### Difficulty Level 1Difficulty 1 Challenges

### Challenge 1

Design a program which asks the user to **input** their name, age and favourite colour.

ANSWER

name = input(“Key in your name”)

age = input(“Key in your age”)

colour = input(“Key in your favourite colour”)

### Challenge 2

The program asks the user to **input** their first name. The program then **outputs** the users first name.

ANSWER

name = input(“Key in your first name”)

print(name)

### Challenge 3

The program asks the user to **input** their surname and then their first name. The program then **outputs** the user’s first name and then their surname **separately**.

ANSWER

surname = input(“Key in your surname”)

firstname = input(“Key in your first name”)

print(firstname)

print(surname)

### Challenge 4

The program asks the user to **input** their first name and then their surname. The program then **outputs** the user’s first name and then their surname **on the same line**.

ANSWER

firstname = input(“Key in your first name”)

surname = input(“Key in your surname”)

print(firstname, “ “,surname)

### Difficulty Level 2Difficulty 2 Challenges

### Challenge 5

The program asks the user to **input** two numbers. The program adds them together and then **outputs** the total.

ANSWER

num1 = input(“Key in your first number”)

num2 = input(“Key in your second number”)

total= num1 + num2

print(total)

### Challenge 6

The program asks the user to **input** two numbers. The program will then **output**:

* The two numbers added together followed by…
* The two numbers multiplied together.

ANSWER

num1 = input(“Key in your first number”)

num2 = input(“Key in your second number”)

total= num1 + num2

times=num1 \*num2

print(total)

print(times)

**Tip:** Speed = Distance / Time

### Challenge 7

Write an algorithm that:

* Asks the user for the distance (in metres).
* Asks the user for the time in seconds that a journey was completed in.
* Calculates and outputs the average speed using a procedure.

ANSWER

def calc\_speed(d,t)

 speed=d/t

 print(speed)

distance = input(“Key in the distance”)

time = input(“Key in journey time in seconds”)

calc\_speed(distance,time)

### Difficulty Level 3Difficulty 3 Challenges

### Challenge 8

The program asks the user to **input** how many minutes and texts they have used in the last month and then **outputs** the total cost of the bill. This is calculated by working out:

* The total cost of the minutes (at £0.10 per minute) and….
* Adding this to the total cost of the texts (at £0.05 per text) and….
* Adding on an additional monthly charge of £10.00.

### Challenge 9

Write an algorithm that:

* Stores a random first name as a variable.
* Asks the user to input their first name.
* If it is the same as the stored name, outputs 'You’re cool.'
* Otherwise outputs 'Nice to meet you.'

### Challenge 10

The program asks the user to **input** the number of letters in the alphabet. The program must then **output** whether they got it correct or incorrect.

### Difficulty Level 4Difficulty 4 Challenges

### Challenge 11

The program asks the user to **input** two numbers. It will then **output** the larger of these two numbers.

### Challenge 12

Write an algorithm that:

* Generates a random number between 1 and 10.
* It must then ask the user to guess this number.
* If they guess it correctly it should display ‘Correct’
* Otherwise, display ‘Not what I was thinking’

### Challenge 13

A company calculates holiday allowance for employees.

The company gives each employees 28 days holiday each year. Holidays are awarded based on the following rules:

1. Full time employees who work 5 days a week get 28 days holiday a year
2. Part time employees get a proportion of holiday allowance based on how many days they work, e.g. An employee who works 1 day a week would only get 1/5th of the holidays allowed.

Write an algorithm that calculates the number of days a worker gets and outputs the result in a user friendly way.

### Difficulty Level 5Difficulty 5 Challenges

### Challenge 14

Write an algorithm that:

* Asks the user to input the traffic light colour.
* If the traffic light colour is green, outputs ‘Go.’
* If the traffic light colour is amber, outputs ‘Get Ready.’
* Otherwise outputs ‘Stop.’

### Challenge 15

Write a program that:

* Asks the user to name one of the Olympic Values (Respect, Excellence and Friendship)
* If they correctly name one, output 'That’s correct‘
* Otherwise outputs ‘Incorrect’

### Challenge 16

Write an algorithm that:

* Asks the user how long on average they spend watching TV each day.
* If it is less than 2 hours, outputs ‘That should be ok’
* If it is between 2 and 4 hours, outputs ‘That will rot your brain’
* Otherwise outputs “That is too much TV”

### Challenge 17

Write an algorithm that:

* Outputs all numbers between 1 and 10 only.

### Challenge 18

Write an algorithm that:

* Outputs all odd numbers between 1 and 20 only.

### Challenge 19

Write an algorithm that:

* Asks the user to input a number and repeat this until they guess the number 7.
* Congratulate the user with a ‘Well Done’ message when they guess correctly.

**ELSE**

### Pseudocode only challenges

### Challenge 20

MyHotPizza company have developed a new loyalty reward system for customers. Customers are automatically sent a reward card if they order more than 20 pizzas in a year.

