



OFFICE OF TASMANIAN
ASSESSMENT, STANDARDS
& CERTIFICATION

Tasmanian Certificate of Education
External Assessment 2018

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COMPUTER SCIENCE

(ITC315118)

SECTION A

Time: 36 minutes

Pages:	12
Questions:	3
Attachments:	Information Booklet

Candidate Instructions

1. You **MUST** make sure that your responses to the questions in this examination paper will show your achievement in the criterion being assessed.
2. Answer **ALL** questions. Answers must be written in the spaces provided on the examination paper.
3. You should make sure you answer all parts within each question so that the criterion can be assessed.
4. This examination is 3 hours in length. It is recommended that you spend approximately 36 minutes in total answering the questions in this booklet.
5. The 2018 External Examination Information Booklet for Computer Science can be used throughout the examination.
6. All written responses must be in English.

On the basis of your performance in this examination, the examiners will provide results on the following criterion taken from the course statement:

Criterion 1 Design, extend and improve algorithmic solutions to a range of problems.

Additional Instructions for Candidates

To be considered for a 'C' rating on a criterion, you must provide a satisfactory answer to at least the first questions of the relevant section.

To be considered for a 'B' rating on a criterion, you must provide a satisfactory answer to at least the first two questions of the relevant section.

To be considered for an 'A' rating on a criterion, you must provide a satisfactory answer to all three questions of the relevant section.

Show the methods used in deriving answers.

Take care with the presentation of your answers, which should be complete and to the point. Diagrams should be used where appropriate. Complete sentences should be used in questions involving explanations. You are reminded that poor handwriting, spelling and expression that make it difficult for the examiners to understand what you mean may lead to lower marks.

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Question 1

The following is a **partially completed** algorithm to work out the number of days of access to online **T**ext and **V**ideo resources by a user. The number of days of access depends on whether the user is a **N**on-member, **M**ember or **E**xecutive member.

The numbers on the left of the algorithm are provided for reference purposes.

```

1  Initially
2      set media = 'V'
3      set member = 'N'
4      set days = 5
5      set rate = 1
6      set period = 5

7  When a letter is entered into the "Member" Textfield
8      set member to value in "Member" TextField
9      if member is not equal to 'N' or 'M' or 'E'
10         set member = 'N'
11         if member equals 'N'
12             set rate = 1
13         if member equals 'M'
14             set rate = 2
15         if member equals 'E'
16             set rate = 3
17         display "Membership is: " member

18 When a letter is entered into the "Media" Textfield
19     set media to value in "Media" TextField
20     if media equals 'T'
21         set days = 30
22     if media equals 'V'
23         set days = 5
24     display "Media is: " media

25 When the "Calculate" button is pressed
26     set period = days * rate
27     display "Access period is: " period "days."

```

(a) (i) What is the initial value of the variable **rate**? (Circle the correct answer.)

1 5 N M

(ii) How many textfields have been used? (Circle the correct answer.)

1 2 3 4

(iii) Which of the following is **not** a valid value for the variable **member**?
(Circle the correct answer.)

E M N T

Question 1 continues.

Question 1 (continued)

(b) (i) What is the value given to the variable **rate** if the user is an **Executive** member?

.....

(ii) What is the period an **Executive** member can access a **Video**?

.....

.....

(c) Modify the algorithm so that the value entered from the textfield for variable **media** is validated. If the value entered for **media** is not valid, media is to be set to **V**.

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(d) Add a **Bonus** button to the algorithm that could be used after the **Calculate** button, to increase the access period by 5 days each time the **Bonus** button is used.

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Question 2

The following is a *partially completed* algorithm to calculate the best price for an order at a burger fast food store. The customer can order burgers at \$8.00 each, fries at \$2.50 each and drinks at \$3.00 each.

The store has a special price for a “meal” which is one burger, one fries and one drink.

Given the number of burgers, fries and drinks ordered, the algorithm calculates the **lowest possible price** by determining how many times the special meal price can be used; and then uses the standard prices for the remaining burgers, fries and drinks in the order.

For example, if a customer ordered 3 burgers, 4 fries and 2 drinks the algorithm will calculate the price of 2 meals plus 1 burger and 2 fries.

The numbers on the left of the algorithm are provided for reference purposes.

```

1  Initially
2      set drinks = 1
3      set burgers = 1
4      set fries = 1
5      set total_price = 11.00

6  When a number is entered into the “Burgers” Textfield
7      set burgers to value in “Burgers” TextField

8  When a number is entered into the “Fries” Textfield
9      set fries to value in “Fries” TextField

10 When a number is entered into the “Drinks” Textfield
11     set drinks to value in “Drinks” TextField

12 When the “Calculate” button is pressed
13     set total_price = 0.00
14     while burgers >= 1 and fries >= 1 and drinks >= 1
15         set total_price = total_price + 11.00
16         set drinks = drinks – 1
17         set burgers = burgers – 1
18         set fries = fries – 1
19     display “Total price is: ” total_price

```

(a) What is the total price if the customer orders two burgers, two fries and two drinks?

