**Aga Khan University Examination Board**

**Notes from E-Marking Centre on SSC-II Computer Science Examination May 2018**

## Introduction:

This document has been produced for the teachers and candidates of Secondary School Certificate (SSC-II) Computer Science. It contains comments on candidates' responses to the 2018 SSC-II Examination, indicating the quality of the responses and highlighting their relative strengths and weaknesses.

## E-Marking Notes:

This includes overall comments on candidates' performance on every question and *some* specific examples of candidates' responses which support the mentioned comments. Please note that the descriptive comments represent an overall perception of the better and weaker responses as gathered from the e-marking session. However, the candidates' responses shared in this document represent some specific example(s) of the mentioned comments.

Teachers and candidates should be aware that examiners may ask questions that address the Student Learning Outcomes (SLOs) in a manner that requires candidates to respond by integrating knowledge, understanding and application skills they have developed during the course of study. Candidates are advised to read and comprehend each question carefully before writing the response to fulfill the demand of the question.

Candidates need to be aware that the marks allocated to the questions are related to the answer space provided on the examination paper as a guide to the length of the required response. A longer response will not in itself lead to higher marks. Candidates need to be familiar with the command words in the SLOs which contain terms commonly used in examination questions. However, candidates should also be aware that not all questions will start with or contain one of the command words. Words such as 'how', 'why' or 'what' may also be used.

## General Comments:

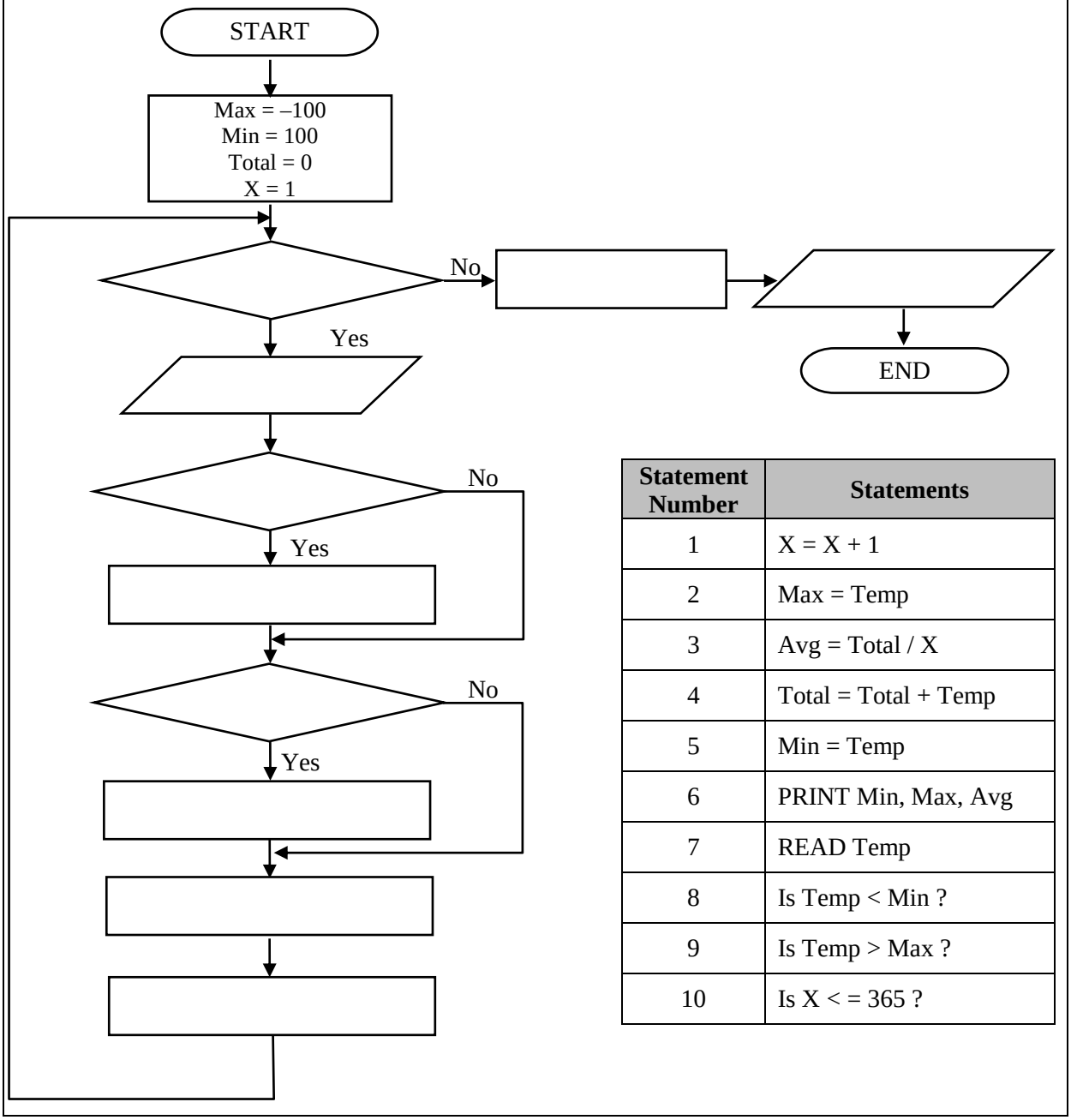
In general, questions related to arithmetic operations and relational operators in GW-BASIC, arrays, repetition using IF…ELSE statement, completion of the truth table and threats in computers were well attempted. However, questions based on completing flowchart, user-defined functions in GW-BASIC, uses and benefits of artificial intelligence in the defense industry and the weather forecast, calculating the checksum and performing arithmetic operations on arrays using GW-BASIC were generally not well attempted.

**Detailed Comments:**

## Constructed Response Questions (CRQs)

**Question 1:**

The given flowchart takes temperature as input once a day for a year. It calculates and gives minimum, maximum and average temperature values as output. Some of the flowchart statements are missing. Complete the given flowchart by using the statement number only from the given table.



