Python Exercises 2a: Decision Making *Solutions*

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Decision Making with `if-elif-else`

1.Income Limits for Maintenance Grant
The family income limits for eligibility for a full maintenance grant in 2019-2020 are as follows:

Number of dependent children	Full maintenance
Less than 4	€39,875
4 to 7	€43,810
8 or more	€47,575

Write a program which inputs the number of dependents and then determines and displays the corresponding income limit.

Specification Table

Input	Processing	Output
number of dependents	Input number of dependents Determine income limit based on number of dependents Display income limit	income limit

Python Program

```
# Program Name: section02_solutions01_grant_eligibility.py
# Purpose: To display the income limits for a full maintenance grant
# Example of: if-elif-else

print("This program displays the income limits for a full maintenance grant")

# input number of dependents
num_dependents = int(input("Number of dependents: "))

# set income limit based on number of depenents
if num_dependents < 4:
    limit = 39875
elif num_dependents <= 7:
    limit = 43810
else:
    limit = 47575

print(f"The income limit is: {limit}")
```

Sample Output

```
This program displays the income limits for a full maintenance grant

Number of dependents: 3
The income limit is: 39875

This program displays the income limits for a full maintenance grant

Number of dependents: 5
The income limit is: 43810

This program displays the income limits for a full maintenance grant

Number of dependents: 9
The income limit is: 47575
```

2.Degree Awards
In AIT, degrees are graded according to the average course mark as follows:

Mark	**Grade**
70-100	1st Class Honours
60 - <70	2nd Class Honours, Grade 1
50 - <60	2nd Class Honours, Grade 2
40 - <50	Pass
0- <40	No award

Write a program which inputs a mark and determines and displays the corresponding grade. If an invalid mark is entered, a suitable error message should be displayed.

Specification Table

Input	**Processing**	**Output**
mark	Input mark Determine grade based on mark Display grade	grade

Python Program

```
# Program Name: section02_solutions02_degree_awards.py
# Purpose: To display the degree awarded for a specific mark
# Example of: if-elif-else

print("This program displays the grade awarded based on average mark")

# input number of dependents
mark = int(input("Enter average mark: "))

# set grade based on mark
if mark > 100:
    print("Invalid mark")
elif mark >= 70:
    print("1st Class Honours")
elif mark >= 60:
    print("2nd Class Honours, Grade 1")
elif mark >= 50:
    print("2nd Class Honours, Grade 2")
elif mark >= 40:
    print("Pass")
elif mark >= 0:
    print("No award")
else:
    print("Invalid mark")
```

Sample Output

```
This program displays the grade awarded based on average mark

Enter average mark: 67
2nd Class Honours, Grade 1

This program displays the grade awarded based on average mark

Enter average mark: 35
No award
```

3.Match Results

Write a program which inputs the final score of a match:

home team name and score

away team name and score

and determines and displays the match result (the name of the winning team, or "draw").

Sample Values:

Home Team	Home Score	Away Team	Away Score	Result
Latvia	1	Sweden	4	Winner: Sweden
Wales	2	N Ireland	2	Draw
Ireland	2	Montenegro	0	Winner: Ireland

Specification Table

Input	Processing	Output

home team name
home team score
away team name
away team score
	Input home team name and score
	Input away team name and score
	If home score > away score
	  Display "Winner is" home team name
	Else if home score = away score
	  Display "Draw"
	Else
	  Display "Winner is" away team name
		match outcome

Python Program

```
# Name: section02_solutions03_match_outcome.py
# Program to determine outcome of a match
# Example of: if-elif-else

print("This program displays the outcome of a match")

#Input home team and score
home_team = input('Home team name? ')
home_score = int(input('Home team score? '))

#Input away team and score
away_team = input('Away team name? ')
away_score = int(input('Away team score? '))

#Did the home team win?
if home_score > away_score:
    print("Winner is", home_team)
# Or was it a draw?
elif home_score == away_score:
    print("Draw")
#Otherwise the away team won
else:
    print("Winner is", away_team)
```