.....

Question 2 continues.

Question 2 (continued)

**For
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- (b) Currently the algorithm determines the total price of meals in the order but does not yet include the price of the remaining **burgers at \$8.00 each, fries at \$2.50 each and drinks at \$3.00 each** in the total price.

Include this calculation in the algorithm.

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- (c) The owner of the store decides to introduce a special price for a “half meal” which is a burger and one fries.

The special half meal price is \$9.00 for one burger and one fries.

Add this extra feature to the algorithm, specifying the location of your code within the algorithm.

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Question 3

The owner of a café in a town a short distance from a major port, wishes to create an applet that can be used to determine the number of extra customers for a given day depending on the cruise ships that are in port on that day. The port can have a maximum of three cruise ships on a day.

The applet will be given the number and type of cruise ships in port and whether it is forecast to rain on that day.

The café owner has examined the impact of the cruise ships on the number of extra customers and has collected the following data.

- The number of extra customers from a cruise ship is dependent on the size of the cruise ship according to the following table.

Size of cruise ship	Number of extra customers
Small	10
Medium	15
Large	25

- Some cruise ships are family-friendly and the café is family-friendly as well. The café will get three (3) times as many customers if the cruise ship is family friendly.
- If the forecast for the day is for rain, this will reduce the number of extra customers to a percentage dependent on the number of cruise ships in on that day as shown in this table.

Number of cruise ships	Percentage of extra customers if it rains
One	40%
Two	50%
Three	60%

The owner of the café wishes to be able to enter the number of cruise ships, and their size and family-friendly status, along with the forecast for rain and determine the number of extra customers.

An example of the calculation would be:

If there were **2 cruise ships** in port, **one large** and **one small** with the **small one being family-friendly**, and **rain is forecast**, then the number of extra customers would be:

$$\text{Number of extra customers} = [(25) + (10 \times 3)] \times \frac{50}{100} = 55 \times \frac{50}{100} = 27.5$$

Question 3 continues.

Question 3 (continued)

For
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Create an algorithm to implement this applet.

Notes:

- The applet should work correctly no matter what order the buttons or textfields are used.
 - It can be assumed that all data entered is the appropriate type for each textfield.
 - Appropriate variable names are to be used.
- (a) Design a possible screen for this applet, identifying all the textfields and/or buttons to be used.



Question 3 continues.



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(ITC315118)

SECTION B

Time: 36 minutes

Pages:	12
Questions:	3
Attachments:	Information Booklet

Candidate Instructions

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On the basis of your performance in this examination, the examiners will provide results on the following criterion taken from the course statement:

Criterion 2 Create programs in a high level programming language.

Additional Instructions for Candidates

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If you use a spare answer sheet, you MUST indicate you have done so in your answer to that question.

In this section you need to show how you obtained your answers as this may help you to gain part marks.

For
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Only

Question 4

- (a) (i) What will be the value of **a** after the following code is executed?

```
int a = 3 * 2;
```

(Circle the correct answer.)

3 5 6 9

- (ii) What will be the value of **b** after the following code is executed?

```
int b = 5;  
b = b + 2;
```

(Circle the correct answer.)

2 5 7 10

- (iii) What will be the value of **c** after the following code is executed?

```
double c = Math.pow(4, 2);
```

(Circle the correct answer.)

4.0 6.0 8.0 16.0

Question 4 continues.

Question 4 (continued)

(b) (i) What will be the value of **d** after the following code is executed?

```
int d;  
d = 2 + 5 * 4 + 1;
```

Value of **d**:

Explanation:
.....

(ii) What will be the final value of **e** after the following code is executed?

```
int e;  
e = 15 / 2;
```

Value of **e**:

Explanation:
.....

(iii) What will be the final value of **f** after the following code is executed?

```
char f = 'b';  
char f2 = 'a';  
char temp;  
temp = f2;  
f2 = f;  
f = temp;
```

Final value of **f**:

Explanation:
.....

(c) (i) What will be the value of ***h*** after the following code is executed?

```
double h;
h = 4.0;
if (h > 4.0)
{
    h = 2.0;
}
else
{
    h = 6.0;
}
```

Final value of ***h***:

Explanation:

.....

(ii) Trace the following code and find the final value of the variable ***k***.

```
int k = 4;
for (int i = 9; i > 6; i--)
{
    k = i;
}
```

Final value of ***k***:

<i>k</i>	<i>i</i>

(iii) Trace the following code and find the final value of the variable ***m***.

```
double m = 3.0;
while (m <= 10.0)
{
    m = m + 3.0;
}
```

Final value of ***m***:

<i>m</i>

Question 4 continues.

