ICT159

Week 7 | Weekly Assignment | Exercises 6

# Algorithm

FUNCTION returnIp(arr[]: FLOAT) : INTEGER

DECLARE typeCheck : INTEGER

PRINT "Please enter the kelvin temperatures of 10 samples"

FOR i ← 0 TO 9

PRINT(“i + 1”)

typeCheck ← INPUT(“arr[i]”)

IF typeCheck = 0 THEN

PRINT "Please enter a positive number only."

RETURN 0

ELSE IF arr[i] < 0 THEN

PRINT("Please enter a positive Kelvin temperature —-----------------only.")

i -= 1

ENDIF

NEXT i

RETURN 1

ENDFUNCTION

PROCEDURE toCelsius(arr[]: FLOAT, cArr[]: FLOAT)

FOR i ← 0 TO 9

cArr[i] ← arr[i] - 273

NEXT i

ENDPROCEDURE

PROCEDURE toFahren(cArr[]: FLOAT, fArr[]: FLOAT)

FOR i ← 0 TO 9

fArr[i] ← ((9 \* cArr[i])/5) + 32

NEXT i

ENDPROCEDURE

FUNCTION printSamples(kArr[], cArr[], fArr[])

FOR i FROM 0 TO 9 DO

PRINT "Sample (i+1): kArr[i] K"

CALL state(cArr, i)

PRINT "cArr[i] C and fArr[i] F"

END FOR

END FUNCTION

FUNCTION returnMax(arr[]: FLOAT) : INTEGER

DECLARE max ← arr[0]: FLOAT

DECLARE maxIx ← 0 : INTEGER

FOR i ← 0 TO 9 DO

IF arr[i] > max THEN

max ← arr[i]

maxIx ← i

ENDIF

NEXT i

RETURN maxIx + 1

ENDFUNCTION

FUNCTION returnMin(arr[]: FLOAT) : INTEGER

DECLARE min ← arr[0] : FLOAT

DECLARE minIx ← 0 : INTEGER

FOR i ← 0 TO 9

IF min > arr[i] THEN

min ← arr[i]

minIx ← i

ENDIF

NEXT i

RETURN minIx + 1

ENDFUNCTION

PROCEDURE calcAvg(arr[10]: FLOAT, cArr[10]: FLOAT, fArr[10]: FLOAT, —----------------avgArr[3]: FLOAT)

DECLARE kSum ← 0, cSum ← 0, fSum ← 0: FLOAT

FOR i ← 0 TO 9

kSum ← kSum + arr[i]

cSum ← cSum + cArr[i]

fSum ← fSum + fArr[i]

NEXT i

avgArr[0] ← kSum / 10

avgArr[1] ← cSum / 10

avgArr[2] ← fSum / 10

ENDPROCEDURE

PROCEDURE printAvg(avgArr[3]: FLOAT)

PRINT("Average temperatures of samples in Kelvin: ", avgArr[0])

PRINT("Average temperatures of samples in Celsius: ", avgArr[1])

PRINT "Average temperatures of samples in Fahrenheit: ", avgArr[2])

ENDPROCEDURE

PROCEDURE input() : FLOAT

DECLARE input : FLOAT

DECLARE type : INTEGER

PRINT "Enter a threshold to find K-temp samples lower it."

REPEAT

type ← INPUT(input)

IF type = 0 AND input > -1 THEN

PRINT("\*\*\*Note decimals values will be rounded to —-----------------floor.")

RETURN input

ELSE

PRINT("Please enter a number only.")

END IF

UNTIL FALSE

ENDPROCEDURE

FUNCTION kUnderThreshold(arr[]: FLOAT, threshold: FLOAT) : INTEGER

DECLARE i ← 0: INTEGER

FOR j ← 0 TO 9 DO

IF arr[j] < threshold THEN

i ← i + 1

END IF

NEXT i

RETURN i

ENDFUNCTION

PROCEDURE state(cArr[]: FLOAT, index: INTEGER)

IF cArr[index] > 0 THEN

IF cArr[index] < 100 THEN

PRINT "Liquid"

ELSE

PRINT "Gas"

ENDIF

ELSE

PRINT "Solid"

ENDIF

ENDPROCEDURE

START

DECLARE kArr[10], cArr[10], fArr[10], avgArr[3], threshold: FLOAT

DECLARE underThreshold : INTEGER

IF returnIp(kArr) = 1 THEN

CALL toCelsius(kArr, cArr)

CALL toFahren(cArr, fArr)

FOR i ← 0 TO 9

PRINT("Sample", i + 1, ": ", kArr[i], "K | State: ")

CALL state(cArr, i)

PRINT(" | ", cArr[i], " C | ", fArr[i], " F")

NEXT i

PRINT("Sample number ", returnMax(kArr), " has the highest —-----------temperature.")

PRINT("Sample number ", returnMin(kArr), " has the lowest —-----------temperature.")

