

Name: _____

Rules and Hints

- You may use one handwritten 8.5 x 11" cheat sheet (front and back). This is the only additional resource you may consult during this exam. *No calculators.*
- When you write code, be sure that the indentation level of each statement is clear.
- Explain/show work if you want to receive partial credit for wrong answers.
- As long as your code is correct, you will get full credit. No points for style.
- As always, the SSU rules on academic integrity are in effect.

Problem	Max Score	Your Score
<i>Problem 1: Trace Code</i>	40	
<i>Problem 2: Write snippets of code</i>	30	
<i>Problem 3: Write a complete program</i>	30	
Total	100	

Problem 1: Trace Code (40 points)

Write what will be printed to the screen when each of the following snippets of code is executed in PyCharm or in the Online Python Tutor.

Be very clear with spacing, line breaks, etc.

Treat each sub-problem as an independent question.

All questions in this section are worth 5 points.

Problem 1A

```
num = 3
print(num*2)
```

Problem 1B

```
y = 3 ** 2
print(y)
y = y + 1
print(y)
```

Problem 1C

```
a = 11
b = 4
c = a // b
d = a % b
print(c,d)
```

Problem 1D

```
sweet = 'cupcakes '  
print('I want ', sweet)  
print(sweet + 'sweet')
```

Problem 1E

```
print(1, 3, '=', 4, sep='+')
```

Problem 1F

```
total = 10  
for i in range(1,5):  
    print(i)  
    total = total + i  
print(total)
```

Problem 1G

```
x = 3
print('Apples? We have ')
if (x >=3):
    print('several ')
if (x == 2):
    print('a pair ')
elif (x == 1):
    print('just one ')
elif (x == 0):
    print('no ')
else:
    print('many ')
print('apples ')
```

Problem 1H

```
for i in range(1,3):
    for j in range(0,3):
        print(i,j)
    print('i =', i)
```

Problem 2: Write snippets of code (30 points)

Write snippets of code to do the following. Your code should only print the requested output. You will lose points for printing additional output.

You can assume that all your snippets are enclosed within a main function and that any necessary libraries have been imported. You only need to write the specific lines of code that accomplish each task.

Problem 2A (8 points)

Einstein's Calculator: prompt the user to input a mass (in kilograms), then calculate its equivalent energy (in Joules) and print it.

The formula for mass-energy equivalence was given by Einstein, famously, as

$$E = mc^2$$

where m is in kilograms, E is in Joules, and c is the speed of light given as 299,792,458 m/s.

Problem 2B (10 points)

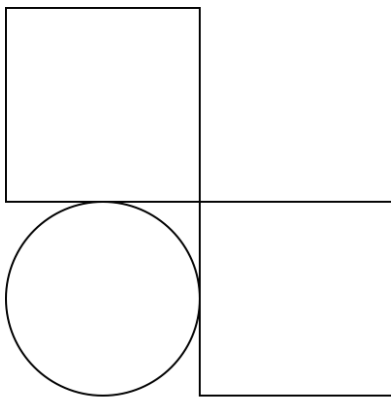
For this question, assume that the graphics library has been imported. The snippet of code below opens a graphics window and draws two rectangles and a circle.

Insert a snippet of code that will:

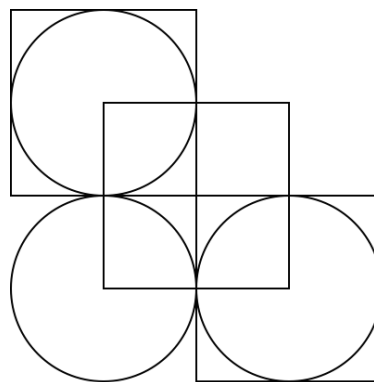
- Draw a circle (of radius 50) centered in rectangle `r1`.
- Draw a circle (of radius 50) centered in rectangle `r2`.
- Draw a rectangle (of width and height 100) centered where `r1` and `r2` touch.

```
window = GraphWin('Rectangles', 250, 250)
r1 = Rectangle(Point(0, 0), Point(100, 100))
r1.draw(window)
r2 = Rectangle(Point(100, 100), Point(200, 200))
r2.draw(window)
c1 = Circle(Point(50, 150), 50)
c1.draw(window)
```

```
window.getMouse()
```



Before



After

Problem 2C (12 points)

Shipping Calculator: you own a company that ships 32 flavors of ice-cream to customers. Write a snippet of code that will:

- Prompt the customer 32 times (once for each flavor), each time asking how many gallons of that flavor they want and reading the number they enter.
 - Assume: customers only order full gallons (no fractions of gallons).
 - Example prompt: `Input Flavor 18 (in gallons):`
- Afterwards, print the total gallons in the customer's order.
- Print the number of trucks needed to ship the customer's order.
 - The total order is loaded onto trucks, filling the trucks one at a time.
 - Every truck has the same capacity: 104 gallons; therefore, a total order for 105 gallons of ice cream would need two trucks.
 - Example output: `We need 11 trucks for this order!`
- If the last truck is not full, print its remaining space.
 - Example output: `We still have room for 42 gallons in the last truck!`

You do *not* need to match the example outputs (above) exactly — they are just to explain the problem better.

Problem 3: Write a complete program (30 points)

For this problem, you must write a complete program. This includes writing a docstring, logic in `def main()`, a call to `main()`, any necessary library imports, etc.

Read the instructions carefully before you start coding! If you get stuck, try to maximize your partial credit. Your program is for a dairy that produces a specialty cheese, to help a farmer track her monthly milk and cheese yields. The program should do the following:

- Prompt the user to enter the total number of cows on the farm.
- For each cow:
 - Prompt the user for that cow’s monthly milk yield (in lbs).
 - If the cow produced more than 400 lbs of milk, print the message: “Cow-of-the-month contender!”
 - If the cow produced less than 200 lbs of milk, print the message: “Schedule a vet.”
- After the user has entered all of their data:
 - Print the average yield per cow
 - Print the yield of the largest individual producer
 - Print the total yield of all cows
 - Print the theoretical cheese yield from the total milk yield. Use the conversion that 100 lbs of milk yields 9.24 lbs of cheese at your dairy.

Your program *should* match the sample output below, exactly. User input is underlined.

```
Enter number of cows: 3
Enter monthly yield for Cow 1 (lbs): 100.0
    Schedule a vet.
Enter monthly yield for Cow 2 (lbs): 500.0
    Cow-of-the-month contender!
Enter monthly yield for Cow 3 (lbs): 400.0
Average milk yield: 333.33 lbs
Largest milk yield: 500.0 lbs
Total milk yield: 1000.0 lbs
Theoretical total cheese yield: 92.4 lbs
```


Problem 3, continued ...