## **Problem identification**

Using Python I am going to be making a holiday comparison program which will search through keywords in a description given by the user to try and find the perfect holiday based on past reviews left by other users. I came up with the problem as I realised there was nowhere which allowed for this as previous holiday comparison websites work based off the user already knowing where they wish to go on holiday. I want to create a program which allows to user to come to a conclusion of where they want to go on holiday based off what they are looking for in a holiday. What makes this solvable is the ability for a computer to search through a program text much faster than a human could. This means the computer can do a human holiday advisors job but faster and more automated.

The program needs to be written well as to make it be able to make it clear what the user must do and user computing principles of iteration and selection to compare and contrast the multiple different options for a holiday to be able to offer them to a user.

#### **Stakeholders**

This program helps people who don't know where they want to go on holiday but know what kind of things they want to get done. For example, someone may want a good place to go hiking that's also close to a beach and my program will search through holiday destinations to find which location would be best based on the given description. A company that could use a program like this would be Trivago as they already have a search program inbuilt into their website and they could use a program like this because it would bring in more customers that are unsure of what they are doing. Helping Trivago compete with businesses based off human holiday advisors by making the search for their ideal holiday much simpler than ever before.

This program could be used both on the Trivago website and also be later adapted to the Trivago mobile app to make the program accessible to as many users as possible.

The other main stakeholder would be the User as they will ultimately be the people after a holiday so the program needs to be suited towards making their experience the best possible. That is why throughout testing I am going to try and keep the users as close to the development as possible.

## **Potential Issues**

Some issues that may come in the program are that this program is based on user opinions so it may differ for each person and if the program is not user friendly in the UI it could become very clustered and drive customers away. The way I'm going to try and solve these problems is that for each person's opinion I'm going to compare it to other user reviews and find the closest ones to what is being searched for by finding an average over all reviews. To make the UI not clustered I'm going to try and keep everything very simple for the user and use ideas of information hiding to keep all of the unnecessary data from the user. The simpler the program for the user the more people that will want to use the program so the more beneficial it will be for the end company.

There are limitations to this program as with any other. The limitations of this program have to do with the allotted time the amount of available data usable by the program. To compare the descriptions of the user to previous reviews I have to have a backlog of these reviews. This program is also opinion based which causes a problem as everyone's opinions differ and certain interpretations of the given description may mean different things to different people. If I have

enough time at the end of the project, I'll make the program learn from ratings that way over time that way it will improve as more people use it.

#### Research

Primarily my research has been on Trivago and other holiday comparison websites so I can see how they find their "best deals" and the layout of their search functions.

For the object oriented approach, I'm looking to take I'm choosing to write my code in python, I have also considered using java. In the end I chose python as this is the language I am more confident with and am familiar with what needs to be done.

Other research I intend on doing is looking up other comparison codes to see how other people have compared two items in their codes. My code intends on using text searching and list comparison algorithms to compare the input options the user selects to a list of country attributes and place attributes desirable by the user. The reasons I have selected python to work in is there is a lot of in built list comparison available. I can use cmp(list1, list2) or I could pop particular attributes from the list to compare and search for it in the selected options.

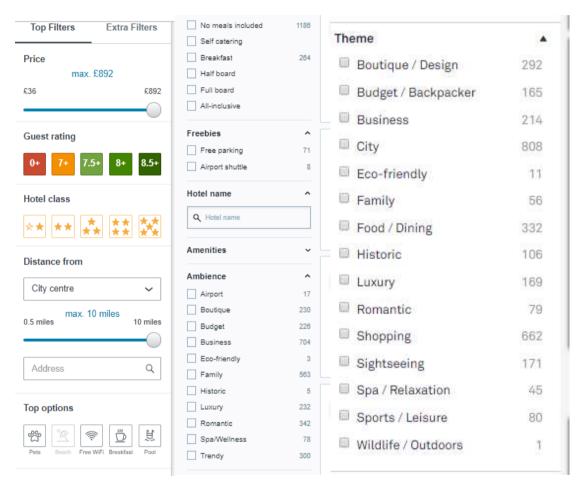
In order to create the attributes for each place for the comparison beforehand ill look at attributes listed on holiday comparison websites already and from that create a list to be compared to. The sample list I'm going to be using to compare to as proof of concept will be 20 items long in order to adequately meet testing requirements. I will be selecting each of these destinations by looking at what the top 15 destinations are and selecting the last 5 by hand. This is because some of the items will need to be similar to each other in order to try and fool the algorithm. My testing will try and find as many different scenarios as possible and I'll try and get members of the public to test my code in order to try and find scenarios which I may not have thought about. In asking members of the public I will be looking for people between the ages of 20 and 60 as that is the age of most people using this kind of program. The target age range is as wide as this is a holiday booking system and people of all ages go on holiday. The reasons I haven't included younger and older age groups than the selected range is that older people are not as technology capable and tend to not travel as much and younger people need their parents to travel with them. Any Questions I ask will also be to people of that same age range.

After considering how I should start and approach the project I decided to ask some members of the public how they thought the code should work. The response I got showed that people don't want to have to write a lot when looking for holidays so this gave me the idea of giving the user options for what they want out of a holiday. At the start of the code the user will be given the choice of writing a description or picking set choices this way they can choose how much they want to write the description should end up being more accurate as more accurate information is given so more can be interpreted. The way this would look is once you start the code the interface will ask what you want out of your holiday with examples and sliders showing things like distance from beaches, big cities or other thing people could look for in a holiday. To find out what people are looking for in a holiday I will research other holiday comparison sites to see what features they list with each of their reviews of holiday locations.

The requirements for the system will be python as this is what I'm creating the code on, in the real world and once the code would be transferred to the Trivago website it may have to be interpreted into java script and given more visual aid than already used as on the website it needs to fit the style of the rest of the website.

For my code to be successful I need the user to select from a list of options of what they can have in a holiday and for it to select a destination based on this. To test weather my code is accurately selecting destinations I will ask the user at the end for feedback and to rate the selected destination. This way I can improve on the code over time. It may be difficult for the code to distinguish between two destinations from time to time as sometimes they may be too similar. This isn't something that I can easily fix as this is down to user opinion. My solution for this will be to offer both location names and ask further questions to determine their preference.

I looked at three different holiday comparison websites and found the different features they offer when selecting a holiday, the three I looked at were Trivago, kayak and travel supermarket.



These websites offered ideas for features that my user can select in deciding what they want in their holiday. Not all of the above options are applicable for what I intend on doing for finding out what holiday the user is after so when creating my code, I will select only the appropriate options and ask the user to select from those.

From what can be seen in the research conducted I found that all the comparison websites required me to input a known destination and the features offered seemed to be based of the style of location picked. This led me to pick some features from each different websites and come up with some features of my own that may not have been applicable to the holiday comparison programs available.

I then researched some comparison code examples but couldn't find any full codes so used tutorials point to give an example of list comparison. The method of comparison ill be using will be comparing the indexes of the list in order to give a score where the first index gives the highest score. This

method will work as if the first and second item get compared the first item will give a higher multiplier than the second item so lists only comparing the last items will only give the lowest scores.

## **System Requirements**

The system requirements are that you must be able to run python and TKinter for the gui programming for the menu. In terms of other hardware only a keyboard and mouse are required the mouse will be used in the gui programming.

Once the program is complete and sold to Trivago there will be no need for the user to have python as it will be attached to their website most likely via importing cgitb and using that to convert the python to the webpage. A similar process will be used to the app however this will be determined by what language the app will be written in.

## Success Criteria

To ensure the program is a success it needs to be able to distinguish between similar cities and pick up words from the user description given. It needs to feel user friendly and accessible enough so even the least tech savvy people can understand what needs to be done. To ensure that happens I will keep in close connection with users so any wording changes or design changes can be made immediately.

For the program to be an improvement on Trivagos interface they already have it needs to add something that doesn't already exist. The city finder doesn't already exist and should help customers find where they want to go much easier.

For this project I will not be using AI this is because of the lack of available data to me so for this project to be successful the program needs to do all the already mentioned criteria whilst proving that if AI was used it would be possible for a more accurate and sustainable program to be created. Whilst my program should be successful in its own right. This will be because im also only searching through 20 cities.

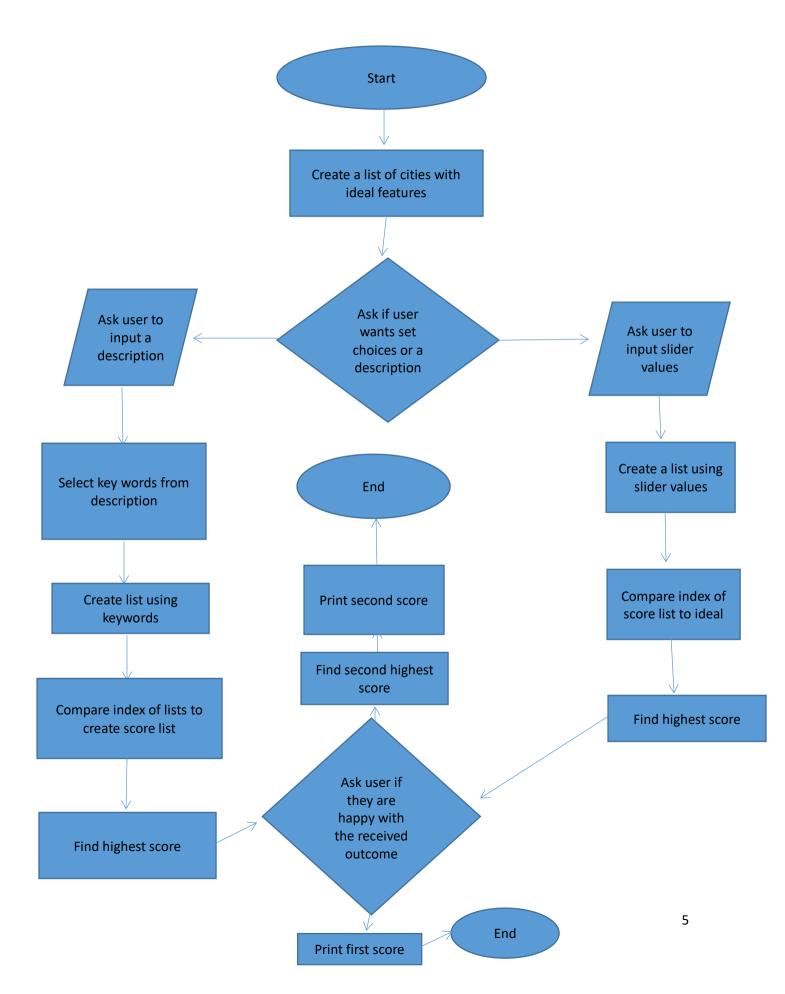
## Design

For my design I opted to use both a flowchart and sudo code in order to really understand and plan the structure of the code I then plan on designing the menus to be used in the code that the user will be using to select their choices for their holidays.

The program can be seen to be programmed in two separate parts being the choices section and the description section. The choices part will be designed and created using GUI programming to make an interface for the menu to appear on. This is the method I have chosen as it feels like it will be the most user friendly option. This is important as user friendliness is a key factor in the designing of this program. This is a usability feature that will help the user visualise what they are selecting for their holiday.

These two parts can also be further broken down into smaller parts with the different steps including separating the user answers into lists to then be compared with the lists created for each city. This will allow for a computational solution as lists can quickly be compared by a computer and can also be easily ordered. There are many different ways to manipulate lists such as stacks or queues and these different ways will each provide a different method for me to use the data.

# **Flowchart**



## Sudo Code

```
Create lists (Most important, second most, third, least)
Choice = input ("Do you want to write a description or use a menu selection")
If Choice is description:
        Description = input ("write a description with no spelling errors")
        Key_words = Select key words in Description
        Key list (Keyword 1, keyword 2, ect.)
        For each option in key_list:
                Inverse key list
                Inverse created list
                For each item in key list:
                        Score =Keylist index * created list index
                Select list with highest score
                Is (Highest score list) a destination you want to go to:
                         If yes:
                                 END
                         If no:
                                 Select next highest score
                                 Return until answer is yes
Else:
        Select options from set menu
        Order these options based user preferences
        Keylist( option1,option2,option3)
        For each option in key_list:
                Inverse key list
                Inverse created list
                For each item in key list:
                        Score =Keylist index * created list index
```

Select list with highest score

Is (Highest score list) a destination you want to go to:

If yes:

**END** 

If no:

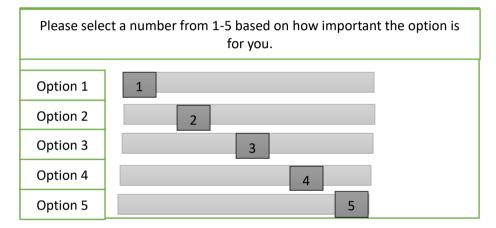
Select next highest score

Return until answer is yes

**END** 

## Menu Design

This is the menu design for the menu which will be available if you select to select the features.



This menu is a usability feature to be added to the program in order to help the user visualise what they are actually doing. This is going to be added both for those users that do not wish to write a lot and those users that may get confused or stuck using the descriptions option.

Test Table (Description)

Test Table (Description)	1		
Test Number	Input	Desired output	Reasoning
1	Historic being the only feature selected	Bangkok, London, Prague, Barcelona, Amsterdam, Moscow	This test shows that multiple cities can be detected these cities should be the selected ones as they all have historic as the first attribute and in this test none of the other attributes matter.
2	Historic, Shopping, Nightlife, Transport	Bangkok	This test shows the features can select a specific city.
3	Historic being only feature selected with the user selecting no after options given	Same cities as test 1 but after no selected the next cities will be Budapest, Vienna, Paris, New York	This shows the saying no also works. The cities selected are all the cities with historic in place number two.
4	Historic, Cheap , Food, Health	Budapest	This should be the outcome given as there are only 2 attributes in the wrong place. This test shows that the attributes don't have to be perfect for one city to be selected they just have to be close.
5	No keywords given	Should give user option to select from all of the attributes	I will be making sure that if the list of attributes picked up is equal to 0 then all attributes will be selected from.
6	Wrong word put in when selecting	Should ask user to input one of the options again	If the input isn't equal to the picked up on attributes it should ask the user to input the attributes again.
7	Not putting in the words either choices or description	Should ask the user to input either choices or description	If the input isn't equal to either choices or description the user should be asked again.

Test Table (Menu)

Test Table (Menu) Test Number	Input	Desired output	Reasoning
1	Historic bar pulled to 5	Bangkok	This section is
	stars		different to the
			description section as
			even though I have
			only selected on
			attribute to 5 stars
			because all attributes
			are still accounted for
			the printed cities are
			not just those with
			historic In position
			one but instead is the one with historic in
			position on and the
			other attributes listed
			in order which in this
			case is Bangkok
2	Culture set to 5	Hong kong and	With these attributes
	shopping set to 4	Istanbul	the scores for Hong
	Food and historic on 3		kong and Istanbul
	and nightlife set to 2		should be similar as
			there is only one
			difference between
			the two.
3	None of the scores	Bangkok	Because this will be
	changed		creating a list with all
			the attributes in order
			this should give
			Bangkok as Bangkok
			has the first 4
4	Fach har tasted	Chauld show the situ	attributes in order. This test will show
4	Each bar tested individually	Should show the city that has the current	that each bar has an
	Individually	bar set to 5 in position	effect on the program
		one with the next	individually and show
		attributes being in the	the cities selected are
		order of historic	calculated.
		shopping ect	
5	Saying no with each	Should give the	This shows that a
	test	second option	second choice is given
			and if multiple second
			choices aren't given
			for any of the tests
			that shows that the
			code isn't functioning
			correctly.

## Software Development and testing Iteration 1

The software development methodology that I have decided to follow is the RAD system life cycle. I will be using 3 different iterations. These iterations will each contain a different aspect that users will point out during the testing of my program. This will work as I am only one person and will not think of every feature that users may wish to include.