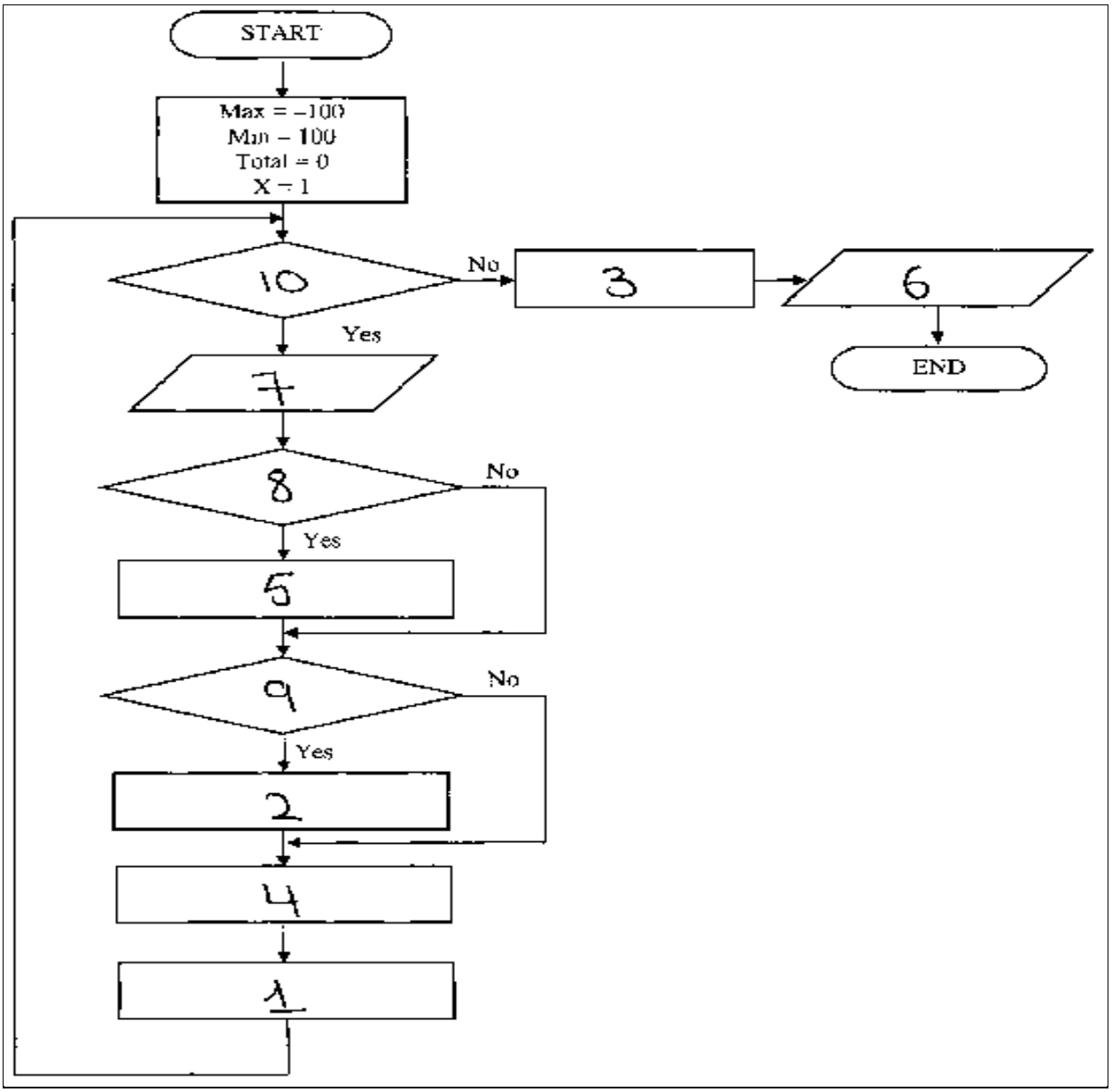

| Statement Number | Statements |
|---|---|
| 1 | X = X + 1 |
| 2 | Max = Temp |
| 3 | Avg = Total / X |
| 4 | Total = Total + Temp |
| 5 | Min = Temp |
| 6 | PRINT Min, Max, Avg |
| 7 | READ Temp |
| 8 | Is Temp < Min ? |
| 9 | Is Temp > Max ? |
| 10 | Is X < = 365 ? |

(**Note:** Most of the candidates performed below average in this question despite the fact that this question is from the first topic of Grade 10 Computer Science syllabus that forms the basis for the rest of the syllabus.)

*Better responses* demonstrated that candidates had a clear understanding of the purpose of each flowchart symbol and inserted the statement numbers inside the relevant symbols in the required order.

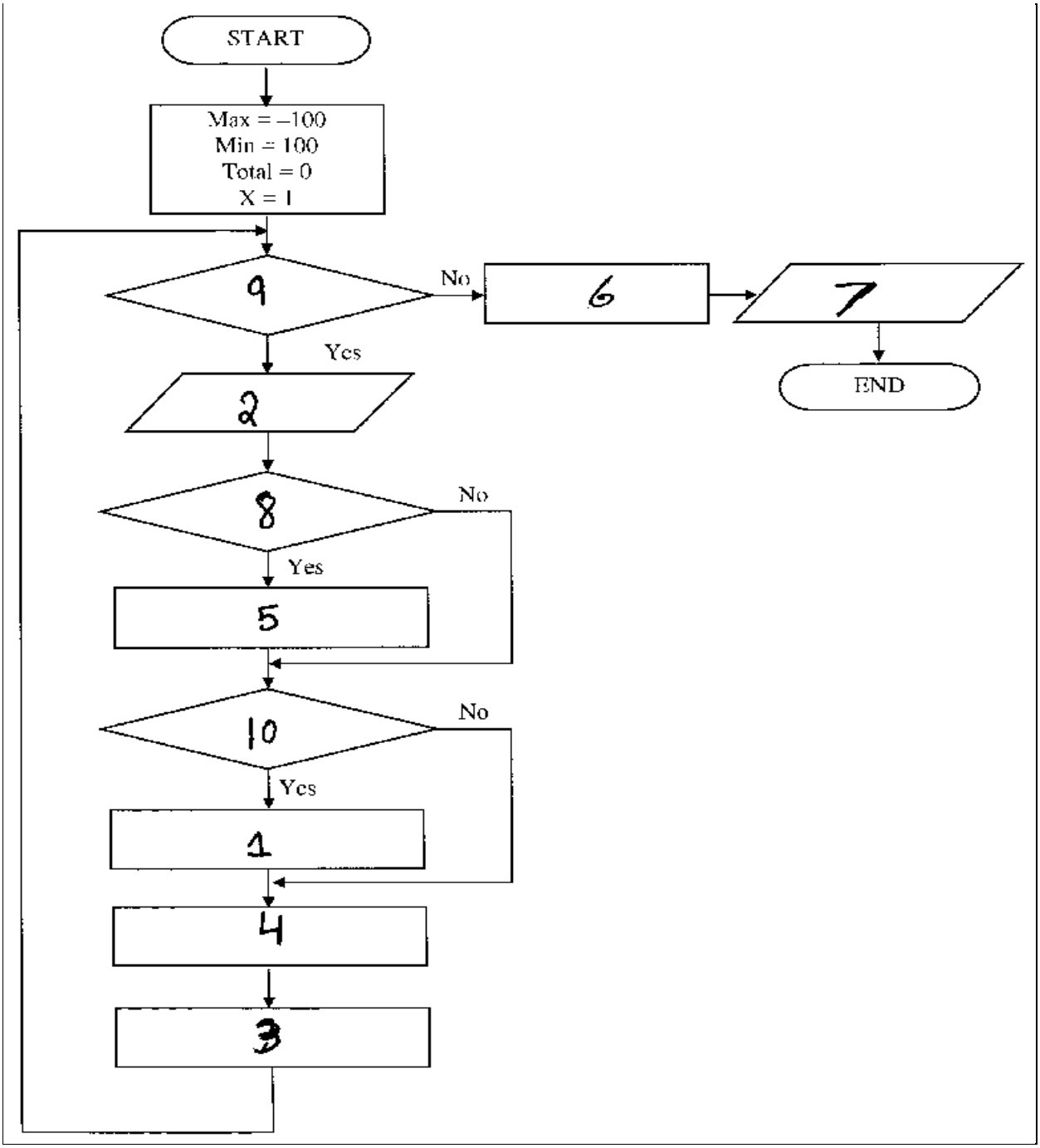
The pair of statements 9 and 2 can be used in the place of the pair of statements 8 and 5 and vice versa.

