CSI31 Introduction to Computer Programming I

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Topics

- Multi-way branching
- Max of three
- Exception handling

Decision structures: multiway branching

- Quadratic equation again

  $$ax^2 + bx + c = 0$$

- Actually three cases:
  - no real roots
  - a repeated real root
  - two distinct real roots

Improve the quadratic equation solver

- Test the value of the discriminant $b^2 - 4ac$

  - If $b^2 - 4ac < 0$, the equation has no real roots.

  - If $b^2 - 4ac = 0$, the equation has a repeated real root. Find it.

  - If $b^2 - 4ac > 0$, the equation has two different real roots. Find it.

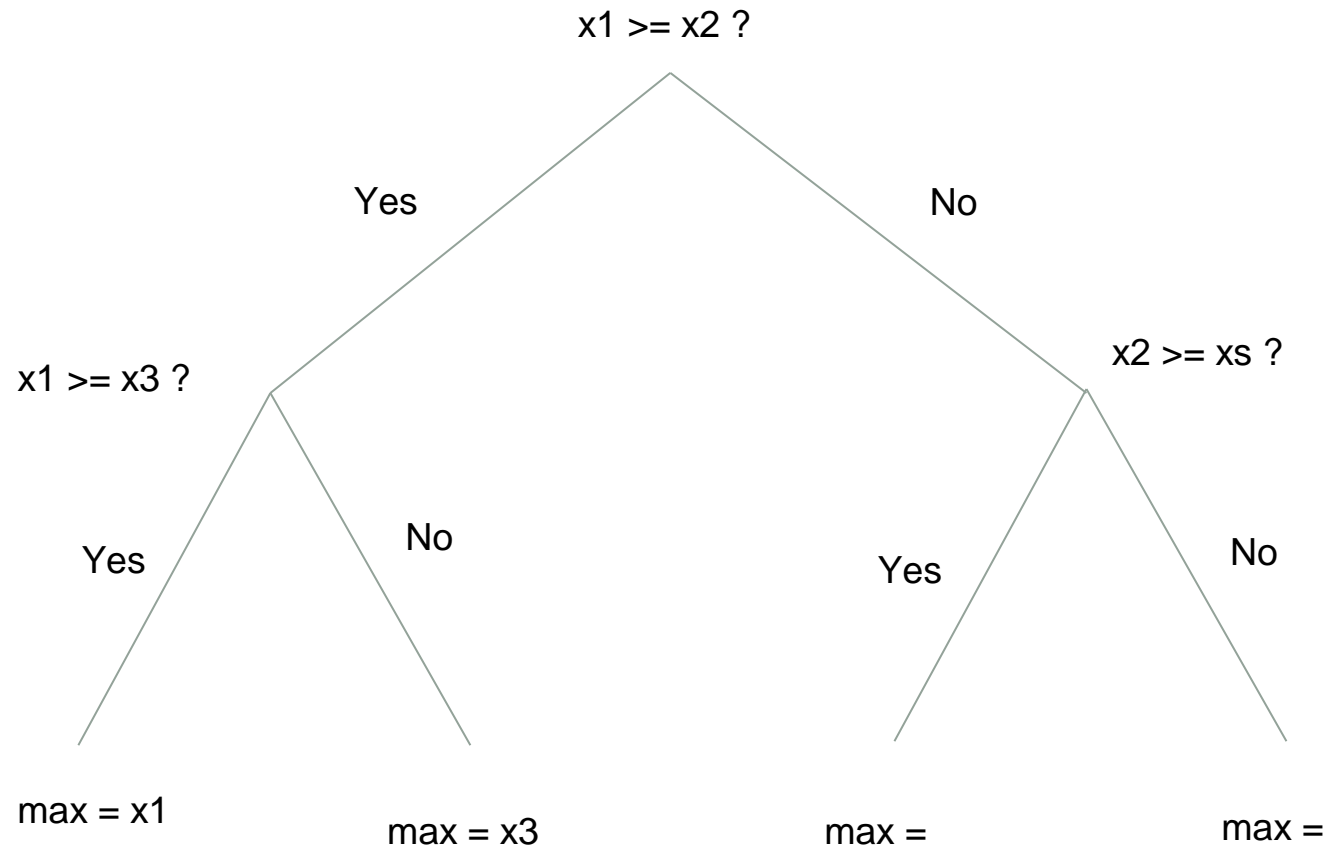# Three way decision tree
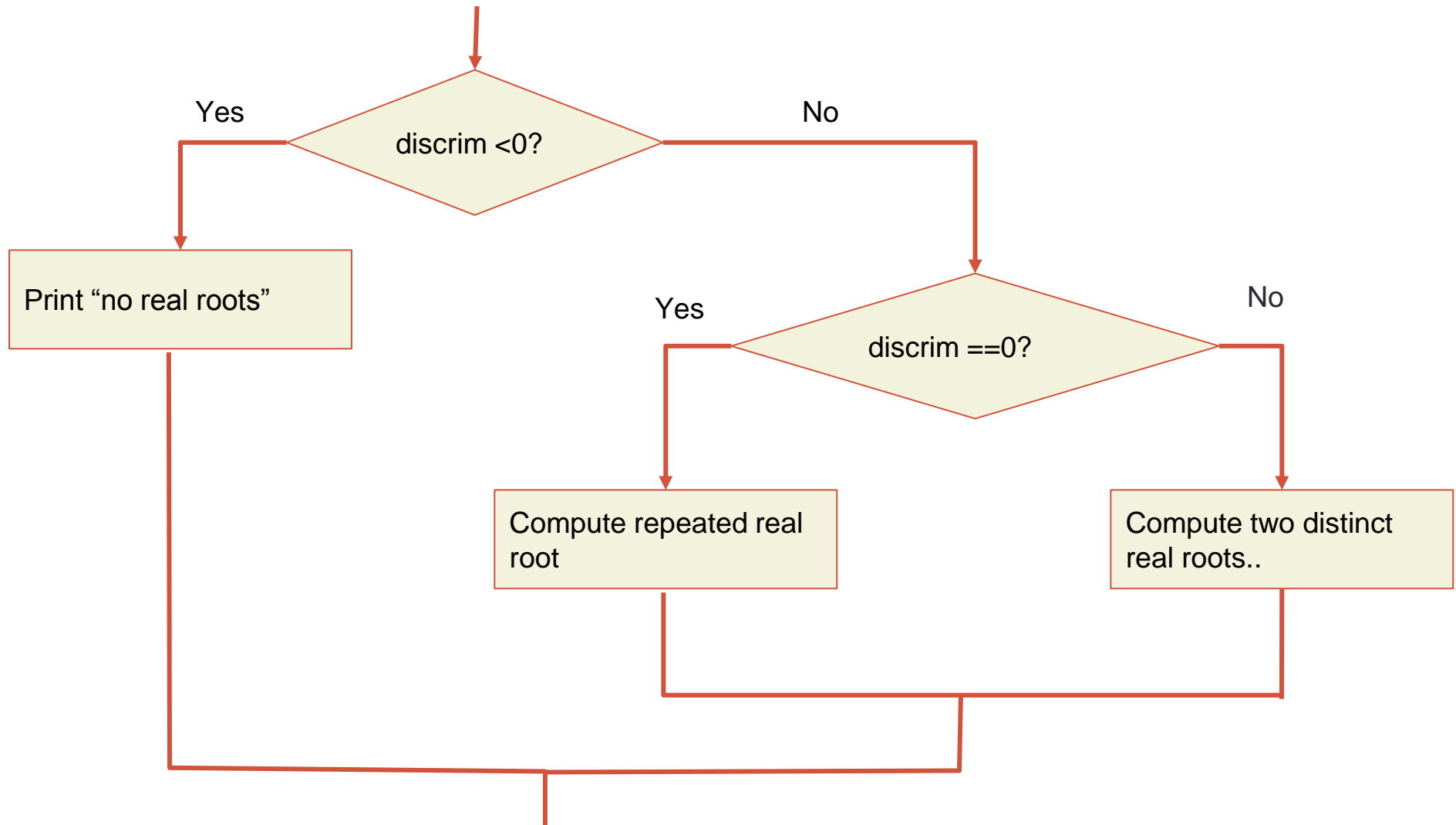
Modify the code