I have chosen the RAD system life cycle as this should provide the ability to improve on what I have the most as with each time I reach the end of the cycle I will receive user feedback

To begin before coding I had to select cities. To do that what I did was select the top 15 most visited cities and then selected 3 more that I considered similar to another city on the list and then 2 which I considered completely different. After this I had to create model attributes for these cities so I could compare each city. A problem with this was this was mostly based off my opinion or experiences other people have had that I researched. This would be different for everyone and the only way to make this more accurate would be over time I could gather reviews and use AI to slowly make the searching algorithm better and use more people's opinions than just mine. The attributes I had come up with were:

Bangkok ('Historic', 'Shopping', 'Nightlife', 'Transport') Budapest ('Cheap', 'Historic', 'Food', 'Health') London ('Historic', 'Shopping', 'Nightlife', 'Culture', 'Health') Vienna ('Food', 'Historic', 'Transport', 'Culture', 'Health') Paris ('Food', 'Historic', 'Shopping', 'Nightlife') Prague ('Historic', 'Cheap', 'Culture', 'Family', 'Food') Dubai ('Shopping', 'Health', 'Nightlife', 'Food') Singapore ('Health', 'Shopping', 'Food', 'Nightlife') Tokyo ('Shopping', 'Food', 'Culture', 'Family', 'Historic') Seoul ('Culture', 'Food', 'Historic', 'Nightlife') New York ('Shopping', 'Historic', 'Culture', 'Nightlife') Kuala Lumpur ('Nightlife', 'Cheap', 'Transport', 'Shopping', 'Food') Hong Kong ('Culture', 'Shopping', 'Food', 'Nightlife') Istanbul ('Culture', 'Shopping', 'Historic', 'Nightlife') Barcelona ('Historic', 'Food', 'Culture', 'Nightlife') Amsterdam ('Historic', 'Culture', 'Nightlife', 'Food') Milan ('Food', 'Shopping', 'Culture', 'Nightlife') Osaka ('Food', 'Culture', 'Shopping', 'Historic') Moscow ('Historic', 'Nightlife', 'Health', 'Culture') Johannesburg ('Health', 'Shopping', 'Historic', 'Nightlife')

I ordered each of these attributes in the lists to make what I considered the most important attribute first and the least important last this is so I can actually distinguish between the different cities otherwise these just become words that mean nothing to a searching algorithm.

This was following this step in the flow chart:

Create a list of cities with ideal features

To convert this list into python code to create a list in python what I did is this:

```
Bangkok = ['SISTORIC', 'SHOPPING', 'HIGHTLIFE', 'TRANSPORT']
Budapest = ['AFFORDABILITY', 'MISTORIC', 'FOOD', 'REALTR']
Vanna = ['FOOD', 'RISTORIC', 'BROFFING', 'HIGHTLIFE', 'CULTUME', 'REALTR']
Vanna = ['FOOD', 'RISTORIC', 'GROFFING', 'GULTUME', 'REALTR']
Faris = ['FOOD', 'RISTORIC', 'GROFFING', 'GULTUME', 'FOOD']
Cubal = ['SHOPPING', 'HIALTR', 'HIGHTLIFE', 'FOOD']
Singapose = ['REALTR', 'SHOPPING', 'FOOD', 'RIGHTLIFE']
Tokyo = ['SHOPPING', 'HOOD', 'CULTUME', 'FAMILY', 'RIGHTLIFE']
Hew York = ['SHOPPING', 'HISTORIC', 'HIGHTLIFE']
Hew York = ['SHOPPING', 'HISTORIC', 'HIGHTLIFE']
Hous Lampur = ['NIGHTLIFE', 'CHEAP', 'TRANSPORT', 'SHOPPING', 'FOOD']
Houng Rong = ['NIGHTLIFE', 'CHEAP', 'TRANSPORT', 'SHOPPING', 'FOOD']
Houng Rong = ['MISTORIC', 'RODE', 'CULTUME', 'HIGHTLIFE']
BRICELONS = ['MISTORIC', 'CULTUME', 'HIGHTLIFE']
MASSESSAME = ['MOOP', 'CULTUME', 'CULTUME', 'HIGHTLIFE']
Osaks = ['FOOD', 'CULTUME', 'RHOPPING', 'HISTORIC']
Noscow = ['HISTORIC', 'HIGHTLIFE', 'HEALTH', 'CULTUME']
Johnnesbury = ['MEALIN', 'SHOPPING', 'HISTORIC', 'SIGHTLIFE']
```

The first thing the user must do is decide whether or not they wish to write a description or choose the attributes from a menu.





To implement this choice I just put in a simple if statement as if they do not put choices or description an error will occur:

```
print("This is a incline comparison node which will Chinese a billing description into annual the world based on either art input description or a list of any channel."

Online a impact the pass wise, the course a consciption to phonone from a list of any channel impact description at phonone to make the description of increase to make the description of the description o
```

The else statement is in place in case either description or choices are not input.

This made me think I should create a function to restart the program if the correct answers are not input. I just called my function "Restart":

```
Theirs w "quantities you wish he write a description on choose from a last of any obscious (squal description on chooses to make the description of theirs or "chains or "chains
```

I placed the restart after the else statement as the program should return to the top if description or choices are not input and will ask the user again whether or not they want to go down the description path or the choices path.

I decided I would start coding the description part first and move on to the selected section after as I thought that part would be easier.

As I was not using proper AI modules because I do not have the data available to utilise it I decided to find words that would then link to specific attributes I could then add to this list of words later and as I get other people to test it they will definitely come up with more words I didn't think of as without more resources it would be hard to come up with every word that could be used to describe an attribute.

```
| Chance == 'description' of Choice title() == (Theoretical') |
| Description = (squarifficant script a description of group perfect belong description') |
| Description = (squarifficant script a description of group perfect belong description') |
| Description = (Theoretical') of 'description' of 'description' or 'description'
```

I then had to make a list of all the attributes the user has found based on the words they used in the description and also ask the user what their description of their perfect holiday is as followed by the flow chart:



When testing if this had worked I discovered that nothing was being picked up. Another method I tried to use to solve the problem was this:

## When testing this:



For 1-word shopping should not have appeared twice this was also strange because only one word was mentioned and the position of gift in the keywords list for shopping isn't in the second position either.

This made me then change my method for how I searched though both lists.

I then found a solution that functioned the way I wanted it to:

```
Change or "Assembly has " bedge Maight on ("Deanighment')

district of Assembly Those cours a powering of your peopless believe the second of Assembly of Assembly of Those course a powering of your ansembly of Those of
```

```
This is a boilder comparison mode which will obscure a boilday destination bity annual the dystal based on either as input description as a list of set choices to you wish to write a description or choice to make the decision/description Places on the decision/description Places on the decision/description Places on the decision of your perfect holiday measuration old shop food places now type for important these expects are for your heliday by typing each of these inexus in the order from most to least important ["Historic Aspects", "Homping", "Food"]
```

This solution searches through each index of the word list and compares them with the description the user has input appending each value to a list called order. The not in order part just makes sure that if the user uses 2 works for one attribute that it does not end up in the list twice.

The next thing I had to do was make sure that the list was in order so that it could be compared with the ordered lists of each of the cities.

If the user had put in no picked up words I decided to ask the user to order each attribute individually I did this by checking if the length of the attributes at the end was 0 then give all attributes.

```
If lactHomes on 5;

palet "The propose compaled to past up on any woods from your manufacture of you could please salest from the great list or on case try aid wood out your perfect death follows: "Theories appears," "Repeated," "Theories appears," "Repeated," "Theories are type like important these appears and fin your faileds by typing work of bless town in the count for most to leave important." , Break!"
```

To do this I just asked the user to order each attribute based on importance to their ideal holiday. This was simply done by getting the user to type each item out individually in order of importance and then creating a list out of the order said. Another way this could have been done would be to judge how often each keyword came up and in what order however without AI this would have been an ineffective method so I opted for asking the user directly.

```
print ("jears and sign has important their aspects are to point holiday by typing wall of these hims in the noise fine most an least haparound;", fodes)

finally a proper to the objects one of a time")

Chest appear (lampth)

print "imput the object you conside to be in position", [+1, "of importants")

Mestics a (appear)

Finally a proper (lampth)

print "imput the object you conside to be in position", [+1, "of importants")

Healing a (appear)

Finally a consideration of the important of the consideration of the same in", finders

against

Unclaim = Unclaim appear)

Onclaim = Unclaim appear)
```

The list "NewList" is created so that the user's attributes can be placed into a list at the end. We then check the length of the list Order as this is how many attributes they have so we can make sure they put in all of them. I made the list Check to make sure that the user had actually put in an attribute name making both comparisons in the .upper form to ensure they were checking the same word. I then compare each item in "UserList" by finding the word after the space than in the correct order append all of the information we have to "NewList". The function again will restart that particular sequence if the user inputs an unexpected response.

This is shown in my flow chart as this step:

Create list using keywords

Following my flowchart the next step I had to do was to compare the indexes of both list to create a score:

Compare index of lists to create score list

First what I did is I turned the cities into a list and then created a list of score 0 for the number of cities in the list. I then iterated through each city and then each attribute in the created ideal list. The next thing I did was check that the item I was looking at was in both lists otherwise the score should be 0 as it's not in either list. Then to compare the two lists I got the length of the lists and added the index and 1 because the first index is 0 and I multiplied both lists together and this creates a score for each item in the cities list.

```
Catine = (Banghob , Badepert , London , Vience , Fecia , Srepus , Dohal , Singapore , Enky , Sanii , San Yozk , Stale_Lumper , Hong_Song , Jananbul , Sacraiona , Answerds Strondies = (String | International | International
```

The reason I have the value of 5+m for the cities indexes is because the biggest lists in the cities table are 5 attributes long.

```
This is a boiling comparison and which will charge abolity destination city account the world based on aither at input description or whose from a list of est obtains for you wish to write a description or whose from a list of est obtains for your perfect hilling perturbing and a second to be a description of your perfect hilling perturbing and perfect to be a description of your perfect hilling perfect perfect and a second perfect to the perfect to be a second to be
```

After testing I noticed a mistake. I tested with one attribute being historic. This is something I said Bangkok has as a number 1 attribute so it should be first however, the result I got doesn't show it as first. Through this I realised that I had to compare the negative indexes of each one so that the first values have the highest value and the next ones all decrease by one. This would also help solve the problem of longer lists having higher scores as the last value isn't worth much to the score and so can almost be disregarded. I believe cities with more attributes should come up a little bit more often as these will tend to be more popular locations anyway. For this reason I don't think the tiny extra score received will be a problem.

To create the negative indexes I took the index away from the value instead of adding it.

The result printed worked for the one attribute test as all the highest values are all of the cities that contain the historic attribute in position 1.

I tested the same code for multiple attributes to see if I would get the same result and I got the result I expected. The first test was for all of the qualities that my first city had so It should have been the highest score.

```
This is a billidep comparison and which will those a buliday destination sky eround his would become an attree on input description or a list of set obsides do you will no write a description or only perfect buliday destinationald stop significant includes to make the desiration description.

These writes a description of your perfect buliday destinationald stop significant for type four important these expects are for your buliday by typing sect of these these in the sider from most to less important: [Wistoria sepects', 'Bight and secretable'] specially also be secretabled in the second of the s
              put the object you consider to be it position 8 of imports
desire
                                                    shown you complied to be in position 4 of importance
 Slaces put in one of the imame in ('Microsic aspecte', 'Mosppring', 'Mightlife', 'Tomosport', 'Mealth and permettion')
Health on percention
1704, 44, 85, 75, 74, 42, 71, 88, 88, 68, 68, 68, 68, 78, 87, 62, 48, 48, 79, 511
```

The second test I did was for if it was always making the first score highest so I tested with the first quality of the second city just to be sure.

```
by On the Coconia city just to be smill.

Including compensor code which will choose a haliday destination thy around the world based on either an input description or a list of ser choices the twister of serrigition or choice face a list of set choices impact description or choice to make the destinant description into a description of your perfect haliday destinatedness or type how important these aspects are for your haliday by typing seem of these trace in the sides from most to least important: ('Chemp')
                    one type but important these aspects are for your holidating the objects one at a time on the objects one at a time on the object on the in position 1 of importance on the object you consider to be in position 1 of importance.
```

And lastly I tested it with all the qualities of the second city to see if It would return that as the highest score.

```
This is a holiday comparison node which will thorse a bulleay destination only accound the would bessed on without an import description or a list of set thorses of you with to write a description of your perfects holiday destination what will descript in a discover to base the description of your perfects holiday destination what will feel aport please more type from important these aspects are for your builday by typing sends of these insent in the united fine most to least important: ("Minterior aspects", "Energy", "Soud", "M plant the important that is time the interior aspects in the interior of the provision of interiors the interior of the provision of the interior of importance (These in the interior of the provision of of the
                   Found the object you consider to be in prelicint & of importance Health and percention 124, 60, 50, 42, 50, 60, 10, 51, 50, 51, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50, 51, 50
```

After all of these test were successful I decided to move on to the next flowchart point which was:

Find highest score

My method for doing this was to use the iter() function to iterate through my score list to make sure I got every highest value and then use the max() function to look for every maximum value of the already iterated score list.

I then created a variable called o which I made equal to -1 so that the range of the for loop starts on 0 as this is the first index of the score list. This is because each time I cycle through my for loop I am adding a value of 1 and -1+1 is equal to 0.

I then check if the Current city being iterated through has the same value as the maximum value from the score list and if it does I append the index. This means that I now have a list made of just the indexes of all of the highest value cities.

```
IterScore = iter(ScoreList)
City = max(ScoreList)
0 = -1
Options = []
for n in range(0, len(ScoreList)):
    NextItem = next(IterScore)
    if NextItem == City:
         Options.append(o)
```

To test if this worked I just printed the value of the table options. I could then check the value options which what I expected the outcome to be.

```
This is a boliday comparison code office will offices a builday devolution city around the world beard on eight at types description or a list of set choices do you high to orize a description or choice a list of set choices (right description or decision/description or your perfect builday feathers could step food glasses now type how seportated these aspects are for your builday by type how seportated these aspects are for your builday by type how seportated these aspects are for your builday by typing each of these items in the order from most to least important: ["Historic aspects", "Bhopping", "Food"] picase injury the objects one at a time.

Applied to the order of the control of the position is of importance.
    import the object you consider to be in position 8 of importance
import the object you consider to be in position 8 of importance
    100, 26, 30, 62, 44, 25, 24, 21, 16, 24, 81, 13, 13, 61, 14, 10, 27, 16, 29, 31)
```

This first test was to see if the code worked for 1 value. The outcome of the value 4 shows the

```
highest value is in the 5<sup>th</sup> position or the 4<sup>th</sup> index.

This is a heliday apparatus and which will draw the large description of the 4<sup>th</sup> index.

This is a heliday apparatus and which will draw the large description of the action of th
        Slaces bytics a description of your perfect believe one perfect being described to the boundary of the perfect being appears are for your beliefs, "dealth and necessition"; "leadth and necessition"; "leadth input the objects one at a time along the object you describe to be in position 1 of importance bishood appears.

Instruct the object you consider to be in position 1 of importance that the object you consider to be in position 1 of importance.
             hightlife the object you consider to be in position 0 of importance food
        Field 
Apper his object pos consides to be in prairies 4 of importance 
health has requestion 
184, 18, 10, 47, 58, 38, 48, 48, 24, 47, 29, 81, 84, 82, 87, 48, 10, 84, 84, 42) 
[187]
```

We checked if this same test worked again for different values and again it displayed the highest

```
This is a holiday companion code which will choose a military destination city account the world beast on either or input description or a list of set choices the possible to withe a description of plur perfect holiday ferminationald please more by the more separate and expensional please more type from important three appears are for your holiday by typing such of these instances from most to least importance. ['Historic superts'] please input the objects one at a time importance includes the content of the co
```

This test involved checking if it was discovering all the indexes of all the highest numbers. The outcome shows all the cities with value of 12 and by their index.

```
a holding comparison code which will choose a holding destination miny account the model based on address of cross description or a list of ear choices intend to the contribution of choose from a list of ear choices (require a secription of choose from a list of ear choices (require a secription of choose in make the decision description or choices (require a secription of choose in make the decision description of choose in make the decision description or choices (require a secription of choose in make the decision description of the codes of the model of the model of the model of the codes from most to least important. ['Shopping'] has chosen for consider to the line in the codes from most to least important.
```

This last test was just to ensure that it wasn't just lucky that we got all of these values.

With these indexes what we can do is then print each city with these values.

To do this the first method we tested was to just create a for loop which prints all the values for the length of how many indexes there were.

```
print("The program has discovered", len(Options), "ideal destination(s)
              print("These are the cities we have picked up on: ")
              for p in range(len(Options)):
                                               print(Cities[Options[p]])
print (Cities [Options [p]])

This is a uniday comparison code which will move a tribley destination in parameter as a tribley of the second o
                      t the impact you consider to be no position I of importance
```

The results for the test were as that it printed the lists and not the city names. I then thought that what I would have to do is create a list of cities where the cities are strings and not lists.

```
print("The progress has discovered", [emilyminat, "sheal destructions of the year builders")

for a sin compacted destroyed and process up on "?

g in compacted destroyed and in a second and process of the print factorials (print factorials);
```

#### This code resulted in this outcome:

```
Disgrang", "Fred":
places input the objects one on a time
input the object you consider to be its position i. of importance
National empents
august the object you intended to be its position i of importance
output the object you intended to be its position if of importance
 thoughted object you consider to be in position I of importants
          origine has discretized i check destination for your british,
```

Seen as the result was a city name I checked with my previous testing values as I have used those attributes before to see if the city name was the correct one.