They have a log of customer’s orders stored in a file, as shown:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Customer Name | Large | Medium | Small | Card? |
| Smith, J | **5** | **6** | **1** | **No** |
| Williams, P | **10** | **12** | **3** | **Yes** |

etc

Write an algorithm that goes through the customer orders, and where needed, sends customers a loyalty card if they do not already have one. If they have not ordered enough pizzas, then it removes them from the card list.

### Challenge 21

A local swimming centre offers the following discounts:

1. Members who are **aged between 13 and 15** receive a 30% discount.
2. Members who are **aged between 16 and 17** receive a 20% discount.
3. Members who are **aged 50 and over** receive a 40% discount.
4. All other members receive no discount.

Create an algorithm using Pseudocode for the above actions.

### Challenge 22

Write an algorithm that:

* Asks the user to input how many marks they got on a test.
* It should then convert this to a grade between 1 to 9 using the table below and then output the grade to the user. If they have not scored enough to be given a grade than a ‘U’ grade must be output.

|  |  |
| --- | --- |
| Mark | Grade |
| Greater than or equal to 10 | 1 |
| Greater than or equal to 20 | 2 |
| Greater than or equal to 30 | 3 |
| etc |  |

### Challenge 23

Create an algorithm that will:

* Allow the user to input how much money they want to change to coins.
* Select which coin they want to convert the money into £1, 50p, 20p, 10p, 5p, 2p ,1p
* Calculate how many of each coin will be given.
* State if there will be any money left over that cannot be changed into the chosen coin

### No help given, pseudocode only!

### Challenge 24

Create an algorithm that:

* Randomly generates the computer status ‘rock’ ‘paper’ or ‘scissors.’
* Asks the user to input their status ‘rock’ ‘paper’ or ‘scissors.’
* If the computer and user have the same status then output ‘Game Tied.’
* If the computer generates ‘Rock’ and user generates ‘Scissors’ then output ‘Computer Wins’
* If the computer generates ‘Paper’ and user generates ‘Rock’ then output ‘Computer Wins’
* If the computer generates ‘Scissors’ and user generates ‘Paper’ then output ‘Computer Wins’

Otherwise output ‘You Win!’

### Challenge 25

SpeedyClub Runners is a local sports club, who organise a 5k race every year.

The results of the race are stored in a record structure (called **RaceFile**) as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| RunnerNumber | Name | AgeCatagory | Club? |
| 44325 | Wilburforce, Emily | U18 | SpeedyClub |
| 543 | Chan, Zhu | Snr |  |
| 2425 | Patel, Aisha | Vet |  |
| 5552 | Ewards, Craig | Snr | LighteningFast Runners |

Produce an algorithm that counts the number of runners in each Age category for the race.

### Challenge 26

A dog that is 5 years old is equivalent to a 42 year old human. Ashok is writing a program which converts the age of the dog to the equivalent age for a human.

The program uses the following method:

* The user inputs age of the dog in years
* If the age is 2 or less, the human equivalent is 12 times the age
* If the age is more than 2, the human equivalent is 24 for the first 2 years, plus 6 for every additional year.

Write an algorithm to calculate and output the human equivalent of the age of the dog using the method described.

### Challenge 27

The cost of a day-time journey is £3 for the first kilometre and £2 for every kilometre after that. If there are five of more passengers in the taxi, an extra 50% is added to the charge.

Write an algorithm to calculate the cost of a day-time journey.

Your algorithm should:

* Allow the number of passengers and the distance of the journey to be input as whole numbers,
* Calculate the cost of the journey,
* Output the cost that has been calculated.

### Difficulty Level 6Difficulty 6 Challenges

### Challenge 28

A gardener needs to buy some turf for a project they are working on. The garden is rectangular with a circular flower bed in the middle.

Produce an algorithm that:

* Asks the user for the dimensions of the lawn and the radius of the circle (in metres)
* Calculates and output the amount of turf needed

**Tip:** Circle area = Pi x Radius2

###

### Challenge 29

The wages earned by a worker is either £2 for every teddy bear they have made or £5 for every hour they have worked, whichever is larger.

Write an algorithm that:

* allows the user to input the number of teddy bears made and the number of hours worked
* calculates the wages for the number of teddy bears made
* calculates the wages for the number of hours worked
* outputs the larger of the two results.

### Challenge 30

An isosceles triangle is a triangle that has at least two equal sides. The diagram below shows examples of isosceles triangles. In each diagram the marked sides are equal.



Write an algorithm for a computer program that determines whether a triangle in an isosceles triangle.

* The user inputs the lengths of the three sides as Length 1, Length 2 and Length 3
* If any two side have the same length the program outputs “Isosceles”
* Otherwise the program outputs “Not Isosceles”

### Challenge 31

The student is writing an algorithm to solve a problem.

* The user will provide a series of numbers, representing the weights in grams of individual fruits.
* The weights are always **whole positive numbers**.
* The number of weights to be entered will also be provided by the user.
* The solution should calculate and report the **mean** weight of the fruits to **two decimal places**.

