Recursion

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One Example

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String reverse(String s) {
    if (s.length() == 0) return s;
    return reverse(s.substring(1, s.length())) + s.charAt(0);
}
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}

Use mathematical induction to prove the program is correct:
(1) For empty string, the function is correct.
(2) If reverse works for string of length n, then it works for string of length n+1.
(3) Therefore it works for arbitrary strings.
How to Construct a Recursive Function?

- Define the function signature and its functionality.
- Define the base case.
- Define the induction rule – obtain the result by combining the results of the same procedure on smaller sub-problems.

- The key: pretend the function has been there when you write a recursion.
Q: Convert a positive integer to a string which is the base \( b \) representation of the number.

```java
String convertBase(int n, int b)
```
String convertBase(int n, int b)
{
    if (n < b) return n + ""; // base case
    return convertBase(n/b, b) + (n%b);
}