0 1 Develop an algorithm using either pseudo-code or a flowchart that allows a taxi company to calculate how much a taxi fare should be.

The algorithm should:

- prompt the user to enter the journey distance in kilometres
  - the distance entered must be greater than zero
  - the user should be made to re-enter the distance until the distance entered is valid
- prompt the user to enter the number of passengers (no validation is required)
- calculate the taxi fare by
  - charging £2 for every passenger regardless of the distance
  - charging a further £1.50 for every kilometre regardless of how many passengers there are
- output the final taxi fare.

[8 marks]

Turn over for the next question

0 2 A cake recipe uses 100 grams of flour and 50 grams of sugar for every egg used in the recipe.

Figure 3 shows the first line of an algorithm that will be used to calculate the amount of flour and sugar required based on the number of eggs being used. The number of eggs is entered by the user.

Figure 3

```
eggsUsed ← USERINPUT
```

0 2 . 1 Shade **one** lozenge to show which of the following lines of code correctly calculates the amount of flour needed in grams.

[1 mark]

A `flourNeeded ← USERINPUT` ⬭

B `flourNeeded ← eggsUsed * USERINPUT` ⬭

C `flourNeeded ← eggsUsed * 100` ⬭

D `flourNeeded ← eggsUsed * 50` ⬭

0 3 **Figure 4** shows a C# program that calculates car park charges.

The user inputs their car registration (eg `MA19 GHJ`) and the length of the stay. The program then outputs the charge.

- Line numbers are included but are not part of the program.

Figure 4

```
1   int charge = 0;
2   Console.Write("Enter your car registration: ");
3   string carReg = Console.ReadLine();
4   while (carReg.Length > 8) {
5      string displayMessage = " is not valid";
6      Console.Write(displayMessage);
7      carReg = Console.ReadLine();
8   }
9   Console.Write("Enter your stay in hours: ");
10  int hours = Convert.ToInt32(Console.ReadLine());
11  if (hours < 2) {
12     charge = 0;
13  }
14  else {
15     charge = hours * 2;
16  }
17  Console.WriteLine(charge);
```

0 3 . 1 Rewrite **line 5** in **Figure 4** to **concatenate** the car registration with the string `" is not valid"`, and store the result in the variable `displayMessage`.

Your answer must be written in C#.

[1 mark]

0 3 . 2 The charge for parking for two or more hours is changed to include an additional £2 fee.

Rewrite **line 15** in **Figure 4** to show this change.

Your answer must be written in C#.

[1 mark]

0 4 Write a C# program that calculates the value of a bonus payment for an employee based on how many items they have sold and the number of years they have been employed.

The program should:

- get the user to input the number of items sold
- get the user to input the number of years employed
- output the value of the bonus payment:
  - if the years of employment is less than or equal to 2 **and** the number of items sold is greater than 100, then the bonus will be the number of items sold multiplied by 2
  - if the years of employment is greater than 2, then the bonus will be the number of items sold multiplied by 10
  - otherwise, the bonus is 0

You **should** use meaningful variable name(s) and C# syntax in your answer.

The answer grid below contains vertical lines to help you indent your code.

[7 marks]

0 5 **Figure 3** shows a program written in C# that calculates the area of a rectangle or the volume of a box from the user inputs.

Figure 3

```
public static int calculate(int width, int length,
int height) {
   if (height == -1)
   {
      return width * length;
   } else
   {
      return width * length * height;
   }
}

public static void Main() {
   int numOne, numTwo, numThree, answer;
   Console.Write("Enter width: ");
   numOne = Convert.ToInt32(Console.ReadLine());
   Console.Write("Enter length: ");
   numTwo = Convert.ToInt32(Console.ReadLine());
   Console.Write("Enter height, -1 to ignore: ");
   numThree = Convert.ToInt32(Console.ReadLine());

   answer = calculate(numOne, numTwo, numThree);

   if (numThree == -1)
   {
      Console.WriteLine($"Area {answer}");
   } else
   {
      Console.WriteLine($"Volume {answer}");
   }
}
```

0 5 . 1 Complete the trace table using the program in **Figure 3**.

[3 marks

numOne	numTwo	numThree	Final output
5	6	−1	
10	4	0	
3	5	10	

0 5 . 2 Describe **one** way that the program in **Figure 3** could be made more robust.

[1 mark]

Turn over for the next question

0 6 A theme park charges £15 per person for a daily ticket. If there are six or more people in a group, the group is given a £5 discount.