Two examples of the executing solution are shown below:

How many weights do you want to enter?

3

Enter a weight:

138

Enter a weight:

135

Enter a weight:

285

Average weight is: 186.00

How many weights do you want to enter?

4

Enter a weight:

279

Enter a weight:

135

Enter a weight:

145

Enter a weight:

138

Average weight is: 174.25

Write an algorithm for the process described above.

###

### Challenge 32:

Norma would like to invest her savings in a bank account that generates the most money. She would like a program that will allow her to:

* Enter the amount of money she wants to save.
* Input the number of bank accounts she wants to compare.
* Enter the interest rate for each account.
* The interest is calculated by dividing the money to be saved by 100 and then multiplying this by the interest rate.
* The total is calculated by adding the money to be saved to the interest and then outputted.
* The program should repeat this for all bank accounts.

Create an algorithm using Pseudocode for the above actions.

### Difficulty Level 7Difficulty 7 Challenges

### Challenge 33

Write an algorithm that:

* Ask the user to input how many GCSE’s they have.
* They should then be allowed to enter a result for each GCSE grade.
* The computer should work out how many points they have got (9=9, 8=8, 7=7 etc).
* If their score is 40 or over it should output ‘You can go to the sixth form’
* If they their score between 35 and 39 it should output ‘A discussion is needed’
* Otherwise it should say ‘Sorry not enough points.’

### Challenge 34

Roger has switched to a new electric supplier. He will receive free electric one day a week. He will not pay for the day that he uses the least amount of electric. Write an algorithm that will:

* Allow the user to input the day of the week and then units of electric used.
* Compare them until all comparisons are completed.

Output the day that will be free of charge.

### Challenge 35

Write an algorithm that:

* Asks the user to **input** how many cars are available for a trip.
* Asks the user to **input** how many people are going on the trip.
* If there are enough seats it should output ‘We have enough seats’
* If there are not enough seats it should calculate how many extra cars are needed and then output ‘Another x cars are needed’ with x being the number of cars.

NOTE: Assume you can fit FIVE people in each car.

### Difficulty 8 challenges

### Challenge 36

* Petrol costs £1.40 per litre. Diesel costs £1.55 per litre. LPG costs £0.95 per litre.
* Ask the user for which type of fuel their car uses and how much they have put into it.
* Calculate the correct price of the fuel they have taken.
* Ask how much money they have handed over and calculate the amount of change they are due.
* Finally, ask them if they have a loyalty card and if they do calculate how many points they should have added to it using the following – 1 point for every litre of fuel they’ve taken plus 1 point for every full pound they’ve paid.
* If the number of points they get is more than 100 they get a bonus 10% extra points.
* The number of points should then be outputted

### Drinks machine display and key padChallenge 37

A free drinks machine in an office provides 20 different drinks.

The machine has a small keypad with keys 0 to 9, OK and CANCEL. It also has a small LCD screen, which can display a short message.

To get a drink, users select an item number between 1 and 20 with the keypad and confirm their choice by pressing OK. If they make a mistake they can press the CANCEL button and start again. If the selection is valid and the drink is available it dispenses the drink. The display screen is used to show suitable short messages throughout the process.

Write an Algorithm of the process described above.

### Difficulty Level 9Difficulty 9 Challenges

### Challenge 38

The company also offers a saving plan. Customers pay a fixed amount each year into the savings plan. At the end of each year, the company adds the value of the savings plan at the start of the year to the amount paid, and then adds interest of 10% to obtain the final value for the year.

For example, if a customer saves £100 each year, the value of the savings plan for 5 years is shown in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Start | Paid in | Interest | Final |
| 1 | 0.00 | 100.00 | 10.00 | 110.00 |
| 2 | 110.00 | 100.00 | 21.00 | 231.00 |
| 3 | 231.00 | 100.00 | 33.10 | 364.10 |
| 4 | 364.10 | 100.00 | 46.41 | 510.51 |
| 5 | 510.51 | 100.00 | 61.05 | 671.56 |

Write an algorithm which allows the user to input the amount saved each year and the number of years, and then outputs the growth of the savings plan in the format shown above.

### Challenge 39

A primary school teacher wants a computer program to test the basic arithmetic skills of her students. The program should generate a quiz consisting of a series of random questions, using in each case any two numbers and addition, subtraction and multiplication. The system should ask student’s name, then ask 10 questions, output if the answer to each question is correct or not and produce a final score out of 10.

Scores from the quiz should be stored and added to when a student takes a new quiz.

Write an algorithm for the process described above.

### Challenge Rating 10

### Challenge 40

Write an algorithm that:

* Gives the user 3 lives at the start of the game.
* Allows the user to play the game until their have no lives left.
* They should move onto the next level for every 5 points they earn.
* The game is complete when they receive 20 points.
* At the end of the game it should tell the user which level they got up to.

**ANSWERS**

### Difficulty Level 1Difficulty 1 Challenges

### Challenge 1

Design a program which asks the user to **input** their name, age and favourite colour.