**Example:**



*Weaker responses* depicted that candidates did not know clearly that which statement number would go inside which flowchart symbol and placed incorrect statement numbers such as wrote statement 8 or 9 in place of statement 10/ statement 3 in place of statement 1 and vice versa/ statement 6 or 7 in place of statement 3/ statement 2 in place of statement 5 and vice versa, etc.

**Example:**



**Question 2a:**

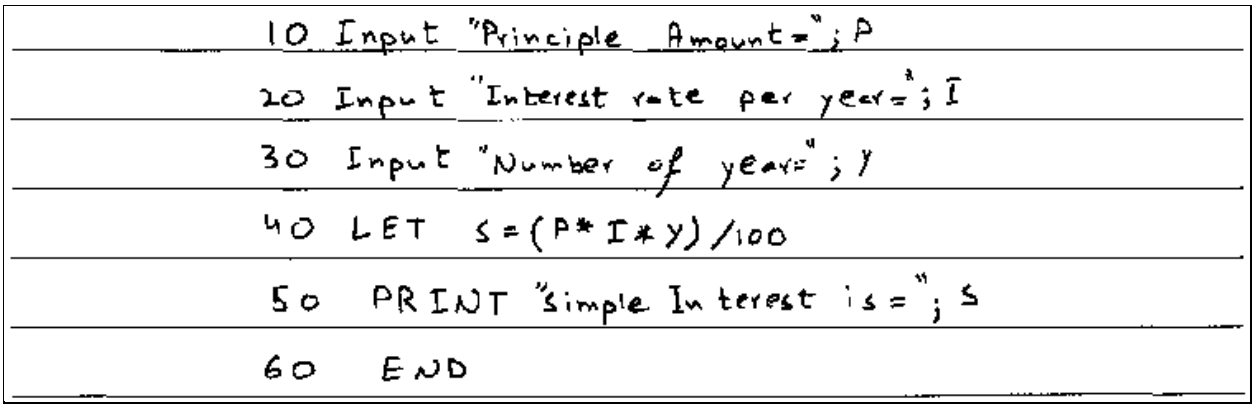
Write a GW-BASIC program that would calculate and give simple interest as output. The input would be the principal amount, interest rate per year and the number of years.

The formula to calculate simple interest is given below.

(Principal Amount × Interest Rate per Year × Number of Years) ÷ 100

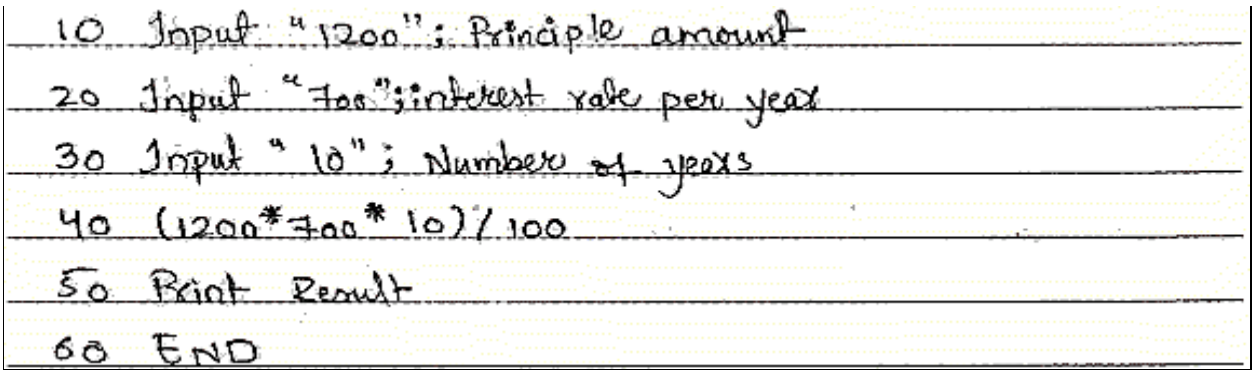
*Better responses* depicted good understanding of basic concepts of GW-BASIC programming, i.e. input from the user, performed calculations on input by writing the formula in GW-BASIC and displayed output with an appropriate message.

**Example:**




*Weaker responses* showed poor understanding of basic concepts of GW-BASIC programming and wrote incorrect GW-BASIC statements such as incorrect input statement/ used constant values for principal amount, interest per year and number of years/ used arithmetic operator of mathematics for division and multiplication rather than of GW-BASIC/ did not assign the result of arithmetic formula to a variable etc.

**Example:**



**Question 2b:**

There are SIX relational operators in GW-BASIC.

Complete the given table by writing the operations and symbols of relational operators.

(**Note:** This first operation has been mentioned for your convenience.)

| Operation | Symbol |
|---|---|
| Equal to | = |
| | |
| | |
| | |
| | |
| | |

*Better responses* wrote the correct names of relational operators and their symbols as shown in the below example.