Question 4 (continued)

**For
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(d) Trace the following code and find the final value of the variable ***n*** and ***n2***.

```
int n = 0;
int n2 = 0;
for (int i = 1; i <= 3; i++)
{
    n = n2 + i;
    n2 = n - n2;
}
```

<i>i</i>	<i>n</i>	<i>n2</i>

(i) Final value of ***n***:.....

(ii) Final value of ***n2***:.....

Question 6

This question relates to the applet below.

For
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The numbers on the left are not part of the program and are provided for reference purposes.

```
1  import java.awt.*;import java.applet.Applet;
2  public class Question6 extends Applet
3  {
4      final int size = 5;
5      int    index = 0;
6      int    position[] = {2,4,9,13,18,20,21,23,24,25};
7      char   symbol[] = {'(', ')', 'X', 'X', '|', '=', 'X', 'X', '=', '|'};
8      char   pattern[][] = new char[size][size];

9      public char setSymbol(int count)
10     {
11         char temp;
12         if (count == position[index])
13         {
14             temp = symbol[index];
15             index = index + 1;
16         }
17         else
18             temp = '.';
19         return temp;
20     }

21     public void paint(Graphics g)
22     {
23         int begin = 0;
24         int end = size - 1;
25         int count = 1;
26         while (end - begin > 1)
27         {
28             for(int i = begin; i <= end-1; i++)
29             {
30                 pattern[begin][i] = setSymbol(count);
31                 count = count + 1;
32             }
33             for(int i = begin; i <= end-1; i++)
34             {
35                 pattern[i][end] = setSymbol(count);
36                 count = count + 1;
37             }
38             for(int i = end; i >= begin+1; i--)
39             {
40                 pattern[end][i] = setSymbol(count);
41                 count = count + 1;
42             }
43             for(int i = end; i >= begin+1; i--)
44             {
45                 pattern[i][begin] = setSymbol(count);
46                 count = count + 1;
47             }
48             end = end - 1;
49             begin = begin + 1;
50         }
51         if (count == position[index])
52             pattern[begin][begin] = symbol[index];
53     }
54 }
```

Question 6 continues.

Question 6 (Continued)

(a) (i) Enter the contents of the arrays **position** and **symbol** in the tables below.

Contents of **position**:

0	1	2	3	4	5	6	7	8	9

Contents of **symbol**:

0	1	2	3	4	5	6	7	8	9

(ii) What value will the method call

```
setSymbol(1)
```

return if the value of the global variable **index** = 0?

.....
.....

(iii) What value will the method call

```
setSymbol(2)
```

return if the value of the global variable **index** = 0?

.....
.....

(iv) Analyse the code in order to determine the final contents of the array **pattern**.

Contents of array **pattern**:

SPARE:

Question 6 continues.

Question 6 (Continued)

**For
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(b) (i) What is the scope of the variable *temp*?

.....
.....
.....

(ii) What global variables are used in *setSymbol*?

.....
.....
.....

(iii) Could the global variables used in *setSymbol* be made parameters of *setSymbol*?

Explain your answer.

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(ITC315118)

SECTION C

Time: 36 minutes

Pages:	16
Questions:	3
Attachments:	Information Booklet

Candidate Instructions

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On the basis of your performance in this examination, the examiners will provide results on the following criterion taken from the course statement:

Criterion 3 Use appropriate objects in the design of programs.

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Question 7

(a) (i) What will be drawn in the applet's window after the following code is executed?

```
g.drawString("text", 2, 20);
```

(Circle the correct answer.)

- "text" text texttext "text", 2, 10

(ii) What is the name of the variable in the following code?

```
Button open = new Button("Enter");
```

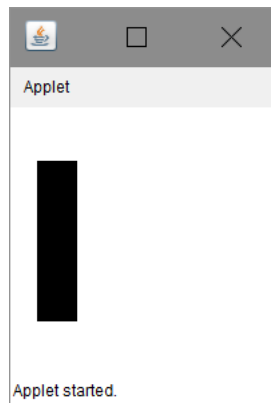
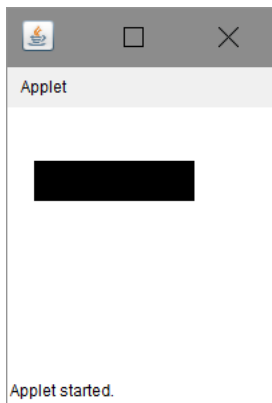
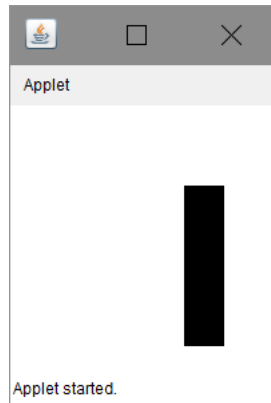
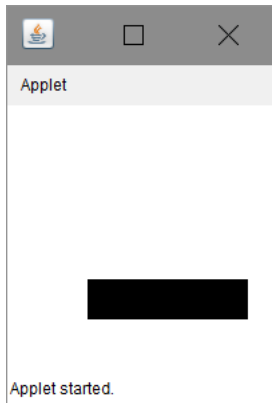
(Circle the correct answer.)

