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Name: _____

Student ID: _____

ENGI1020: Introduction to Programming
Final exam

Question	Points	Score
1	10	
2	10	
3	4	
4	10	
5	10	
6	6	
7	9	
8	8	
9	8	
10	8	
11	8	
12	4	
13	8	
Total:	103	

Instructions

1. This is a closed-book exam: written aids are not permitted.

2. Calculators, phones and all other electronic aids are forbidden.
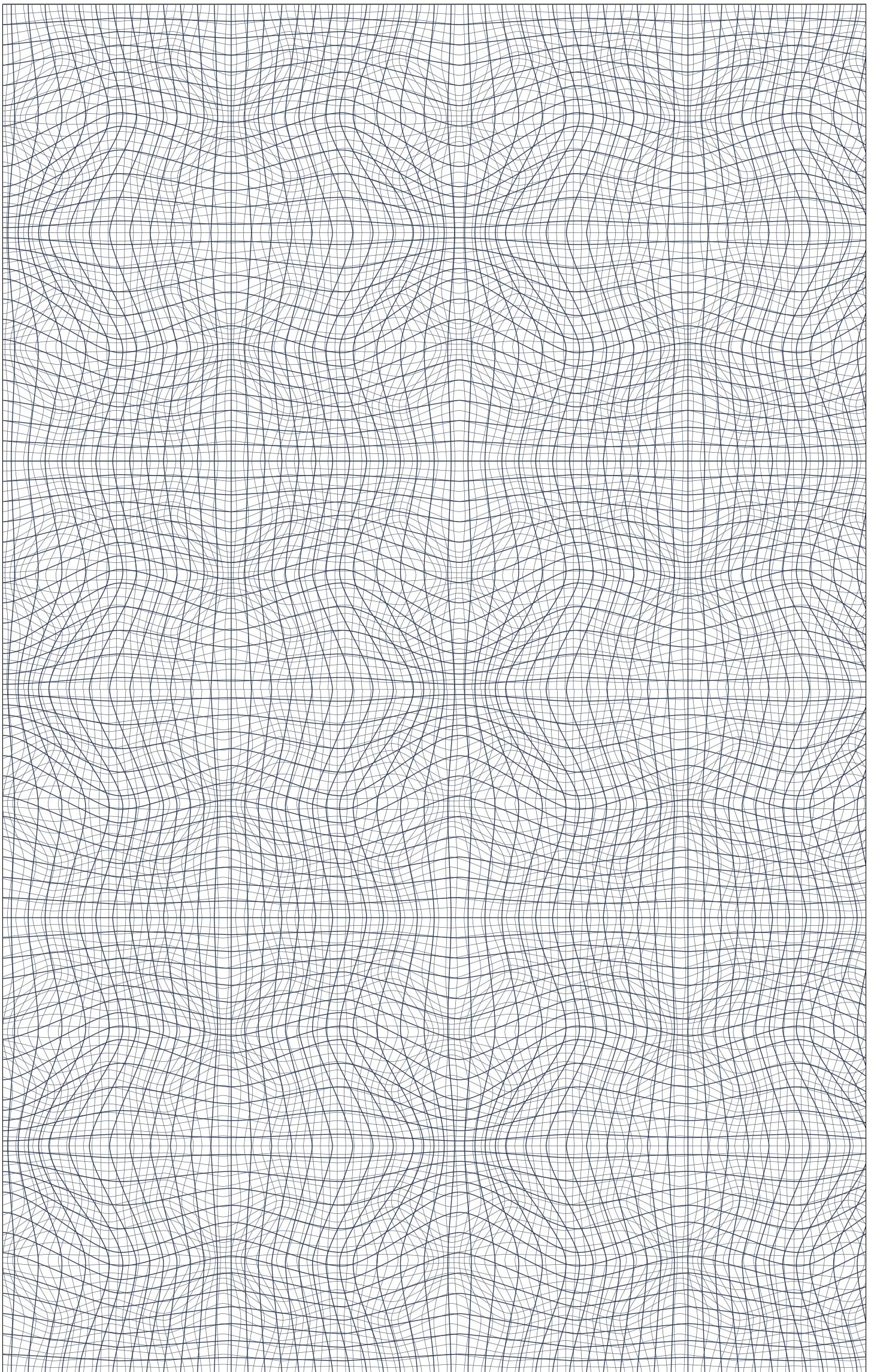
Fundamentals