**Example:**

| Operation | Symbol |
|---|---|
| Equal to | = |
| Not equal to | <> |
| greater than | > |
| less than | < |
| greater than or equal to | >= |
| less than or equal to | <= |

*Weaker responses* showed confusion between relational and arithmetic operators and wrote names and symbols of arithmetic operators in the place of relational operators/ wrote mathematical symbols of relational operators rather than symbols of relational operators in GW-BASIC/ wrote lesser than and/or greater than instead of not equal to for relational operator < >.

**Example:**

| Operation | Symbol |
|---|---|
| Equal to | = |
| greater than | < |
| less than | > |
| greater than or equal to | <= |
| lessthan or equal to | >= |
| is a member of | € |

**Question 3:**

Loops are used for repetition of code in any programming language. However, it is possible to repeat a program code without using the loop as well.

Write a GW-BASIC program that would display the following text TEN times on output screen by using IF…THEN…ELSE and GOTO statements.

I LOVE PAKISTAN

(**Note:** Do NOT use any type of loops.)

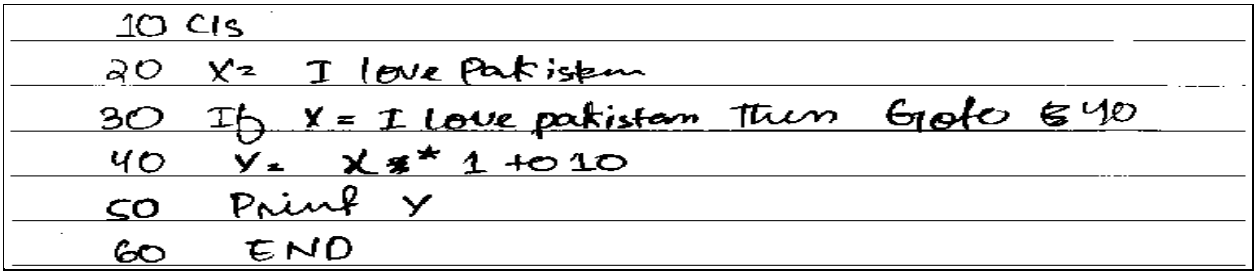
*Better responses* demonstrated a good understanding of repetition via IF statement in GW-BASIC. These responses wrote the correct condition of the IF statement and used a counter variable to count the number of iterations and printed the statement given in the question.

**Example:**

```
10 cls
20 let A=1
30 IF A <=10 then Print "I LOVE PAKISTAN" Else Goto60
40 A = A+1
50 Goto 30
60 End
```

*Weaker responses* did not write the correct program and made the common mistakes such as used FOR loop/ did not use IF condition in program/ incorrect condition of IF statement/ counter-statement outside of the IF statement/ did not use GOTO statement/ did not use counter statement etc.

**Example:**




**Question 4:**

a. Identify whether the given array representation is a one-dimensional array or two-dimensional array?

| | |
|---|---|
| X$(0) | Lahore |
| X$(1) | Karachi |
| X$(2) | Quetta |
| X$(3) | Peshawar |
| X$(4) | Islamabad |

b. State the major reason to support your selection of array in part (a).

c. If Hyderabad, Faisalabad, Khairpur, Gujranwala, Sukkur and Jacobabad are to be added to the array shown in part (a), then what would be the index number of the last element?

d. By looking at the array representation in part (a), how can one judge the data type of this array?

*Better responses* showed good visual understanding of arrays and identified array as one dimensional, gave the correct reason to identify the array, i.e. it has one column only/ it has single subscript value. Similarly, these responses wrote 10 as an index number in part **c** which means they know that index number starts from 0. Likewise, they wrote a **$** symbol to determine the data type of array as string.

**Example (a):**

One dimensional array

**Example (b):**

The above array contains one subscript which means it is a one dimensional array.

**Example (c):**

X$(10)

**Example (d):**

The data type of array in part (a) is 'string data" because it contain ($) which is the symbole of string data.

*Weaker responses* mostly identified the array given in this question as two-dimensional instead of one-dimensional which means they considered the column containing index numbers of the array as the second column of the array and wrote the same reason for the identification. Similarly, most of these responses wrote index number 11 to answer part **c** which means they have considered 1 as the first index number of the array instead of 0. Moreover, most of these responses answered the part **d** of this question correctly, i.e. data type of array can be determined as string by looking at **$**.

**Example (a):**

Two dimensional.

**Example (b):**

If we write above representation using Gw basic, we would write X$(5,2) b/c 5 rows 2 columns

**Example (c):**

either X$(11, 2) (using 2 dimensional)
~~or X$(10)~~

**Example (d):**

Data type is string b/c "$" represents strings

**Question 5:**

Write a user-defined function (using GW-BASIC) named CUBE to calculate the cube of any positive integer value. Input any integer value from user; call this function and print the output.

The formula to calculate the cube of any integer A is given below.

The formula for Cube = A × A × A

(**Note:** Most of the candidates performed below average in this question which means most of the candidates obtained marks below than 2 out of 3)

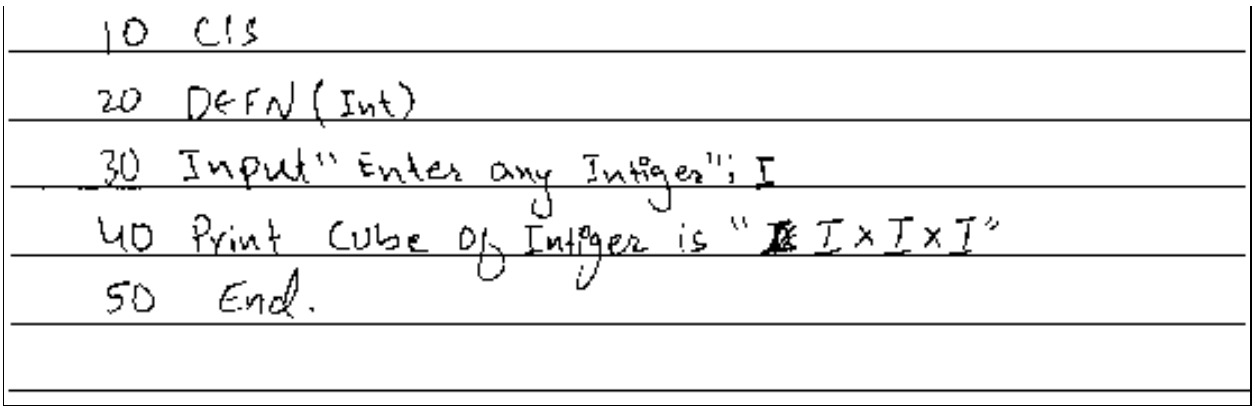
*Better responses* used the correct syntax to define the function named CUBE with an appropriate number of function parameters. Furthermore, these responses transformed the formula to calculate the cube in GW-BASIC instruction correctly and finally printed the value of cube function by calling the function with the PRINT keyword.