- Button open new Enter

(iii) What will the applet's window look like after the following code is executed?

```
g.fillRect(20, 40, 30, 120);
```

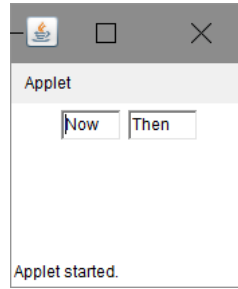
(Circle the correct answer.)



Question 7 continues.

Question 7 (Continued)

(b) The diagram on the right shows an applet window with two text fields with variable names of **text1** and **text2**.



(i) If the values in the text fields are:



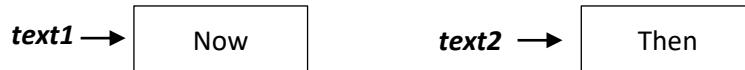
What will be the value of the text fields after the following code is executed?

```
String s = text2.getText();
text1.setText(s);
```

Value of **text1** text field:

Value of **text2** text field:

(ii) If the values in the text fields are:



What will be the value of the text fields after the following code is executed?

```
char c = text2.getText().charAt(0);
text1.setText(c+"ea");
```

Value of **text1** text field:

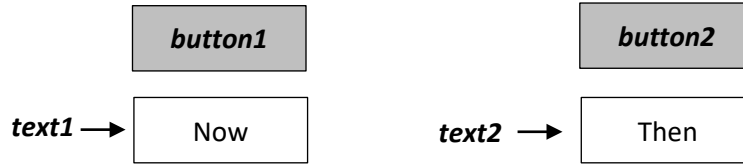
Value of **text2** text field:

Question 7(b) continues.

Question 7(b) (Continued)

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- (b) (iii) Two new buttons (**button1** and **button2**) have been added to the previous applet window.



The ActionListener has been added to the buttons and the **actionPerformed** method for the applet contains the following code:

```
if (e.getSource() == button2)
    text1.setText ("Back");

if (e.getSource() == button1)
    text2.setText ("Front");
```

What will be the value of the text fields after **button2** is clicked?

Value of **text1** text field:

Value of **text2** text field:

- (c) (i) Show the value of **string1** after the following section of code is executed.

```
String string1 = "Not required now";
string1 = string1.charAt(0) + string1.substring(14)+"!";
```

Value of **string1**:

- (ii) Show the value of **string2** after the following section of code is executed.

```
String string2 = "Farther away";
string2 = string2.substring(string2.length() - 4);
```

Value of **string2**:

- (iii) Show the value of **string3** after the following section of code is executed.

```
String string3 = "This Is Not Right.";
if (string3.indexOf("not") != -1)
    string3 = string3.toLowerCase();
else
    string3 = string3.toUpperCase();
```

Value of **string3**:

Question 7 continues.

Question 7 (Continued)