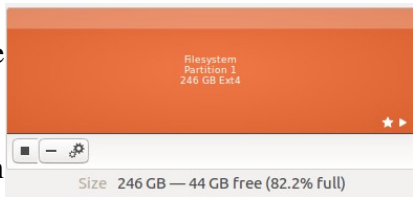
Sample Output

```
Home team name? Latvia
Home team score? 1
Away team name? Sweden
Away team score? 4
Winner is Sweden
```

```
Home team name? Wales
Home team score? 2
Away team name? N Ireland
Away team score? 2
Draw
```

```
Home team name? Ireland
Home team score? 2
Away team name? Montenegro
Away team score? 0
Winner is Ireland
```

4.Percentage Free Space



An important System Administration task is to monitor the availability of disk space on a computer system:

- If there is no free space, the system might crash;
- If the percentage of free disk space is less than 5% then system performance degrades.
- If at least 5% disk space is available, then system performance is unaffected.

Write a Python program which will input the total disk space and the amount used. The program should then

- check if the amount used exceeds the total disk space; if it does, then a message should be displayed indicating that the input data is invalid;
- otherwise calculate and display the percentage of free space. It should then determine and display a message based on the amount of free space.

Specification Table

Input	Processing	Output

total space
amount used
	Input total space
	Input amount used
	Calculate percentage free space
	Display percentage free space
	If percentage free space = 0
	  Display “System full”
	Else If percentage free space < 5
	  Display “Low disk space”
	Else
	  Display “Sufficient disk space”
		percentage free space

Python Program

```
# Name: section02_solutions04_disk_free.py
# Program to check percentage free disk space
# Example of: if-elif-else

print("This program checks free disk space")

#Input total disk space
total_disk_space = float(input('Enter total space: '))

#Input amount used
amount_used = float(input('Enter amount used: '))

#Calculate percentage free space
percent_free = 100 * (total_disk_space - amount_used) / total_disk_space

#Print percentage free space
print(f"The percentage free space is {percent_free:.1f}%")

# display a message based on the percentage free space
if percent_free == 0:
    print("Warning: system full")
elif percent_free < 5:
    print("Warning, low disk space")
# otherwise say everything's ok
else:
    print("System has sufficient disk space")
```

Sample Output

```
Enter total space: 500

Enter amount used: 500
The percentage free space is 0.0%
Warning: system full
Enter total space: 500

Enter amount used: 489
The percentage free space is 2.2%
Warning, low disk space
Enter total space: 500

Enter amount used: 350
The percentage free space is 30.0%
System has sufficient disk space
```

5.Power Ratio Conversion

dBm is an abbreviation for the power ratio in decibels (dB) of the measured power referenced to one milliwatt (mW). It is used in radio, microwave and fiber optic networks as a convenient measure of absolute power.

To convert from power P (in milliwatts) to dBm: $dBm = 10\log_{10} P$

To convert from dBm to power (in milliwatts): $P = 10^{\frac{dBm}{10}}$

Write a program which will convert power to dBm, or dBm to power, depending on the user's choice. The program should input the required value and display the converted equivalent. If the user inputs an invalid choice, then a suitable error should be displayed.

Specification Table

Input	Processing	Output

choice
power
dBm
	Input choice
	If choice = 1
	  Input power
	  Calculate dBm
	  Display dBm
	Else choice = 2
	  Input dBm
	  Calculate power
	  Display power
	Else
	  Display “Invalid choice”
		dBm
		power

Python Program

```
# Name: section02_solutions05_power_ratio.py
# Program to perform power ratio conversions
# Example of: if-elif-else, math module
from math import log10

print("Program for Power Ratio Conversions")

# display a menu
print("1. Power to dBm")
print("2. dBm to Power")
choice = int(input("Enter your choice: "))

# process the user's choice
if choice == 1:
    power = float(input("Enter Power in milliwatts: "))
    dbm = 10 * log10(power)
    print(f"Power ratio is {dbm:.1f} decibels")
elif choice == 2:
    dbm  = float(input("Enter Power Ratio in decibels: "))
    power = 10 ** (dbm/10)
    print(f"Power is {power:.1f} milliwatts")
else:
    print("Invalid choice")
```

Sample Output

```
Program for Power Ratio Conversions
1. Power to dBm
2. dBm to Power

Enter your choice: 1

Enter Power in milliwatts: 100
Power ratio is 20.0 decibels
```

```
Program for Power Ratio Conversions
1. Power to dBm
2. dBm to Power

Enter your choice: 2

Enter Power Ratio in decibels: 5
Power is 3.2 milliwatts
```

6.VAT

The VAT (Value Added Tax) Rates for Ireland are:

Category	Rate
Standard	23%
Reduced	13.5%
Lower	9%
Livestock	4.8%
Exempt	0%

Write a program which inputs the price of an item and the VAT category, and then calculates and displays the VAT due and the total price.

