Python Basics Cheatsheet

Scientific Programming

1. Basic Calculation Operations

```
5 + 3   # 8              5 / 3   # 1.66...
5 - 3   # 2              5 // 3  # 1
5 * 3   # 15             5 % 3   # 2
5 ** 3  # 125

# Rounding
round(1.6667)      # 2
round(1.6667, 2)   # 1.67
int(1.6667)        # 1
```

2. Math (*not allowed during exam!*)

```
import math

# Constants
math.pi        # 3.14159...
math.e         # 2.718...

# Power and Roots
math.sqrt(16)          # 4
math.pow(2, 3)         # 8
math.exp(1)            # e^1
math.log(10)           # log(10) base e
math.log(100, 10)      # log(10) base 10

# Trigonometric Functions
math.sin(math.pi / 2)  # 1
math.cos(0)            # 1
math.tan(math.pi / 4)  # 1

# Inverse Trigonometric Functions
math.asin(1)           # pi/2
math.acos(1)           # 0
math.atan(1)           # pi/4

# Rounding
math.floor(3.7)        # 3
math.ceil(3.2)         # 4
```

3. Basic Type Conversions

```
int("42")       # String to int
float("3.14")   # String to float
str(42)         # Int to string
list("abcd")    # String to list
```

4. Lists

```
# Create a list
my_list = [3, 2, 1]

# Operations
item = my_list[2]       # 1 - element at index 2
my_list.append(3)       # [3, 2, 1, 3]
new_list = my_list + [5, 6] # [3, 2, 1, 3, 5, 6]
x = len(new_list)           # 6 - length of list
"Apple" in new_list         # False

# Looping 1
for item in my_list:
    print(item)

# Looping 2
for i in range(len(my_list)):
    item = my_list[i]
    print(item)

# Methods
new_list.sort()         # [1, 2, 3, 3, 5, 6]
new_list.insert(2, 10) # [1, 2, 10, 3, 3, 5, 6]
new_list.remove(3)      # [1, 2, 10, 3, 5, 6]
i = new_list.index(10) # 2     (↑ index of 10: 2)

# Slicing
lst = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
lst[2:5]      # [2, 3, 4] (from 2 to 4)
lst[:3]       # [0, 1, 2] (from start to 2)
lst[7:]       # [7, 8, 9] (from 7 to end)
lst[-3:]      # [7, 8, 9] (last 3)
lst[::2]      # [0, 2, 4, 6, 8] (every 2nd)
lst[1:8:3]    # [1, 4, 7] (from 1 to 7 step 3)
lst[::-1]     # [9, 8, ...] (reverses list)
lst[8:2:-2]   # [8, 6, 4] (from 8 to 3 step -2)
```

5. Strings

```
# Strings
my_str = "Hello, World!"

my_str.lower()       # Convert to lowercase
my_str.upper()       # Convert to uppercase
my_str.capitalize() # Only first char uppercase
my_str.lstrip()      # Remove leading whitespace
my_str.rstrip()      # Remove trailing whitespace
my_str.strip()       # Combined lstrip and rstrip
my_str.isalpha()     # all characters alphabetic?
my_str.isdigit()     # all characters digits?
my_str.islower()     # all characters lowercase?
my_str.isupper()     # all characters uppercase?
my_str.split(" ")    # split string on spaces

# Looping through characters 1
for char in my_str:
    print(char)

# Looping through characters 2
for i in range(len(my_str)):
    char = my_str[i]
    print(char)
```

6. Reading files

```
# Open and read whole file
file = open("file.txt", "r")
content = file.read()
print(content)
file.close()

# Open and read line by line
file = open("file.txt", "r")
for line in file:
    print(line)
file.close()

# Alternative method: with open
with open("file.txt", "r") as file:
    for line in file:
        print(line)
```