CALL calcAvg(kArr, cArr, fArr, avgArr)

CALL printAvg(avgArr)

threshold ← input()

PRINT(kUnderThreshold(kArr, threshold), " samples have a —-----------Kelvin temperature below the threshold of ", threshold)

ENDIF

END

# Structure Chart

# 

# Testing

| **Test #** | **Text Description** | **Inputs** | **Expected Outputs** | **Algorithm Outputs** | **Program Success/Failure** |
| --- | --- | --- | --- | --- | --- |
| 1 | Positive integer temperature values and positive integer value for threshold | 1. 10  2. 12  3. 14  4. 16  5. 18  6. 20  7. 22  8. 24  9. 26  10. 28  20 | Sample 1: 10.00K | State: Solid | -263.00 C | -441.40 F  Sample 2: 12.00K | State: Solid | -261.00 C | -437.80 F  Sample 3: 14.00K | State: Solid | -259.00 C | -434.20 F  Sample 4: 16.00K | State: Solid | -257.00 C | -430.60 F  Sample 5: 18.00K | State: Solid | -255.00 C | -427.00 F  Sample 6: 20.00K | State: Solid | -253.00 C | -423.40 F  Sample 7: 22.00K | State: Solid | -251.00 C | -419.80 F  Sample 8: 24.00K | State: Solid | -249.00 C | -416.20 F  Sample 9: 26.00K | State: Solid | -247.00 C | -412.60 F  Sample 10: 28.00K | State: Solid | -245.00 C | -409.00 F  Sample number 10 has the highest temperature.  Sample number 1 has the lowest temperature.  Average temperatures of samples in Kelvin: 19.00 K  Average temperatures of samples in Celsius: -254.00 C  Average temperatures of samples in Fahrenheit: -425.20 F  Enter a threshold to find K-temp samples lower it: 20  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  5 samples have a Kelvin temperature below the threshold of 20. | Sample 1: 10.00K | State: Solid | -263.00 C | -441.40 F  Sample 2: 12.00K | State: Solid | -261.00 C | -437.80 F  Sample 3: 14.00K | State: Solid | -259.00 C | -434.20 F  Sample 4: 16.00K | State: Solid | -257.00 C | -430.60 F  Sample 5: 18.00K | State: Solid | -255.00 C | -427.00 F  Sample 6: 20.00K | State: Solid | -253.00 C | -423.40 F  Sample 7: 22.00K | State: Solid | -251.00 C | -419.80 F  Sample 8: 24.00K | State: Solid | -249.00 C | -416.20 F  Sample 9: 26.00K | State: Solid | -247.00 C | -412.60 F  Sample 10: 28.00K | State: Solid | -245.00 C | -409.00 F  Sample number 10 has the highest temperature.  Sample number 1 has the lowest temperature.  Average temperatures of samples in Kelvin: 19.00 K  Average temperatures of samples in Celsius: -254.00 C  Average temperatures of samples in Fahrenheit: -425.20 F  Enter a threshold to find K-temp samples lower it: 20  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  5 samples have a Kelvin temperature below the threshold of 20. | Success |
| 2 | Positive float temperate values, and float value for threshold | 1. 1.2  2. 121.56  3. 3.5  4. 45.2  5. 53.1  6. 1.1  7. 1.01  8. 2.1  9. 3.1  10. 9.0  30.15 | Sample 1: 1.20K | State: Solid | -271.80 C | -457.24 F  Sample 2: 121.56K | State: Solid | -151.44 C | -240.59 F  Sample 3: 3.50K | State: Solid | -269.50 C | -453.10 F  Sample 4: 45.20K | State: Solid | -227.80 C | -378.04 F  Sample 5: 53.10K | State: Solid | -219.90 C | -363.82 F  Sample 6: 1.10K | State: Solid | -271.90 C | -457.42 F  Sample 7: 1.01K | State: Solid | -271.99 C | -457.58 F  Sample 8: 2.10K | State: Solid | -270.90 C | -455.62 F  Sample 9: 3.10K | State: Solid | -269.90 C | -453.82 F  Sample 10: 9.00K | State: Solid | -264.00 C | -443.20 F  Sample number 2 has the highest temperature.  Sample number 7 has the lowest temperature.  Average temperatures of samples in Kelvin: 24.09 K  Average temperatures of samples in Celsius: -248.91 C  Average temperatures of samples in Fahrenheit: -416.04 F  Enter a threshold to find K-temp samples lower it: 30.15  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  7 samples have a Kelvin temperature below the threshold of 30. | Sample 1: 1.20K | State: Solid | -271.80 C | -457.24 F  Sample 2: 121.56K | State: Solid | -151.44 C | -240.59 F  Sample 3: 3.50K | State: Solid | -269.50 C | -453.10 F  Sample 4: 45.20K | State: Solid | -227.80 C | -378.04 F  Sample 5: 53.10K | State: Solid | -219.90 C | -363.82 F  Sample 6: 1.10K | State: Solid | -271.90 C | -457.42 F  Sample 7: 1.01K | State: Solid | -271.99 C | -457.58 F  Sample 8: 2.10K | State: Solid | -270.90 C | -455.62 F  Sample 9: 3.10K | State: Solid | -269.90 C | -453.82 F  Sample 10: 9.00K | State: Solid | -264.00 C | -443.20 F  Sample number 2 has the highest temperature.  Sample number 7 has the lowest temperature.  Average temperatures of samples in Kelvin: 24.09 K  Average temperatures of samples in Celsius: -248.91 C  Average temperatures of samples in Fahrenheit: -416.04 F  Enter a threshold to find K-temp samples lower it: 30.15  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  7 samples have a Kelvin temperature below the threshold of 30. | Success |