All of this being correct lead me test if it worked for multiple cities these where the results:

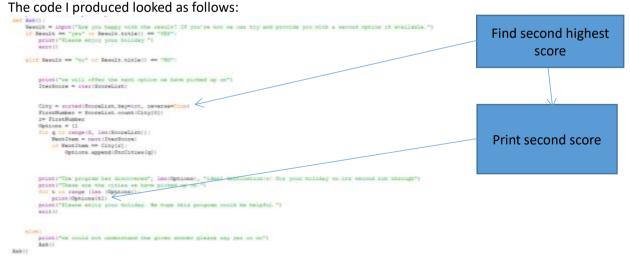
This is a builday immardiant mode which will otherwise a military Amethather rity a second who mentil based on applies as a longer description as a list of set of set obscised in you wish to write a description to chance from a list of set chains imput a waterpains or or chance to meak the description for the control of the control of

This proved that my code was working as intended.

Following my flowchart my next task was to give the user a second highest option for a city if they weren't happy with the first.



Thinking about how to approach this I thought I should order the score list and find the second value. The problem I thought with this was there may be multiple highest values so it is not just the second index. Thus I had to add the number of the first index numbers that existed.



The line City = sorted(ScoreList, .....) is used because what needs to be done first is to sort the score list from biggest to smallest because this isn't directly possible in python what must be done is you have to make the list from smallest to biggest and reverse it. Using the key int as a way for python to know what is actually being sorted as you can either sort numbers or letters.

The first few lines of this code are just asking the user weather they wish to have the second option. From the IterScore = iter (ScoreList) these lines were very similar to when we I first selected the city. The only difference was the variable r is not equal to -1 as its trying to find the second index so we add the variable FirstNumber because using the count () function we discovered how many of the first number existed.

We then printed each value in options and after all of these options are printed we can then exit the code as both solutions have been offered to the user.

When testing if this worked I added what the complete score list is so I could see what the second highest option should have been each time. These were the test results:

```
This is a holiday suspected mode which will choose a boling destination stry around the woll bessel on atther so input description or a list of sex wholese they note to their a description or a list of sex wholese they note to description or a list of sex wholese they note that the description of our perform holiday destinationed places they a description on a first part of the description of your perform holiday destinationed places import the objects one in these species are for your holiday by typing made of these places (a the name first month to lease important. ["Missoria angents"] input the object you consides to be in preliminary for your holiday.

The program has discovered 6 (ideal destinations) for your holiday.

The program the object white the sexial if you've not be and by one destination.

The program has discovered it shall destination to be provided up to the program has discovered a destination.

The program has discovered it is a destination of the poor holiday on the second option of available made we will affect the heart option to Name pictude up to the program has discovered it shall destination; for your holiday on the second put through the second print to have pictude up to the program has discovered it shall destination; for your holiday on the second put through the second your holiday. We hope while program rould be helpful.
```

I used the same test words as I did for the first choices. This first test was to see if multiple second choices would be printed. Comparing this to the score list I could see that this was as intended.

This is a boundary comparison cost which will decree a Nationy destposition only account the would beared on epists on began description on a place of any observable of you wink to write a featuration or thisses firm a list of set obtains listen featuration or this to the color of the decreasing of the observable of the color of the c

This also test if multiple outcomes can be printed and it all works as I want it to.

```
This is a builded companion come which mill impose a hilder destination mily around the would bessed on either an input membragation on a list of ant chaines the put which we certise a description of prince properties to the order of prince of prince prince of prince prince or make the destination of prince prince prince prince or make the destination destination of prince prince prince prince or make the destination of prince princ
```

This test proved that only one value could be printed and the value it printed is the intended one.

```
This is a brindey comparison code which will shows a hiddey devination stay account the would besed on extinct an input description of shices from a list of est choices limped description of choices to make the declarations of posts perfect brindey descriptions of choices to make the declarations of posts perfect brindey descriptions of these interests the shipers of posts being descriptions of these interests the shipers of posts of these apports are for your holiday by typing each of these interests the other one at time one at time the shipers one at time one at time of importance shapers are the shipers put contains to be in posts on a stay of the expect apports the shipers put contains to be in posts one at time of importance shapers are the shipers on being the shipers of the interest of time in the contains of interests of the shipers of the
```

This test was too see if one word would produce the correct result.

Seen as all my tests were successful I decided to move onto the second part of my code which is the menu choices.

For this I will also follow my flowchart however to start I have to use my menu design so create a blank template.

At the beginning of the program we are importing the module.

```
Chains or "Discourse" in Chain-Intellia or ("Discours")

Same 7 Told

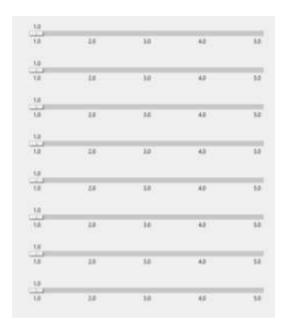
Wiscourt = Label Inserts:
Wiscourt = Label Inserts:
Wiscourt = Ministrate point)

Silenter = Wiscourt = Ministrate | Single | Label | Label |
Silenter = Wiscourt = Ministrate | Single | Single |
Silenter = Wiscourt = Ministrate |
Silenter = Wiscourt = Ministrate |
Silenter = Wiscourt = Ministrate |
Silenter = Wiscourt |
Silenter = Wiscourt |
Silenter = Ministrate |
```

I used the pack method to implement each slider to the same window I could have also used a grid method however I opted for not using the grid as the sliders should be perfectly central on the window and packing them is the easiest way to do this.

I chose to make my slider go from 1-5 with intervals of 0.5 to represent a star system with half stars so that the program is more accurate.

This was the outcome of the program:



From this I decided to add labels so that I could see what each of the sliders meant and introduce the menu to the users.

This also follows the first step of the flowchart:

Ask user to input slider values

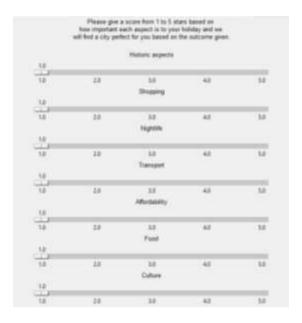
```
percent = [6.1]

worked official = Lefel (meeter, benew Tirems gave a newer flow 1 to 5 replic based on lattice Lappinson, bent separate by the proof building of Tirlis_pecks)

Tirlis_pecks;

Tirlis_pe
```

In labelling each slider I also decided to bring the window to the front of the user's computer screen as it can be irritating for the user to constantly have to click through to it.



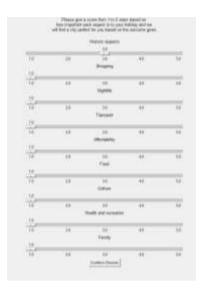
To then confirm this value I decided to create a button labelled confirm choice.

```
Chieronia.pet()
Shingping (pet()
Shingpi
```

This was the method I tried to get the values. The problem I encountered with this was nothing and the values of each attribute were not a 1-5 number.

This prompted me to do some further reading on tkinter and the solution I found was to run my code as the function with the button. This would mean I could have a very similar code as I have for my description part. The reason this would work is that the issue I was having before was how I could make it so I knew what the current value of the slider is as once the window is closed these sliders get random values. My method for doing this involved running the code in the button before the button closed the code.

To start with I had to test that this method would actually work. To test this I wanted to see if I changed a value on the slider and then clicked confirm choices if the value output would be the value I put on the slider.



```
This is a follow temperature and which will become being description only second the well bear or allowed as a page of an argument of a page of a reference or a page of a reference or a page of a reference or a page of a sector of a page of a reference or a page of a page of
```

This proves that the values obtained are correct so I can now manipulate them.

The first step was to create an ordered list based off the highest numbers in the list. To do this I needed to create a list that changed based on the changes made in the first list.

```
**Whatcoin = SELymanin.pri/)
**Strong = SELymanin.pri/)
**Stron
```

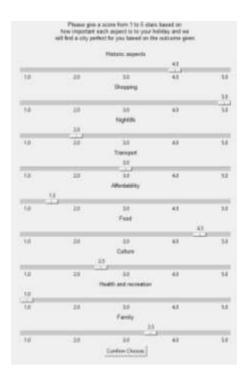
Create a list using slider values

This was the code I used to do that.

The inspiration for how I did that came from a user on stack overflow who created this code:

```
littl = (5.2,4,1, 1)
littl = ('three', 'tour', 'tour', 'unea', 'unea')
sorteffer = sorte(in)(litt, list), Neywlaedde x N(#) * Nos * N : monording on what you
soo (CL. 'unea'), (1, 'unea'), (2, 'unea'), (4, 'four'))
.
```

```
This is a holiday comparison code which will choose a holiday destination city around the world based on either an i mput description or a list of set theiras do you wish to write a description or choose from a list of set choices (input description or choices to make the de claim) choices ('SHOSPINO', 'FOOD', 'HISTORIC', 'FRHILY', 'TRANSPORT', 'COLTURE', 'HIGHTLIFE', 'CHEAP', 'HEALIN')
```



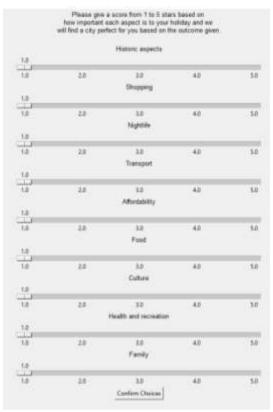
From the result you can see that the list created was ordered based off the values I input. This then meant I could use the code I created from the first part for finding a score and comparing and just adapt it to fit the new numbers we are working with. This will work as both parts are trying to reach the same end goal and we now have our menu values in the same format as when we manipulated the values from the first part.



This is the code we will be using for the finding of the city. As you can see it is exactly the same other than we are working with different variable names.

This is what happened when I tested if it worked:

```
This is a holiday comparison code which will choose a holiday destination city around the world based on either an 1 mput description or a list of set choices
do you wish to write a description or choose from a list of set choices (input description or choices to make the de
cition) choices
[149, 85, 140, 126, 125, 36, 131, 125, 117, 35, 125, 135, 107, 115, 103, 104, 111, 102, 115, 133]
The program has discovered 1 ideal destination(s) for your holiday
These are the cities we have picked up on:
Bangkok
```



I kept the score on to see if the city the program was providing was the correct one. In this case the city provided matched the input data.

This is a holiday comparison code which will choose a holiday destination city around the world based on either an nput description or a list of set choices
do you wish to write a description or choose from a list of set choices (input description or choices to make the cisionicholoes
[155, 109, 149, 137, 133, 104, 121, 117, 117, 104, 131, 122, 59, 119, 118, 118, 103, 107, 128, 137]
The program has discovered I ideal destination(s) for your holiday
These are the cities we have picked up on:

Rangkok  Please give a score from 1 to 5 stars based on flow important each supert is to your holistsy and we will find a city perfect for you based on the subcome given.				
		Historic aspects		
				5.0
1.0	24	3.0	43	5.0
		Shopping		
a				
		760	100	111
10	28	1.0	43	5.0
		Nightile		
.0				
LØ .	2.0	3.0	40	5.0
		Transport		
1.0				
0	2.0	1.0	42	5.0
		Afterbality		240
1.0		Petriality		
10	28	10	42	5.0
		Fund		
1,0		man		
0	28	1.0	42	5.0
77.71		Orbert		375
in.		- Lineare		
L.F	-	Total Control		
3	2.6	18	43	5/8
		Health and recreation		
1.0	2.0	3.0	45	50
75.5		Family	2000	- 17
0		17.77279		
	740	70.00	11000	
1.0	2.0	3.0	43	5.00
		Confirm Charges		

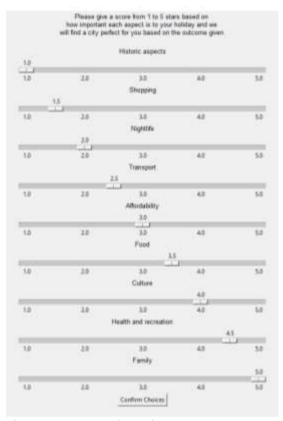
The reason putting historic to the top and leaving all the other attributes at 1 doesn't just give historic as the score is because this code makes a list out of all of the sliders this is why making a description is more accurate for the user but this method is faster for them. This is why I give the user a choice at the beginning.

This is a holiday comparison code which will choose a holiday destination city around the world based on either an input description or a list of set choices do you wish to write a description or choose from a list of set choices (input description or choices to make the demission; choices (input description or choices to make the demission; choices (input description or choices to make the demission; choices (input description or choices to make the demission; choices (input description or choices to make the description or choices the description or choices to make th

Please give a score from 1 to 5 stars based on hose important each aspect is to your holiday and we will find a city perfect for you based on the outcome given.					
		Historic aspects			
1.0					
-	1221	1102	1000	- 22	
1.0	2.0	3.0	4.0	3.0	
		Shopping			
1.0					
1.0	20	1.0	4.0	53	
		Naghtile			
14					
1.0					
1.0.	2.0	3.0	4.0	51	
		Transport			
1.0					
1.6	2.6	14	48	3.0	
-	***		-	- 77	
		Affectionly			
		3.0			
18	2.0	3.0	4.0	5.0	
		Food			
	20				
9,59	100	903	77/27		
10	20	3.0	4.0	34	
		Culture			
			- 4	5	
1.0	2.0	3.0	40	54	
		Health and recreation			
18					
			19331	- 0	
10	2.0	38	4.0	31	
		Family			
1.0					
12	2.0	- 10	40	5.0	
-					
		Confirm Choices			

This test here shows you can get 2 results as when two scores are equal it still prints 2 results.

This is a boliday comparison code which will choose a holiday destination city around the world based on either an i uput description or a list of set choices do you wish to write a description or choose from a list of set choices (input description or choices to make the de cision)choices
[ha, 101, 89, 114, 76, 118, 100, 108, 119, 103, 72, 97, 103, 63, 91, 89, 101, 100, 92, 69]
The program has dispovered 1 ideal destination(s) for your holiday
These are the cities we have picked up on:



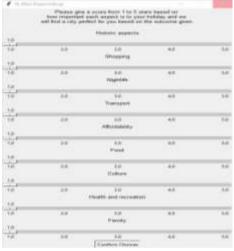
This was a test to show that it is not just giving the same cities each time and the different attributes are effecting the chosen city.

With all of these tests being successful we could then move on to asking the user if they liked their first choice or not and then giving them a second choice if they said no as we did with the first part.



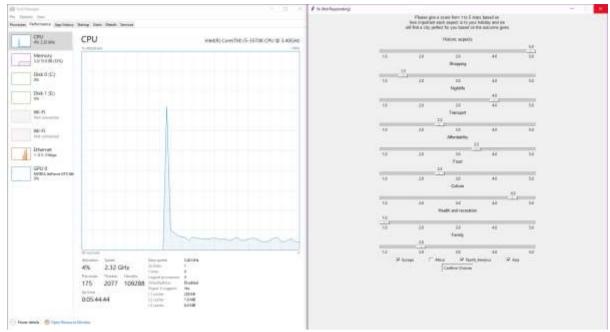
To do this I took my code from the first part and changed it to fit the variables used in the second.

Through testing I discovered that occasionally if your computer doesn't have a good enough cpu or you are running too many tasks in the background the program can often crash. I believe this may be the cause of the crash but it is difficult to tell as the crashes seem to be random and I haven't been able to see my cpu activity whilst the crash occurs.



This is an example of the crash.

After this I tried to find the cause of the crash by running my computers task manager at the same time to see if I could see a spike in cpu usage



The results shown found that the cpu only spiked when opening the menu and memory usage was constantly at 33% I couldn't find the cause of the crashes due to there being so many reasons possible. This impacts overall usability however the functionality of the program is unchanged as once this crash occurs even if the window is closed a result is still given with this result being the expected value received every time.