ANSWER

name = input(“Key in your name”)

age = input(“Key in your age”)

colour = input(“Key in your favourite colour”)

### Challenge 2

The program asks the user to **input** their first name. The program then **outputs** the users first name.

ANSWER

name = input(“Key in your first name”)

print(name)

### Challenge 3

The program asks the user to **input** their surname and then their first name. The program then **outputs** the user’s first name and then their surname **separately**.

ANSWER

surname = input(“Key in your surname”)

firstname = input(“Key in your first name”)

print(firstname)

print(surname)

### Challenge 4

The program asks the user to **input** their first name and then their surname. The program then **outputs** the user’s first name and then their surname **on the same line**.

ANSWER

firstname = input(“Key in your first name”)

surname = input(“Key in your surname”)

print(firstname, “ “,surname)

### Difficulty Level 2Difficulty 2 Challenges

### Challenge 5

The program asks the user to **input** two numbers. The program adds them together and then **outputs** the total.

ANSWER

num1 = input(“Key in your first number”)

num2 = input(“Key in your second number”)

total= num1 + num2

print(total)

### Challenge 6

The program asks the user to **input** two numbers. The program will then **output**:

* The two numbers added together followed by…
* The two numbers multiplied together.

ANSWER

num1 = input(“Key in your first number”)

num2 = input(“Key in your second number”)

total= num1 + num2

times=num1 \*num2

print(total)

print(times)

**Tip:** Speed = Distance / Time

### Challenge 7

Write an algorithm that:

* Asks the user for the distance (in metres).
* Asks the user for the time in seconds that a journey was completed in.
* Calculates and outputs the average speed using a procedure.

ANSWER

def calc\_speed(d,t)

 speed=d/t

 print(speed)

distance = input(“Key in the distance”)

time = input(“Key in journey time in seconds”)

speed=calc\_speed(distance,time)

### Difficulty Level 3Difficulty 3 Challenges

### Challenge 8

The program asks the user to **input** how many minutes and texts they have used in the

 last month and then **outputs** the total cost of the bill. This is calculated by working out:

* The total cost of the minutes (at £0.10 per minute) and….
* Adding this to the total cost of the texts (at £0.05 per text) and….
* Adding on an additional monthly charge of £10.00.

ANSWER

minutes = input(“Key in number of minutes”)

texts = input(“Key in your number of texts”)

cost\_minutes= minutes\*0.1

cost\_texts=texts\*0.05

cost\_total=cost\_minutes+cost\_texts+10

print(“£”,cost\_total)

### Challenge 9

Write an algorithm that:

* Stores a random first name as a variable.
* Asks the user to input their first name.
* If it is the same as the stored name, outputs 'You’re cool.'
* Otherwise outputs 'Nice to meet you.'

ANSWER

names= [“James”,”Jane”,”Geoff”]

random\_name=names.randchoice()

name = input(“Key in your first name”)

if name==random\_name

 print(“You’re cool.”)

else

 print(“Nice to meet you.”)

### Challenge 10

The program asks the user to **input** the number of letters in the alphabet. The program must then **output** whether they got it correct or incorrect.

ANSWER

num = input(“Key in the number of letters in the alphabet”)

if num==26

 print(“Correct.”)

else

 print(“Incorrect”)

### Difficulty Level 4Difficulty 4 Challenges

### Challenge 11

The program asks the user to **input** two numbers. It will then **output** the larger of these two numbers.

ANSWER

num1 = input(“Key in your first number”)

num2 = input(“Key in your second number”)

if num1>num2

 print(“The first number is biggest.”)

else if num2>num1

 print(“The second number is biggest.”)

else

 print(“The numbers are equal.”)

### Challenge 12

Write an algorithm that:

* Generates a random number between 1 and 10.
* It must then ask the user to guess this number.
* If they guess it correctly it should display ‘Correct’
* Otherwise, display ‘Not what I was thinking’

ANSWER

random\_num= randnum(1,10)

guess = input(“Guess the number”)

if guess==random\_num

 print(“Correct.”)

else

 print(“Not what I was thinking.”)

### Challenge 13

A company calculates holiday allowance for employees.

The company gives each employees 28 days holiday each year. Holidays are awarded based on the following rules:

1. Full time employees who work 5 days a week get 28 days holiday a year
2. Part time employees get a proportion of holiday allowance based on how many days they work, e.g. An employee who works 1 day a week would only get 1/5th of the holidays allowed.

Write an algorithm that calculates the number of days a worker gets and outputs the result in a user friendly way.

ANSWER

status = input(“If you work full time key in ‘F’, if you work part time key in P”)

if status=”P”

 days=input(“How many days a week do you work?”)

 holiday=(days/5)\*28

else

 holiday=28

print(“Number of days holiday is ”, holiday)

### Difficulty Level 5Difficulty 5 Challenges

### Challenge 14

Write an algorithm that:

* Asks the user to input the traffic light colour.
* If the traffic light colour is green, outputs ‘Go.’
* If the traffic light colour is amber, outputs ‘Get Ready.’
* Otherwise outputs ‘Stop.’