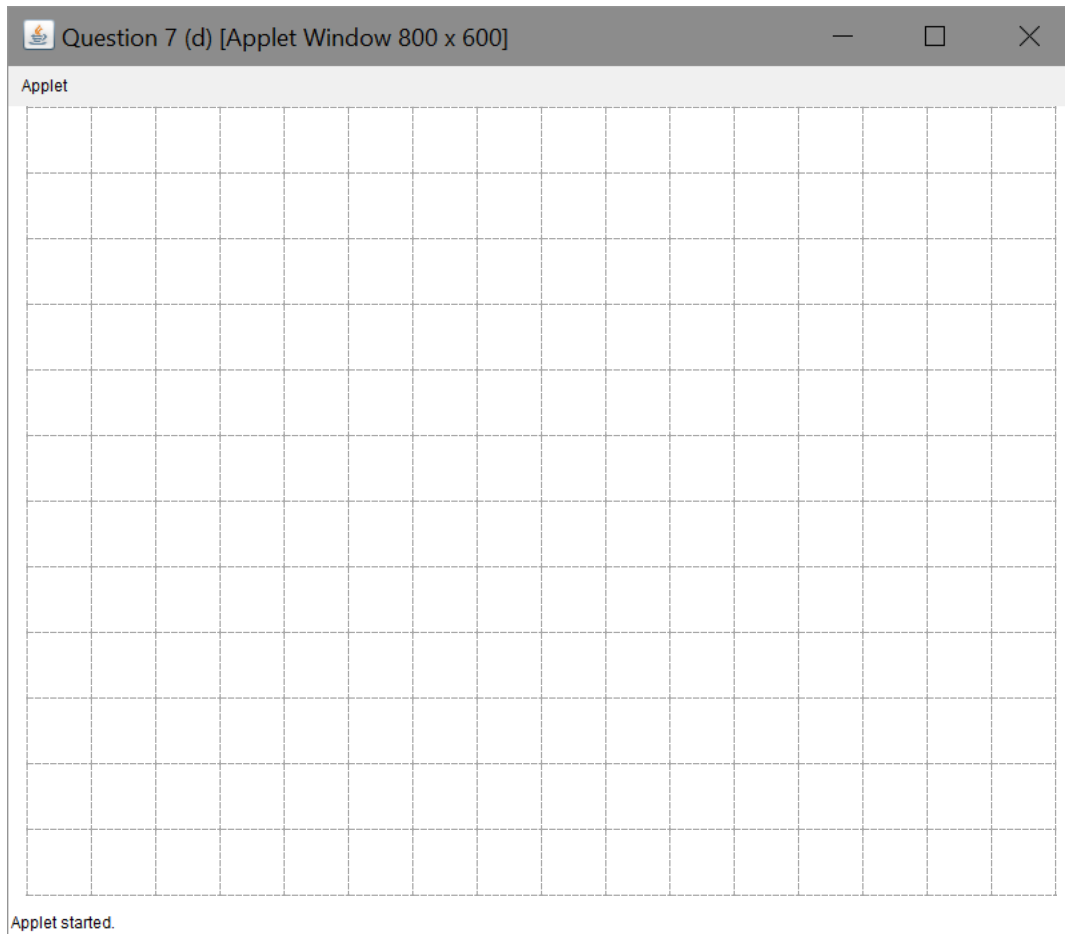
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- (d) The following section of code uses the *drawRect* and *drawLine* methods from the *Graphics* class.

```
g.drawRect(50, 50, 300, 300);  
g.drawRect(200, 200, 300, 300);  
g.drawLine(100, 100, 550, 550);
```

In the 800 x 600 applet window below, draw the applet window as it would appear after the section of code has been executed.

A grid has been added to the applet window display to assist with this question.



Question 8

This question relates to the class definition below, which defines weather forecast data for specific towns. The data stored is the name of the **town**, the forecast minimum and maximum temperatures (**minTemp**, **maxTemp**), the probability of rain (**probRain**), and the forecast **rainfall**.

```
public class Weather
{
    public String town;
    public int minTemp, maxTemp, probRain;
    public double rainfall;

    public Weather(String newTown, int newMinTemp, int newMaxTemp,
                    int newprobRain, double newRainfall)
    {
        town = newTown;
        minTemp = newMinTemp;
        maxTemp = newMaxTemp;
        probRain = newprobRain;
        rainfall = newRainfall;
    }

    public void setMaxTemp(int temp)
    {
        maxTemp = temp;
    }

    public void setMinTemp(int temp)
    {
        minTemp = temp;
    }

    public int getMaxTemp()
    {
        return maxTemp;
    }

    public int getMinTemp()
    {
        return minTemp;
    }

    public String getTown()
    {
        return town;
    }

    public int range()
    {
        return maxTemp - minTemp;
    }
}
```

Question 8 continues.

Question 8 (Continued)

- (a) (i) Using the class definition, write code to declare and instantiate two variables of the object type defined by the class with the following information (make sure the correct type is used for each parameter):

Town	Maximum Temperature	Minimum Temperature	Forecast rainfall	Probability of rain (%)
Hobart	25	13	3.5	20
Launceston	28	9	5.5	10

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- (ii) Write code that uses the methods within the class to change the maximum temperature to the following values:

Town	Maximum Temperature
Hobart	23
Launceston	27

.....

.....

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.....

- (iii) Write code that uses the methods within the class to display the temperature range for each town.

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Question 9

A class is needed to store data related to the temperature at a remote weather sensor.

