1. Given these assignments: \(a = 5\), \(b = 2\), and \(s = 1.5\) write the type and value of the following expressions. Circle **ERROR** if the expression will result in a run time error.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Type</th>
<th>Value</th>
<th>ERROR</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{a}{b})</td>
<td>float</td>
<td>2.5</td>
<td>ERROR</td>
</tr>
<tr>
<td>(b ** a)</td>
<td>int</td>
<td>32</td>
<td>ERROR</td>
</tr>
<tr>
<td>(\frac{\text{float}(a)}{b})</td>
<td>float</td>
<td>2.5</td>
<td>ERROR</td>
</tr>
<tr>
<td>(a % b)</td>
<td>int</td>
<td>1</td>
<td>ERROR</td>
</tr>
<tr>
<td>(s // a)</td>
<td>float</td>
<td>0.0</td>
<td>ERROR</td>
</tr>
<tr>
<td>(a &gt; b)</td>
<td>bool</td>
<td>True</td>
<td>ERROR</td>
</tr>
<tr>
<td>(a == b)</td>
<td>bool</td>
<td>False</td>
<td>ERROR</td>
</tr>
<tr>
<td>(a // b)</td>
<td>int</td>
<td>2</td>
<td>ERROR</td>
</tr>
<tr>
<td>(a + b * a)</td>
<td>int</td>
<td>15</td>
<td>ERROR</td>
</tr>
<tr>
<td>(b &lt;= s)</td>
<td></td>
<td></td>
<td>ERROR</td>
</tr>
</tbody>
</table>
2 Conversion between binary, decimal and hexadecimal numbers:

a. Convert the binary number 11101011 to decimal: ______235_________

b. Convert the decimal number 151 to binary: ___10010111___

c. Convert the binary number 10011100 to hexadecimal: ______9C_________

d. Convert the hexadecimal number 5F to binary: ______1011111_______ (please show all 8 binary digits)

e. Convert the decimal number 90 to hexadecimal: ______5A_________

3 What is the output from the following code if the user enters 75?

C = int(input('Enter a value: '))
if c > 100:
    print("A")
elif c > 50:
    if c % 5 == 0 and not(c % 10 == 0):
        print("B")
    if c % 5 == 0:
        print("C")
    else:
        print("D")
if c > 20:
    print("E")
else:
    print("F")

Your answer:
B
C
E
4 What is the value of acc at the end of the following code?

```python
acc = 0
if 3 * acc:
    acc += 1
else:
    if acc:
        acc += 5
    elif acc + 2:
        acc += 10
    else:
        acc += 20
acc += 10
```

Your answer:

`acc = 20`
5 Write a program to calculate the federal tax for single filers. The program will take user’s income as input and print out the amount of federal tax that user needs to pay. The program will use 2021-2022 tax brackets as follows:

<table>
<thead>
<tr>
<th>Tax Rate</th>
<th>Income bracket</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>$0 to $9,950</td>
<td>10% of taxable income</td>
</tr>
<tr>
<td>12%</td>
<td>$9,951 to $40,525</td>
<td>$995 plus 12% of the amount over $9,950</td>
</tr>
<tr>
<td>22%</td>
<td>$40,526 to $86,375</td>
<td>$4,664 plus 22% of the amount over $40,525</td>
</tr>
<tr>
<td>24%</td>
<td>$86,376 to $164,925</td>
<td>$14,751 plus 24% of the amount over $86,375</td>
</tr>
<tr>
<td>32%</td>
<td>$164,926 to $209,425</td>
<td>$33,603 plus 32% of the amount over $164,925</td>
</tr>
<tr>
<td>35%</td>
<td>$209,426 to $523,600</td>
<td>$47,843 plus 35% of the amount over $209,425</td>
</tr>
<tr>
<td>37%</td>
<td>$523,601 or more</td>
<td>$157,804.25 plus 37% of the amount over $523,600</td>
</tr>
</tbody>
</table>

Tax brackets show you the tax rate you will pay on each portion of your income. For example, if you are single, the lowest tax rate of 10% is applied to the first $9,950 of your income in 2021. The next chunk of your income is then taxed at 12%, and so on, up to the top of your taxable income.

