

FACULTY OF COMPUTING
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FCIT
KAU

كلية الحاسبات
وتقنية المعلومات

جامعة الملك عبدالعزيز

Sample Exam Questions

Mid-Term Exam 1 – Part 2 (Writing Code)

CPIT 110 (Problem-Solving and Programming)



تنبيه!

- هذه الأسئلة عبارة عن عينة فقط توضح طريقة أسئلة اختبار الدوري الأول - الجزء الثاني (كتابة البرامج) لمقرر البرمجة وحل المشكلات (CPIT-110).
- هذه الأسئلة لا يُعتمد عليها للمذاكرة.
- قد لا تشمل هذه الأسئلة جميع المواضيع المقررة للاختبار.
- هذه الأسئلة مناسبة للمراجعة بعد الانتهاء من مذاكرة وتطبيق المواضيع المقررة للاختبار.
- حلول الأسئلة مرفقة نهاية صفحات هذا الملف.

Program #1

Write a program that evaluates $\frac{9.5 \times 4.5 - 2.5 \times 3}{45.5 - 3.5}$ and print its result.

The following is a sample run:



```
0.8392857142857143
```

Program #2

Write a program that displays the area and perimeter of a circle that has a radius of 5.5 using the following formulas (Note: $\pi = 3.14159$):

$$\text{area} = \text{radius} \times \text{radius} \times \pi$$

$$\text{perimeter} = 2 \times \text{radius} \times \pi$$

The following is a sample run:



```
95.0330975  
34.55749
```

Program #3

Assume a runner runs 14 kilometers in 45 minutes and 30 seconds. Write a program that displays the average speed in miles per hour. (Note that 1 mile is 1.6 kilometers.)

The following is a sample run:



```
11.538461538461538
```

Program #4

Write a program to get a purchase amount from the user. Then your program should calculate and display the sales tax (6%) with two digits after the decimal point.

The following is a sample run:



```
Enter purchase amount: 197.55 <Enter>  
Sales tax is 11.85
```

Program #5

Write a program that prompts the user to enter two points, computes their distance, and displays the result.

$$\textit{distance}((x_1, y_1), (x_2, y_2)) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

The following is a sample run:



```
Enter x1 and y1 for Point 1: 1.5, -3.4 <Enter>  
Enter x2 and y2 for Point 2: 4, 5 <Enter>  
The distance between the two points is 8.764131445842194
```

Program #6

Write a program that reads in the radius and length of a cylinder and computes the area and volume using the following formulas:

$$\begin{aligned} \text{area} &= \text{radius} \times \text{radius} \times \pi \\ \text{volume} &= \text{area} \times \text{length} \end{aligned}$$

The following is a sample run:



```
Enter the radius and length of a cylinder: 5.5, 12 <Enter>  
The area is 95.0330975  
The volume is 1140.39717
```

Program #7

Write a program that prompts the user to enter the minutes (e.g., 1 billion), and displays the number of years and days for the minutes.

For simplicity, assume a year has 365 days.

The following is a sample run:



```
Enter the number of minutes: 1000000000 <Enter>  
1000000000 minutes is approximately 1902 years and 214 days
```

Program #8

Body mass index (BMI) is a measure of health based on weight. It can be calculated by taking your weight in kilograms and dividing it by the square of your height in meters. Write a program that prompts the user to enter a weight in pounds and height in inches and displays the BMI.

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Note that one pound is 0.45359237 kilograms and one inch is 0.0254 meters.

The following is a sample run:



```
Enter weight in pounds: 95.5 <Enter>  
Enter height in inches: 50 <Enter>  
BMI is 26.857257942215885
```

Program #9

Write a program that reads the subtotal and the gratuity rate and computes the gratuity and total. For example, if the user enters 10 for the subtotal and 15% for the gratuity rate, the program displays 1.5 as the gratuity and 11.5 as the total.

The following is a sample run:

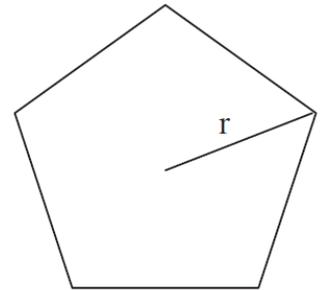


```
Enter the subtotal and a gratuity rate: 15.69, 15 <Enter>  
The gratuity is 2.35 and the total is 18.04
```

Program #10

Write a program that prompts the user to enter the length from the center of a pentagon to a vertex and computes the area of the pentagon, as shown in the following figure.

The formula for computing the area of a pentagon is $Area = \frac{3\sqrt{3}}{2} s^2$, where s is the length of a side. The side can be computed using the formula $s = 2r \sin \frac{\pi}{5}$, where r is the length from the center of a pentagon to a vertex.



The following is a sample run:



```
Enter the length from the center to a vertex: 5.5 <Enter>  
The area of the pentagon is 108.61
```

Program #11

The area of a pentagon can be computed using the following formula (s is the length of a side):

$$Area = \frac{5 \times s^2}{4 \times \tan\left(\frac{\pi}{5}\right)}$$

The following is a sample run:



```
Enter the side: 5.5 <Enter>
```

```
The area of the pentagon is 52.04444136781625
```

Program #12

Write a program that prompts the user to enter a four-digit integer and displays the number in reverse order.

The following is a sample run:



```
Enter an integer: 3125 <Enter>  
The reversed number is 5213
```

Program #13

Write a program that generates two integers under 100 and prompts the user to enter the sum of these two integers. The program then reports true if the answer is correct, false otherwise. Also, the program displays the correct result if the answer was wrong.