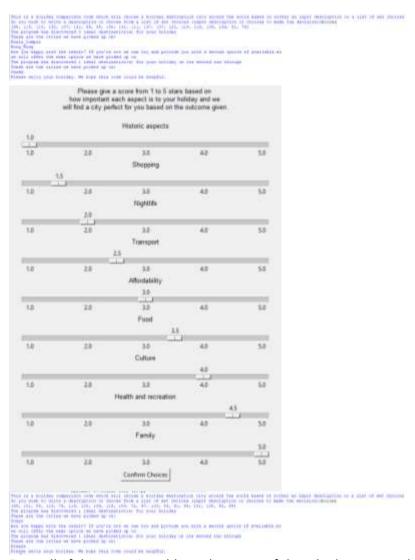
		Historic aspects			
.0	2.6	3.0	4.0	5.0	
		Shopping			
3					
2	241	3.0	4.0	5.0	
		16ghtile			
.0					
3	2.0	10	4.0	5.0	
		Transport			
.0	2.0	1.0	4.0	5.0	
80	550	Affordability		1 Table	
a.		11117000000			
3	2.0	10	4.0	5.0	
		Food			
4		1000			
4	24	10	40	5.0	
	.00	Cuthere	40	5.0	
			7.12		
	2.0	5.0	AD	3.0	
		Health and recreation			
	111	5743		1277	
	28	1.0	4.0	5.0	
		Family			
	11700	77111			
a .	28	3.0	4.8	5.0	
		Confirm Choices			
		Last Halle Talanas alessa	nine transparent to		the of my
GIR TO SELLE	A SHARRAST OF STREET	become figure a class of art officer	a copy decision	or on observe to make the decision of the con-	the street see

I used all of the same tests to see if it would work saying no for each one

Phease give a score from 1 to 5 stars based on flow important each aspect is to your holiday and we will find a city perfect for you based on the subcome given:					
		Historic aspects			
				5.0	
a	24	3.0	43	5.0	
		Shopping			
a					
0	28	18	42	5.0	
Life Company		Noprille	40	540	
a		ragross			
a .		111111	1111111		
.0	23	3.0	40	5.0	
		Transport			
D .					
n .	29	1.0	42	5.0	
		Afterbunkty			
а					
0	281	38	42	5.0	
	400	Fund	49	200	
0		F 9000			
3	- 20	7000			
B	28	3.0	40	5.0	
		Culture			
e e					
a	24	10	43	5/8	
		Health and recreation			
.0					
D D	28	1.0	45	50	
		Family		20	
0		- mind			
	2000			///	
D .	2.0	1.0	42	5.0	

The is a building compatible that do not build the set of the set

Please give a score from 1 to 5 stars based on how exportant each aspect is to your haliday and we will find a city perfect for you based on the outcome given. Historic aspects 20 3.5 40 3.0 Shopping 1.0 20 3.0 52 4.0 Nightlik 14 2.0 3.0 4.0 52 Transport 18 2.0 3.0 48 5.0 Afterbollty 12 18 2.5 48 5.0 Food 20 10 3.0 3.0 40. Culture 3.0 1.0 50 2.0 40 Health and recreation 10 2.0 38 48 50 Fanily 12 2.0 32 4.0 5.0 Confirm Chaires



From all of these test I could see that none of them had two second results so to make sure it was working for that as well I made another test.

		effect for you become on the	e indicione green.		
		Historic aspects			
1.0					
1.0	2.6	3.0	148	5.0	
		Shopping			
		3.0			
10	261	2.0	1.44	- 52	
(1997)	4.00	Nightlie			
10		- Control			
100		111		744	
10	28	3.8 Tomoport	48	58	
10		Triming party.			
mind .					
1.0	2.0	3/8	4.0	58	
		Aftrodity			
1.0				1000	
1.0	2.0	5.0	48	5.0	
		Find			
				58	
1.0	10	. 10	4.0	5.8	
		Culture			
		3.8			
101	2.6	3.0	4.0	- 58	
		Health and recreation			
10					
18	28	1.2	4.0	52	
		Family	1,000	1.00	
10		1			
		3.8	7.48		
1.0	3.0			- 58	

This result proved that it works for showing two results.

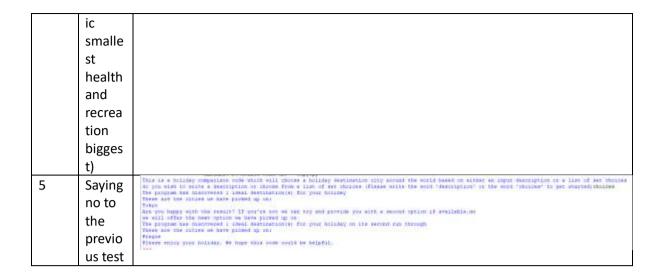
With all of this testing the core code now works any changes made now are all for user experience. This will include adding any extra words and switching some of the wording of the program to suit a better user experience.

Test table results (Description)

Test table r	esults (Descri	ption)
Test	Input	Actual results
Number		
1	Historic being the only feature selected	Thus is a belify properties only which will choose a belify marking out instance only around the wold based on white an input the returning of the wold based on white a security or choose from a list of an induser (flear wolf of the wolf description) to get characteristical flear and the wolf description of the wolf description in the schooled flear the wolf description of the wolf description.  Flear with a description of your perfect mainly describe mainly the proper believe to poor as another will thus on once accurate a the please tony the chosen of our at a time.  Please that the choice of a time is position; of imputance historic agents.  The proper has discovered a local describation; for your believe the school agents.  The proper has discovered a local describation; for your believe the accurate historic agents.  The proper has discovered a local describation; for your believe the accordance for the energy with the result; if you're not we and try and provide you with a second option if evaluation.  Acc you hopey with the result; if you're not we don't by and provide you with a second option if evaluation.  These was the cities we have proved up on the your believe on the cities we have proved up on the propers has discovered a local described up on the second on through the accordance of the cities we have proved up on the propers has discovered a their force on the cities we have proved up on the second on through these are the cities we have proved up on the second on through the control of the control of the propers has discovered a their propers to be happed.
2	Historic, Shopping, Nightlife, Transport	Into is a noticely comparison once which will choose a noticely instination city around the world based on either an input description of your perfect holiday destination that may be as long or short as needed longer description of your perfect holiday destination that may be as long or short as needed longer descriptions will turn please now type how important these aspects are for your holiday by typing each of these items in the order from most to least large please input the objects one at a time input the object you monaided to be in position 1 of importance historic aspects input the object you densides to be in position 2 of importance shopping input the object you densides to be in position 3 of importance mightlife input the object you densides to be in position 3 of importance transport. The program has discovered 1 ideal destination(s) for your holiday. These are the cities we have picked up on:  Rangkok Are you happy with the result? If you're not we don try and provide you with a second option if available no we will offer the next option we have picked up on:  These are the cities we have picked up on:  London please enjoy your boiliday. We hope this program could be helpful.
3	Historic being only feature selected with the user selecting no after options given	This is a holiday comparison code which will choose a holiday destination city around the world based on either an input do you wish to write a description or choose from a list of set choices (Flease write the word 'description' or the word Flease write a description of your perfect holiday destination this may be as long or short as needed longer description; please now type how important these aspects are for your holiday by typing each of these items in the order from most to please input the objects one at a time input the object you consider to be in position 1 of importance historic aspects  The program has discovered 6 ideal destination(s) for your holiday These are the cities we have picked up on: Bangkok London Frague Baycelona Amsterdam Wilen Are you happy with the result? If you're not we can try and provide you with a second option if available.
4	Historic, Cheap , Food, Health	This is a notidey comparison wode which will choose a holiday destination city around the world based on either an input description or a list of set in you wish to write a description of purpose to list of set obtains a list of set obtained which would be set of the set of
5	No keywords given	This is a boliday comparison code which will choose a boliday destination city around the world based on either an input description or a list of set choices do you wish to write a description or choose from a list of set choices (Flease write the word 'description' or the word 'choices' to get started) description.  Flease write a description of your perfect holiday destination this may be as long or short as needed longer descriptions will turn out more accurate in the end. The program struggled to pink up on any words from your description if you could please select from the given list to we can try and work out your perfect destination please now type how important these aspects are for your holiday by typing each of these items in the order from most to least important: ("Sistoric aspects", "Enoughing", "Dightlife", "To alth and recreation", "Semily")  please input the objects one at a time input the object you consider to be in position 1 of importance.

6	Wrong word put in when selecting	This is a holiday comparison code which will choose a holiday destination city around the world based or do you wish to write a description or choose from a list of set choices (Please write the word 'descript Please write a description of your perfect holiday destination this may be as long or short as needed to please now type how important these aspects are for your holiday by typing each of these items in the or please input the objects one at a time input the object you consider to be in position 1 of importance shopping  Please put in one of the items in ['Historic aspects']
7	Not putting in the words either choices or description	This is a holiday comparison code which will choose a holiday destination city around the do you wish to write a description or choose from a list of set choices (Please write the The choice you have input is not valid please try again do you wish to write a description or choose from a list of set choices (Please write the

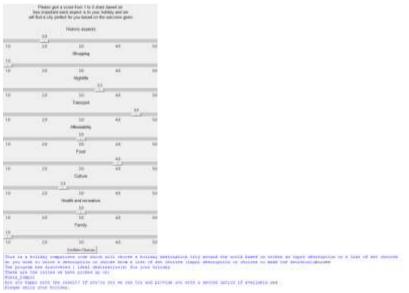
Test tab	le results	(choices)
Test Num ber	Input	Actual output
1	Histori c bar pulled to 5 stars	This is a holiday comperison code which will choose a holiday destination city around the world based on either do you wish to write a description or whose from a list of set choices (Please write the world 'description' or The program has discovered i ideal destination(s) for your holiday. These are the cities we have picked up on: Hangkok Are you happy with the result? If you're not we can try and provide you with a second option if available.
2	Cultur e set to 5 shoppi ng set to 4 Food and histori c on 3 and nightli fe set to 2	This is a holiday comparison code which will choose a holiday destination city around the world hased on either an in do you wish to write a description or choose from a list of set choices (Please write the word 'description' or the word the program has discovered 2 ideal destination(s) for your holiday.  These are the cities we have picked up on: London  Istanbul  Are you happy with the result? If you're not we can try and provide you with a second option if available.
3	None of the scores chang ed	This is a milding comparison ands which will choose a holiday destination city atomed the world based on either an input description or a list of set chaines in you exact to exit a description or choises from a list of set chaines exits the word 'description' or the word 'description' to get exacts(obscure). The program has discovered it ideal destination(s) for your biliney.  There are the cities we have ground up on;  Ranging with the result! If you're not we see try and provide you with a second uption if available.
4	Each bar from smalle st to bigges t (histor	The is a full second control which will be a described on a list of over the list of over the second control over the second c



After completing this iteration of the code I then proceeded to ask some members of the public and people that were available to test my code and give feedback. Their inputs where as follows:

```
That is a boilday comparison only made a boild above a Third pretocute of the condition of
```

This first user gave the feedback that I should include different regions. This would mean if the user asked for a city in Europe the program would only select those cities found in Europe.



This user helped show some users will actually use the choices feature when available for less time typing.

```
The probable consistence where which is settled before a probable of probability of the p
```

From this last user what could be determined was that users do wish for the region selection to be a possibility.

All of my testing previously had been done on a tower pc so there was an issue that I hadn't found yet. On certain computers primarily laptops the screen size isn't big enough to fit all of the sliders and the button. The solution to solve this problem would be to create a scroll bar however a problem with this is you cannot scroll through packed widgets. Seen as all of my widgets are packed this is not solvable. The other solution could be to find the screen size of the computer being run on and change the details depending on that. This is an issue that due to time constraints I cannot solve so any testing involving the choices aspect of the program will have to be done on a tower pc. With the final product this may not be a problem as it would eventually be uploaded onto a website were scrolling would be possible but for the app on phones if that were to be made this would have to be changed.

Please give a score from 1 to 5 stars based on the insectant each assect or to your holiday and we	
how important each aspect is to your holiday and we will find a city perfect for you based on the outcome given.	
Historic aspects	
10 10 20 30 40 50	
Shapping 1.0	
Nightife 1.0	
10 20 30 40 50 Transport	
15	
18 28 38 48 58	
Affordability	
1.0 1.0 3.0 3.0 4.0 5.0	
10 20 30 40 50	
1.0 3.0 3.0 4.0 5.0 Food	
The second second	
18 28 30 40 50	
Culture	
18 18 28 38 48 58	
Tealth and recreation	
M.	

As can be seen from the printed screenshot this is what the user can see on certain laptops and any information below this point is un-clickable. It is also possible that there may be a solution of some kind that I don't know about as I am not vastly experienced with using tkinter and many of my solutions for problems encountered are research based.

For example my biggest problem found so far has been finding a method of receiving slider values it

was after research that I found the .get() method however this was still not working for me. It was then that I discovered that buttons could run functions and I found my solution.

# Test Table (Description)

Test number	Input	Expected output	Reasoning
1	Test with Europe and	London,Prague,	This is all the places
	historic	Barcelona, Amsterdam,	which have historic as
		Moscow	the first attribute
			being in Europe.
2	Test with Africa and	Johannesburg should	I will be programing a
	historic with no being	be the first city given	response for if there
	said afterwards	with the program	are no cities left
		informing the user of	
		the state of the	
		program after.	
3	The test for north Ameri	ica should be the same as	the test for Africa with
	new York substituted.		
4	Test with Asia and	Bangkok	This is the only Asian
	historic		city with historic as
			the first aspect.
5	Just Europe selected	Should ask for an	Just selecting the
	with no attributes	order and whichever	region should cut
	selected	item is put first all	down the number of
		European cities with	available cities but
		that attribute should	should still ask for all
		be printed	attributes to be
			ordered.

# Test Table (Choices)

Test number	Input	Expected output	Reasoning
1	Europe selected	London	This is because
	without changing any		London is a European
	attributes		city which in the
			program before would
			be the second
			outcome after
			Bangkok which isn't a
			European city.
2	Africa selected with	Should print	As with the first part I
	no being said after	Johannesburg with	will be programming a
		users being informed	response which will
		afterwards	only be needed in this
			version due to a lack
			of cities.
3	Find an input which	Should do exactly as	This will test if
	will print multiple	intended	multiple region
	outputs for the first		options can be printed

	option		
4	Find an input which will print multiple outputs for the second option	Should do exactly as intended	This will test if multiple region options can be printed with no being said to see if my program is now restricting anything
5	All regions selected	Should print as if no regions are selected	All items will be added so nothing will be different

## Software Development and testing Iteration 2

From the user feedback I received after the testing in iteration one it seemed that I could make some of the wording clearer to begin the code I asked the users how they would like it phrased as to allow more people to understand and this was the response give:

```
Choice = imput("do you wish to write a description or choose from a list of set choices (Flease write the word 'description' or the word 'choices' to get started)")

if Choice = "description" or Choice.title() = ("Description"):
```

This led me to make another wording change with the description instructions and just clarify that the description can be any length:

importance only a description of your perfect incides destriction this may be or imp at ours, as order longer mentions will take our more equal to the end.

This was the first thing I began to work on in the second iteration. I would first sort this out by creating a list named by the region. Within this list it would contain each city that is from that region. The regions will be the different continents: Europe, Africa, Asia, North America, South America, Oceania This excludes the continent Antarctica due to this not being a holiday destination.

When making the lists I found that I do not have any Oceanic or South American cities in my sample however, if I was doing all cities I would include these as well.

```
CULLAR = (Bangeon , Bonapeen , London , Vienne , Barts , Fragre , Tonat , Engapore , Tonyo , Banto , Bengrous , Bonapeen , Bonapeen , Bonapeen , Bonapeen , Bonapeen , Banton , Banapeen , Banton , Banapeen , Banton , Banapeen , Bonapeen , Bona
```

Next what I had to do was when picking up from the description I had to search for the region words those being (Europe, North America, Asia and Africa)

The testing for if this works will have to be done on the European and Asian continents as north America and Africa only have 1 city each from my sample list.

With these lists what I first tried to do was make cities equal to the variables of the different lists as follows:

```
if "Europe" or "europe" in Description:
   StrCities = StrEurope
```

This didn't do anything and would still print cities not from Europe.

The next thing I tried was to change the variable cities:

```
if ("Europe") == ("surope") in Description:
    Cities = [Budapest, London, Vienna, Paris, Frague, Istanbul, Sarcelona, Amsterdam, Milan, Muscow)
if ("Africa") == ("africa") in Description:
    Cities = [Johannesburg]
if ("Murth America") == ("corth america") of ("North america") == ("corth America") in Description:
    Cities = [Hew_York]
if ("Asia") == ("asia") in Description:
    Cities = [Bangkok, Dubei, Singapore, Tokyo, Secul, Musia_Lumpur, Hong Mong, Istanbul, Osaha]
```

## When tested with Europe this gave all results that had a location in Europe:

```
This is a boiling comparison code which will choose a military destination city accord the until based on either at input description to a list of set choices the year which is notice of descriptions or offices of the description of purp perfect military destinational description or description of your perfect military destinational description or description of your perfect military destinational description of your perfect military destinational description or description of purposes. It is not the dispect of these expects the description of accordance in the control of the control
```

## To ensure this had actually worked, I tested the program with another region:

```
This is a boiling comparation and related till discover a boiling amplication ally assembly the more based on allier at input description of a light of any decimal to you might by region a description of a light of any decimal to you might by region at a description of private perfects hilling descriptions in the region of private perfects hilling descriptions in the region of the decimal of private perfects hilling descriptions in the region of the decimal of private perfects hilling any temperature of the region of the decimal of the decimal of the region of the regio
```

Seen as this gave the same result this told me that it had not worked. The fact it also changed the regular value of what would appear if just historic aspects was input would appear there is something else that needs to be changed.

```
Statistics of Paragraph, "Resignant, "Constant, "Constant, "Respect, "Respec
```

After going through the code I quickly realised it was searching through the old cities list so I needed to change the string lists to make sure it's searching through the correct list.