The information to be stored is the following:

Data item	Type of data
Maximum Temperature	This is an integer between -100 and +100
Minimum Temperature	This is an integer between -100 and +100
Current Temperature	This is an integer between -100 and +100
Apparent Temperature	This is a decimal number between -100 and +100
Humidity	This is a decimal number between 0 and 100
Wind Speed	This is a decimal number between 0 and 500

The class will contain the following methods:

- A constructor method that will set the initial values for the current temperature, humidity, wind speed using parameters. The minimum and maximum temperatures should be set to the same value as the current temperature.
- A method that will set the value of the apparent temperature within the class using the following formula:

$$\text{Apparent temperature} = \text{current temperature} + ((0.354 * \text{humidity} * \text{current temperature}) / 100) - (0.70 * \text{wind speed}) - 4.25$$

- A method that will set the current temperature to a value given as a parameter to the method. The method will also set minimum and maximum temperatures as described below:

If the current temperature is greater than the maximum temperature it will become the new maximum temperature.

If the current temperature is less than the minimum temperature it will become the new minimum temperature.

Create a class to hold the specified data and that contains the methods specified.

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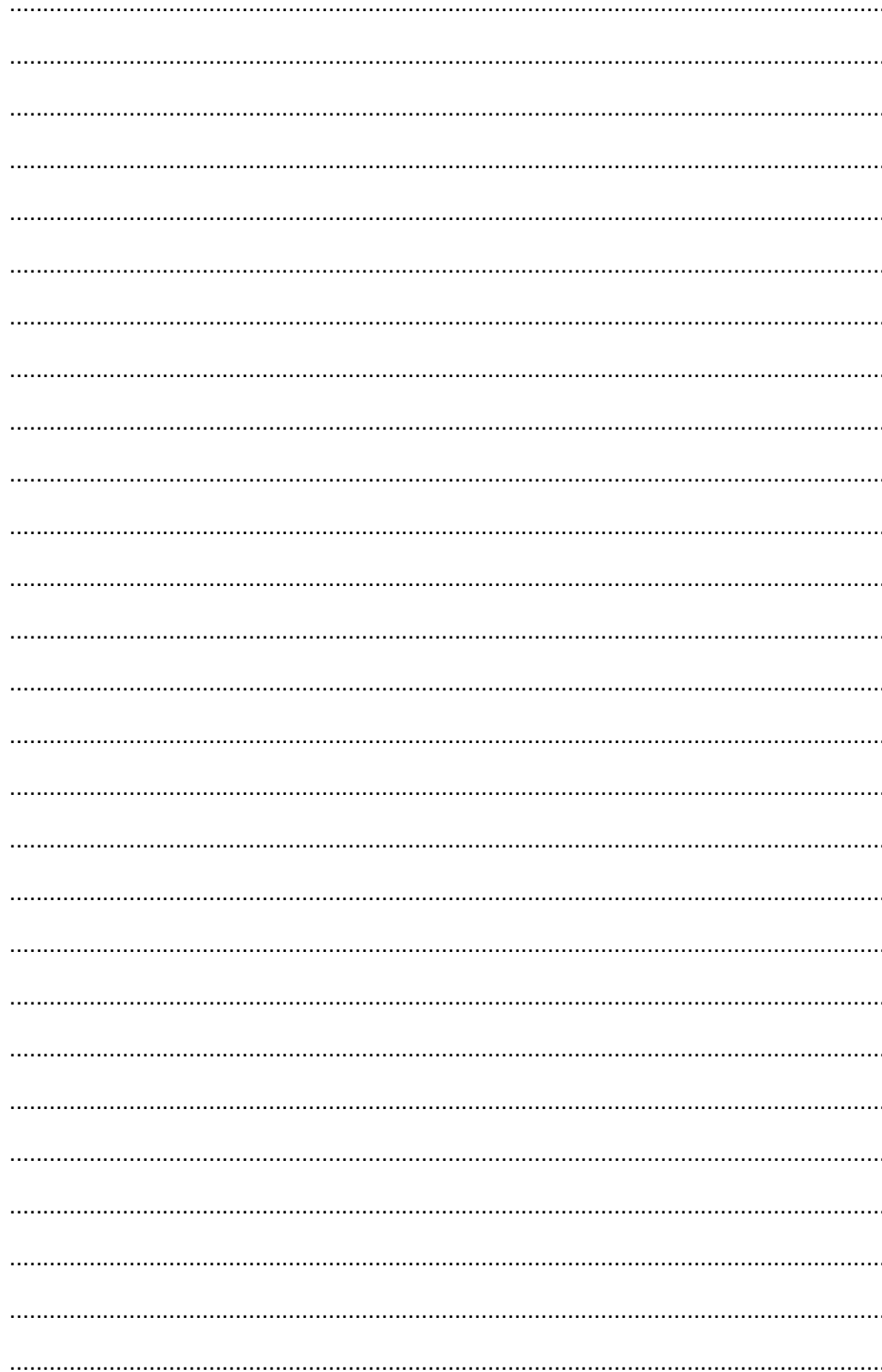
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Question 9 continues.