The following is sample runs:



```
What is 30 + 43? 50 <Enter>
30 + 43 = 50 is False
The correct answer is 73
```



```
What is 30 + 43? 111 <Enter>
15 + 96 = 111 is True
```

Program #14

Suppose you shop for rice and find it in two different-sized packages. You would like to write a program to compare the costs of the packages. The program prompts the user to enter the weight and price of each package and then displays the one with the better price.

The following is sample runs:



```
Enter weight and price for package 1: 50, 24.59 <Enter>  
Enter weight and price for package 2: 25, 11.99 <Enter>  
Package 2 has the better price.
```



```
Enter weight and price for package 1: 25, 11.50 <Enter>  
Enter weight and price for package 2: 25, 11.99 <Enter>  
Package 1 has the better price.
```

Program #1 (Solution)

```
'''  
( (9.5 * 4.5) - (2.5 * 3) ) Numerator  
    /                               Divided by  
(45.5 - 3.5)                       Denominator  
'''  
print( ((9.5 * 4.5) - (2.5 * 3)) / (45.5 - 3.5) )
```

Program #2 (Solution)

```
# Area
print(5.5 * 5.5 * 3.14159)
# Perimeter
print(2 * 5.5 * 3.14159)
```

Program #3 (Solution)

```
print((14 / 45.5) * 60 / 1.6)
```

Program #4 (Solution)

```
# Prompt the user for input
purchaseAmount = eval(input("Enter purchase amount: "))

# Compute sales tax
tax = purchaseAmount * (6 / 100)

# Display tax amount with two digits after decimal point
print("Sales tax is", int(tax * 100) / 100.0)
```

Program #5 (Solution)

```
# Enter the first point with two float values
x1, y1 = eval(input("Enter x1 and y1 for Point 1: "))

# Enter the second point with two float values
x2, y2 = eval(input("Enter x2 and y2 for Point 2: "))

# Compute the distance
distance = ((x1 - x2) * (x1 - x2) + (y1 - y2) * (y1 - y2)) ** 0.5

print("The distance between the two points is", distance)
```

Program #6 (Solution)

```
# Enter radius of the cylinder
radius, length = eval(input("Enter the radius and length of a cylinder: "))

# Calculate the area of the cylinder
area = radius * radius * 3.14159

# Calculate the volume of the cylinder
volume = area * length

# Print the results
print("The area is", area)
print("The volume is", volume)
```

Program #7 (Solution)

```
# Obtain input
minutes = eval(input("Enter the number of minutes: "))

# Calculate the number of days
numberOfDays = minutes // (24 * 60)
# Calculate the number of years
numberOfYears = numberOfDays // 365
# Get remaining days
remainingDays = numberOfDays % 365

# Display results
print(minutes, "minutes is approximately",
      numberOfYears, "years and", remainingDays, "days")
```

Program #8

(Solution)

```
# Ask the user to enter the weight in pounds
weight_in_pounds = eval(input("Enter weight in pounds: "))

# Ask the user to enter the height in inches
height_in_inches = eval(input("Enter height in inches: "))

# Convert the weight in pounds to kilograms
ONE_POUND_IN_KILOGRAMS = 0.45359237
weight_in_kilograms = ONE_POUND_IN_KILOGRAMS * weight_in_pounds

# Convert the height in inches to meters
ONE_INCH_IN_METERS = 0.0254
height_in_meters = height_in_inches * ONE_INCH_IN_METERS

# Calculate the body mass index (BMI)
bmi = weight_in_kilograms / (height_in_meters * height_in_meters)

# Display the result
print("BMI is", bmi)
```

Program #9

(Solution)

```
subtotal, rate = eval(input("Enter subtotal and gratuity rate: "))  
  
gratuity = subtotal * rate / 100  
total = subtotal + gratuity  
  
print("The gratuity is", int(gratuity * 100) / 100,  
      "and total is", int(total * 100) / 100)
```

Program #10 (Solution)

```
import math

# Get the length from the center to a vertex
r = eval(input("Enter the length from the center to a vertex: "))

# Calculate the length of the side
s = 2 * r * math.sin(math.pi / 5)

# Calculate the area
area = 3 * math.sqrt(3) * s * s / 2

# Display the result
print("The area of the pentagon is", round(area, 2))
```

Program #11 (Solution)

```
import math

side = eval(input("Enter the side: "))
# Compute the area
area = 5 * side * side / math.tan(math.pi / 5) / 4

print("The area of the pentagon is", area)
```

Program #12 (Solution)

```
number = eval(input("Enter an integer: "))

d1 = number % 10
number = number // 10

d2 = number % 10
number = number // 10

d3 = number % 10
number = number // 10

d4 = number % 10
number = number // 10

print("The reversed number is", d1, end = '')
print(d2, end = '')
print(d3, end = '')
print(d4, end = '')
```

Program #13

(Solution)

```
# To use randint function we need to import random module
import random

# Generate two numbers randomly between 0 and 99 inclusive
number1 = random.randint(0, 99)
number2 = random.randint(0, 99)

# Calculate the sum of two numbers
sum = number1 + number2

# Ask the user to enter the answer
answer = eval(input("What is " + str(number1) + " + "
                    + str(number2) + "? "))

# Check the user answer (answer) with the correct answer (sum)
print(number1, "+", number2, "=", answer, "is", answer == sum)

# Display the correct answer if the answer is wrong
if sum != answer:
    print("The correct answer is ", sum)
```

Program #14

(Solution)

```
weight1, price1 = eval(input("Enter weight and price for package 1: "))
weight2, price2 = eval(input("Enter weight and price for package 2: "))

if price1 * 1.0 / weight1 <= price2 * 1.0 / weight2:
    print("Package 1 has the best price.")
else:
    print("Package 2 has the best price.")
```