**Example:**

```
10 CLS
20 Def fncube(A) = A*A*A
30 Input "Enter the number" ;N
40 Print fncube(N)
50 End.
```

*Weaker responses* were not able to write the correct GW-BASIC code to define the function with the proper keyword (DEF) and the function name and instead of that, most of the responses wrote DEF keyword only. Likewise, these responses invoked the defined function incorrectly. However, most of these responses wrote input statement correctly and converted cube formula into GW-BASIC expression.

**Example:**




**Question 6:**

Complete the truth table for the given Boolean expressions.

| A | B | C | A + B | $\overline{A+B}$ | $X = \overline{(A+B)}.C$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | | | |
| 0 | 0 | 1 | | | |
| 0 | 1 | 0 | | | |
| 0 | 1 | 1 | | | |
| 1 | 0 | 0 | | | |
| 1 | 0 | 1 | | | |
| 1 | 1 | 0 | | | |
| 1 | 1 | 1 | | | |

(**Note:** Most of the candidates performed very well in this question)

*Better responses* demonstrated a very good understanding of the Boolean operations (complement, AND, OR), applied these operations on given variables and completed the table correctly as shown in the example.

**Example:**

| A | B | C | $A+B$ | $\overline{A+B}$ | $X=\overline{(A+B)}.C$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 |

*Weaker responses* were mostly able to calculate the complement of **A**+B. However, these responses did not perform the AND/ OR operations correctly.

**Example:**

| A | B | C | $A+B$ | $\overline{A+B}$ | $X=\overline{(A+B)}.C$ |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 | 0 | 0 |

**Extended Response Questions (ERQs)**

The following questions offered a choice between part **a** and **b**.

**Question 7a:**

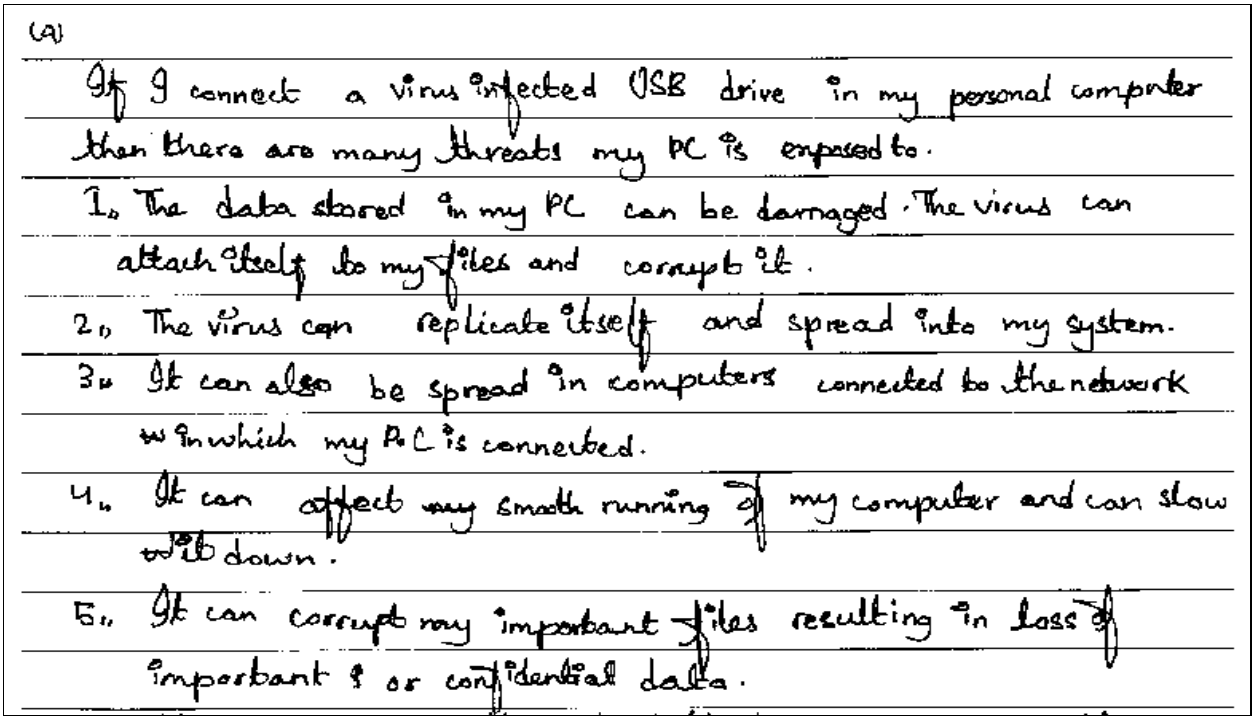
Suppose you connect a virus infected USB drive to your Personal Computer (PC).

i. What are the possible threats that your PC might be exposed to? Discuss at least SIX possible threats.
ii. What steps should you take to avoid the viruses that can infect your PC?

**(Note:** Most of the candidates opted part **a** of this question and it was clear after assessment that most of the candidates performed well in this part.)

*Better responses* described possible threats such as replication of folders due to viruses/ failure of operating system/ corruption of data and files/ damaging the boot sector/ changing the location of the file and making their shortcuts/ consuming the hardware and software resources to make system slow etc. Moreover, these responses wrote appropriate steps to prevent computer systems from viruses such as scan USB drive before opening it/ install anti-virus software and keep it updated/ avoid double click on USB drive because it may execute the virus in computer system/ run your anti-virus program regularly/ open USB drive in new window through menu via right click.