Question 9 (Continued)



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ASSESSMENT, STANDARDS
& CERTIFICATION

Tasmanian Certificate of Education
External Assessment 2018

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COMPUTER SCIENCE

(ITC315118)

SECTION D

Time: 36 minutes

Pages:	12
Questions:	3
Attachments:	Information Booklet

Candidate Instructions

1. You **MUST** make sure that your responses to the questions in this examination paper will show your achievement in the criterion being assessed.
2. Answer **ALL** questions. Answers must be written in the spaces provided on the examination paper.
3. You should make sure you answer all parts within each question so that the criterion can be assessed.
4. This examination is 3 hours in length. It is recommended that you spend approximately 36 minutes in total answering the questions in this booklet.
5. The 2018 External Examination Information Booklet for Computer Science can be used throughout the examination.
6. All written responses must be in English.

On the basis of your performance in this examination, the examiners will provide results on the following criterion taken from the course statement:

Criterion 4 Describe and apply knowledge of computer architecture.

Additional Instructions for Candidates

To be considered for a 'C' rating on a criterion, you must provide a satisfactory answer to at least the first question of the relevant section.

To be considered for a 'B' rating on a criterion, you must provide a satisfactory answer to at least the first two questions of the relevant section.

To be considered for an 'A' rating on a criterion, you must provide a satisfactory answer to all three questions of the relevant section.

Show the methods used in deriving answers.

Take care with the presentation of your answers, which should be complete and to the point. Diagrams should be used where appropriate. Complete sentences should be used in questions involving explanations. You are reminded that poor handwriting, spelling and expression that make it difficult for the examiners to understand what you mean may lead to lower marks.

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Question 10

(a) (i) Complete the following truth table by selecting the correct answer:

A	B	A OR B
F	F	
F	T	
T	F	
T	T	

(Circle the correct answer.)

A OR B
F
F
F
T

A OR B
F
T
T
T

A OR B
T
F
F
F

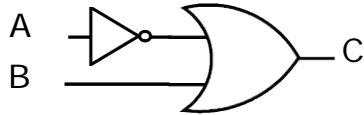
A OR B
T
T
T
F

(ii) The simplified expression for $\sim(\sim A)$ is:

(Circle the correct answer.)

A T $\sim A$ F

(iii)



The logic expression for C in this circuit is:

(Circle the correct answer.)

$\sim A \vee C$ $\sim A \wedge B$ $\sim(A \vee B)$ $\sim A \vee B$

(b) (i) Complete the truth table for the logic expression:

$$D \equiv (\sim A \wedge B) \vee (A \wedge \sim C)$$

A	B	C	$\sim A$	$\sim C$	$\sim A \wedge B$	$A \wedge \sim C$	D
0	0	0					
0	0	1					
0	1	0					
0	1	1					
1	0	0					
1	0	1					
1	1	0					
1	1	1					

Question 10(b) continues.

(b) (ii) Complete the logic expression for **E** in the following truth table.

E \equiv

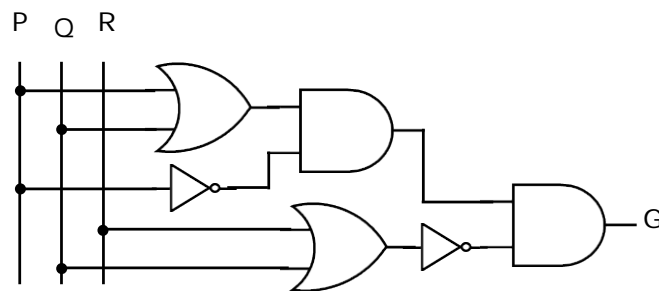
A	B	E
0	0	1
0	1	0
1	0	0
1	1	1

(c) (i) Draw the logic circuit for the expression for **F**.

$$F \equiv \sim(\sim P \vee Q) \vee \sim(P \wedge \sim R)$$

(ii) Give the logic expression for **G** in the following circuit.

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Question 10 (Continued)

Question 10 continues.

- (d) Analyse the following TOY code program to determine the final value stored in Register A.

Memory Address	Contents	Pseudocode	Explanation
01	0003	data	Contains the value 3
02	0004	data	Contains the value 4
10	8A01	R[A] ← mem[01]	Set register A to the contents of location 01
11	8B02	R[B] ← mem[02]	Set register B to the contents of location 02
12	1AAB	R[A] ← R[A] + R[B]	Set register A to register A + register B

Final value stored in Register A:.....

Question 11

(a) (i) Produce a simple logic expression for **H** from the following Karnaugh map.

		C				
		0	0	1	1	
A	0	1	1	1	1	0
	0	1	1	0	0	1
	1	1	0	1	0	1
	1	1	0	0	1	0
		0	1	1	0	
		D				

H ≡

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(ii) Use logic laws to simplify the following logic expression:

$$K \equiv \sim(\sim P \wedge \sim Q) \vee (\sim R \vee \sim R)$$

Indicate which logic law(s) were applied to each stage of your answer.