| 3 | Zero input and lower bound values | 0 for all 10 values | Sample 1: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 2: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 3: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 4: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 5: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 6: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 7: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 8: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 9: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 10: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample number 1 has the highest temperature.  Sample number 1 has the lowest temperature.  Average temperatures of samples in Kelvin: 0.00 K  Average temperatures of samples in Celsius: -273.00 C  Average temperatures of samples in Fahrenheit: -459.40 F  Enter a threshold to find K-temp samples lower it: 0  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  0 samples have a Kelvin temperature below the threshold of 0.00. | Sample 1: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 2: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 3: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 4: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 5: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 6: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 7: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 8: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 9: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample 10: 0.00K | State: Solid | -273.00 C | -459.40 F  Sample number 1 has the highest temperature.  Sample number 1 has the lowest temperature.  Average temperatures of samples in Kelvin: 0.00 K  Average temperatures of samples in Celsius: -273.00 C  Average temperatures of samples in Fahrenheit: -459.40 F  Enter a threshold to find K-temp samples lower it: 0  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  0 samples have a Kelvin temperature below the threshold of 0.00. | Success |
| 4 | Null Input for temperatures | “” | Please enter a number only. | Please enter a number only. | Failure |
| 5 | Null input for threshold | “” | Please enter a positive number only. | Please enter a positive number only. | Failure |
| 6 | Negative inputs for temperature | -1 | Please enter a positive number only. | Please enter a positive number only. | Success |
| 7 | Negative inputs for temperature | -1 | Please enter a positive number only. | Please enter a positive number only. | Success |
| 8 | Very large mix of integer and float values | 1. 31241  2. 523155.121  3. 14014  4. 202.102  5. 4723  6. 326  7. 1387420  8. 3100  9. 380  10. 700  4500 | Sample 1: 31241.00K | State: Gas | 30968.00 C | 55774.40 F  Sample 2: 523155.13K | State: Gas | 522882.13 C | 941219.81 F  Sample 3: 14014.00K | State: Gas | 13741.00 C | 24765.80 F  Sample 4: 202.10K | State: Solid | -70.90 C | -95.62 F  Sample 5: 4723.00K | State: Gas | 4450.00 C | 8042.00 F  Sample 6: 326.00K | State: Liquid | 53.00 C | 127.40 F  Sample 7: 1387420.00K | State: Gas | 1387147.00 C | 2496896.50 F  Sample 8: 3100.00K | State: Gas | 2827.00 C | 5120.60 F  Sample 9: 380.00K | State: Gas | 107.00 C | 224.60 F  Sample 10: 700.00K | State: Gas | 427.00 C | 800.60 F  Sample number 7 has the highest temperature.  Sample number 4 has the lowest temperature.  Average temperatures of samples in Kelvin: 196526.13 K  Average temperatures of samples in Celsius: 196253.13 C  Average temperatures of samples in Fahrenheit: 353287.56 F  Enter a threshold to find K-temp samples lower it: 4500  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  5 samples have a Kelvin temperature below the threshold of 4500.00. | Sample 1: 31241.00K | State: Gas | 30968.00 C | 55774.40 F  Sample 2: 523155.13K | State: Gas | 522882.13 C | 941219.81 F  Sample 3: 14014.00K | State: Gas | 13741.00 C | 24765.80 F  Sample 4: 202.10K | State: Solid | -70.90 C | -95.62 F  Sample 5: 4723.00K | State: Gas | 4450.00 C | 8042.00 F  Sample 6: 326.00K | State: Liquid | 53.00 C | 127.40 F  Sample 7: 1387420.00K | State: Gas | 1387147.00 C | 2496896.50 F  Sample 8: 3100.00K | State: Gas | 2827.00 C | 5120.60 F  Sample 9: 380.00K | State: Gas | 107.00 C | 224.60 F  Sample 10: 700.00K | State: Gas | 427.00 C | 800.60 F  Sample number 7 has the highest temperature.  Sample number 4 has the lowest temperature.  Average temperatures of samples in Kelvin: 196526.13 K  Average temperatures of samples in Celsius: 196253.13 C  Average temperatures of samples in Fahrenheit: 353287.56 F  Enter a threshold to find K-temp samples lower it: 4500  \*\*\*Note: Decimal numbers will be rounded to floor\*\*\*  5 samples have a Kelvin temperature below the threshold of 4500.00. | Success |
| 9 | String input for temperatures | “abc” | Please enter a number only. | Please enter a number only. | Success |
| 10 | String inputs for threshold | “xyz” | Please enter a number only. | Please enter a number only. | Success |