ANSWER

colour = input(“Key in traffic light colour”)

if colour==”green”

 print(“Go.”)

else if colour==”amber”

 print(“Get Ready.”)

else

 print(“Stop.”)

### Challenge 15

Write a program that:

* Asks the user to name one of the Olympic Values (Respect, Excellence and Friendship)
* If they correctly name one, output 'That’s correct‘
* Otherwise outputs ‘Incorrect’

ANSWER

value = input(“Key in one Olympic Value”)

if value==”Respect” OR value==”Excellence” OR value==”Friendship”

 print(“That’s correct.”)

else

 print(“Incorrect”)

### Challenge 16

Write an algorithm that:

* Asks the user how long on average they spend watching TV each day.
* If it is less than 2 hours, outputs ‘That should be ok’
* If it is between 2 and 4 hours, outputs ‘That will rot your brain’
* Otherwise outputs “That is too much TV”

ANSWER

time = input(“Key in how long you watch TV each day in hours”)

if time<2

 print(“That should be OK.”)

else if time>=2 AND time<=4

 print(“That will rot your brain.”)

else

 print(“That’s too much TV.”)

### Challenge 17

Write an algorithm that:

* Outputs all numbers between 1 and 10 only.

ANSWER

For x=1 to 10

 Print(x)

### Challenge 18

Write an algorithm that:

* Outputs all odd numbers between 1 and 20 only.

ANSWER

For x=1 to 20, step 2

 Print(x)

### Challenge 19

Write an algorithm that:

* Asks the user to input a number and repeat this until they guess the number 7.
* Congratulate the user with a ‘Well Done’ message when they guess correctly.

**ELSE**

ANSWER

answer=0

while(answer!=7)

 answer=input(“Key in your guess”)

print(“Well done.”)

### Pseudocode only challenges

### Challenge 20

MyHotPizza company have developed a new loyalty reward system for customers. Customers are automatically sent a reward card if they order more than 20 pizzas in a year.

They have a log of customer’s orders stored in a file, as shown:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Customer Name | Large | Medium | Small | Card? |
| Smith, J | **5** | **6** | **1** | **No** |
| Williams, P | **10** | **12** | **3** | **Yes** |

etc

Write an algorithm that goes through the customer orders, and where needed, sends customers a loyalty card if they do not already have one. If they have not ordered enough pizzas, then it removes them from the card list.

ANSWER – You are not told the file name or the type of file, so the algorithm will be vague.

open file (R,W)

 for each record

 numpizzas=large+medium+small

 if numpizzas<=20

 delete record

 else

 if card=”No”

 card=”Yes”

close file

### Challenge 21

A local swimming centre offers the following discounts:

1. Members who are **aged between 13 and 15** receive a 30% discount.
2. Members who are **aged between 16 and 17** receive a 20% discount.
3. Members who are **aged 50 and over** receive a 40% discount.
4. All other members receive no discount.

Create an algorithm using Pseudocode for the above actions.

ANSWER

age = input(“Key in your age in years”)

if age>=13 AND age<=15

 discount=30

else if age>=16 AND age<=17

 discount=20

else if age>=50

 discount=40

else

 discount =0

### Challenge 22

Write an algorithm that:

* Asks the user to input how many marks they got on a test.
* It should then convert this to a grade between 1 to 9 using the table below and then output the grade to the user. If they have not scored enough to be given a grade than a ‘U’ grade must be output.

|  |  |
| --- | --- |
| Mark | Grade |
| Greater than or equal to 10 | 1 |
| Greater than or equal to 20 | 2 |
| Greater than or equal to 30 | 3 |
| etc |  |

ANSWER

mark = input(“Key in your mark”)

if mark>=90

 grade=9

else if mark>=80

 grade=8

else if mark>=70

 grade=7

else if mark>=60

 grade=6

else if mark>=50

 grade=5

else if mark>=40

 grade=4

else if mark>=30

 grade=3

else if mark>=20

 grade=2

else if mark>=10

 grade=1

else

 grade=”U”

print(“Your grade is “, grade)

### Challenge 23

Create an algorithm that will:

* Allow the user to input how much money they want to change to coins.
* Select which coin they want to convert the money into £1, 50p, 20p, 10p, 5p, 2p ,1p
* Calculate how many of each coin will be given.
* State if there will be any money left over that cannot be changed into the

 chosen coin

ANSWER

money = input(“Key in how much money to change in pence”)

coin= input(“Key in which type of coins you want, e.g 5, 10, 50 (for £ type 100)”)

num\_coins=money DIV coin

remainder=money MOD coin

if remainder!=0

 print(“There will be “,remainder, ” pence left over”)

### No help given, pseudocode only!

### Challenge 24

Create an algorithm that:

* Randomly generates the computer status ‘rock’ ‘paper’ or ‘scissors.’
* Asks the user to input their status ‘rock’ ‘paper’ or ‘scissors.’
* If the computer and user have the same status then output ‘Game Tied.’
* If the computer generates ‘Rock’ and user generates ‘Scissors’ then output ‘Computer Wins’
* If the computer generates ‘Paper’ and user generates ‘Rock’ then output ‘Computer Wins’
* If the computer generates ‘Scissors’ and user generates ‘Paper’ then output ‘Computer Wins’

Otherwise output ‘You Win!’

