Module 3: Control Structures

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Topics to be covered in Module 3,

- Decision making and Branching
- if, if – else, nested if, multi-way if-elif statements
- Looping - While loop, For loop, else clauses in the loop,
- Nested loop
- Break, Continue, and Pass Statements

Example 1: For loops

Example (Problem)

Write a for loop that prints the numbers 1 to 10

Example 1: For loops

Example (Python snippet)

```python
for i in range(1, 11):
    print(i)
```

Example 2: For loops

Example (Problem)

```
Write a for loop that prints the numbers 1 to 10.
Modify the above loop to print only even numbers.
```

Example 2: For loops

Example (Python snippets)

```python
for i in range(1, 11):
    if i % 2 == 0:
        print(i)
```

Example 3: For loops

Example (Problem)

Write a for loop that iterates through the numbers 1 to 10.
If the loop encounters the number 5, it should stop executing
the loop.

Example 3: For loops

Example (Python snippet)

```python
for i in range(1, 11):
    if i == 5:
        break
    print(i)
```

Example 4: For loops

Example (Problem)

Write a for loop that iterates through the numbers 1 to 10.
If the loop encounters the number 5, it should skip printing
that number and continue with the next iteration.

Example 4: For loops

Example (Python snippet)

```python
for i in range(1, 11):
    if i == 5:
        continue
    print(i)
```

Example 5: For loops

Example (Problem)

Write a for loop that iterates through a list of words and
checks if each word contains the letter 'a'. If the word
does not contain 'a', the loop should do nothing (pass).

Example 5: For loops

Example (Python snippet)

```python
words = ['apple', 'banana', 'cherry', 'date', 'fig', 'grape']

for word in words:
    if 'a' not in word:
        pass
    else:
        print(f"'{word}' contains the letter 'a'")
```

Example 6: For loops

Example (Problem)

Write a for loop that iterates through a list of numbers
and prints each number. Use the else block to print "All
numbers printed" after the loop completes.

Example 6: For loops

Example (Python snippet)

```python
numbers = [3, 7, 1, 9, 4]

for num in numbers:
    print(num)
else:
    print("All numbers printed")
```

Example 7: While loops

Example (Problem)

```
Write a while loop that prints the numbers 1 to 5.
```

Example 7: While loops

Example (Python snippet)

```python
i = 1

while i <= 5:
    print(i)
    i += 1
```

Example 8: While loops

Example (Problem)

Write a while loop that keeps asking the user to enter a number. The loop should stop if the user enters a negative number.

Example 8: While loops

Example (Python snippet)

```python
while True:
    num = int(input("Enter a number: "))
    if num < 0:
        print("Negative number entered. Loop stopped.")
        break
```

Example 9: While loops

Example (Problem)

Write a while loop that prints the numbers 1 to 10. However,
if the current number is divisible by 3, the loop should skip
printing that number.

Example 9: While loops

Example (Python snippet)

```python
i = 1

while i <= 10:
    if i % 3 != 0:
        print(i)
    i += 1
```

Example 10: While loops

Example (Problem)

Write a while loop that runs until the user enters the number
0. The loop should do nothing if the user enters a number
that is not 0 (pass).

Example 10: While loops

Example (Python snippet)

```python
while True:
    num = int(input("Enter a number (0 to stop): "))
    if num == 0:
        print("Zero entered. Loop stopped.")
        break
    else:
        pass
```

Example 11: While loops

Example (Problem)

Write a while loop that counts from 1 to 3. Use the else
block to print "Counting completed" after the loop completes.

Example 11: While loops

Example (Python snippet)

```
i = 1

while i <= 3:
    print(i)
    i += 1
else:
    print("Counting completed")
```

Example 12: Combination of Loops and Control Statements

Example (Problem)

Write a program that prints a multiplication table for numbers 1 through 5. If the product is greater than 15, the inner loop should break.

Example 12: Combination of Loops and Control Statements

Example (Python snippet)

```python
for i in range(1, 6):
    for j in range(1, 6):
        product = i * j
        if product > 15:
            break
        print(f"{i} x {j} = {product}")
    print()
```

Example 13: Combination of Loops and Control Statements

Example (Problem)

Write a program that finds and prints all the prime numbers between 1 and 20 using a for loop and an else block.

Example 13: Combination of Loops and Control Statements

Example (Problem)

```
for num in range(2, 21):
    is_prime = True

    for i in range(2, num):
        if num % i == 0:
            is_prime = False
            break

    if is_prime:
        print(num)
else:
    print("All prime numbers between 1 and 20 have been
    printed.")
```

Example 14: Combination of Loops and Control Statements
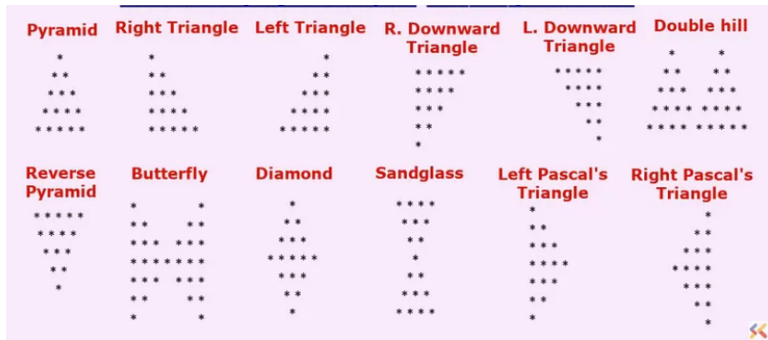
Example (Problem)

Create a simple number guessing game using a while loop. The program should ask the user to guess a number between 1 and 10. The loop should continue until the user guesses correctly, using break to exit the loop when they do.

Example 14: Combination of Loops and Control Statements

Example (Python snippet)

```python
import random
correct_number = random.randint(1, 10)
while True:
    guess = int(input("Guess a number between 1 and 10: "))
    if guess == correct_number:
        print("Congratulations! You guessed the correct number
        break
    else:
        print("Wrong guess. Try again!")
```

Star Patterns

```
printf("* \n");
printf("** \n");
printf("*** \n");
printf("**** \n");
printf("***** \n");
```