Write a C# program to calculate the total charge for a group of people visiting the theme park.

The program must:
- get the user to enter the number of people in a group
- calculate the total charge by:
  - charging £15 per person
  - reducing the total charge by £5 if there are six or more people
- output the total charge.

You **should** use meaningful variable name(s) and C# syntax in your answer.

The answer grid below contains vertical lines to help you indent your code.

[6 marks]

0 7 A group of people have a meal in a restaurant. Instead of one person paying for the whole meal, each person will pay for what they eat.

Write a C# program that asks each person in the group how much they are paying towards the meal and works out when the bill is fully paid. Each person can pay a different amount.

The program should:

- get the user to enter the total amount of the bill
- get a person to enter how much they are paying towards the bill
- subtract the amount entered from the bill:
  - if the amount left to pay is more than `0`, output how much is left to pay and repeat until the amount left to pay is `0` or less
  - if the amount left to pay is `0`, then output the message `Bill paid`
  - if the amount left to pay is less than `0`, then output the message `Tip is` and the difference between the amount left to pay and `0`

You **should** use meaningful variable name(s) and C# syntax in your answer.

The answer grid below contains vertical lines to help you indent your code.

[8 marks]

0 8 Question **8** is about a dice game played against a computer.

The aim of the game is to get as close to a score of 21 as you can, without going over 21. If your score goes over 21 then you lose.

The player's score starts at 0.

For each turn:

- two dice (each numbered from 1 to 6) are rolled
- the total of the two dice rolls is added to the player's score
- the value of each dice and the player's new total score is output
- if the current score is less than 21, the player is asked if they would like to roll the dice again: if the player says yes, they get another turn; otherwise, the game ends.

At the end of the game, the program should work as follows:

- if the final score is 21, output a message to say the player has won
- if the final score is greater than 21, output a message to say the player has lost
- if the final score is less than 21, the program generates a random number between 15 and 21 inclusive:
  - if this random number is greater than the player's final score, output a message to say the player has lost
  - otherwise, output a message to say the player has won.

Figure 17 shows the output of a program that plays this dice game.

Figure 17

```
Roll 1: 1
Roll 2: 4
Current score: 5
Would you like to roll again? yes

Roll 1: 1
Roll 2: 6
Current score: 12
Would you like to roll again? yes

Roll 1: 1
Roll 2: 2
Current score: 15
Would you like to roll again? yes

Roll 1: 6
Roll 2: 1
Current score: 22
You lost!
```

Write a C# program to simulate this game.

The first line has been written for you in the answer grid.

The dice rolls are carried out by the program generating random numbers between 1 and 6. You will need to use the C# function `r.Next(a, b)` which generates a random integer in the range `a` to `b` starting at `a` but finishing one before `b`.

You **should** use meaningful variable name(s) and C# syntax in your answer.

The answer grid below contains vertical lines to help you indent your code.

[11 marks]

```
Random r = new Random();
```


0 9 A programmer has written a C# program that asks the user to input two integers and then output which of the two integers is the largest.
Complete the program by filling in the gaps using the information in **Figure 3**.
Each item in **Figure 3** should only be used once.

[5 marks]

Figure 3

Console.Write	num1	num2	output
else	<	>	else if
string	double	int	

```
int num1;

__________ num2;

Console.WriteLine("Enter a number: ");

num1 = int.Parse(Console.ReadLine());

Console.WriteLine("Enter another number: ");

num2 = int.Parse(Console.ReadLine());

if (num1 > num2)

{

    Console.WriteLine("    _________ is bigger.");

}

else

if (num1 _____________ num2)

{

    Console.WriteLine("    _________ is bigger.");

}

____________________

{

    Console.WriteLine("The numbers are equal.");

}
```

1 0 Write a C# program that allows a taxi company to calculate how much a taxi fare should be.

The program should:

- allow the user to enter the journey distance in kilometres (no validation is required)
- allow the user to enter the number of passengers (no validation is required)
- calculate the taxi fare by
  - charging £2 for every passenger regardless of the distance
  - charging a further £1.50 for every kilometre regardless of how many passengers there are
- output the final taxi fare.

You **should** use meaningful variable name(s), correct syntax and indentation in your answer.

The answer grid below contains vertical lines to help you indent your code accurately.

[7 marks]

1 1 A programmer has written the C# program in **Figure 5** to add up the numbers between one and five.

Figure 5

```
int total = 0;
for (int number = 1; number < 6; number++)
{
  total = total + number;
}
Console.WriteLine(total);
```

The program needs to be changed so that it also multiplies all of the numbers between one and five.