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Question 11 continues.

- (b) (i) In the TOY instruction format, the space for a memory address is 8 bits and the space for a register address is 4 bits.

Explain the difference.

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- (ii) Von Neumann architecture was a breakthrough in computer architecture. Explain the main advantage of von Neumann architecture compared with the computer architecture that was in use at the time.

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On the basis of your performance in this examination, the examiners will provide results on the following criterion taken from the course statement:

Criterion 5 Analyse how data are represented and stored.

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Question 13

(a) (i) When D_{16} is converted to binary the value is:
(Circle the correct answer.)

- 100_2 01000100_2 1101_2 10000_2

(ii) When 1110_2 is converted to decimal the value is:
(Circle the correct answer.)

- 3 14 32 70

(iii) What is the ASCII code (in decimal) for the character '#'?
(Circle the correct answer.)

- 4 16 35 83

(b) Fill in the four missing bits in the following binary addition.

$$\begin{array}{rcccccc} & & 1 & 0 & 1 & 1 & \square \\ + & \square & 0 & \square & 1 & 1 & \\ \hline 1 & 0 & 1 & 1 & \square & 1 & \\ \hline \end{array}$$

(c) (i) What is the representation of -1 using 8 bit two's complement representation?

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(ii) Explain what an overflow is and when it occurs.

Use the example $(125 + 4)$ in a two's complement 8 bit representation to demonstrate an overflow situation.

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Question 13 continues.

- (d) (i) Use the ASCII table to compare the binary values of upper and lower case letters. Indicate which bit in the code can be used to identify whether a letter is upper or lower case.

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- (ii) A programmer is developing a system where 6 bits will be used to represent colours. How many colours will be available?

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Question 14

(a) The following is a table showing the hexadecimal code for a selection of colours.

Colour name	Hex Code
crimson	DC143C
tomato	FF6347
dark golden rod	B8860B
golden rod	DAA520
dark olive green	556B2F
green yellow	ADFF2F
sea green	2E8B57
blue violet	8A2BE2
dark slate blue	483D8B
slate blue	6A5ACD
dark orchid	9932CC
medium orchid	BA55D3
medium violet red	C71585
deep pink	FF1493
sienna	A0522D

The Hex Code is created by taking the 8 bit binary values for **R**ed, **G**reen, **B**lue and putting them together to form a long binary number which is then converted to hexadecimal.

The long binary number is made up by first using the 8 bits for **R**ed as the most significant bits, then to their right the 8 bits for **G**reen and then to their right the 8 bits for **B**lue.

Which colour in the table is given by the **RGB** values (85, 107, 47) which has the binary values (01010101, 01101011, 00101111)?

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(b) (i) Show how binary fractions are converted to decimal by doing the conversion of 0.1001_2 to decimal.

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Question 14(b) continues.

Question 14(b) (Continued)

- (b) (ii) If a floating point number has a 4 bit mantissa, then adding $0.5 + 0.03125$ would equal 0.5. Explain why this would be the case.

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- (c) A game programming team needs to work out the size of a storage space. This needs to be large enough to hold up to 11 data groups, plus the actual number of groups. They want to use the least number of bits to do this.

A data group is made up of three characters taken from 'W', 'S', 'A', 'D' such as WSA.

The storage space starts with the number of groups and is followed by the data groups as shown in the following examples.

Example 1:

Storage space:

2	DDW	SSA									
---	-----	-----	--	--	--	--	--	--	--	--	--

Example 2:

Storage space:

11	WWS	SSS	SDW	DWA	WWD	SSD	SSA	SAD	SWD	WDW	WAW
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Calculate the least number of bits used to create the storage space as shown in Example 2. Explain your calculation.

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Question 15

- (a) An Animated GIF is an image file type that can store a number of images called Image Frames. Software can then be used to display the frames in sequence to create an animation.

The structure of the Animated GIF file is shown below:

800 bytes file header	
Frame 1	18 bytes frame header
	Image data for Image Frame
Frame 2	18 bytes frame header
	Image data for Image Frame
Up to final Frame...	
File terminator 1 byte	

If an Animated GIF stores 44 frames for an image and each Image Frame requires 36720 bytes for the image data, what is the file size of the GIF file in bytes?
Show your calculation.

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- (b) The following Java code should be an infinite loop. However, on most systems it will terminate with **p** having the value 127.

Explain why the code would terminate with **p** = 127.
What error should have been reported by the system?

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byte p = 1;
while (p > 0)
    p = (byte)(p + 1);
p = (byte)(p - 1);
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