This is a bolimag comparison and which will these a higher destination they around the would be added to a single description or a list of an obtained that will be come of the come of th

The results clearly show cities not in Asian cities. This showed there was a problem with the code somewhere

To find out where the issue was I would print what StrCities was after it should have been changed. For Europe the correct cities list was printed however, when I used African cities as an example the cities being printed were the exact same as the Europe list.

This is a buildey comparison onto which will observe a brightey destination only second the much board on either an impost description or a time of see observe do you wish to write a description of your partner buildey description of your partner buildey description of your partner buildey description the world "description" of the world "description" of the world "description" of your partner buildey description things by epping each of these liens in the world image description will worn not more accurate in the excitate appears not type four appointant these aspects are for your beliable by epping each of these liens in the video from nort to least important: "Historic appears" places import the objects one as a time.

Included by "historic degrees" the partner of the part

When testing without a region I found that the European list was still printed:

```
This is a "holidy comparison code which will choose a buildey destination city around the world based on either of input description or a list of set theirses "Passa withe he word "description or your partner hilldry destination this may be as long or which as description of your partner hilldry destination this may be as long or which as needed imped descriptions of this partner hilldry destination this may be as long or which as needed imped descriptions will wint wors accurate in the or please now type for impredicts those as special are for your holiday by typing each of these bless is the order from most to least improbable ("Historia aspects") please down the highest one at a bias larger two shopped your positions in the partner of impredicts the property or commonder to be in position I of imprehense flavours aspects") [This is, 10, 12, 8, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 1, 10, 12, 11, 10, 12, 11, 10, 12, 11, 10, 12, 11, 10, 12, 11, 10, 1
        Throws the providing the second of you're not us one tay and provide you wish a second option of scalings so 
us cold offer the mann option we have probed up by 
The program has discovered it ideal descinations: for your builday on the second our storage 
These are the utilise we have picked up us.
Staces enjoy your holiday. We hope till progress could be neighbor.
```

By checking if it was true the Europe was in the description list and all the other regions where as well I found that all of these results were returning true. This led me to change the method I was using to select the region.

The method I would be using would be using would be similar to ones I have used in the past with the searching algorithm where I could create a list of keywords and use that.

This is the list of key words I would be searching for. This is incomplete and isn't as long as intended however, I cannot thing of all the words that would be used to describe these regions.

```
africatal) : Bearingian ** "Africa" ** Segime: Segime:
     on in samps [los (Mresh_Memorica)) )
Worth_America(a)]
(** Morth_America(a)] ): Description and "Morth America" and in Degions:
Sequence, append ("North America")
Scie[a]]
```

This searches through each region keyword list for the length of the keyword list and checks if the words found are in the description. If they are found in the description it checks that the region is not already there and then appends the region name to a list called regions.

```
Cross - Degree - Designer, Sondon, Yawren, Detin, Steppen, Satestral, Barrelone, Secretari, State, Steppen, States - Designer, Sondon, Vierre, Detin, Steppen, Satestral, Barrelone, Secretaria, State, Steppen, States - Degree - Chicar - (Adaptive of Degree - Chicar - (Adaptive of Degree - Chicar - (Degree - (Degr
(1) "Anja" il Beginne:
Cities * (Bergins, Dahn, Singupres, Tokyo, Sensi, Rusis, Longes, Song, Kong, Istochol, Sussa)
```

The code will then check if the region is in the regions list and if it is it will change the value of the list cities to equal only those cities within the specific region.

I then tested if this method had worked and the results were as follows:

```
This is a bridge competent code which will offere a believe destination only account the results well as Input description or a list of any observed to you wish to retain a description or a list of any observed to you wish to retain a description of your partial his list at a believe the open description of your partial his list at a believe the open of your partial highly descination white any description of your partial highly descination which was a long or a state of account to the open and the partial highly descination which was a long or a state of a long of description will your not not now account on the open and the open and the open and the open and the last important [Washelp agents] in the open and the last important [Washelp agents]
   become
we you happy with the result! If you've not us can key sed provide you with a secret uption if available no
e will offer the new option we have picked up int
the program has discovered it ideal descisation of for your hillday on the second you through
these are the cities on there picked up on:
                   eatry your holiday. We hope this program could be helpful.
```

This initial test was to see if the values for Europe were correct and being searched for.

```
This is a boilday comparisor code which will choose a boilday destination only annual the world become on either as impost description in a list of eat choines on you wish to make a description or offices or feet of eat choines (Means write the coord "description" in the coordinate of the coordinate
          (1)
("Adhenicating")
The properties the discovered i Limal description in for your holiday
Theorems the cities we have promed up on:
              Indemnestracy with the resolut IF yearse now we can very end provide you with a second option if evaluable so will affect the next option on have picked up on seconds from reach relations. File 20. Choice Mark (E. py*, line 2%, in manula-
Nextern File 20. Choice Mark (E. py*, line 2%, in manula-
File 20. Choice Mark (E. py*, line 2%, in manula-
                                                               )

O-Common Whith (El gy?, line lys, in her

exting -- City(s)

o- live index one of range
```

I then tested for Africa and an error occurred as because the list is only of length 1 city there can be no second option available.

This is a boiling comparison code which will choose a boiling destination miny around the would based on either as input description or a list of set obsides do you mish be write a description of these from a list of set obsides flease write the word 'description' or the word 'obsides' to get stated description flease write a description of your perfect holiday destination whis may be as long or short as needed longer descriptions will turn but note accurate in the emplaces now type how arguments News experts are for your holiday by typing each of these ineeds longer descriptions will turn but note accurate in the emplaces input the objects one at a time important blue presents and the interest in the surface from most to least important: 'Historic aspects' I important the objects was consider to be in president I of importance historic aspects. Their [nut']
The program has discovered I ideal descination(s) for your holiday.
These are the cilias we have givened up on
New York e. Then
a possible per with the secolar IF years were we man top and provide you with a second option of available as
will offer the sect option we have picked up in
without incore termin call limit;
file "Do Common Wirsh if py", lime 154, in 'manufac'
Determin!
Elia "Do Colores Wirsh if py", lime 150, on Beautre. File 72 (Course Note (1) py\*, line ist, in her 12 Hardten == Corpir) Todordrane: line index one of range

North America had the same problem. This prompted me to fix this by creating an if statement saying if the length of the cities found is 0 then we should apologise and say no secondary cities could be found. If more cities were included this problem wouldn't be encountered as there would be enough cities in the world but this will be the solution for the proof of concept I am currently building.

This is a bilder comparison code which will choose a builday destination city around the world bases in either an input description or a list of set choices in you wish no withe a description or choose from a list of set choices (Flasse write the word 'description' or the word 'description' or the word 'description or place in yet assessible stripes as a description of your perfect builday destination that may be set iong or short as needed limper description will from not now a concate in the episses now type how important these expens are for your builday by typing each of these times in the order from most to least important ('Historic expects') layor the objects use as a line use of a line president of importance historic expects. despine Are you happy with the recalcy If you're not see has try and provide you with a second option if available no se will offer the nest option we have proved up of The program has discovered I ideal destination(s) for your billday on its second run through These axes the cities we have picked up on: e enjoy your haladay. We hope this progress rould be helpful.

This final test was to see if it would search for multiple cities in the Asia list as well.

This shows that all the regions work to some extent. For the final testing of this section I will test with other attributes just to ensure it works with other values as well.

```
Gong = normal/decambles, septics, overse
FirstNumber = Prosellet.comms(Ging(E))
on FirstNumber
Options = E)
           ediaber of incidentalists:
IntiMe could not find any merchant vicins. This program is a word or proposes and does not consist all occide just just just in
```

This is the code for testing if the second value is possible to find. This will only be applicable to the city of New York and Johannesburg when searched with region as these cities are only a list of size

```
This is a hillday compared only will observe a hillday destination can ecound the model board on atther of apart description or a list of set observed you wish to rects a description of purpose to the or observed the model of the set of the set of the order of the set of the
           [3]
["Anhanneshrep"]
The program has discovered i Limal destination(s) for your holiday
[here arm the chiles on here plotted us on.
           Decorporating the province of the province and we not very one provide you wish a second opening of available and not the your terms of the province of available and not the province of the
```

The code functions as intended and exits before the error occurs.

The next thing to do was I needed to add regions on to the choices section. I could do this by making the choices options be buttons contained at the side of the screen.

```
frame = Frame(winth=800, height=600,)
frame.pack(side=TOF)

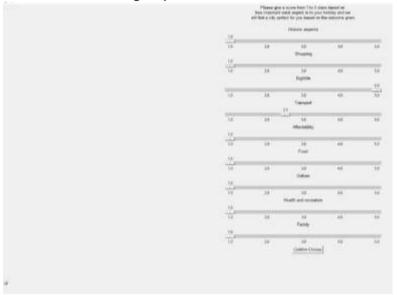
AREurope = Checkbutton(frame, text = "Europe")
AREurope.pack(side = LEFT, pade = 20)

ALAfrica = Checkbutton(frame, text = "Africa")
ALAfrica.pack(side = LEFT, pade = 20)

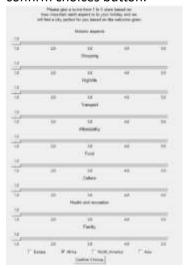
ARMorth_America = Checkbutton(frame, text = "Birth_Amerida")
ARMorth_America.pack(side = LEFT, pade = 20)

ARAsia = Checkbutton(frame, text = "Asia")
ARAsia = Checkbutton(frame, text = "Asia")
ARAsia = pack(side = LEFT, pade = 20)
```

This is the code I used to create the buttons. Initially I did not have the frame line and all buttons were attached to master so when I padded the buttons to a particular side they appeared as shown below with them being very small and to the side.



After adding the frame the buttons now appear centred and on line with each other above the confirm choices button.



The pixel padding I chose to be 20. This was decided through trial and error as all the other looked either too small or too large whereas this look just right.

Currently these buttons don't actually conduct a task so pressing the confirm choices button will still serve the same purpose as before.

In order to make the check boxes do something what I need to do is implement them into the button I need to check the state they are in when the confirm choices button is pressed (that being ticked or

not) those that are ticked need to be the cities in the city list and those that aren't need to be discarded. This allows for implementation of the region selection into both parts of the holiday selection program.

```
AMERICO - Checkbuttun(frame, trat - "furne", novalut - 1, offvalue - 0, variable - Europe"ne)

AMERICO - Checkbuttun(frame, text - "furne", novalue - 1, offvalue - 0, variable - Africa"n)

AMERICO - Checkbuttun(frame, text - "furne", novalue - 1, offvalue - 0, variable - Africa"ne)

AMBORTH Americo - Checkbuttun(frame, text - "furne Americo", novalue - 1, offvalue - 0, variable - Europe - EFT, pade - 20)

AMERICO - Checkbuttun(frame, text - "Ania", onvalue - 1, offvalue - 0, variable - Asia"azi

AMERico - Checkbuttun(frame, text - "Ania", onvalue - 1, offvalue - 0, variable - Asia"azi

AMERico - Checkbuttun(frame, text - "Ania", onvalue - 1, offvalue - 0, variable - Asia"azi

AMERico - Checkbuttun(frame, text - "Ania", onvalue - 1, offvalue - 0, variable - Asia"azi

AMERico - Checkbuttun(frame, text - "Ania", onvalue - 1, offvalue - 0, variable - Asia"azi
```

To give the check boxes a value I had to give them a value of 1 when on and 0 when off. To get the current state of the check boxes in tkinter what must be done is a variable must be set to the check box

```
print(ALEurope)
print(ALETica)
print(ALEOTH_America)
print(ALESia)
```

To test if this was being picked up on, I printed each one out.



With the test on the left, the result on the right was what was printed. This was printed as intended so I knew that with that I could now manipulate the values and use them to change the number of available cities.

If the value is equal to one that means the check box is ticked. This means I can then change the value of cities of each region based on the indicated check box.

```
Paddise - ("Sugar", "Sugar", "
```

As with the descriptions part of the code what I had to change the values of the string cities too with the same changes to the cities list.

```
City = sorted(Scorelist, Reywint, reverse*Cook)
FirstNamber = Scorelist.count(City[0])
ad = FirstNamber >= len(Scorelist):
priot("We should not find any secondary rities. This progress is a work in progress and does not contain all rities pust yet.")
exit()

This broad(D. Len(Scorelist)):
```

Because there is only one city in both the North America list and Africa list I need to make sure if the user is saying no to the provided list they are informed of the state of the program. In the real program this would not be included as more cities would be available from each region so it wouldn't be possible for the program to not find a second choice.

To test if the code had worked I conducted the same tests as I made with the descriptions part by testing each region individually with the historic option. It is not needed to test the program with the other search options as I already know it is searching correctly I just need to ensure it searches through the correct region list.



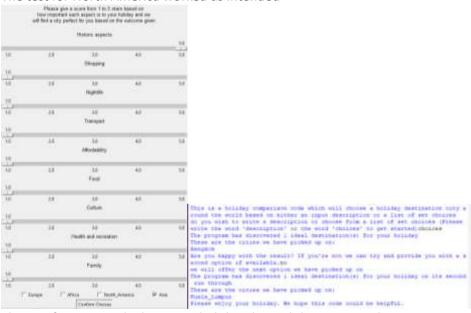
The test for Europe worked as intended.



The test for Africa worked as intended

	See inpeter	a a come from 1 to 1 prans I spath regard to its year hall what the year based on the	Boy and year		
		House, especto		146	
	- 24	300	40	36	
		Graphy.			
	20.	10	40	1.0	
		Nighths.			
		- 12		0.00	
	28		40	58	
		Temper			
	40	30	40	3.6	
		Affectables			
	- 27		AN	140	
	38		44	24	
		Fine			
_					
	327	36	40	1,340	
		O.Rim			
-					
	10	10	40	- 14	
	-			-	
		LANGE AND ADDRESS.			
	30	34	40	100	
		Facely			
	28	30	40	3.0	
		mer Warman		Ass	
13.7	200	Contine Debas	30	200	
20.0	SHIPPING SHIP	MILES THE PERSON IN	11 (00)	PERSONAL PROPERTY.	tion july estand the most based on estant an object description to a sign of set ob
TH MAR	th to state a	description of our	pe from a l	Lan of her or	see Where with the will presidents, in the will children, to bet are tong applie
		e bave garded on on-			
THE					
proc Pa		SELECT AN UNION STORY OF A		NA BAR BARANA	you with a provint type on of evertibility to

## The test for North America worked as intended



The test for Asia worked as intended this showed that region selection was working.

After this I decided to test to see what would happen if multiple regions were selected for both the descriptions part and the menu.

```
This is a brindey comparation took which will choose a brindey destinative they entered the world besset on either we imput description or a list of set obtained the provided to provide a description of the prefetch brilling bestimation to the set of the control of the prefetch brilling bestimation this may be a long or singuration there expects to the provided best provided by typing each of these times to the imput descriptions will form not may a required in the entered expects of the provided by typing each of these times to the imput descriptions will form not may a required in the entered expects of the provided by typing each of these times to the imput descriptions will into most the provided by typing each of these times to the imput description will be entered each of the provided by typing each of these times to the imput description will be entered each of the provided by typing each of these times to the imput description will be entered each of the entered e
```

When both regions of Europe and Asia were input a logical error occurred. This happened because my program is done via if and elif statements so only the first city list will be selected so the asia list never would. To sort this problem what I would have to do is append each city to the cities list based

on the region so that more can be added.

```
Cities glower in Segions:
City = [Budages, London, Vienne, Feris, Pregue, Istandon], Resterden, Milan, Morecow)
For All in range Lan (City):
Cities appear (City):
Cities (City):
Citie
```

To make it work as intended and append the statements as needed I created loops to append the cities individually based on the loop number.

```
Parcisies = []

If "Enouge" to Degions;

Surcise = [Thutspeer", "Lummus", "Farie", "Frague", "Jetannal", "Enresions", "Missions", "Missions", "Missions"]

Furcise appears (Parcise), "Lummus", "Farie", "Frague", "Jetannal", "Enresions", "Missions", "Missions")

If "Arrais" to Regions:

Surcises appears ("Advanceours")

If "Morth America" to Regions:

Surcises appears ("Missions")

Surcises and "Missions", "Missions", "Missions", "Faries", "Fundans", "Missions", "Missions",
```

I had to make sure the string values were the same or they wouldn't be attached correctly.

I then had to test if the values being used now are correct just in case I had reordered one of the lists. This shouldn't have happened as I appended by the index of the other list but I just have to make precautions.

The tests I made were according to the descriptions test table as this should be the final issue of this section of the code.

This part will also be tested according to the test table too.