1. Identify the programming or Python term that matches the given definition. Circle the correct answer. **[10]**

    (a) Procedure with decisions ☐1

        A. Algorithm   B. Argument   C. Declarative knowledge   D. Expression   E. Parameter

    (b) Value passed to a function call ☐1

        A. Algorithm   B. Argument   C. Declarative   D. Module   E. Parameter

    (c) Values and operations that evaluate to a value ☐1

        A. Algorithm   B. Declarative knowledge   C. Expression   D. Identifier   E. Keyword

        randomizeoneparchoices

    (d) Statements and facts ☐1

        A. Argument   B. Declarative knowledge   C. Imperative knowledge   D. Literal   E. Parameter

    (e) Value that means exactly what's written ☐1

        A. Argument   B. Expression   C. Imperative knowledge   D. Identifier   E. Literal

    (f) Name for a variable ☐1

        A. Algorithm   B. Expression   C. Identifier   D. Keyword   E. Literal

    (g) How to do things ☐1

        A. Declarative knowledge   B. Expression   C. Imperative knowledge   D. Keyword   E. Module

    (h) Identifier whose meaning is defined by a language ☐1

        A. Algorithm   B. Expression   C. Keyword   D. Literal   E. Parameter

    (i) Collection of statements ☐1

        A. Argument   B. Expression   C. Literal   D. Module   E. Parameter

    (j) Variable whose value is assigned by a function call ☐1

        A. Algorithm   B. Argument   C. Declarative   D. Module   E. Parameter

2. Number representation **[10]**

    (a) What is the binary representation of the decimal number 100? ☐2

        (a) ——————

    (b) What is the binary representation of the decimal number 80? ☐2

        (b) ——————

    (c) What is the binary representation of the decimal number 127? ☐2

        (c) ——————

    (d) What is the decimal representation of the binary number 1011? ☐2

        (d) ——————

    (e) What is the decimal representation of the binary number 11001001? ☐2

        (e) ——————

Software analysis

3. What are the types of the following literal values? Circle the correct answer. [4]

(a) `'ENGI 1020'` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(b) `1020` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(c) `True` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(d) `1.020` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

4. What type will each of the following expressions evaluate to? Circle the correct answer.

(a) `1020` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(b) `1020.0` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(c) `10/20` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(d) `10 % 20` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(e) `10 < 20` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(f) `10 // 20` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(g) `sin(10.20)` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(h) `sin(0)` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(i) `10 < 20 < 3` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

(j) `10 < 20 and 20 < 30` [1]

    A. **bool**   B. **float**   C. **int**   D. **list**   E. **str**

5. Given the variables `p = False`, `q = True` and `r = True`, what will the following expressions evaluate to? [10]

(a) `p` [1]

(a) —————

(b) `p and q` [1]

(b) —————

(c) `p and not q` [1]

(c) —————

(d) `p or q and r` [1]

(d) —————

(e) `p or q or r` [1]

(e) —————

(f) `p and not q and r` [1]

(f) —————

(g) `p ^ q`   ☐1

(g) —————————

(h) `p ^ q ^ r`   ☐1

(h) —————————

(i) `(p and not q) ^ r`   ☐1

(i) —————————

(j) `p ^ p`   ☐1

(j) —————————

6. Given the variables x=6, y=2 and z=4, what will the following expressions evaluate to?

(a) `x * 20 // y ** z`   ☐2

(a) —————————

(b) `z > y > x`   ☐2

(b) —————————

(c) `x--y*z`   ☐2

(c) —————————

7. The Python files illustrated in Figure 1 are located in the same directory/folder on a computer. When the script `main.py` is run, what will the final values of x, y and z be?

