Name: ……………………………………………….. ( ) Class: ……… Date: …………………..

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| **4.1** | **Program Development** | **Selection Statements** |

**Selection Statements**

Selection statements consists of branches, which are generally executed in the order in which they appear. The correct use of colon : and indentation is very important in selection statements. There are three typical types of selection statements.

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| **Type 1** |  | **Type 2** |  | **Type 3** |
| **if** condition(s)**:**  <statement(s)> |  | **if** condition(s)**:**  <statement(s)>  **else:**  <statement(s)> |  | **if** condition(s)**:**  <statement(s)>  **elif** condition(s)**:**  <statement(s)>  **else:**  <statement(s)> |

1. For each piece of code in the following table, write down the number of branches that produce output and predict what the expected output will be. Enter the code into a Python shell and check the actual output against the expected.

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| **Part** | **Code** | **Number of Branches that Produce Output** | **Expected output** |
| a | **a = 7**  **if a > 0:**  **print('a is positive!')** |  |  |
| b | **a = -7**  **if a > 0:**  **print('a is positive!')**  **else:**  **print('a is negative or zero!')** |  |  |
| c | **a = 0**  **if a > 0:**  **print('a is positive!')**  **elif a == 0:**  **print('a is zero!')**  **else:**  **print('a is negative!')** |  |  |

1. Suggest how the following code should be indented such that it runs according to the two samples provided. Note that the last print statement should always be run.

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| --- | --- |
| 1  2  3  4  5  6 | **x = int(input("How old will you be as of 1 Mar? "))**  **if x < 21:**  **print("Sorry, you can't vote yet!")**  **else:**  **print("Hurray, you are eligible for voting!")**  **print("The age to vote is 21 years or older. ")** |

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| **Sample 1** | How old will you be as of 1 Mar? **24**  Hurray, you are eligible for voting!  The age to vote is 21 years or older. |
| **Sample 2** | How old will you be as of 1 Mar? **15**  Sorry, you can't vote yet!  The age to vote is 21 years or older. |

Suggested Code:

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1. Examine the following program and the provided two sample runs.

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| --- | --- |
| 1  2  3  4  5  6  7  8  9  10  11  12  13 | **text = ""**  **while text != "quit":**  **text = input("Enter chemical formula (or 'quit' to exit): ")**  **if text == "quit":**  **print("...exiting program")**  **elif text == "CO2":**  **print("Carbon Dioxide")**  **elif text == "CH4":**  **print("Methane")**  **elif text == "O2":**  **print("Oxygen")**  **else:**  **print("Unknown compound")** |

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| **Sample 1** | Enter chemical formula (or 'quit' to exit): **O2**  Oxygen  Enter chemical formula (or 'quit' to exit): **CH4**  Methane  Enter chemical formula (or 'quit' to exit): **quit**  ...exiting program |
| **Sample 2** | Enter chemical formula (or 'quit' to exit): **H2**  Unknown compound  Enter chemical formula (or 'quit' to exit): **quit**  ...exiting program |

How many branches are there in the if statement from line 5 to 14? ………………………………..

Briefly describe what the program does.

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1. There are two syntax errors in the following code. Correct the code such that it runs according to the two samples provided.

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| **temperature = float(input("Enter today's temperature: ")**  **if temperature > =30:**  **print("The weather is warm today.")**  **else:**  **print("The weather is less than 30 degrees Celsius today.")** |

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| --- | --- |
| **Sample 1** | Enter today's temperature: **30**  The weather is warm today. |
| **Sample 2** | Enter today's temperature: **26**  The weather is less than 30 degrees Celsius today. |

Suggested code:

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1. The following are two fragments of code to print a message about positive and negative numbers. Which set of code is incorrect? Circle the error in the incorrect block.

Block A Block B

|  |  |
| --- | --- |
| **a == 9**  **if a > 0:**  **print("a is positive.")**  **else:**  **print("a is not positive.")** | **a = 9**  **if a > 0:**  **print("a is positive.")**  **else:**  **print("a is not positive.")** |

Explanation:

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1. The following is a fragment of code to print a message about the weather based on user input of the temperature. However, it contains a logic error. Run the code with various inputs see how it differs from the sample runs, then identify where the logic error is located and correct it.