Test tal	ole Resul	ts (Description)
Test	Input	Actual output
nu		
mb		
er		
1	Test with Europ e and histor ic	This is a holiday comparison code which will choose a holiday destination city around the world based on eit do you wish to write a description or choose from a list of set choices [Please write the word 'description' Please write a description of your perfect holiday destination this may be as long or short as needed longer please now type how important these aspects are for your holiday by typing each of these items in the order please input the object one at a time input the object you consider to be in position I of importance historic aspects  The program has discovered 5 ideal destination(s) for your holiday These are the cities we have picked up on: London Prague Barcelona Amsterdam Moscow Are you happy with the result? If you're not we can try and provide you with a second option if available.
2	Test with Africa and histor ic with no being said after wards	This is a builday comparison code which will those a builday destination by around the world based on either an input description of do you wish to write a description of choice from a list of red choice (Finese with the world 'description of the worn 'choice' to a Siese waite a description of your perfect builday destination this new be a long or where a meeted long of sent will turn out. The progress erloy(ded to pick up on ear words from your description of you could please select from the present in the new age to the grown list or we can try and we please how type both appearance there aspects are for your beliefable by typing such of these items in the order from more to least important along the object you consider to be in position i of importance another object you consider to be in position 3 of importance historic aspects.  Input the object you consider to be in position 3 of importance taxonapes input the object you consider to be in position 5 of importance taxonapes to be in position 5 of importance deformability input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food input the object you consider to be in position 5 of importance food in the object you consider to be in position 5 of importance food in the object you consider to be in position 5 of importance food in the object you consider to be in positio
3		
4	Test	Dais is a boliday comparison code which will choose a boliday destination city account the world based on either an input description or a list of set choices for you wish to write a description or choose from a list of set choices [Rease write the word 'description' or the wor
	with	Please write a description of your perfect bolishy destination this may be as long or short as needed longer descriptions will turn out more accurate in the endamna and historic
	Asia	please now type how important these aspects are for your holding by typing each of these items in the order from most to least important: ["Historic aspects"] please import the objects one at a time
	and	input the diffect you consider to be in position I of importance
	histor	historic aspects The program has discovered I bdeal destination(s) for your haliday
	ic	These are the cities we have picked up on:
		Respirate  Are you happy with the central of you're not we can try and provide you with a second option of amellable.
5	luct	This is a bottomy companions note which will above a naturally destruction only around the would haved no action as input destruction or a line of securities.
5	Just	An year one to write a sensighter to make from a lass of set despend of the wood "description" on the wood "description of your perform belong destruction and your perform belong destruction of your perform belong destruction of your description of your performance of the scheduling the program struggles to proxify a way write from your description of you could please select from the given in a set or an log and work our your perform sections.
1	Europ	place for type he algorithm then expects at a her your builder by typing each of these items in the crise first som to least ingerment ("Enterior aspects", "Engages", "Engages"
	е .	places there the aboves one as a time input the aboves on as in time through expect you contains to be in position ; of importance through expects
1	select	inget the Object you consider to be in position 2 of importance (Monaton
	ed	larges the object you need not to be in produced to do importance mightings larges the object you immediate to do in position 4 of importance
	with	Tanaparts of the Control of the Cont
	no	afformulate the determined to be in position of of omposeums than
	attrib	qual the mire pla mexical to be in plantion * of aquation *
	utes	output the disject the numerous to be in position 6 of importance backs and proveding copies the object you immunes to be in position 8 of importance
		Sering Two program has discrepted 1 mind. Serinarization for your building
	select	Description the cities of here proved up on: London London Lin box happy with the removal of you're out or one toy and gravide pre-mills a would spirite. If you're happy with the removal of your control of you're happy with the removal of your control of
	ed	The same was the same of the s

Test table Results (Choices)

Test	Input	Actual outcome
numb		
er		
1	Europe selected without changin g any attribut	This is a boilder comparison code which will choose a boildey destination city annual the world hased on winder an imput destription or a list of set the day gos wish to write a despription or choose from a list of set the day of set of the world "description" or the world "choices" to get scarted chaines the program has discovered I ideal destination(s) for your holiday.  These are the critical we have plotted up cot limits.  Are you happy with the result? If you're not we can try and provide you with a second option if smallable.
•	es	This is a holiday comparison code which will choose a holiday destination city around the world based on either an input description or a liv
2	Africa selected with no being said after	mo you wish to write a description or choose from a list of set choices (Flease write the word 'description' us the word 'choices' to get sta The program has discovered I ideal destination(s) for your holiday. These are the cities we have picked up on: Johannessurg Are you happy with the result If you're not we can try and provide you with a second option if available.no we will offer the next option we have picked up on We could not find any secondary cities. This program is a work in programs and does not contain all cities just pet.
3	Find an	Its very difficult to find multiple printed cities as the program has far too many
	input	available variables to account for and there is no way for a human to calculate
	which	what the input should be
	will	
	print	
	multiple	
	outputs	
	for the	
	first	
	option	
4	Find an input which will print	Its very difficult to find multiple printed cities as the program has far too many available variables to account for and there is no way for a human to calculate what the input should be
	multiple	
	outputs	
	for the	
	second	
	option	
5	All	This is a builday comparison code which will choose a builday destruction only around the world based on solder at input description or a list of set chooses on you wish to work a description or choose from a list of set chooses write the world 'description' or the world 'choices' to got started choices.  The program has discrepted 1 lists descripted to your builday.
	regions	Those are the culture we have glotted by ter. Bengrox
	selected	Are you happy with the result? If you're not we can may and provide you with a second opins of available.

After conducting these tests in the test table I asked some members of the public to help test my code. Each time I conduct user testing I am trying to find something I may not have thought of myself. As I am not a team of people like would be programmed with ordinarily, I cannot think of every possible writing style as many different age groups write differently. If this was further developed I would be using AI which would help account for all the different writing styles possible.

#### User 1



### User 2

		score from 1 to 1 also extrapolate to your		
	it find a only such	of the later beared shift	Per part trianglesses	
		Three agents		
		Lance Square		
77				
16	141	14	41	1,00
		dissilve		
	181			
				-
16	17	44	- 11	- 17
		No.		
	-0			
d.	11	44	44	146
		Tennor		
	- 11			
	3.4		1111	
	18	- 10	- 11	- 17
		Membra		
	14	10	44	1.66
		Fred		
4.7				
(although	271	7100	-11	1772
	181	10	44	- 10
		Subse		
4	14.	14	44	. 160
	1	half and months		
(4)				
	227	1121	44	77.2
	081	16		
		Fants		
-				
6	14	847	49	
M Aud	we / W	te Y'tem,	Johnson C &	teo.
		Contract Station		
10.14 1 1	office order	David Series 1000		
DISTRIBUTED OF	DO NELTH A.	BOOK STREET, SALES	Charles TAGE 4 3	141 02:40
ARREST VALUE	E & DESCRIPTION	of temport to	NOT BELLEVILLE BE	MINOR OF
SAME TOP !	form now page	STREET TORING AND	series any district	ory Antar
		1000 91 4 1000		
Light Living		B1 645 25 26 25	annual part	
40.00	edact yes im	middle to be on	protection ( of	DESTRUCTION
anapare .	clark her on		enterton dust :	(morning)
also my	Internal Line			
in property as	her Stanier	nd i tenti me		great total
wid laws		part parent so		
in him hope	op while the	mental theybrid		12 mile pr
e out 169	PE COS 1991	makes on here a	1100 00 00	
bette been b	as address on	have properly up	101	
the second				
ness my	L Line porty	the gate over 1977	SALAbre mery	be yerle

## User 3



These test provided some words to be added to the lists to be picked up on as these all provide different writing styles that I couldn't have thought of myself. I got each user to test both the choices and the descriptions part of the code as the descriptions part would provide a writing style that I wouldn't have thought of and the choices menu tests it in ways I couldn't have thought of myself. The users asked for two different holidays in each case providing evidence as if I had 8 different people testing however having 8 different people would be more accurate but I do not have the resources available to sustain this. This is because each time I ask users to test this takes time from their day and many people in the target audience range have things that they need to be doing with their days so don't have the time to take out. Especially because I am a sixth form student many of the people attending my sixth form are too young for my target audience.

From this user feedback I could see that users wanted to be able to not include certain features in their holidays this would allow then to exclude certain features by putting a keyword in front. Putting a feature like that in would require some extra programing and a new prototype version which I will call iteration 3.

## <u>Software Development and testing Iteration 3</u>

For this Iteration I will be changing the program to make it respond to negative words as per user feedback.

What this means is if someone were to say not Europe or no swimming or something similar the program will pick up on that and respond accordingly. This will be a challenge to integrate correctly as it will be difficult to determine what words not to include. This can be because there are many different ways to say you don't wish to do something. This would be easier to integrate with AI as you would then be able identify the different ways humans would say no with it only being inaccurate in the beginning.

My idea for how I was going to do this was to turn my input into a list of words and compare every two adjacent words to see if any of the words in my negative words list were there and discard the adjacent ones.

This will work as I am searching for the next attribute. I will only be searching for the next attribute within a given range after the negative word as after a certain point the negative word will no longer be referring to the attribute.

Test table (Description)

Test Number	Input	Desired output	Reasoning
1	Not word word word	Not word word word	The program should
	historic word	word	remove the next
			attribute after the
			word not within a 5
			word range
2	Not not historic	Not not	Historic should be
			removed and no error
			should occur as I will
			account for list sizes
3	Not historic historic	Not historic	The program should
			only remove the first
			attribute after the
			negative word
4	Not shopping	not	This is to check that
			historic isn't the only
			aspect being removed
5	not	not	This is to check no
			error occurs
6	Not historic word	Not word word word	This checks that the
	word word word not	word not word word	program is iterating
	historic word word	word word	through and not just
	word word		removing the first
			cycle of negative
			words used.
7	Not Europe	not	This checks the
			program is still

	working with region
	selection as well

### Test table (Menu)

The choices section of the code will not need testing seen as it should be the same as in previous versions.

I thought to start by splitting the description into individual words in a list

```
Description = impost ("Flores write a Marcrigation of your perfect builday destination this may be as long or about as needed longer descriptions will turn not more sommer Description.agist()
```

I used the .split() method to do this as this would split the input by individual words. I also stored that in a variable so that I could keep and manipulate the list.

```
Not - ("no", "not in", "sint went", "not")
```

I created a list of keywords that the program should pick up on as the negative words. Of course because everyone has a different writing style as with the other keywords there is no way without using ai that I could account for every possible writing style. With my code I am trying to make it account for as much as possible however I also cannot think of every possible word that could be used. Once this section of the program is finished I will also be testing it with members of the public as to ensure anything I haven't thought of gets mentioned. This will help as it will offer a different perspective.

```
to a in range (less (less ))

for an in anapar (less (less ))

for an in anapar (less (less ))

to less (less ) Const

to less (less ) constant (less )

for less ) constant (less )

for less (less (less )
```

Then to account for any list length errors as the Description word list or the list of keyword could both be longer and I cannot tell which will be. I iterate through both the length of the description word lit and the length of the keyword list. This means that the same keyword will be picked up multiple times so I will need to test to see if the method I come up with to solve this only removes the next keyword attribute and not all of them within that given range.

The first if statement checks whether or not any words in the negative words list are actually in the description word list.

If they are the program sets a range based on how many remaining words there are after the negative word. This is because the negative word could be near the end so the list would give an error. I set the amount of words to be 5 because I thought that would be an appropriate amount to pick up on the word. The loops check for 6 words after the length of description list minus the iteration number of the negative word as lists start on index number 0.

Then for each individual attribute I iterated through for the amount of keywords there are in each list and removed the attribute if it was there.

```
Chemical

16 Oraquinal Description

16 Oraquinal Description

18 Oraquinal Description

18 Description (Description)

18 Description (Description)

18 Description

18 Description (Description)

18 Description

18 Cadinary (Description)

18 Cadinary (Description)
```

Then once all of the attribute words that I don't want included in the description are removed I then re-join the description back to a string form and not a list as my program is written with it searching through a string for the attributes and not a list for them instead.

The first test I conducted was to see if the program would work with not old and not Europe I choose to test these two aspects at the same time here as it would tell me if the program is working faster than testing them individually.

```
The se a boliday compations under which will observe a boliday the highest with state on either as input description as a list of est choices of your performance from a list of est choices (flease with size with 50 wither a gave provediment plate)

The program entergales to prove you provide the provide perform boliday destruction that may be so be long or shrur as readed linguar description will not been entered to the second of the provide performance of the performance of the provide performance of the pe
```

Seen as the program worked as intended I could see that the code I wrote was doing what it was intended to.

This requires further testing but to find a problem I decided to use the test table until an issue was found.

# Test table

Test Number	Input	Actual Outcome
1	Not word word historic word	This is a billifey comparison code which will choose a billifey destination coty around the world based on either or topes description or a list of set choices. Glease worke the world descriptions will form not note account in the entities and send soon soon in the entities work as description of your perfects billifey destination this say be as long or short as needed longer descriptions will form not note accounts in the entities word soon soon in the entities work the original to the entities and soon soon in the entities word the entities word the entities word the original to the interest of the position I of importance.  The issue I discovered with this test was I had missed the capital version of the word not as when tested with the lower case version the program functioned differently.  This is a billifey comparison code which will choose a billifey destination city around the world based on either as input description or a list of set choices do you wish to write a description or choose from a list of set choices (Rease write the word 'description' or the word 'doctors' to get started description (lasses write a description of your perfect billifey destination this may be as long or short as needed longer descriptions will turn out note accounts in the endou word word billistoric word.  The program struggled to pick up on any words from your description if you could please select from the given list so we can tray and work out your perfect destination pleases now type how important these aspects are for your bullifey by typing each of these trans in the order from most to least important: ("distortic aspects", "Roughiny", Wight life", "Toody", "Outcore", "Bealth and recreation", "Remily") please toput the drives you consider to be in position I of importance.  This was functioned as intended.  To fix this issue I added the upper case version of not to the list  Not = "no", "not in", "don't want", "not", "Not")
2	Not not historic	This is a boliday comparison onde which will choose a boliday destination city around the world based on either an input description or a list of set choices in you wish to write a description or choose from a list of set choices (Flesse write the word 'description' or the sond 'choices' to get started description. Please write a description of your perfect beliefay destination this may be as long or short as needed imper descriptions will turn out more arounds in the endiet may be be proposed to give up on any words from your description of you could please select from the given list so we can try and work out your perfect destination please now type how important these aspects are for your beliefay by typing each of these items in the under from next to least important: ['Historic aspects', 'Bougling', 'Bughling', 'Taxangers', 'Affordability', 'Bood', 'Galtone', 'Bealth and recreation', 'Taxangers', 'Historic can at a time input the object you consider to be in position I of importance.
3	Not historic historic	This didn't work as intended as this has shown that the program is removing all aspects after the word not. This will not affect any of the other tests in the test table so I will finish conducting the tests and then fix the problems after the table is finished.
4	Not shopping	This is a belief comparison rode which will above a beliefy destination city around the world based on either an input description or a liet of set above do you wish to write a description or choose from a list of set above. Classe write the word 'description' or the word 'choices' to get started description. He have write a description of your perfect belief as as long or short as media longer descriptions will num out and a constant in the endict shopping. The progress strongled to girk up on any words from your description if you could please select from the gives list as we can try and word out your perfect description glasses now type have important these separts are for your beliefs by typing each of these lines in the order from most to least important ["Historic separts", 'Stamping', 'Wighti life', 'Transport', 'Affordability', 'Tood', 'Culture', 'Meelts and recreation', 'Family'! please input the objects one at a time input the objects you consider to be in position i of importance.
5	not	This is a holiday comparison onde which will choose a holiday destination ray around the world based on either an input description or a list of set choices do you wish to write a description or choose from a list of set choices (Desse write the word 'description' or the word 'choices' to get started description.  The program struggled to girk up on any words from your description if you could please select from the given list or we can try and work not your perfect destination please now type how important these espects are for your boliday by typing each of these items in the order from most to least important: ['Mistoric aspects', 'Thopping', 'Bightlife', 'Tomapore', 'Affordability', 'Tood', 'Uniture', 'Realth and recreation', 'Family') please imput the objects one at a time input the object you consider to be in goaltion I of importance

6	Not historic word word word not historic word word word word word word word	ins is a boundary comparison code which will choose a noticinal destination city around the world "description" or the word "choices" to get started/description.  Flease write a description of your perfect holiday destination this may be as long or short as needed longer descriptions will turn out more accurate in the endfort historic word word word word word word word word
7	Not Europe	The is a minimary comparison code omich will decome a minimary decomes and interest of the code of addition and place of one of the code of addition to be and of additional to the code of additional t

The only issue found in the program found in the test table was that after a negative word all attributes are being removed.

