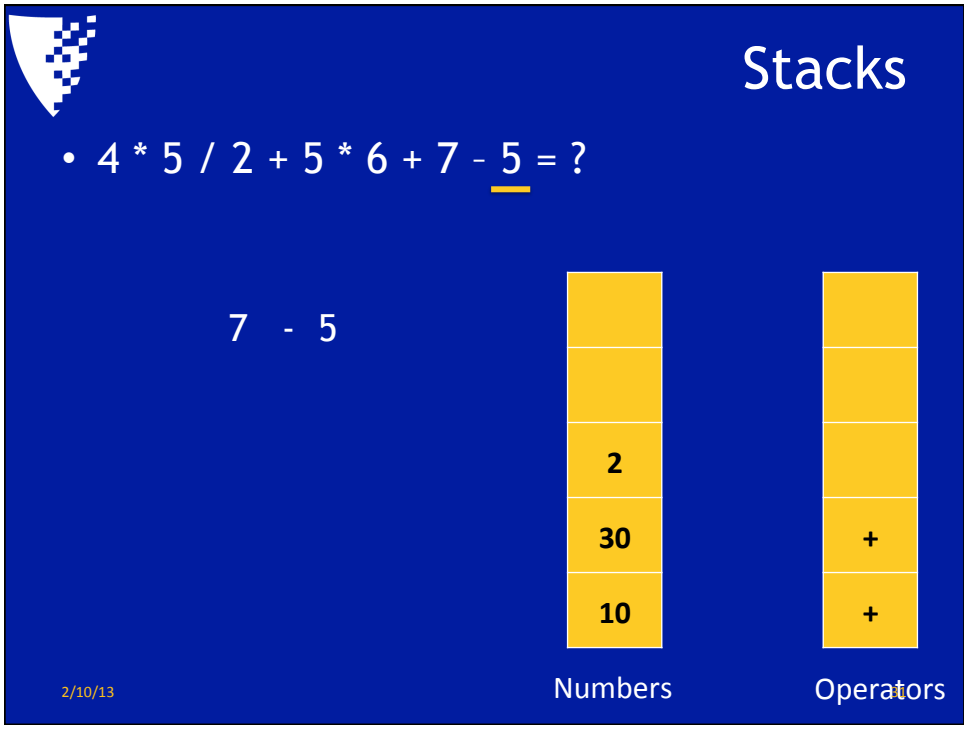
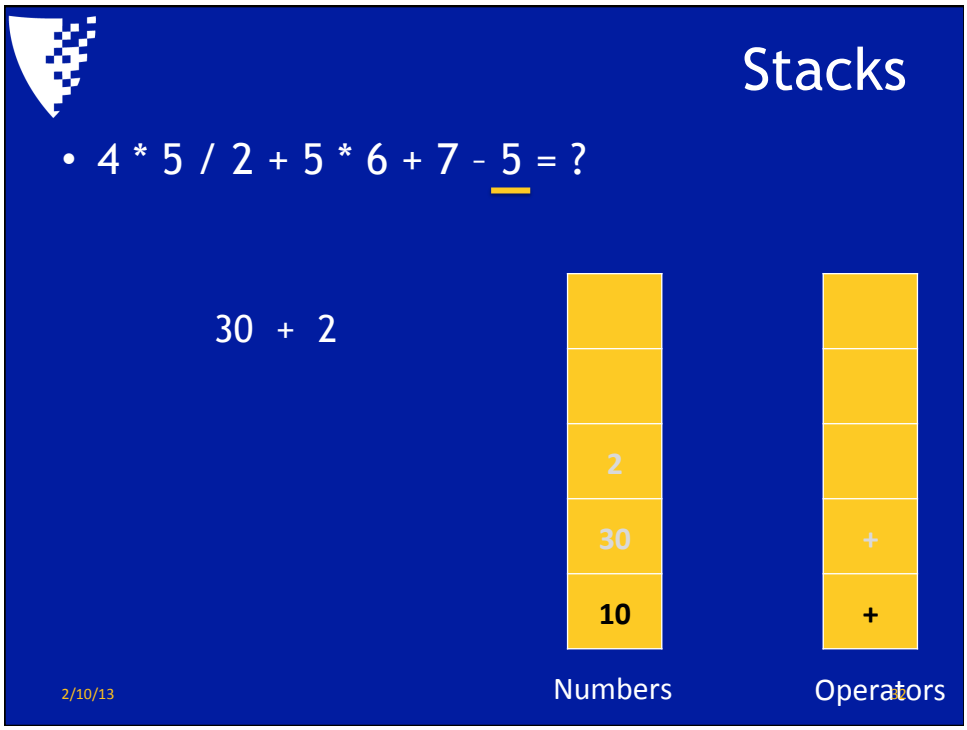
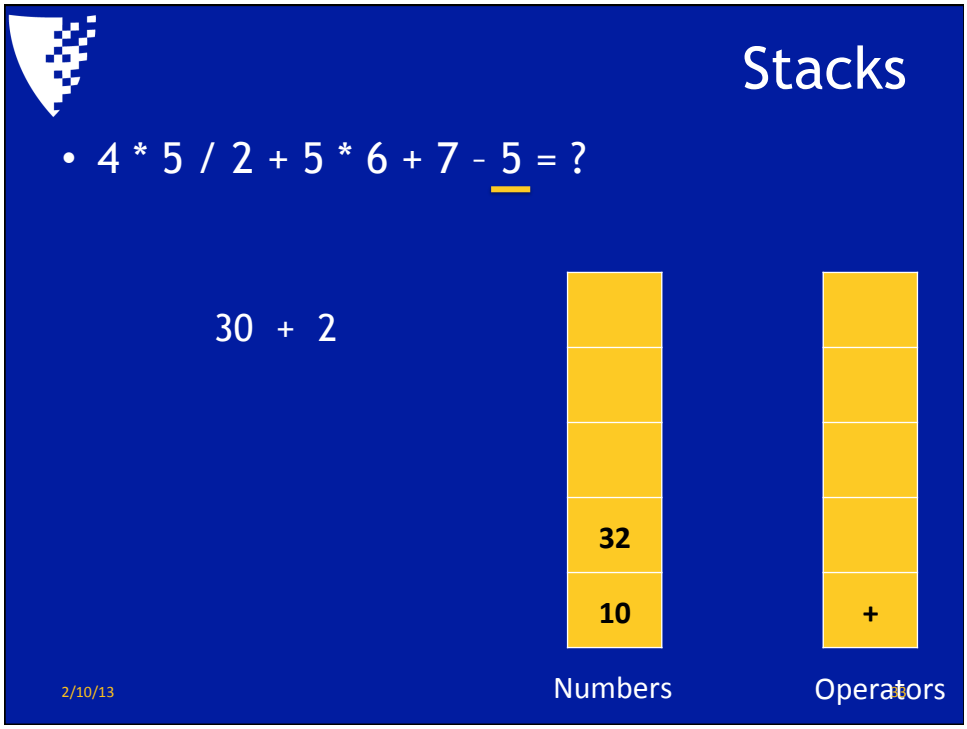