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| --- | --- |
| 1  2  3  4  5  6  7 | **temperature = int(input("What is the temperature today? "))**  **if temperature > 29:**  **print("What a hot day!")**  **elif temperature >= 28 and temperature <= 32:**  **print("It is moderately hot today.")**  **else:**  **print("It is cooling today.")** |

Expected Sample Run 1:

|  |
| --- |
| What is the temperature today? **30**  It is moderately hot today. |

Expected Sample Run 2:

|  |
| --- |
| What is the temperature today? **33**  What a hot day! |

Expected Sample Run 3:

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| What is the temperature today? **27**  It is cooling today. |

Explain where the logic error is located.

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Corrected Code:

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1. Examine the following code:

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| 1  2  3  4  5  6  7  8  9  10 | **if not False and not True:**  **if '123' == 123:**  **print('1')**  **elif 2 \*\* 3 == 3 \*\* 2:**  **print('2')**  **else:**  **if (not True or not False) and (False and True):**  **print('3')**  **elif False or True:**  **print('4')** |

What will be the code's output? ( )

|  |  |
| --- | --- |
| **A** | 1 |
| **B** | 2 |
| **C** | 3 |
| **D** | 4 |

1. The program below calculates the kinetic energy of a moving object.

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| --- | --- |
| 1  2  3  4  5 | **print("This program calculates kinetic energy")**  **m = float(input("Enter the object's mass in kg: "))**  **v = float(input("Enter the object's speed in m/s: "))**  **e = 0.5 \* m \* v \* v**  **print("The object has " + str(e) + " J of kinetic energy.")** |

Write a similar program to calculate the gravitational potential energy of an object at a height. The formula is P.E. = m.g.h where m is mass of the object in kg, g is gravitational acceleration in m/s2 and h is height in m. The user is required to enter the values of m and h. The value of gravitational acceleration can be taken as 9.8 m/s2.

P.E. = m.g.h

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| **Sample 1** | Enter the object's mass in kg: **35**  Enter the object's height in m: **10**  The object has 3430.0 J of gravitational potential energy. |
| **Sample 2** | Enter the object's mass in kg: **10.0**  Enter the object's height in m: **30.0**  The object has 2940.0 J of gravitational potential energy. |

1. Write a program that asks the user for an integer PSI value and prints a corresponding message about the air quality based on the table below.

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| **PSI Value** | **Air Quality Descriptor** |
| 0 - 50 | Good |
| 51 - 100 | Moderate |
| 101 - 200 | Unhealthy |
| 201 - 300 | Very unhealthy |
| Above 300 | Hazardous |

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| **Sample 1** | Enter a PSI value: **50**  The PSI level is good. |
| **Sample 2** | Enter a PSI value: **320**  The PSI level is hazardous. |

Extension:

1. Write a program that will print the name of a regular polygon depending on the number of sides. The user can only enter numbers between 3 and 8 to indicate the number of sides. If they enter any other number, then the program should repeat the prompt to enter a number between 3 and 8. *(Hint: You may need to use a loop)*

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| **Sample 1** | Enter number of regular polygon sides (3 to 8): **6**  This is a hexagon. |
| **Sample 2** | Enter number of regular polygon sides (3 to 8): **10**  Enter number of regular polygon sides (3 to 8): **9**  Enter number of regular polygon sides (3 to 8): **6**  This is a hexagon. |

1. Write a program that will:

* Ask the user for ten integers
* Print the total sum of the integers
* Print the count of negative integers, zeroes and positive integers.

1. Write a program that will implement a simple calculator. It will show a menu of arithmetic operations including addition, subtraction, multiplication and division. The user is asked to select the type of operation and enter two integers. The calculator will print the result of the operation on the two integers.

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| **Sample 1** | \*\*\*\*\*Types of operation\*\*\*\*\*  1. +  2. -  3. \*  4. /  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  Key in the number for operator (1 to 4): **3**  Enter your first integer? **9**  Enter your second integer? **5**  45 |
| **Sample 2** | \*\*\*\*\*Types of operation\*\*\*\*\*  1. +  2. -  3. \*  4. /  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  Key in the number for operator (1 to 4): **4**  Enter your first integer? **16**  Enter your second integer? **4**  **4.0** |