The first thing I did to try and resolve the issue was add a break to the end of the if statement to try and stop it removing more than one historic

```
for av in range (len (Historic)):
   Historic[av]
    if Historic(av) in NextFew:
       Des.remove(Historic[av])
```

This did not work and yielded the same results as in the test table

```
The art of the control of the contro
```

The next thing I tried was to set a variable equal to zero and remove the item only if the value of the variable is zero and add one after the item has been removed.

When testing to see if this method had worked I found an issue.

```
This is a builder compensate ands which will choose a builday deviced on my account the world based on atther or input description or a list of our choose from a list of ear photose (Fases writes the used "darryppine" or the used of the
```

This was only removing the first attribute and then because the value of the variable would be greater than zero after that point it does not continue to remove anymore. This made me think about the problem some more and I realised I couldn't just create multiple variables what I would have to do is find a way to stop the loop another way.

The issue being had here is the program is checking all of the next 5 words after the negative word. This is an issue due as the attribute after the first attribute removed isn't one we want removed at all.

This means we have to find a way to stop the loop after the first attribute is found. An issue with this is that there can be multiple negative words in the input meaning after the first removal we need to find a way to ignore the next words until a negative word is found again.

The solution I came up with to solve this issue was to set a variable value to zero if the current item of the description word list is equal to the current word of the not word list and then only remove the next attribute if the value is equal to zero.

```
This is a building impurious of your Paulies

This is a building impurious of your Paulies

This is a building impurious of your pattern building destination with any he as long is short as inspired exceptions of the works of your pattern of your pattern
```

The outcome shows that it is performing the task I wanted it to however an error is printed as I have removed a value from the descriptions list so the program is trying to look for that value.

To solve this problem what I thought to do was to add a new word to the descriptions list in the place that had been removed. The word I add would have to be one which doesn't affect any of the search algorithms as it has to have the same effect as the attribute not existing on the program it would also have to be in a position of +1 to the current loop number as we remove the words after the word not and so to add that position back we have to add one.

```
### ab in pergellen(Hest):

### as in sumprise(Hest):

### fast of Bert

print(Derint):

#### fast of Bert

##### fast of Bert

#### fast of Bert of Be
```

For testing purposes I have included the printed loop value and have only made this work for historic values. If these tests are successful I will then add the rest of the values in and input values from the test table again as was done previously.

```
This is a boliday comparison code which will choses a boliday destination city a round the world hased on either an input description or a list of set choices do you wish to write a description or choose from a list of set choices for making the world description or the word "choices" to get started description? If you can be set in the set of choices are set of the control of choices and the set of choices are set of the control of choices and the set of choices are set of the word choices are set of the word of the set of the choices are set of the choices are set of the set of the choices are set of the choices are set of the set of the choices are set of the choices of
```

This method seems to have worked. I will now conduct the same test table tests as was conducted before all of the tests will have to be conducted again as changes have been made to all parts of this part of the program.

To show the outcomes I will keep the description printed however in the final version this line will be taken out. Anywhere where the word was expected to be removed is not expected to be replaced with the word "word" as this is the method I used to keep the index within the correct range.

## Test table results

Test	Input	Actual Outcome
Numb	Прис	notadi Oditoonic
er		This is a bookley suggestion cole which cold chicke's bookles questionation cary production on a larger description of a last of age their as
1	Not	do not used to here a depositation or domes from a last of set checked [Disact veyle the note 'charcepain' or the long colores' to get established the ending the set long or their as messed longer decompanies will been not not not reliable and a support of the colorest transfer and the colors of
	word	의 대한민국인 기계의 점에는 1945년 1945년 1945년 1945년 전에는 1945년 1945년 1945년 1945년 전에는 1945년 1945년 1945년 1945년
	word	The party depth of the control of th
	word	The adoption deloughed to good up on any small from your description of you could please asker from the giran list so on our cay and not not you parties formission yields now type how teperate here appears been any your monitory to appear and by these been him to be comed from most to easily important the country "being to "be a proper to the country of the countr
	historic	please copys the objects one or a time [input time or a time [input time object or a consider to be in purities of imput time object or a consider to be in purities of imput time object.
	word	
2	Not not	This is a billiby compalient come which will choose a billiby destination (its strength based on system or input description or a list of any other which a description of the special below the could "deslive the could "des
	historic	ANN HOUSE BASS.
		the proper strangish to girt up on any words from your description of you could please select from two gives list or we can try and must now your parformance over type for laportant those aspects are for your fallings by typing each of those have in the color from most to large important if "("Your", "Wallings", "Wallings", "Family") please tappe the objects one of time  Japan the object you consider to be no provided out of appropriate topics.
3	Not	This is a builting comparison code onlike till comman a building destination cong a crossed the cyclic based on elected on input description on a list of set obvious
	historic	do you wish to write a densignation or channer form a light of set obtaine. Theses write the word 'description' or the word 'choices' to gen stained description.  Flease write a description of your perfect buildes meaturable bids may be so in
	historic	ng so short so peaked lingue descriptions will turn out more absorbed in the end due side side Now work side
	•	The word old  Unt word old  Unt word old  Unt word old  Unt word old  Union one tipe how importers these departs one for your soliday by typing each  of these insent in the order fire word to less important! ['Winting appeals']  yleans import the dijects one or a time  lapart the diject you ordinate to be all position ) of importance

4	Not	
	shoppi	This is a boiling comparison code of the bolish will there a building destination city around the muld beard to although the description of a list of any observable of the bolish of the control of the
	ng	not work
5	not	The is a bring, comparison note that the control of
6	Not	This is a building respection only which will choose a building destination congrammed the world based on epitter an input description or a list of set choices do you wish to write a description or choose from a list of set choices. These writes the world "description" or the world "choices" to per charted description.
	historic	These with a description of your perfect billing destination this may be as long or storn as medial longer descriptions will not not now accounts in the end of billing feet and the story of the contract of
	word	ward ward ward and mad ward word word word ward ward ward ward ward ward ward wa
		and word word word word and inchanged word word word
	word	an oper oper oper oper oper and the highest part oper oper oper oper oper oper oper oper
	word	and want want want want and tart tarratic want want want want
	word	and word word word word and historica word word word
	not	and word word word word not highwards word word word and word word word word not highwards word word word
	historic	not seed seed seed seed that blastic seed seed seed
		and word word word and highward word word word word when when word word word word word word and highward word word word word word word word wo
	word	not wind want mad want but blancier wind want ward
	word	place to tipe he important these expens are the year billing by typing each of these intens in the order from most to least important. ["Earntin expense"]
	word	places input the objects one at a time imput the object you consider to be in position 2 of importance
	word	
-	11010	This is a buildey companion code which will obsome a builday sectionium with a
7	Not	cound the world beself on wither at input Hencription or a liet of sex choices do you wish to usize a Hencription or choose from a liet of sex choices (Figure
	Europe	write the word "phentinglish" for the word "thelice" to get started description finess while a description of gove perfect behinds pleathering the map he as to make a winer as useded longer descriptions will turn out more accounts in the and entrope must make now word The purpose stanguled to past up on any words from past description if you muck gleans which firm the given like as we must try and must may your perfect dears whilm pleans one type how impurished these aspects are for your building by reging each of these trees in the notes from mean by least deportant ("Machade aspents", " discipling", "Hastile", "Immagner," "Affordability", "Food", "Cultume", "Health please input the sinjects doe at a miss input who ubject you ormainer to be its practions of disputance

The tests all come to the expected results this led me to believe the testing was complete and I could now do further testing with members of the public and get feedback from each person.

```
The is a billion immunity in the property of a property of
```

When I gave the program to the user for testing an error came about. I didn't know why the error occurred but I was able to quickly find the solution by initially setting the values of each of the variables to 0 before the if statement is around.



These variables were labelled using letters of the alphabet as they are just in place in order to ensure the loop occurs once and doesn't remove all attributes.

This shouldn't have changed anything in the test table

After fixing the issue I returned the program to the user to complete the testing and this result was given.

## Usability testing of final version

#### User 1

```
If a context promptions come context all account a boundary description that a prompt one could found up that a context person of the context person of th
                                              the expect for common to be as pressure that approxima
                                                           the outset pur hundre of he in position 4 of Equations
of Dames
of its one of the class is ("Marries aspects", "Magnifals", "Your", "Marrie")
is deposited.
                        a become one processors I have become the best approach to the best approach
                                              or have this her could for any on one the past better on the second and a past better as more than the past better as the could be the 
User 2
                                        promote has districted a limit distriction of the year billing
                                              on begging that the referred LE year on that one one only due provide you note a merced updated
LE office when year opinion on have privated up on
User 3
   USECT S

That is a bouldary comparation come month will floring a maintainful train advance to me word water or colone; by page description; or a last of and indicate floring south to south in fraction of the south in the south in fraction of the south in the sout
                                                     to the property of a state of the state of t
                                        Longite but discovered 1 18441 Sections of the part officery
                                              M SOUR COM BURNEY, M SOME THAN DOWNER COURS DO BRIGHTHA.
```

Places of interest should pick up the item historic however, this is hard to incorporate as each of the words that make up that phrase can be used in other ways so it's likely a phrase like that would have to use AI to help pick up on that.

#### User 4

```
IT IS A BUILDING COMPANIEST THE WHITE A BUILDING OF STREET STREET OF STREET STR
                     ndapen.
De you bappy next the recent? If you've not ne one by and provide you also a second option of precisals, yes
```

These results showed that people would use the features I added to my program in iteration 2 and this current iteration.

What was found was there were a few unexpected results and things that need to be added to each of the aspect lists but nothing worth giving another iteration.

After receiving this positive feedback I decided to add comments to each line of my program. This was to ensure that anyone who wished to further develop this program in the future would understand the purpose and function of each part of the program. This would also allow me to work on the program in the future if needed to help me remember what each lines intention was.

Something that was brought to my attention by one of the users is if an input is put in wrong it gives the options of all the aspects mentioned again and not just the ones that are available. This could mean that the user can input the same item twice I left this in the program as intended as if the user was willing to not put in another aspect this may be because the other aspect wasn't wanted. I decided to make this being a possibility clearer in the program so that users are aware that if they do not like the aspects given they don't have to take the aspects. This could be for a reason such as certain words contain parts of other words within so are picked up unnecessarily this works for things such as nightlife. Nightlife contains the word life so will get picked up on by health and recreation even though this isn't the intended feature. This happens with nightlife being picked up on so in this case the user can discard the health and recreation feature and just use the features that they intended on using from the beginning.

To make this clearer what was said is specified below:

printifylesse input the objects one at a time (If there is a feature picked up on that you don't sent included in the easint please input the last feature tripe)

#### Resources used

Throughout programming if and when I struggled to solve a particular problem I would often try and find similar solutions to certain issues on student forums. Usually these forums wouldn't have the exact solutions I was looking for but often I could use similar ideas to allow myself to adapt these solutions to my own problems. This is because my problems tended to be encountered due to other areas in the programming interfering with the current section I was working on and thus my problem would be unique but the idea of how the problem was solved on student forums would help lead me in the right direction.

## **Testing for Robustness**

With this testing for robustness there may be inaccuracies as it is difficult to predict what my algorithm will say the city is. This is due to the amount of variables to incorporate in finding the solution. If it wasn't difficult to predict the solution there wouldn't be any point in having this program in the first place as computers are able to make calculations much faster than any computer can.

<u>Test</u>	<u>Test</u>	<u>Test</u>	<u>Output</u>	Screenshot (Description)
<u>num</u>	<u>Descript</u>	<u>pass</u>	<u>descript</u>	
<u>ber</u>	<u>ion</u>	<u>ed</u>	<u>ion</u>	
1	Test that Bangko k appears when key aspects of Bangko k are put in (Historic , shoppin g, nightlife , transpo rt) For	yes	The output are each city with the aspects of historic as their first choice	Bangkok London Prague Barcelona Amsterdam Milan

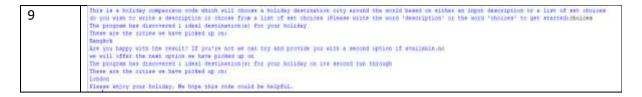
	T		I	
	the			
	choices			
	section			
	just			
	confirm			
	choices			
	immedi			
	ately as			
	the			
	aspects			
	are in			
	order so			
	the			
	score			
	should			
	be			
	highest			
	for			
	Bangko			
	k			
2	Test	yes	The	for an a falling registers can while and storm a falling forestern any expect the most in other companies and most a fall of most can be a fall or companies and the companies of the companies o
	that if		progra	lone was a marginar of you public salang internacion fazo agric en lang or march a medicilizare description of the core and measure as de esti De pague arrappio en para gricio en establica por produci plane establi fina de gren (per se ve vez parrieró en por pedico institucion
	no		m	Does not upon the improve the promotion by graphically lightly with the conduction but its sect approximation (March Approximation), March Approximation (
	descript		offered	Davin zigot file stjenti on in in tale (2) files in in Septimizated ig in the jou had wat calculated in the west plane zigot (N) and Settler Form
	ion is		every	gar an elect ye made is to a parties of algorithm
	put in		attribut	
	all		e to be	
	attribut		ordered	
	es are		and	
	given		thus	
			there is	
			no issue	
3	Test	yes	N/A	N/A
	with			
	food set			
	to 5			
	shoppin			
	g set to			
	4			
	culture			
	set to 3			
	and			
	nightlife			
	set to			
	2.5 this			
	should			
	give the			
	city of			
	Milan			
	and if			
	this test			

	1			
	works it			
	should			
	apply to			
	them			
4	Test for	V05	These	europe historic
4	Europe	yes	cities	please now type how of these items in
	with		are all	please input the of
	historic		Europe	you dont want incli input the object y
	as first		an	historic aspects
	value to		cities	The program has di: These are the citi
	make it		that	London
	easiest		contain	Prague Barcelona
	to		historic	Amsterdam Moscow
	identify		as their	Are you happy with
	the		first	
	correct		aspect	
	city.			
	Expecte			
	d city of			
	London			
5	Test for	yes	The	minut the world based on writer as imput fewritarium or a lim of ear channe.  Mr you wish to entre a description or choice from a list of our choices. These eries the world "description" on the earl "choices" to per started bearingtion.
	Asia		answer	Discovering a description of your perfect holiday destination this may be so in on or storm as needed intend descriptions will have one serverage in the west major every memorial behavior.
	and		given	please one type has important these expects are for your trilling by typing each of these invex in the order flow more to least important: ["Mistoria expects"]
	North		clearly	place capt the shipton one on a time II there is a feature patient up on that you be required in the second place input the last feature voted (open the input you consider to be no provided in the constant of department.
	America		shows	Number apperer The program to discovered 1 along destroyagement for your brigates These are the olders on born patched up on
	historic		the	Respect  Also you happy while the results' lit you've and no can any and provide you make a a
	as first		expecte	econd uprior if sections
	value		d .	
	with		outcom	
	expecte		e as	
	d city of		Bangko k is the	
	Bangko k (this		only	
	tests for		Asian or	
	multiple		North	
	regions)		Americ	
	10610113)		an city	
			with	
			historic	
			as its	
			first	
			aspect	
6	Input a	yes	The	Die is a bilidey comparison note which will choose a bolidey destination tity around the world based on either an input of th you wish to write a description or choose from a list of set choices (Resew write the word "description" or the word "
	holiday		output	Elease write a description of your perfect boliday destination this may be as long or short as needed imper descriptions of
	in Asia		cities	historic will the aspects of shopping and salan please now type how important these aspects are for your builder by typing each of these items in the coder from most to be
	but not		are all	please impor the objects one at a time 12f there is a feature picked up or than you donn sum included in the exact please import the object you consider to be in position 1 of importance
	in		in Asian	stopping The program has discovered 2 ideal destination(s) for your heliday
	Europe		with	These are the cities we have picked up on:
	and not		the	Dibit
1	and not		tile	Integrate the terminal of you're not we can try and provide you with a second option if available.