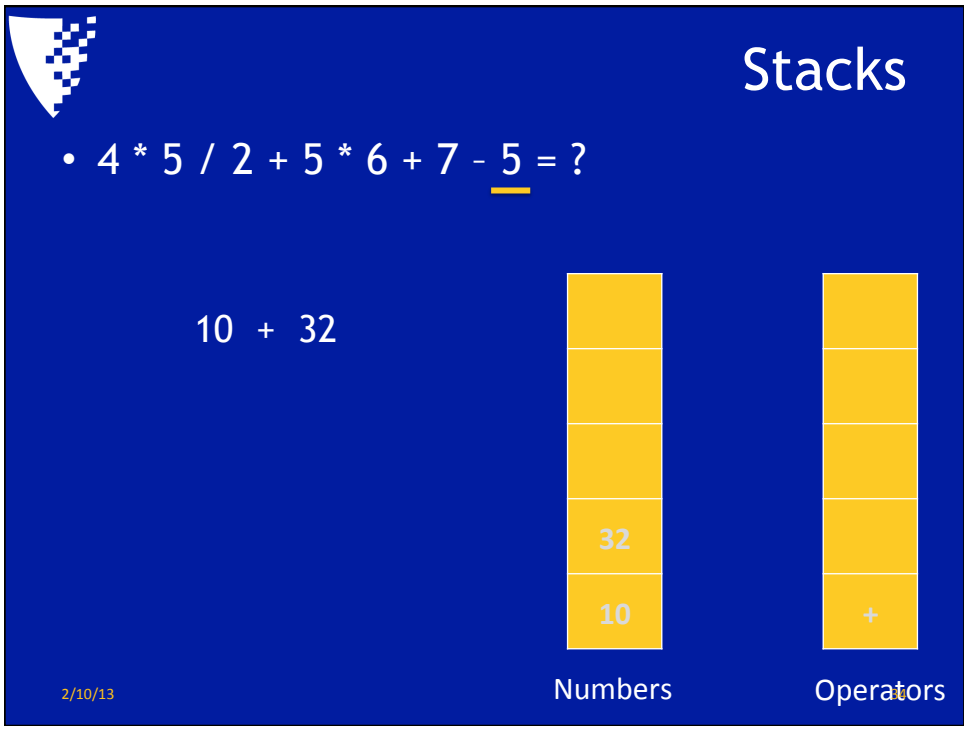
• push operation
5
7
30
10
-
+
+
Numbers
Operators
2/10/13


