

Prelab 06 Solutions

1. What is the output of `print(strange(3))`?

Answer: 63

Solution: `strange(3) = 5 * strange(2) - 2 = 5 * 13 - 2 = 63`
`strange(2) = 5 * strange(1) - 2 = 5 * 3 - 2 = 13`
`strange(1) = 5 * strange(0) - 2 = 5 * 1 - 2 = 3`
`strange(0) = 1`

2. What is the output of `weird(8)`?

Answer: "8 5 4 1 2 6 3 2 4 1 2"

Solution: `weird(8) = "8 " + weird(5) + weird(6)`
`weird(6) = "6 " + weird(3) + weird(4)`
`weird(5) = "5 " + weird(4)`
`weird(4) = "4 " + weird(1) + weird(2)`
`weird(3) = "3 " + weird(2)`
`weird(2) = "2 " + weird(-1) + weird(0)`
`weird(1) = "1 " + weird(0)`

3. Give a recursive definition for n^k .

Answer: `power(n,k)=1` when `k == 0` and
`power(n,k)=n*power(n,k-1)` otherwise

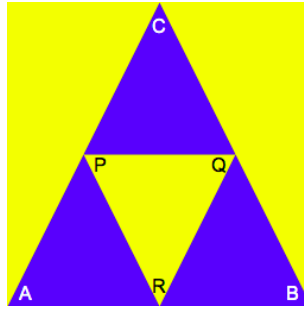
4. Give a recursive definition for the sum of the first n perfect squares.

Answer: `sps(n)=1` when `n == 1` and
`sps(n)= n*n + sps(n-1)` otherwise

5. Give recursive pseudocode for determining whether a string is a palindrome (no loops allowed).

Answer: If the length of `s` `<= 1` return `True`
else
 if the first and last character of `s` are equal
 return `palindrome(slice s to exclude first and last characters)`
 else return `False`

6.



Let A_x and A_y denote the x and y coordinates of the corner labelled A in the large triangle above. Let B_x , B_y , C_x and C_y be defined similarly. Assume P, Q and R each lie at the midpoint of their corresponding edge in the triangle ABC.

Specify the x and y coordinates of P, Q and R **in terms of A, B and C's x and y coordinates**. Don't assume that any coordinates are 0 or that there is any relationship between the points (the triangle ABC pictured happens to be fairly symmetric, but you shouldn't assume this will necessarily be the case).

Answer:

$$\begin{aligned}P_x &= (A_x + C_x) / 2 \\P_y &= (A_y + C_y) / 2 \\Q_x &= (B_x + C_x) / 2 \\Q_y &= (B_y + C_y) / 2 \\R_x &= (A_x + B_x) / 2 \\R_y &= (A_y + B_y) / 2\end{aligned}$$