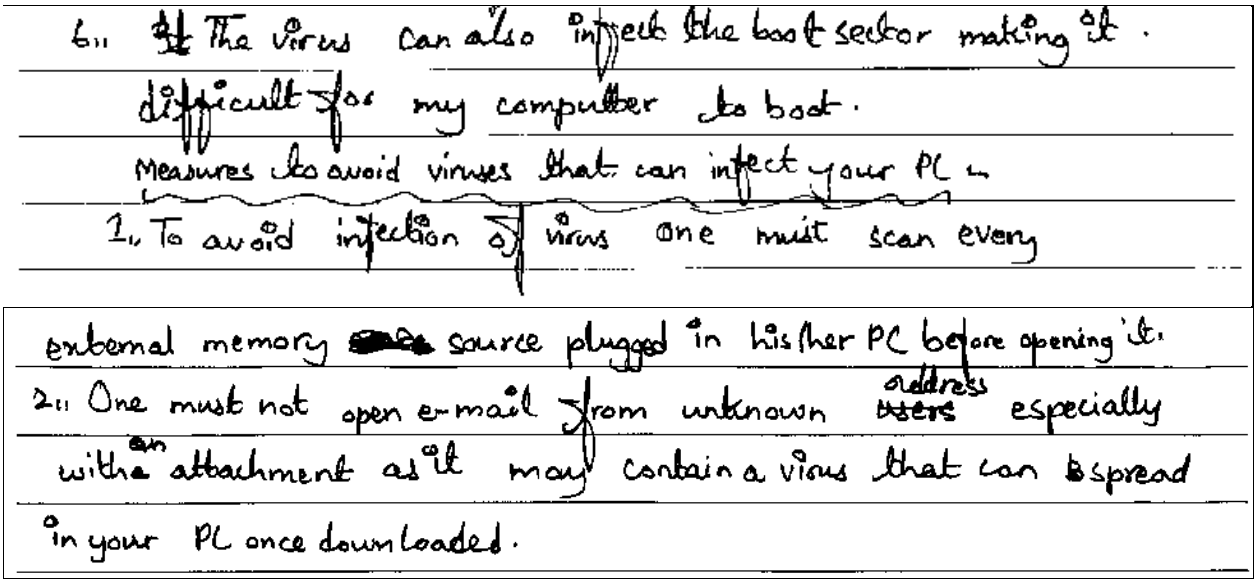
**Example:**



(a)

If I connect a virus infected USB drive in my personal computer then there are many threats my PC is exposed to.

1. The data stored in my PC can be damaged. The virus can attach itself to my files and corrupt it.
2. The virus can replicate itself and spread into my system.
3. It can also be spread in computers connected to the network in which my PC is connected.
4. It can affect my smooth running of my computer and can slow it down.
5. It can corrupt my important files resulting in loss of important & or confidential data.


6.. The virus can also infect the boot sector making it difficult for my computer to boot.

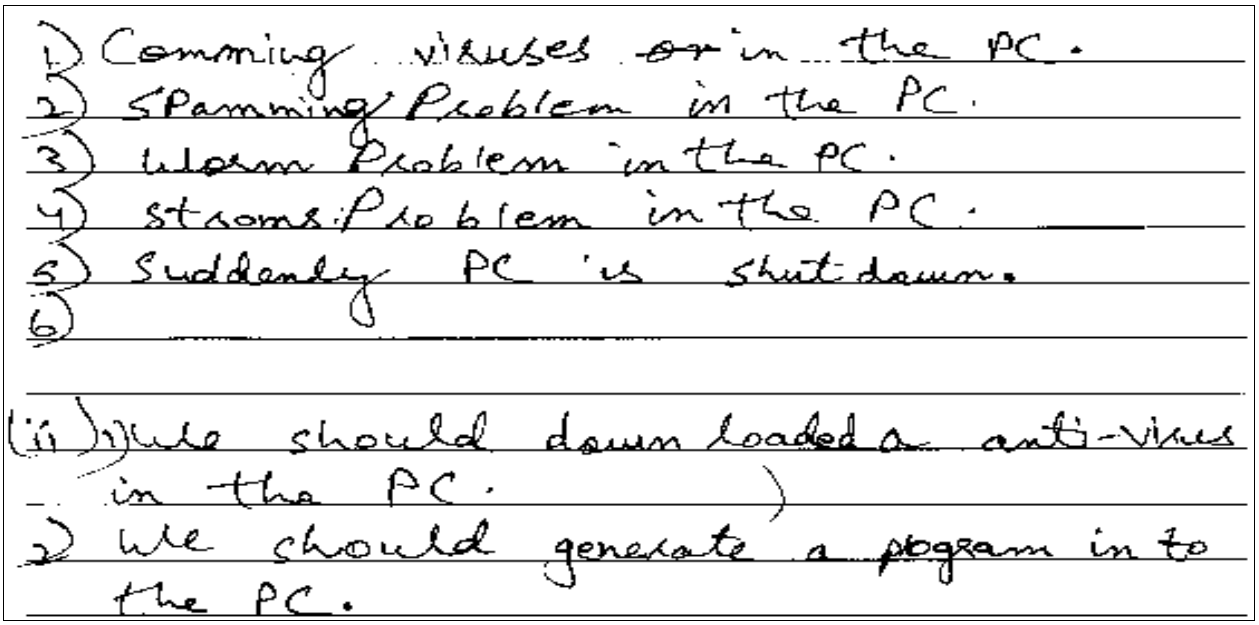
Measures to avoid viruses that can infect your PC ..

1.. To avoid infection of virus one must scan every external memory source plugged in his/her PC before opening it.

2.. One must not open e-mail from unknown address especially with an attachment as it may contain a virus that can spread in your PC once downloaded.

*Weaker responses* mostly wrote irrelevant threats to a computer system or rephrased the one or two threats multiple times rather than writing the unique threats. Moreover, most of these responses were able to write only one step to stop the viruses from attacking a computer system, i.e. using anti-virus software.

**Example:**


1) Comming viruses in the PC.
2) Spamming Problem in the PC.
3) Worm Problem in the PC.
4) Storms Problem in the PC.
5) Suddenly PC is shut down.
6)

(ii) 1) We should download a anti-virus in the PC.
2) We should generate a program in to the PC.