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
7 - 5
5
7
30
10
-
+
+
Numbers
Operators
2/10/13


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
7 - 5
2
30
10
+
+
Numbers
Operators
2/10/13


Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
30 + 2
2
30
10
+
+
Numbers
Operators
2/10/13

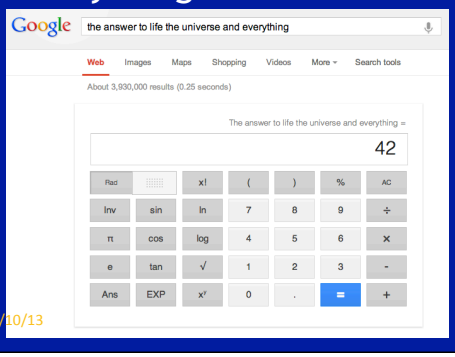

Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
30 + 2
32
10
+
Numbers
Operators
2/10/13

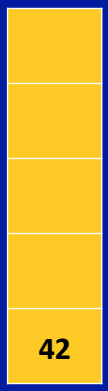

Stacks
• 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?
10 + 32
32
10
+
Numbers
Operators
2/10/13

Stacks

- 4 * 5 / 2 + 5 * 6 + 7 - 5 = ?

The answer to life the universe and everything



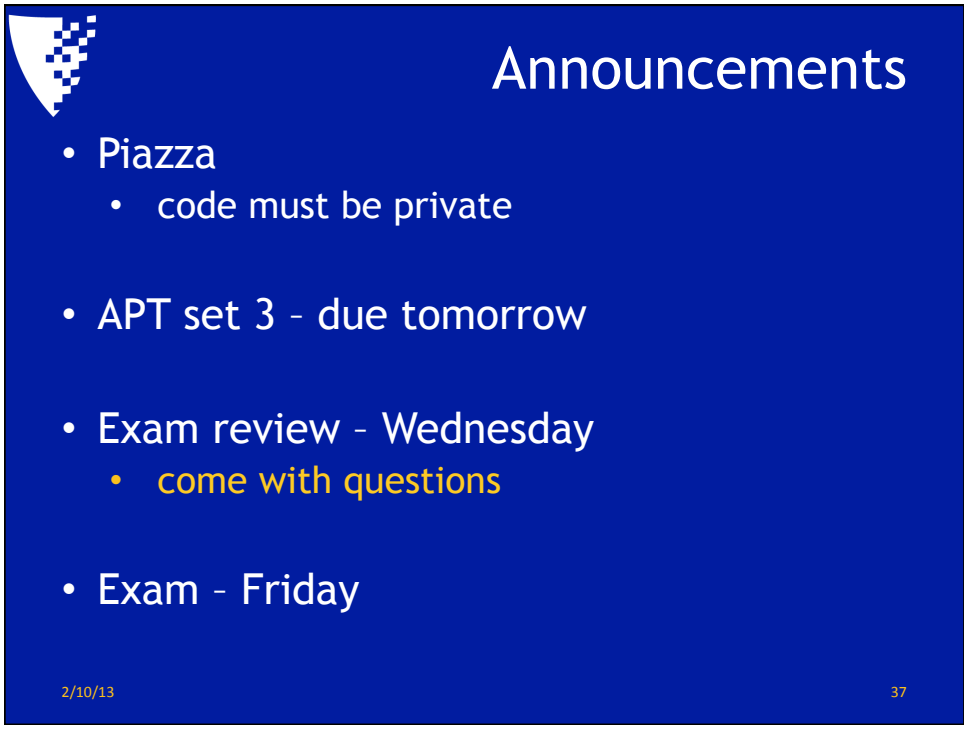


Numbers

Operators

Today

- Write a data structure from scratch!
  - Stack implemented with a Linked List
- Practice with stacks
- Practice with linked lists
- Write a simple calculator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2/10/13
37