Specification Table

Input	Processing	Output
price VAT category	Input price Input VAT category Calculate VAT due based on VAT category Display VAT due Calculate total price Display total price	VAT due total price

Python Program

```
# Name: section02_solutions06_vat.py
# Program to calculate vat due
# Example of: if-elif-else

print("This program calculates VAT")

# input price
price = float(input("Enter price of the item: "))

# input VAT category
category = input("Enter VAT catgeory: ")

# determine VAT rate
if category.lower() == "standard":
    rate = 23
elif category.lower() == "reduced":
    rate = 13.5
elif category.lower() == "lower":
    rate = 9
elif category.lower() == "livestock":
    rate = 4.8
elif category.lower() == "exempt":
    rate = 0

# calculate VAT due
vat_due = price * rate / 100
print(f"VAT due is {vat_due:.2f}")

# calculate total price, including VAT
total_price = price + vat_due
print(f"Total price including VAT is {total_price:.2f}")
```

Sample Output

```
This program calculates VAT

Enter price of the item: 1200

Enter VAT catgeory: standard
VAT due is 276.00
Total price including VAT is 1476.00
```

```
This program calculates VAT

Enter price of the item: 55

Enter VAT catgeory: lower
VAT due is 4.95
Total price including VAT is 59.95
```

Decision Making with nested-ifs / `and or not`

7.TV Show

(a)A new reality TV show is looking for single people aged between 18 and 35 to take part. Write a program which inputs a person's age and marital status and displays a message indicating whether or not the person is suitable for the TV show.

Specification Table

Input	Processing	Output
age martial status	Input age Input marital status If age is between 18 and 35 and marital status is "single" Display "Suitable" Else Display "Not suitable"	message

Python Program

```
# Program Name: section02_solutions07_tv_a.py
# Purpose: to check if someone is suitable for a TV show
# Example of: if-elif-else with and

print("Program to check suitability for TV show")

#Input age
age = int(input("Enter your age: "))

#Input marital status
marital_status = input("Enter your marital status: ")

# Check if the person if suitable for the TV show
if marital_status.lower() == "single" and 18 <= age <= 35:
    print("You are suitable for the TV show")
else:
    print("You are not suitable for the TV show")
```

Sample Output

```
Program to check suitability for TV show

Enter your age: 28

Enter your marital status: single
You are suitable for the TV show
```

```
Program to check suitability for TV show

Enter your age: 28

Enter your marital status: married
You are not suitable for the TV show
```

```
Program to check suitability for TV show

Enter your age: 39

Enter your marital status: single
You are not suitable for the TV show
```

(b)Due to poor ratings, the producers want to include celebrities on the show, and the eligibility rules do not apply for them. However, they must be a genuine celebrity. The Q Score is a measurement of how famous someone is. The higher the Q Score, the more famous they are. http://en.wikipedia.org/wiki/Q_Score To be considered a "genuine celebrity", they must have a Q score over 50.

Modify the program so that it inputs a person's age, marital status and Q score and displays a message indicating whether or not the person is suitable for the TV show. Non-celebrities have a zero Q score.

Specification Table

Input	Processing	Output

Q score
age
martial status
	Input Q score
	If Q score >= 50
	  Display "Suitable"
	Else
	  Input age
	  Input marital status
	  If age is between 18 and 35 and
	  marital status is "single"
	  Display "Suitable"
	  Else
	  Display "Not suitable"
		message

Python Program

```
# Program Name: section02_solutions07_tv_b.py
# Purpose: to check if someone is suitable for a TV show
# Example of: if-elif-else with and, nested if (if within an else)

print("Program to check suitability for TV show")

# input celebrity q score
q_score = int(input("Enter your Q Score: "))

if q_score >= 50:
    print("You are suitable for the TV show")
else:
    #Input age
    age = int(input("Enter your age: "))

    #Input marital status
    marital_status = input("Enter your marital status: ")

    # Check if the person if suitable for the TV show
    if marital_status.lower() == "single" and 18 <= age <= 35:
        print("You are suitable for the TV show")
    else:
        print("You are not suitable for the TV show")
```

