In [1]:
```
#Exercise 1:

sum = 0

#ask the user for an input using a while loop

while True:
    n = int(input("Enter a positive integer: "))
    if n > 0:
        break
    else:
        print("The input you gave is not valid. It must be positive.")

#using a for loop to calculate the sum of odd integers
#1 is the starting value of the sequence; 2*n is the ending value in the sequence, as
#into the sum (2n-1); finally, 2 is the step size to determine that the sequence incre

for i in range(1, 2*n, 2):
    sum += i
print("The sum is:",sum)
```

```
Enter a positive integer: 5
The sum is: 25
```

In [2]:
```
#Exercise 2:

#ask user for an input

n = int(input("Enter a positive integer: "))

#check if the input is a positive number

if(n <= 0):
    print("The input you gave is not valid. It must be positive.")
else:
    #initialize i to start from the first row
    i = 1

    #outer loop
    while(i <=n ):
        #inner loop to print numbers from 1 to i with spaces or tabs
        j = 1
        while(j <= i):
            #end specifies what should be printed at the end of each "print" statement
            print(j, end=" ")
            j += 1
        #print a new line after each row
        print()
        i += 1
```

```
Enter a positive integer: 7
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
1 2 3 4 5 6
1 2 3 4 5 6 7
```

In [3]:
```
#Exercise 3:

while True:
    print("Select operation: 1. Add 2. Subtract 3. Multiply 4. Divide", flush=True)

    choice = input("Enter choice (1/2/3/4): ")

    if choice not in ('1', '2', '3', '4'):
        print("Wrong input")
        continue  # Go back to the beginning of the loop if the choice is not valid.

    num1 = int(input("Enter first number: "))
    num2 = int(input("Enter second number: "))

    if choice == '1':
        result = num1 + num2
        print(f"{num1} + {num2} = {result}")
    elif choice == '2':
        result = num1 - num2
        print(f"{num1} - {num2} = {result}")
    elif choice == '3':
        result = num1 * num2
        print(f"{num1} * {num2} = {result}")
    elif choice == '4':
        if num2 == 0:
            print("Division by zero is not allowed.")
        else:
            result = num1 / num2
            print(f"{num1} / {num2} = {result}")

    another_calculation = input("Do you want to do another calculation (y/n)? ").lower

    if another_calculation == 'n':
        print("Bye")
        break  # Exit the loop and end the program if 'n' is entered.
    elif another_calculation != 'y':
        print("Wrong input")  # Display an error message for invalid input.
```

```
Select operation: 1. Add 2. Subtract 3. Multiply 4. Divide
Enter choice (1/2/3/4): 3
Enter first number: 15
Enter second number: 14
15 * 14 = 210
Do you want to do another calculation (y/n)? n
Bye
```

In [4]:
```
#Exercise 4:

num = int(input("How many marbles to start with? "))

while num > 0:
    p1 = int(input(f"Player #1, there are {num} marbles left. How many marbles will yo

    while p1 > 3 or p1 > num:
        if p1 > 3:
            p1 = int(input("Please enter a number less than 3: "))
        elif p1 > num:
            p1 = int(input(f"Please enter a number less than or equal to {num}: "))
```

```
    num -= p1

    if num == 0:
        print("Player #1, you took the last marble and have won!")
        break

    p2 = int(input(f"Player #2, there are {num} marbles left. How many marbles will yo

    while p2 > 3 or p2 > num:
        if p2 > 3:
            p2 = int(input("Please enter a number less than 3: "))
        elif p2 > num:
            p2 = int(input(f"Please enter a number less than or equal to {num}: "))

    num -= p2

    if num == 0:
        print("Player #2, you took the last marble and have won!")
        break
```

```
How many marbles to start with? 10
Player #1, there are 10 marbles left. How many marbles will you take? 2
Player #2, there are 8 marbles left. How many marbles will you take? 2
Player #1, there are 6 marbles left. How many marbles will you take? 2
Player #2, there are 4 marbles left. How many marbles will you take? 1
Player #1, there are 3 marbles left. How many marbles will you take? 3
Player #1, you took the last marble and have won!
```

In [5]:

```
#Exercise 5:

# Ask the user to enter a positive integer
n = int(input("Enter a positive integer: "))

# Check if n is positive
if n <= 0:
    print("Please enter a positive integer.")
else:
    i = 0

    while i < n:
        # Print spaces for the left side of the pattern
        for j in range(n - i - 1):
            print(" ", end="")

        # Print asterisks for the left half of the pattern
        for j in range(2 * i + 1):
            print("*", end="")

        # Print spaces between the two halves
        for j in range(2 * (n - i - 1)):
            print(" ", end="")

        # Print asterisks for the right half of the pattern
        for j in range(2 * i + 1):
            print("*", end="")

        # Move to the next line for the next row
        print()

        i += 1
```

```
Enter a positive integer: 5
    *         *
   ***       ***
  *****     *****
 *******   *******
*********************
```

In [6]:

```python
pi_approx = 0.0
n = 0

# Example usage with the number of terms as the stopping criterion
while True:
    term = (-1) ** n / (2 * n + 1)
    pi_approx += term
    n += 1

    if n >= 10000:  # Stopping criterion: Number of terms
        break

pi_approx *= 4
print(f"Approximation of π using 10,000 terms: {pi_approx}")

# Example usage with a small sum difference as the stopping criterion
pi_approx = 0.0
n = 0
while True:
    term = (-1) ** n / (2 * n + 1)
    pi_approx += term
    n += 1

    if abs(term) < 0.001:  # Stopping criterion: Sum difference
        break

pi_approx *= 4
print(f"Approximation of π with a sum difference < 0.001: {pi_approx}")
```

```
Approximation of π using 10,000 terms: 3.1414926535900345
Approximation of π with a sum difference < 0.001: 3.143588659585789
```