ANSWER

choices= [“Rock”,”Paper”,”Scissors”]

comp\_choice=choices.randchoice()

user\_choice = input(“Key in your choice – Rock, Paper, or Scissors”)

if (comp\_choice==”Rock” AND user\_choice=”Scissors”) OR

 (comp\_choice==”Paper” AND user\_choice=”Rock”) OR

 (comp\_choice==”Scissors” AND user\_choice=”Paper”)

 print(“Computer wins.”)

else if (comp\_choice==”Rock” AND user\_choice=”Rock”) OR

 (comp\_choice==”Paper” AND user\_choice=”Paper”) OR

 (comp\_choice==”Scissors” AND user\_choice=”Scissors”)

 print(“It’s a tie.”)

else

 print(“You win.”)

### Challenge 25

SpeedyClub Runners is a local sports club, who organise a 5k race every year.

The results of the race are stored in a record structure (called **RaceFile**) as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| RunnerNumber | Name | AgeCategory | Club? |
| 44325 | Wilburforce, Emily | U18 | SpeedyClub |
| 543 | Chan, Zhu | Snr |  |
| 2425 | Patel, Aisha | Vet |  |
| 5552 | Ewards, Craig | Snr | LighteningFast Runners |

Produce an algorithm that counts the number of runners in each Age category for the race.

ANSWER – You are not told the type of file.

U18=0, Snr=0, Vet=0

open RaceFile (R)

 for each record

 if AgeCategory=”U18”

 U18=U18+1

 else if AgeCategory=”Snr”

 Snr=Snr+1

 else if AgeCategory=”Vet”

 Vet=Vet+1

close file

### Challenge 26

A dog that is 5 years old is equivalent to a 42 year old human. Ashok is writing a program which converts the age of the dog to the equivalent age for a human.

The program uses the following method:

* The user inputs age of the dog in years
* If the age is 2 or less, the human equivalent is 12 times the age
* If the age is more than 2, the human equivalent is 24 for the first 2 years, plus 6 for every additional year.

Write an algorithm to calculate and output the human equivalent of the age of the dog using the method described.

ANSWER

dog\_age = input(“Key in the dog’s age in years”)

if dog\_age<=2

 human\_age=dog\_age\*12

else

 human\_age=24+((dog\_age-2)\*6)

print(“The human equivalent age is “, human\_age)

### Challenge 27

The cost of a day-time journey is £3 for the first kilometre and £2 for every kilometre after that. If there are five of more passengers in the taxi, an extra 50% is added to the charge.

Write an algorithm to calculate the cost of a day-time journey.

Your algorithm should:

* Allow the number of passengers and the distance of the journey to be input as whole numbers,
* Calculate the cost of the journey,
* Output the cost that has been calculated.

ANSWER

num\_pass = input(“Key in the number of passengers”)

distance = input(“Key in the distance in km”)

cost=3+((distance-1)\*2)

if num\_pass>=5

 cost=cost\*1.5

print(“The cost is “, cost)

### Difficulty Level 6Difficulty 6 Challenges

### Challenge 28

A gardener needs to buy some turf for a project they are working on. The garden is rectangular with a circular flower bed in the middle.

Produce an algorithm that:

* Asks the user for the dimensions of the lawn and the radius of the circle (in metres)
* Calculates and output the amount of turf needed

**Tip:** Circle area = Pi x Radius2

ANSWER

length = input(“Key in the length of the lawn”)

width = input(“Key in the width of the lawn”)

radius = input(“Key in the radius of the circle”)

area=(length\*width)-(3.14\*radius\*radius)

print(“The area is “, area)

### Challenge 29

The wages earned by a worker is either £2 for every teddy bear they have made or £5 for every hour they have worked, whichever is larger.

Write an algorithm that:

* allows the user to input the number of teddy bears made and the number of hours worked
* calculates the wages for the number of teddy bears made
* calculates the wages for the number of hours worked
* outputs the larger of the two results.

ANSWER

number = input(“Key in the number of teddy bears made”)

hours = input(“Key in the number of hours worked”)

wages1=2\*number

wages2=5\*hours

if wages1>wages2

 print(“Wage is “, wages1)

else

 print(“Wage is “, wages2)

### Challenge 30

An isosceles triangle is a triangle that has at least two equal sides. The diagram below shows examples of isosceles triangles. In each diagram the marked sides are equal.



Write an algorithm for a computer program that determines whether a triangle in an isosceles triangle.