Sample Output

```
Program to check suitability for TV show

Enter your Q Score: 75
You are suitable for the TV show
```

```
Program to check suitability for TV show

Enter your Q Score: 0

Enter your age: 28

Enter your marital status: single
You are suitable for the TV show
```

8.Income Limits for Maintenance Grant (Again)
The family income limits for eligibility for a full maintenance grant in 2019-2020 are as follows:

Number of dependent children	Full maintenance
Less than 4	€39,875
4 to 7	€43,810
8 or more	€47,575

Write a program which inputs the number of dependents income, and then displays a message indicating whether or not a person is eligible for a full maintenance grant.

Specification Table

Input	Processing	Output
number of dependents income	Input number of dependents Input income If number of dependents < 4 and income <= 39875 Set eligible to True Else if number of dependents <= 7 and income <= 43810 Set eligible to True Else if number of dependents >= 8 and income <= 47575 Set eligible to True Else: Set eligible to False If eligible Display “Eligible for full maintenance grant” Else Display “Not eligible for full maintenance grant”	message

Python Program

```
# Program Name: section02_solutions08_grant_eligibility2.py
# Purpose: To check eligibility for a full maintenance grant
# Example of: if-elif-else with and

print("This program checks eligibility for a full maintenance grant")

# input number of dependents
num_dependents = int(input("Number of dependents: "))

# input income
income = float(input("Input income: "))

# check eligibility based on number of depenents and income
if num_dependents < 4 and income <= 39875:
    eligible = True
elif num_dependents <= 7 and income <= 43810:
    eligible = True
elif num_dependents >= 8 and income <= 47575:
    eligible = True
else:
    eligible = False

if eligible:
    print("You are eligible for a full maintenance grant")
else:
    print("You are not eligible for a full maintenance grant")
```

Sample Output

```
This program checks eligibility for a full maintenance grant

Number of dependents: 3

Input income: 30000
You are eligible for a full maintenance grant

This program checks eligibility for a full maintenance grant

Number of dependents: 6

Input income: 75000
You are not eligible for a full maintenance grant
```

9.Validate Email Address

AIT's Wireless service, EduRoam, requires that users login using their email address. The email address must be a valid Student email address (in the form A00123456@student.ait.ie) or a valid Staff email address (in the form jbloggs@ait.ie), based on the following:

Student Email: starts with "A00" and ends with @student.ait.ie
Staff Email: ends with @ait.ie
Otherwise: not a valid AIT email address

Write a Python program which will input an email address, and determine and display a message indicating whether or not it appears to be a valid AIT Student or Staff email address.

Specification Table

Input	Processing	Output
email address	Input email address If email address starts with "A00" and email address endswith "@student.ait.ie" Display "Valid AIT Student email address" Else If email address starts endswith "@staff.ait.ie" Display "Valid AIT Staff email address" Else Display "Not a valid AIT email address"	message

Python Program

```
# Program Name: section02_solutions09_check_eduroam_emailaddress.py
# Purpose: To check if an email address is valid for EduRoam
# Example of: if-elif-else with and, string methods

print("This program validates email addresses for use with EduRoam")

# input email address
email_address = input("Enter the email address: ")

# is it a Student Email address?
if email_address.startswith("A00") and email_address.endswith("@student.ait.ie"):
    print("Valid AIT Student Email Address")
elif email_address.endswith("@ait.ie"):
    print("Valid AIT Staff Email Address")
else:
    print("Not a valid AIT email address")
```

Sample Output

```
This program validates email addresses for use with EduRoam

Enter the email address: A00123456@student.ait.ie
Valid AIT Student Email Address

This program validates email addresses for use with EduRoam

Enter the email address: jbloggs@ait.ie
Valid AIT Staff Email Address

This program validates email addresses for use with EduRoam

Enter the email address: jbloggs@student.ait.ie
Not a valid AIT email address

This program validates email addresses for use with EduRoam

Enter the email address: A00123456@gmail.com
Not a valid AIT email address
```