- if/elif/else

```
if <condition1>:
        <body case 1>

elif <condition2>:

        <body case 2>

elif <condition3>

        <body case 3>

        …

else:

        <default statements>
```

Max of Three: Find the largest of three numbers.

- One approach: Compare each number to each of the others.

- If x1>=x2 and x1>=x3 then max = x1

  If x2>=x1 and x2>=x3 then max = x2

  If x3>=x1 and x3>=x2 then max = x3

- For this case, it takes $6 = 3*2$ comparisons.

- What if there were 4 numbers?

Max of three decision tree version

x1, x2, x3 are numerical. Assign the largest of those numbers, the maximum or max, to the variable max.

$$x1 >= x2 \ ?$$

Yes   No

$$x1 >= x3 \ ?$$ $$x2 >= xs \ ?$$

Yes   No   Yes   No

max = x1   max = x3   max =   max =

Max of three decision tree version

- Uses the information gained from the earlier test to structure the next test.
- Only three comparisons in entire algorithm.
- Needs only two tests to find the max – one branch of tree
- What if there were 4 numbers?

Max of three: Sequential processing

Remember the largest element seen so far.

Compare the next element to the largest seen so far, Update the largest if the next element is larger.

Continue until you have seen all the elements.

This version generalizes to any number of elements.

Exception handling

try/except - special type of control structure for handling errors or exceptions

Look at quadratic5.py and quadratic6.py