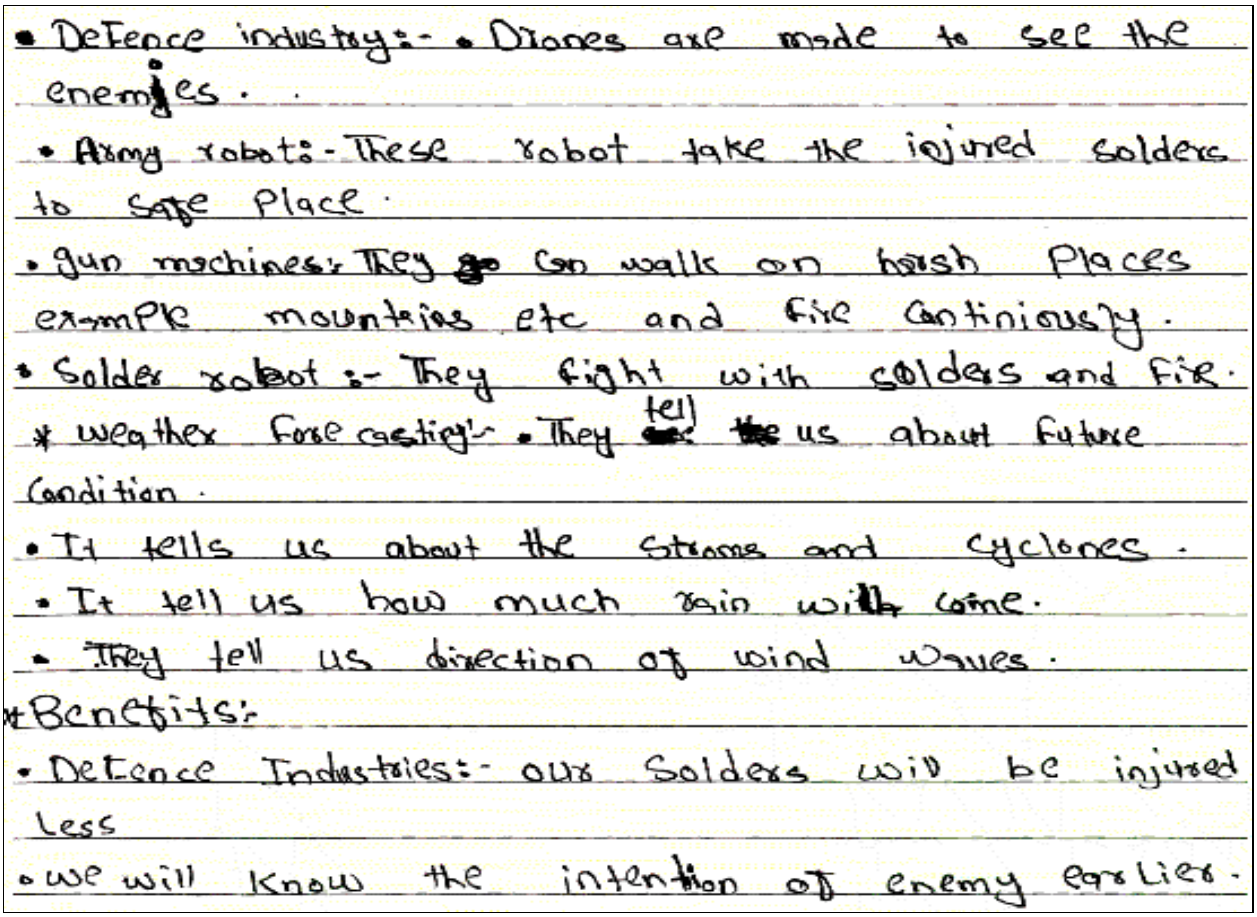
**Question 7b:**

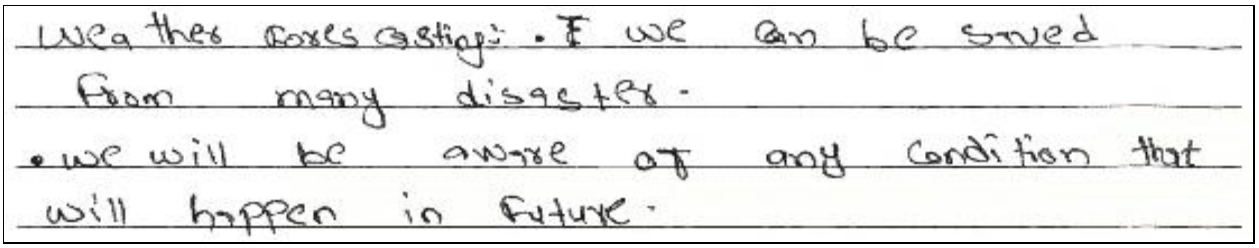
Artificial Intelligence (AI) is the science of making intelligent machines, especially intelligent computer programs. It is related to the task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

Describe the use of artificial intelligence in the defence industry and weather forecasting. Also, write at least TWO benefits of using artificial intelligence in these fields.

*Better responses* described relevant uses of artificial intelligence (AI) in the defence industry weather forecasting such as unmanned drone attacks can be done via AI/ quick and precise attacks on sensitive targets/ analyzing large sets of data to predict the weather better than any experienced weatherman. Moreover, these responses wrote benefits such as AI-based robots can fight in the battle without getting tired for 24×7/ are more accurate than humans/ can be sent to risky and dangerous places where a normal human cannot go/ AI-based systems can generate alarms to warn people in advance about a big storm etc.