Shade **one** lozenge next to the program that will do what the programmer wants.

[1 mark]

A

```
int total = 0;
int product = 1;
for (int number = 1; number < 6; number++)
{
  total = total + number;
  product = total * number;
}
Console.WriteLine(total);
Console.WriteLine(product);
```

B

```
int total = 0;
int product = 1;
for (int number = 1; number < 6; number++)
{
  total = total + number;
  product = product * number;
}
Console.WriteLine(total);
Console.WriteLine(product);
```

C

```
int total = 0;
int product = 1;
for (int number = 1; number < 6; number++)
{
  total = total + number;
  product = product * total;
}
Console.WriteLine(total);
Console.WriteLine(product);
```

D

```
int total = 0;
int product = 1;
for (int number = 1; number < 6; number++)
{
  total = total + number;
  product = (total + product) * number;
}
Console.WriteLine(total);
Console.WriteLine(product);
```

1 2 Write a C# program that calculates an estimate of the braking distance in metres for a new model of go-kart that is travelling between `10` and `50` kilometres per hour (kph).

Your program should:

- keep asking the user to enter a speed for the go-kart until they enter a speed that is between `10` and `50` (inclusive)
- calculate the braking distance in metres by dividing the speed by 5
- ask the user if the ground is wet (expect the user to enter `yes` if it is)
- if the ground is wet, multiply the braking distance by 1.5
- output the final calculated braking distance.

You **should** use meaningful variable name(s), correct syntax and indentation in your answer.

The answer grid below contains vertical lines to help you indent you code accurately.

[8 marks]

1 3 A university is writing a program to calculate a student's total mark for three essays.

If any essays are handed in late, the total mark is reduced.

Write a C# program to calculate the total mark.

You should assume there are three integer variables called `e1`, `e2` and `e3` which have already been given values to represent the marks of the three essays.

The program should:

- get the user to enter the number of essays handed in late and store the number in a variable
- calculate the total mark for the three essays
  - if only one essay is handed in late, the total mark is reduced by 10
  - if more than one essay is handed in late, the total mark should be halved
  - the total mark should **not** be less than 0
- output the total mark.

You **should** use meaningful variable name(s) and C# syntax in your answer.

The answer grid below contains vertical lines to help you indent your code**.**

[7 marks]

Turn over for the next question

1 4 **Figure 6** shows an algorithm, represented using pseudo-code.

Figure 6

```
days ← [10, 15, 4]
sales ← [20, 33, 12]
weeks ← [0, 0, 0]
FOR i ← 0 TO 2
   daysTotal ← days[i] + sales[i]
   weeks[i] ← daysTotal DIV 7
ENDFOR
weeksTotal ← weeks[0] + weeks[1] + weeks[2]
OUTPUT weeksTotal
```

The `DIV` operator is used for integer division.

Complete the trace table for the algorithm in **Figure 6**.

Part of the table has already been filled in.

You may not need to use all the rows in the table.

[6 marks]

i	daysTotal	weeks			weeksTotal
		[0]	[1]	[2]	
		0	0	0	

1 5 **Figure 8** shows a C# program.

Figure 8

```
static void First(int p1, int p2, int p3)
{
   int v1 = p2 + p3;
   Console.WriteLine(Second(v1, p1));
}

static int Second(int p1, int p2)
{
   int v1 = p1 + p2;
   if (v1 > 12)
   {
      v1 = v1 + Third(p1);
   }
   return v1;
}

static int Third(int p1)
{
   if (p1 > 3)
   {
      return 2;
   }
   else
   {
      return 0;
   }
}
```

1 5 . 1 State what will be displayed by the `Console.WriteLine` statement when the subroutine `First` is called with the values `3`, `4` and `4` for the parameters `p1`, `p2` and `p3`

[1 mark]

1 5 . 2 State what will be displayed by the `Console.WriteLine` statement when the subroutine `First` is called with the values `3`, `4` and `8` for the parameters `p1`, `p2` and `p3`

[1 mark]

1 6 . 2 Using C#, write a subroutine to help a museum review the number of visitors in a month.

The subroutine must:

- have the identifier `countDays`
- have the number of days a museum was open in the last month as a parameter
- get the user to enter the number of visitors to the museum for each of those days
- count how many of those days the museum had more than 200 visitors
- return the count.

You **should** use meaningful variable name(s) and C# syntax in your answer.

The answer grid below contains vertical lines to help you indent your code.

[6 marks]