(a) Value of x   ☐3

(a) —————————

(b) Value of y   ☐3

(b) —————————

(c) Value of z   ☐3

(c) —————————

main.py

```python
import foo

z = 1

if __name__ == '__main__':
    x = foo.bar.baz(1, 2, 3)
    y = foo.baz(3, 2, 1)

    if x > y:
        z = x // y

    print(x, y, z)
```

foo.py

```python
import bar

z = 1

def baz(x, y, z):
    return x + y * z
```

bar.py

```python
def baz(a, b, c):
    z = a % b
    y = b // c
    x = c * y

    return x + y - z
```

Figure 1: Some Python files

8. Python errors [8]

(a) Explain the syntax error in the following Python script: [2]

```
my_name = 'Jon'
MY_NAME = 'JON'
_your_name_72 = 'Someone'
2bornot2b = 'William Shakespeare'
their_name_83 = 'Someone Else'
```

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(b) Explain the syntax error in the following Python script: [2]

```
a = 1_000_000
b = a ** 1j
-1 = j
numbers = [1, 2, 3]
print(a, b, c, *numbers)
```

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(c) Explain the logical error in the following Python function. How could it be fixed? (4 pts) [4]

```
def minimum_temperature(temperatures):
    i = 0
    min = 0
    n = 0

    while i < len(temperatures):
        if i < min:
            min = temperatures[i]

        print('Min thus far:', min)
        i += 1

    return min
```

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Software implementation

9. Choose an appropriate type to represent each of the following values. **[8]**

   (a) Your name ⬚1

   (a) _____

   (b) Distance to the moon ⬚1

   (b) _____

   (c) Immutable values representing dimensions of a moving box ⬚1

   (c) _____

   (d) Air pressure ⬚1

   (d) _____

   (e) Air pressure measurements throughout the day ⬚1

   (e) _____

   (f) Database of computers, searchable by serial number ⬚1

   (f) _____

   (g) Your grade on this exam ⬚1

   (g) _____

   (h) Final grade in the course ⬚1

   (h) _____

10. Implement the logic from the flowchart in Figure 2 in Python. ⬚8

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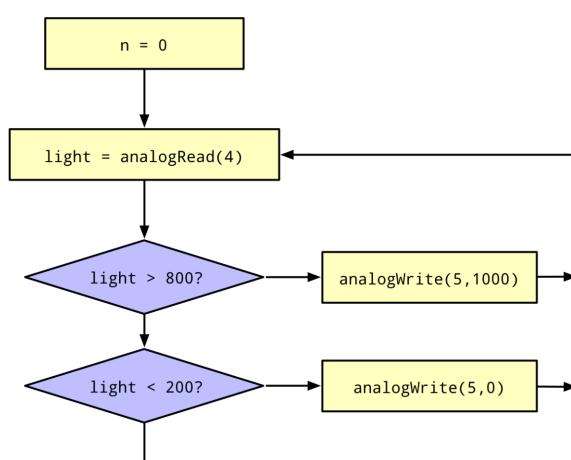
Figure 2: A flowchart using lab Arduino functions

11. **Ideal gas law**

In thermodynamics, the *ideal gas law* states:

$$PV = nRT$$

where P stands for pressure, V stands for volume, n stands for amount (in mols), R is the ideal gas constant ($8.31446 \, \text{L} \cdot \text{kPa} \cdot \text{K}^{-1} \cdot \text{mol}^{-1}$) and T is temperature (in degrees Kelvin).

Write a **contact** (which includes both a descriptive comment *and* a declaration) for a C++ function to calculate the pressure of an ideal gas given its volume, amount and temperature.

Workings:

Answer:

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12. Write a Python function that, when passed a list of numbers, will return the median value. For this question, you may **not** use the math module.

    4

Workings:

Answer:

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13. Assume that, for the purposes of a word game, the letter A is worth 1 point, B is worth 2 points, C is worth 3 points, etc. Write a Python function that, when passed a string, will compute the total "score" for a word by adding up the point values of each letter. 8

Workings:

Answer:

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