For simplicity, assume users will input integers as income. However, the amount of tax to output has to have two decimal points.

Example:

Enter your income: $600000
Amount of tax owed is: $186072.25

Enter your income: $9950
Amount of tax owed is: $995.00
Code:

```
income = int(input("Enter your income: "))
tax = 0

if income <= 9950:
tax = income * 0.1
elif 9951 <= income <= 40525:
tax = 995 + (income - 9950) * 0.12
elif 40526 <= income <= 86375:
tax = 4664 + (income - 40525) * 0.22
elif 86376 <= income <= 164925:
tax = 14751 + (income - 86375) * 0.24
elif 164926 <= income <= 209425:
tax = 33603 + (income - 164925) * 0.32
elif 209425 <= income <= 523600:
tax = 47843 + (income - 209425) * 0.35
else:
tax = 157804.25 + (income - 523600) * 0.37

print("Amount of tax owed is: "+"{:.2f}".format(tax))
```
ANSWER KEY

6 Write a program that will output the user’s astrological sign, or zodiac sign, or horoscope sign, from their birth date. The program will ask the user for the day of birth, then ask for the month of birth (in words, e.g. january, february,...). Finally, print out the user’s current luck point out of a 100 (which we will generate using the random module and also can be 0). The luck point should be an integer.

Assume all inputs are correct.

- **Aries** (March 21 – April 19)
- **Taurus** (April 20 – May 20)
- **Gemini** (May 21 – June 20)
- **Cancer** (June 21 – July 22)
- **Leo** (July 23 – August 22)
- **Virgo** (August 23 – September 22)
- **Libra** (September 23 – October 22)
- **Scorpio** (October 23 – November 21)
- **Sagittarius** (November 22 – December 21)
- **Capricorn** (December 22 – January 19)
- **Aquarius** (January 20 – February 18)
- **Pisces** (February 19 – March 20)

Example:

```
Input the day of birth (e.g. 1, 2, 3 etc): 18
Input month of birth (e.g. march, july etc): january
Your Astrological sign is: capricorn
Your current luck point is: 73
```
import random

day = int(input("Input the day of birth (e.g. 1,2,3 etc): "))
month = input("Input month of birth (e.g. march, july etc): ")

astro_sign = ''
if month == 'december':
    if day < 22:
        astro_sign = 'sagittarius'
    else:
        astro_sign = 'capricorn'
elif month == 'january':
    if day < 20:
        astro_sign = 'capricorn'
    else:
        astro_sign = 'aquarius'
elif month == 'february':
    if day < 19:
        astro_sign = 'aquarius'
    else:
        astro_sign = 'pisces'
elif month == 'march':
    if day < 21:
        astro_sign = 'pisces'
    else:
        astro_sign = 'aries'
elif month == 'april':
    if day < 20:
        astro_sign = 'aries'
    else:
        astro_sign = 'taurus'
elif month == 'may':
    if day < 21:
        astro_sign = 'taurus'
    else:
        astro_sign = 'gemini'
elif month == 'june':
    if day < 21:
        astro_sign = 'gemini'
    else:
        astro_sign = 'cancer'
elif month == 'july':
    if day < 23:
        astro_sign = 'cancer'
    else:
astro_sign = 'leo'
elif month == 'august':
    if day < 23:
        astro_sign = 'leo'
    else:
        astro_sign = 'virgo'
elif month == 'september':
    if day < 23:
        astro_sign = 'virgo'
    else:
        astro_sign = 'libra'
elif month == 'october':
    if day < 23:
        astro_sign = 'libra'
    else:
        astro_sign = 'scorpio'
elif month == 'november':
    if day < 22:
        astro_sign = 'scorpio'
    else:
        astro_sign = 'sagittarius'
luck = random.randint(0,100)

print("Your Astrological sign is : ", astro_sign)
print("Your current luck point is : ", luck)