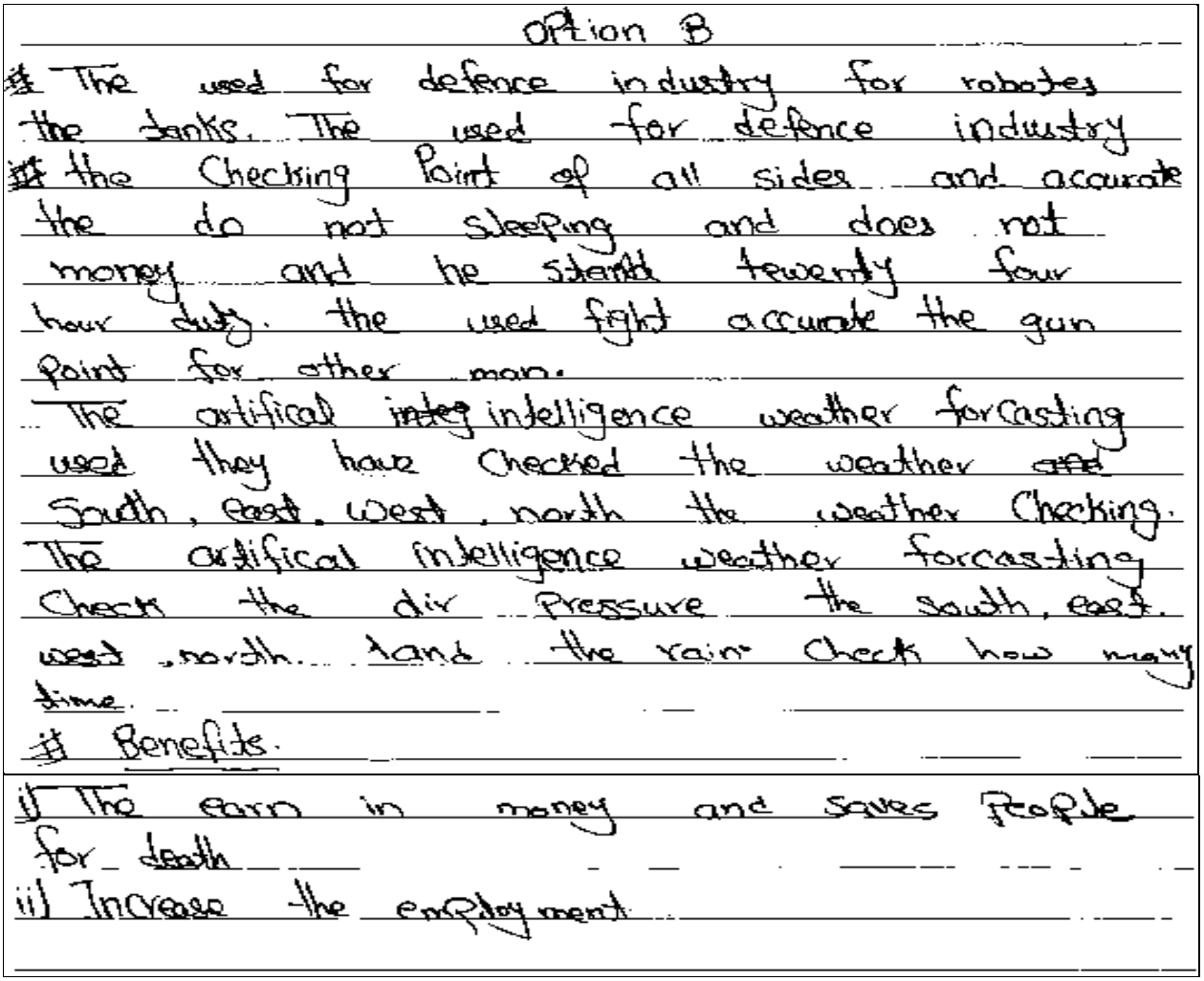
**Example:**


• Defence industry:- • Drones are made to see the enemies.
• Army robots:- These robot take the injured solders to safe place.
• gun machines:- They can walk on harsh places example mountains etc and fire continiously.
• Solder robot :- They fight with solders and fir.
* weather forecasting:- • They tell us about future condition.
• It tells us about the storms and cyclones.
• It tell us how much rain will come.
• They tell us direction of wind waves.
*Benefits:
• Defence Industries:- our Solders will be injured less
• we will know the intention of enemy earlier.


Weather forecasting: • If we can be saved from many disaster.
• we will be aware of any condition that will happen in future.

*Weaker responses* depicted that candidates could not differentiate between uses and benefits and they mostly wrote the benefits of AI. Moreover, most of these responses wrote general benefits of robots rather than relating them with the scenario given in the question, i.e. defence industry and weather forecasting. Likewise, most of these responses repeated the same points rather than writing unique uses and benefits.

**Example:**


Option B

# The used for defence industry for robotes the banks. The used for defence industry # the Checking Point of all sides and acourate the do not sleeping and does not money and he stand twenty four hour duty. the used fight accurate the gun point for other man.

The artifical integ intelligence weather forcasting used they have Checked the weather and South, east, West, north the weather Checking. The artifical intelligence weather forcasting Check the dir Pressure the south, east, west, north and the rain check how many time.

# Benefits.

i) The earn in money and saves People for death

ii) Increase the employment

**Question 8a:**

A small bookshop uses barcode which represents 5 digits. The last digit is called the check digit which is calculated as follows.

1. Add the first and third digit and multiply the result by 3
2. Add the second and fourth digit
3. Add the results of step 1 and 2
4. Divide the result of step 3 by 10 to get the remainder value
5. If the remainder is 0 then use it as a check digit, otherwise, subtract the remainder from 10 to get the check digit.

For instance, in 45678, the check digit is 8.

Write GW-BASIC code that would input the first four digits of barcodes of 150 books. It would calculate the check digit (fifth digit) and show it in output.

(**Note:** Candidates opted both parts of this question equally but they performed well in part **b**.)

*Better responses* demonstrated an excellent understanding of the given problem and wrote the correct FOR loop statement followed by input statement for four input digits and finally applied the different calculations, formulae and conditions given in this question.

**Example:**

```
10 cls
20 dim B(150)
30 FOR A = 1 to 150
40 Input 'Enter first digit of your book's barcode'; B1(A,)
50 Input 'Enter the second digit of your book's barcode'; B2(A)
60 Input 'Enter the third digit of your book's barcode'; B3(A)
70 Input 'Enter the fourth digit of your book's barcode'; B4(A)
80 Next A
90 LET D = (B1(A) + B3(A)) * 3
100 LET E = (B2(A) + B4(A))
110 LET R = D + E
120 LET IF R mod 10 = 0 then print 'F' : GOTO 150
115 LET F = R/10
```

```
140 LET CD = 10 - F : GOTO 160
150 print "Your check data is" ; F
160 print "Your check data is" ; CD
170 End.
```

*Weaker responses* showed lack of understanding of the problem given in the question and wrote incorrect GW-BASIC code that contains majors errors such as no FOR loop used/ FOR loop used with wrong loop condition/ division operator used instead of MOD to calculate the remainder/ constant values used to perform calculations instead of taking input during runtime and storing it in variables etc.

**Example:**

```
10 CLS
20 LET X = 1 to 150
30 Total barcode = 150
40 Barcode digit = 5
50 First no = 1
60 Second no = 3
70 Third no = 5
80 Forth no = 7
90 Fifth no = 9
100 (1 + 3 + 5 + 7 + 9) * 100 / 150
110 Barcode X
120 NEXT X
130 PRINT
140 END.
```

**Question 8b:**

Write a GW-BASIC program that must have one-dimensional arrays **A**, **B** and **C** respectively. Each array should be able to store fifteen integer values. The program should also perform addition operation on array **A** and **B**, store results in array **C** and show the sum of arrays in output.

*Better responses* depicted good understanding of the given problem and declared three arrays with appropriate names and subscript values followed by FOR loop statement with correct loop condition and the addition operation is performed on the values of arrays **A** and **B** and their answer is stored in array **C**. Finally, the output is displayed by printing the values of array **C**.

**Example**:

```
10 DIM A(15), B(15), C(15)
20 For I = 1 to 15
30 Input "Enter the Value of Variable A "; A(I)
40 Input "Enter the Value of Variable B"; B(I)
50 C(I) = A(I) + B(I)
60 Next I
70 For I = 1 to 15
80 Print "Sum of Pair of Value No" I "="; C(I)
90 Next I
100 End
```

*Weaker responses* exhibited lack of understanding of the given problem and wrote the incorrect GW-BASIC code that contains major errors such as incorrect or no declaration of arrays/ storing input values in variables rather than storing in arrays/ no use of FOR loop/ incorrect loop condition/ no output statement to show the sum of array **A** and **B** etc.

**Example:**