* The user inputs the lengths of the three sides as Length 1, Length 2 and Length 3
* If any two side have the same length the program outputs “Isosceles”
* Otherwise the program outputs “Not Isosceles”

ANSWER

length1 = input(“Key in the first side length”)

length2 = input(“Key in the second side length”)

length3 = input(“Key in the third side length”)

if length1==length2 OR length3==length2 OR length1==length3

 print(“Isosceles“)

else

 print(“ Not Isosceles“)

### Challenge 31

The student is writing an algorithm to solve a problem.

* The user will provide a series of numbers, representing the weights in grams of individual fruits.
* The weights are always **whole positive numbers**.
* The number of weights to be entered will also be provided by the user.
* The solution should calculate and report the **mean** weight of the fruits to **two decimal places**.

Two examples of the executing solution are shown below:

How many weights do you want to enter?

3

Enter a weight:

138

Enter a weight:

135

Enter a weight:

285

Average weight is: 186.00

How many weights do you want to enter?

4

Enter a weight:

279

Enter a weight:

135

Enter a weight:

145

Enter a weight:

138

Average weight is: 174.25

Write an algorithm for the process described above.

ANSWER

how\_many = input(“Key in how many fruit”)

total=0.0

for x=1 to how\_many

 weight = input(“Key in fruit weight”)

 total=total+weight

print(“Average weight is “, format(total/how\_many,2dp),” grams”)

### Challenge 32:

Norma would like to invest her savings in a bank account that generates the most money. She would like a program that will allow her to:

* Enter the amount of money she wants to save.
* Input the number of bank accounts she wants to compare.
* Enter the interest rate for each account.
* The interest is calculated by dividing the money to be saved by 100 and then multiplying this by the interest rate.
* The total is calculated by adding the money to be saved to the interest and then outputted.
* The program should repeat this for all bank accounts.

Create an algorithm using Pseudocode for the above actions.

ANSWER

how\_much = input(“Key in how much money to save”)

how\_many = input(“Key in how many accounts to compare”)

int\_rates=[]

for x=1 to how\_many

 interest = input(“Key in interest rate for account ”, x)

 int\_rates.append(interest)

for x=1 to how\_many

 total = (how\_much/100\*int\_rates[x])+how\_much

 print(“The total for account “, x, “ is “,total)

### Difficulty Level 7Difficulty 7 Challenges

### Challenge 33

Write an algorithm that:

* Ask the user to input how many GCSE’s they have.
* They should then be allowed to enter a result for each GCSE grade.
* The computer should work out how many points they have got (9=9, 8=8, 7=7 etc).
* If their score is 40 or over it should output ‘You can go to the sixth form’
* If they their score between 35 and 39 it should output ‘A discussion is needed’
* Otherwise it should say ‘Sorry not enough points.’

ANSWER

how\_many = input(“Key in how many GCSEs”)

score=0

for x=1 to how\_many

 grade = input(“Key in your grade”)

 score=score + grade

if score>=40

 print(“You can go to sixth form”)

else if score>=35 AND score<=39

 print(“A discussion is needed”)

else

 print(“Sorry not enough points”)

### Challenge 34

Roger has switched to a new electric supplier. He will receive free electric one day a week. He will not pay for the day that he uses the least amount of electric. Write an algorithm that will:

* Allow the user to input the day of the week and then units of electric used.
* Compare them until all comparisons are completed.

Output the day that will be free of charge.

ANSWER

days\_list=[], units\_list=[]

for x=1 to 7

 day = input(“Key in day”)

 days\_list.append(day)

 units= input(“Key in units”)

 units\_list.append(units)

minimum=units\_list[1]

free\_day= days\_list[1]

for x=2 to 7

 if units\_list[x]<minimum

 minimum=units\_list[x]

 free\_day= days\_list[x]

print(free\_day)

### Challenge 35

Write an algorithm that:

* Asks the user to **input** how many cars are available for a trip.
* Asks the user to **input** how many people are going on the trip.
* If there are enough seats it should output ‘We have enough seats’
* If there are not enough seats it should calculate how many extra cars are needed and then output ‘Another x cars are needed’ with x being the number of cars.

NOTE: Assume you can fit FIVE people in each car.

ANSWER

cars = input(“Key in how many cars”)

people = input(“Key in how many people”)

seats=cars\*5

if people<=seats

 print(“We have enough seats”)

else

 extra\_cars = ((people-seats) DIV 5) + 1

 print(“Another “, extra\_cars, “ cars are needed “)

### Difficulty 8 challenges

### Challenge 36

* Petrol costs £1.40 per litre. Diesel costs £1.55 per litre. LPG costs £0.95 per litre.
* Ask the user for which type of fuel their car uses and how much they have put into it.
* Calculate the correct price of the fuel they have taken.
* Ask how much money they have handed over and calculate the amount of change they are due.
* Finally, ask them if they have a loyalty card and if they do calculate how many points they should have added to it using the following – 1 point for every litre of fuel they’ve taken plus 1 point for every full pound they’ve paid.
* If the number of points they get is more than 100 they get a bonus 10% extra points.
* The number of points should then be outputted