		ı		
	with a		e of	
	quality		shoppin	
	of		g as	
	shoppin		their	
	g so l		first	
	can		aspect.	
	more		aspect.	
	easily			
	predict			
	the			
	outcom			
	e.			
	should			
	give city			
	of			
	Dubai			
7	Туре	yes	As	landmark please now type has important these expects are for your holiday by typing each
	landmar	, 55	historic	of these twee in the crief from must to least important: ['Mistoric espects']
	k to		was	
	ensure		picked	
	the		up on	
	progra		this	
	m is		proves	
	looking		the	
	through		progra	
	the		m is	
	entire		searchi	
	list of		ng	
	keywor		thought	
	ds.		the	
			entire	
			keywor	
			d list	
8	Input a	yes	As the	The investigation of the fill the entire travel to differ a convey adoption of the file.
	-	yes	error	A to a directive description of their fine i.i.d. of an election flavor case on a fine again; in the cost flavor f
	long		which	It does now, it may not by a does not now the tentions of the factors of the fact
	descript			<ul> <li>A responder section of a complete from the contract of the contra</li></ul>
	ion with		previou	I can on the candow when the first the first of a treat of the candow of
	the .		sly	is to a set of migricus encourse of persignition of more for the product of our person or set of person of the per
	word		occurre	place type the materials on a class of times in a force public or total points and processing the land power right to land became now.  One has the first points and to be a process. If appendix
	not (this		d didn't	
	has		appear	
	caused		and this	
	an error		is a long	
	in the		descript	
	user		ion with	
	testing		multipl	
	previou		e	
	sly but		negativ	
	should		e words	
	be		contain	
	fixed)		ed this	
	lixeu)		eu iiiis	

			proved that the solution is fixed for the know occurre nces of	
			the	
			bug.	No. 1. Company of the
9	Say historic aspects and say no should give cities with historic as the second aspects	yes	The end resultin g cities are all cities with historic as the second aspect which proves this still functions correctly.	This is a stating companion and which will decide a build personal to the color of the color of the personal and the color of the personal and the color of the personal and the color of t

<u>Test</u>	Screenshot of choices where appropriate
numbe	
1	This is a boliday comparison code which will observe a boliday destination bity arount the world based on either an imput description or a list of set observe
1	to you wish to write a description or those from a list of set chuines (Fience with the word 'description' or the word 'doubles' to get etarted chaines. The progress has disjourned I ideal description or those from a list of set chuines (Fience with the word 'description' or the word 'doubles' to get etarted chaines. The progress has disjourned in the word 'description' or the word 'doubles' to get etarted chaines. The progress has disjourned in the word 'description' or the word '
	her you begry outs the security If you're not see can try and provide you wish a second option of available.
2	N/A
3	This is a notiney comparison once office will thoose a builtay destination vivy account the world based on either an input description or observed in the property of the sound "description" or the sound "descri
	her you begry with the secula? If you're not so can try and provide you with a second option if available.
4	This is a builday comparison code which will choose a builday destination mity around the world based on either an input description or a list of set choices to provide a description or choose from a list of set choices (Please write the word 'description' or the word 'choices' to get started) choices. The program has discovered I ideal destination(s) for your builday.  These are the cities we have picked to on:
	London Arm you faggy with the result? If you're not we can may and provide you wish a second option if evaluate.
5	The is a builday comparison under outst with shows a builday destination stly account the word 'description' or the word 'description or shows from a last of eat challes please write the word 'description' or the word 'description or shows from a last of eat challes please write the word 'description' or the word 'description or a last of eat challes please write the word 'description' or the word 'identical or a last of eat challes please write the word 'description' or the word 'identical' to get entyted) under the word 'identical or the state product of the word of the word 'identical or the state product of the word 'identical or the word 'identical' or the word 'identical' or the word 'identical' or the word 'identical' or the word 'identical
	Bure you happy with the semait? If you've not we can try and provide you with a second option if available.
6	This is a boliday comparison once which will those a boliday restrictive city among the world beautiful at a title or imput description or a list of set choices to you also to obta a description in thinse from a list of set choices (bloom miles to out of set choices) to get stated market. The property list of the child of the children is the children of the childr
	Bur you happy with the sendor 18 you're one we can buy and promise you wish a second uption of englishes.
7	N/A
8	N/A



This list of tests should be appropriate to show each of the different solutions and show the program works as many of the different aspects are programmed in the same way. As well as this I have also already done testing previously throughout the documentation of the program. This testing for robustness was done to check that all the features I added worked together as intended as previously I had tried to just test the impact of the new section being added.

Seen as no errors occurred during this testing for robustness this shows that the program is strong and doesn't contain any errors that I can find. It is possible that with a larger number of people testing they may be able to find an interaction that I have not yet thought about but because of a lack of resources and access to such a large number of people I am unable to find anything as such.

## **Evidence of prototyping**

The program I created had 2 previous versions each which was tested by users between my age range I decided when planning.

The first prototype just contained a basic searching algorithm to find keywords in a list and compare them with keywords in a second list. It then created a score with these comparisons and the most alike city was given to the user. This had some problems however, some of these problems did carry over to the final version due to difficulty of implementing without using real AI modules. Other issues were fixed within the second and third iterations such as the issue of users selecting a specific region. Some users when testing said phrases such as "I want a holiday in Europe" previously my program would not be able to pick up on the fact Europe was mentioned and thus it gave the user holidays in other regions of the world. That told me that this was the next thing that needed to be implemented into my program.

This brought on to the second prototype. In this version region selection was added. What could have been done further would be to add things such as distances from lakes or beaches however I did not add this as I am only one person and that would require a lot of research on each of the cities which would ordinarily be done by a team of people. As I am only one person I did not add this however this is something I would add in the future. When users were given this prototype to test some of these users did use phrases such as these and were confused why some of the options given were not by the sea or lake as asked for. In these cases I explained the state of the program and these users provided feedback on other working aspects of the program.

Another thing was the number of cities used in the program. As I am only one person and creating aspects for each city is something it would take individuals a long time to do for every city this would not be possible for me. This meant that I only worked with 20 city lists that I created myself. Seen as I haven't been to many of these cities myself it was difficult to create these initial lists as this is very much based on user opinion and my judgments were mostly based of other people's experiences some of these lists may be inaccurate. This could be the reason for some of the users saying no after receiving the city back from the information they input. In the future this program would be adapted with AI and thus many of these city lists would be edited to find some sort of average based off the average user experience of visiting a place. I feel as though this would be a more fair way to decide what the key aspects of a city actually are as it's less biased. This method also requires much more information however and thus would not totally be sustainable for me to do as my access to information isn't as vast as trivagos database is or another larger companies. These review websites would each have a database with the different reviews in and this could serve as information to

contribute to the aspects of each city.

The last prototype that I added enabled for the user to disregard an aspect based on a list of keyword with different negative words that could be input. This was the hardest part to decide how this worked due to how the English language could be utilised in many different ways. There are far too many different ways to say that you do or don't want something in your holiday so my challenge was to decide what to remove. This would again be another thing that would be improved and become fairer with AI due to computers being able to process large amounts of test much faster than any other person could. This would allow for the computer to examine many different writing styles to see what would be most appropriate to remove and keep from the users answer.

The method I ended up option for was to say that if a negative word was used I should search thought the next 5 words to see if the attribute can be found in there and if nothing was found there the program could then continue to function as normal. This was the method I opted for as I thought that It was most probable that a user would say something with not and then an attribute but it was also possible that the user could say something along the lines of "I do not want to go to Europe" a phrase such as the one just use would use all 5 extra words with the attribute being the last one. It is also possible to use more than 5 words but the more words I use to search with like that the more chance there would be of my program picking out an attribute that was never intending on being removed. This the value of 5 words was a compromise and could never be accurate without the use of AI. An issue with using AI however is it could make the program more CPU and GPU intensive. This could be a problem as the menu section tends to already crash when run and AI would just increase the chance of this happening as more resources would be needed to run.

## Success of solution

I would consider my project to be successful as all of the attributes in the created test tables were created and the goals I set out to achieve at the beginning of the project were all achieved. If I was to change something I made It may be the menu design as I may have tried to use the grid method instead If I was creating this project again in the future however the menu design I created is very similar to the menu design I wrote up in planning but the created menu just has the feature of region selection which Is something I didn't think about adding at the beginning of the project.



Above you can see the menu design side by side with the created menu. I feel all the changes I made to the menu were necessary and turned out to be improvements on the menu design as a whole. I ended up adding more attributes because I found that when creating ideal cities lists many of the cities were too different to be described by only 5 features together.

Earlier when creating my success criteria this is what I said:

#### Success Criteria

To ensure the program is a success it needs to be able to distinguish between similar cities and pick up words from the user description given. It needs to feel user friendly and accessible enough so even the least tech savvy people can understand what needs to be done. To ensure that happens I will keep in close connection with users so any wording changes or design changes can be made internediately.

For the program to be an improvement on <u>Trivagos</u> interface they already have it needs to add something that doesn't already exist. The city finder doesn't already exist and should help customers find where they want to go much easier.

For this project I will not be using AI this is because of the lack of available data to me so for this project to be successful the program needs to do all the already mentioned criteria whilst proving that if AI was used it would be possible for a more accurate and sustainable program to be created. Whilst my program should be successful in its own right. This will be because im also only searching through 20 cities.

The first part of my success criteria was achieved because my program does search though my list of 20 cities for the city with the highest score. Multiple cities are given at times when the scores of all these cities are the same however with more aspects added and more cities added this would happen less often due to the program being able to distinguish between each city much easier. The program I have in place is also an improvement on Trivagos interface as this program doesn't exist yet and from my user feedback I was successful in making finding a holiday easier. This positive feedback also supports the idea that my program is successful at what it aims to achieve even without the use of AI however this sample size is smaller than I would like it to be as for this to be as successful as possible it would have to work internationally meaning I would have to get samples from other counties as well.

Although the program did meet the success criteria successfully there was a number of things that could have been changed or added that would have created a more complete or consistent program with a more user friendly system. Many small changes can however entirely change the program due to the amount of different solutions this program has. My opinion of what makes a perfect holiday comparison program may be different to another person's but that doesn't change the success of either approach.

My program could also be seen as not 100% successful as when users were testing my program they may have had a city in mind that was not selected. This could have been for a number of different reasons such as missing attributes or missing selection features or the ability for the program to interpret what the user was saying. These are features I would consider adding in further development as they would improve the accuracy substantially.

## <u>Description of final product</u>

What I have created is a proof of concept of something which doesn't exist in the holiday marketing industry yet. It is a program which searches though either a description or a menu to find a perfect matching holiday for you or give you a list of ideas of where you could go because this doesn't use AI accuracy is limited but I believe that with the 20 cities I have selected my program is reasonably accurate for the time and resources I had to work with. An idea such as this one could really be sold to a company like trivago however would need to be more accurate for when it Is actually published on their domain. I have made the integration for someone to take over the project very easy as I have provided comments on each line describing what it does and I believe the foundation of this program to be very strong for creating a program which would search though every city in the world. I choose to do cities rather than countries due to the accuracy. Deciding which country the user wishes to go to would be much harder than deciding which city due to a country having many different aspects spread around it and not always having one feature. Some countries are also very split in how the experience of visiting there would be like due to different levels of poverty but both choices between city and country would be complex due to the resources needed to decide.

## Maintainability of my solution

Due to different aspects of cities changing and world politics many of the features I have given to each of the cities could change very rapidly causing a fault in the algorithm however, the only solution for keeping this maintained and up to date would be to have someone changing the program based off current events which would end up being a taxing job. The alternative to this is using AI by making the program keep up to date with current event and making it aware of how the world is changing it could then change the program immediately. Preferably without the user ever receiving a bad holiday destination. This is solvable computationally due to how computers can compare and link information much faster than a human can. A potential problem with this however would be that a computer may decide that a news story is a negative reason to visit a city and could then potentially remove the ideal city the user is after from the search. This would be solved by keeping the strength of the news editing AI very weak in the deciding factor to the aspects of a city.

The AI solution would also work off user reviews so would be maintained as long as people are using the program as the more people using the program the more data the AI would have to work with and thus the better it can become.

Seen as this will also be on the Trivago website another thing to maintain would be each of the servers that Trivagos search engine run on. This shouldn't be too much of an issue as this framework already exist as they are an established company.

In reality these ideal aspects for each of the cities would be constantly changing based off current events and other political events. It would be difficult to weight how much these events should effect how the program selects the city but the most important factor is the users health so the program cannot send the user to a country that is currently dangerous for the user to be in. This is another opinion based aspect as one person may be more of a thrill seeker and enjoy the different aspects of a more dangerous and wild holiday but another may not. This is something that would have to be decided on how to keep the user safe. This is something that a team of programmers would have to decide and the main rules would mostly have to be kept by AI due to the emotional aspect humans have in making choices and decisions.

With how many different inputs there are its very possible that there is an error I have not been able to find that could cause problems in the future this would mean that implementing a report system may be important so users can report the solutions received or the errors received and a programmer can fix the issues as and when they are found.

### Further development of the solution

There are many ways in which this solution could be further developed to create a most sound program which works more accurately. Ultimately however, everyone's experience is different and so one users experience cannot be equated to another users experience. As well as this another user may rate their holiday differently to another. This makes the most sustainable approach to the solution being to work off the average user experience and reviews. To do this would require Al as the amount of data that would need to be handled would be too much for any team of people to deal with. Once the program is running more information will be received every minute and that means more information the team would have to work with. This is impossible and would require a machine to sort though and a machines processing power is much greater and the access to information is also much faster. Further development without Al would include adding a large list of

cities, adding more regions, adding more aspects, adding better regions selection this includes items such as lakes and beaches and if the program is to be uploaded to the trivago page the program should use the users IP address to locate the user and work out how far from each country the user is and possibly flight prices to make the expenses part of the program more accurate. This would be as it would be possible to use the algorithms that trivago already has in place in order to find the cheapest or "best deals" for the user. These things were not included by me in another iteration as they would have taken too much time and too many resources to handle to be sustainable for the scope of the project. This would also largely require the frame work trivago already has in order to find these best deals.

In future a map could also be included which would allow users to select areas from the map for more usability features.

Ultimately there are many features that could be added to improve how the program functions and how it could then be seen by the user.

Adding more aspects would help the program as it would help make each different city totally unique. There being so many different aspects to a city makes it hard to compare how historic a city is compared to another city as they may be historic in different ways and it's just not feasible for one user to compare in this way. This is the method I had to use to compare the 20 city examples that I used and I found that from my experience of comparing the 20 cities there were already many arguments I could make about were and how I was placing each factor. This means that my example of my ideal cities aren't the exact lists that everyone else would put as there is no right answer and it's all opinion based. There being so many different opinion based answers in this solution it makes there being no right answer and the best that can be done is an average of some kind. This also means there are so many different things that can be done for further development with each programmer finding a different outcome. This would mean to find the exact solution trivago would want it would be needed to work very closely with a design or marketing team in trivago. There is also a lot that can be done once you can determine how far the user is from each different country as this is mostly linked to the framework that already exists on the trivago website. For a better front end of the program what could be done is open a menu with two buttons on one with description and one with choices on and describe what each button does with each different button opening a menu one would be the already existing choices menu and the other would be a test box for the user to input their description. This might make the program a little bit easier to use and slightly improve the overall user experience. With this front end a back button could be added to allow the user to return to the other option (choices or description depending on what was previously selected) This will allow the user to manoeuvre around the menu without having to fully restart the program to achieve this.

What could also be added is the option to select countries that you do not wish to go to. This could be a useful feature as if people have travelled to one particular location many times and they do not wish to go there anymore the program could discard this location. This would only affect a minute amount of users but it is best to try and help as many users as possible and the more methods to understand a description the better the functionality should be as long as the user isn't overwhelmed with features.

## **Usability features**

I created a gui menu in order to make the menu section neater and more easy for the different users to use. As well as this I have thorough instructions at the beginning of the program which I had users help word when they didn't understand something. With each different iteration I asked users what could be improved afterwards and from that I changed how the program was understood and added any suggested features throughout the programming process I tried to keep as close as possible to the end users as these would be the people who would be using the program at the end so if they don't like it then the project can be seen as a failure. Thankfully after each test with users the users

seemed to be happy with the functionality of the program and the different features offered especially with the gui menu.

The gui menu never had any questions on how it functioned as it seemed to be something very similar to what people have experienced before and so no questions were asked and the first design I created ended up staying till the end.

One issue found with usability was the GUI menu used frequently crashes when used. I tried to find the solution to why this was by looking at task manager whilst running the program but this doesn't also tell you how much cpu usage python is capped at so it can be difficult to identify the issue. The other issue with identifying the cause is that the crashes weren't always consistent and occurred more frequently with more lines of code. Which does indicate it's a hardware issue rather than a fault in the program itself. This issue only effects usability as the overall functionality isn't harmed as when the window is closed an answer is already given which fits with the expected results. This has been appropriately tested.

## Main problems of my solution

Everyone's experience when they go on holiday is different the experience is different weather you are going alone with friends or with family and its different for each individual person. Most users will know a general idea of what they want out of a holiday and this is what I was trying to find. The problem with this is that everyone's language is different and one person's use of a certain phrase may be interpreted differently by anyone else. As there are no definitive rules of language and it can mean different things for different people it can be very difficult for a computer to create rules to follow to then decide what someone wants because ultimately the user is the only person who can decide that and any program that I make will only be an estimate on this. I believe my program has the ability to make good estimates based on the resources I started with and the user feedback received. For this reason I believe I was successful in what I tried to achieve however, I know that my program cannot work for everyone and the most successful version will work for a majority of people. This version may also not work perfectly for each individual but it would achieve its job as best as it can. With the further development solutions I have proposed, with the main development feature being AI I believe this would create the most accurate version. The more data that's available the more assumptions that can be made therefore the better the program can function.