ANSWER

type = input(“Key in fuel type”)

amount = input(“Key in amount of fuel”)

if type=”petrol”

 cost=amount\*1.4

if type=”diesel”

 cost=amount\*1.55

if type=”LPG”

 cost=amount\*0.95

money\_given=input(“How much money given?”)

change=money\_given-cost

loyalty = input(“Do you have a Loyalty Card (Y/N?”)

if loyalty=”Y”

 new\_pts=(amount DIV 1) + (cost DIV 1)

 if new\_pts>100

 new\_pts=new\_pts \* 1.1

print(“Points earned”, new\_pts)

### Drinks machine display and key padChallenge 37

A free drinks machine in an office provides 20 different drinks.

The machine has a small keypad with keys 0 to 9, OK and CANCEL. It also has a small LCD screen, which can display a short message.

To get a drink, users select an item number between 1 and 20 with the keypad and confirm their choice by pressing OK. If they make a mistake they can press the CANCEL button and start again. If the selection is valid and the drink is available it dispenses the drink. The display screen is used to show suitable short messages throughout the process.

Write an Algorithm of the process described above.

ANSWER

While ok==FALSE

choice= -1

ok=FALSE

drinks=[array of 20 integers (each>=0) representing quantities of available drinks]

while choice<1 AND choice>20

 choice = input(“Please enter your choice between 1 and 20”)

print(“Press OK to confirm or Cancel to reselect”)

if ok pressed

 ok=TRUE

if cancel pressed

 ok=FALSE

if ok==TRUE AND drinks[choice]>0

 dispense drink

 drinks[choice]=drinks[choice]-1

 ok=FALSE

### Difficulty Level 9Difficulty 9 Challenges

### Challenge 38

The company also offers a saving plan. Customers pay a fixed amount each year into the savings plan. At the end of each year, the company adds the value of the savings plan at the start of the year to the amount paid, and then adds interest of 10% to obtain the final value for the year.

For example, if a customer saves £100 each year, the value of the savings plan for 5 years is shown in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Start | Paid in | Interest | Final |
| 1 | 0.00 | 100.00 | 10.00 | 110.00 |
| 2 | 110.00 | 100.00 | 21.00 | 231.00 |
| 3 | 231.00 | 100.00 | 33.10 | 364.10 |
| 4 | 364.10 | 100.00 | 46.41 | 510.51 |
| 5 | 510.51 | 100.00 | 61.05 | 671.56 |

Write an algorithm which allows the user to input the amount saved each year and the number of years, and then outputs the growth of the savings plan in the format shown above.

ANSWER

headings=[“Year”,”Start”,”Paid in”,”Interest”,”Final”]

starts=[], paid\_in=[], interests=[], finals=[]

years=input(“Key in how many years you are going to save”)

for x=1 to years:

amount=input(“Key in amount to be saved in year ”,x)

if x==1

 start=0

 starts.append(start)

 paid\_ins.append(amount)

 interests.append(amount\*110/100)

 finals.append((amount\*110/100) + amount)

else

 start=finals[x-1]

 starts.append(start)

 paid\_ins.append(amount)

 interests.append((start+amount)\*110/100)

 finals.append((start+amount)\*110/100 + amount)

print(headings)

for x=1 to years:

 print(starts[x], paid\_ins[x], interests[x],finals[x])

### Challenge 39

A primary school teacher wants a computer program to test the basic arithmetic skills of her students. The program should generate a quiz consisting of a series of random questions, using in each case any two numbers and addition, subtraction and multiplication. The system should ask student’s name, then ask 10 questions, output if the answer to each question is correct or not and produce a final score out of 10.

Scores from the quiz should be stored and added to when a student takes a new quiz.

Write an algorithm for the process described above.

ANSWER - You are not told the type of file to be used or its structure.

score = 0

name=input(“Key in your name”)

for questions=1 to 10:

 num1=random(1-100)

 num2=random(1-100)

 operator = randomchoice(+,-,/,\*)

 question=str(num1) + str(operator) + str(num2)

 human\_response=input(question)

 if operator==”+”:

 answer = num1 + num2

 if operator==”-”:

 answer = num1 - num2

 if operator==”\*”:

 answer = num1 \* num2

 if operator==”/”:

 answer = num1 / num2

 if human\_response==answer:

 print(“Correct”)

 score += 1

 else:

 print(“Incorrect”)

print(“Final score is “,score)

open test\_scores file (R/W)

 for each record

 if name == name

 retrieve stored\_score

 stored\_score = score + stored\_score

 write all data back to file

close file

### Challenge Rating 10

### Challenge 40

Write an algorithm that:

* Gives the user 3 lives at the start of the game.
* Allows the user to play the game until their have no lives left.
* They should move onto the next level for every 5 points they earn.
* The game is complete when they receive 20 points.
* At the end of the game it should tell the user which level they got up to.