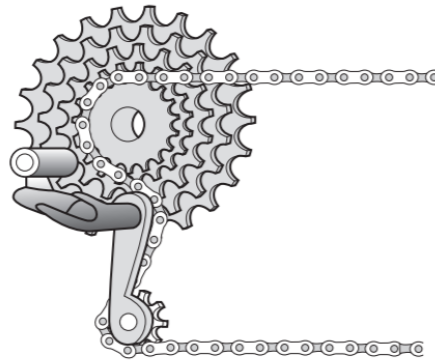


Pseudocode & programming challenges – Y1 CS

- 1) Write pseudocode BEFORE you try to code each problem below.
- 2) Then write your code in C and see whether what you write is logically correct.
- 3) If needed, create an improved version of your pseudocode to show what you learned.

Q1 – Cogs (452 Jan 11 Q4)

The gears of a bicycle contain up to 8 rings with decreasing numbers of teeth.



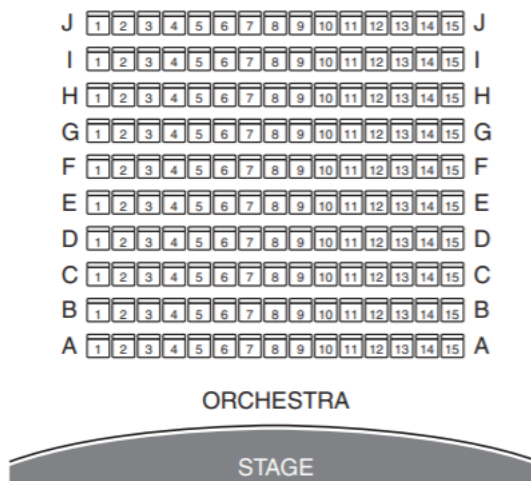
A computer program in a bicycle repair shop allows the user to input the number of teeth on each ring into an array called Ring using the method described below.

- The user inputs the number of rings between 1 and 8.
- The user then inputs the number of teeth on each ring, starting with the largest.
- The program checks that each number of teeth input is smaller than the previous number.
- The program stores the number of teeth on the first ring into the array Ring as Ring(1), the number of teeth on the second ring as Ring(2) and so on.
- If there are fewer than 8 rings, any unused elements of the array Ring are set to 0.

Write an algorithm for the routine to input the number of teeth on each ring as described above.

Q2 – Theatre Seating (452 Jun 09 Q4c)

The theatre has 10 rows, labelled A to J from front to back, and 15 seats in each row, numbered 1 to 15 from left to right.



The program uses the following rules to choose the best seats.

Rule 1: All seats in one booking must be in the same row, next to each other.

Rule 2: The seats must be as close to the front as possible.

Write an algorithm which takes the number of tickets wanted as an input, and outputs the best seats available.

Q3 – 10 marks

The procedure used to insert words into the array is given in structured English below.

```
01 PROCEDURE Insert(Word, StartColumn, StartRow, ColumnChange,
    RowChange)
02     CurrentColumn = StartColumn
03     CurrentRow = StartRow
04     CurrentLetter = first letter from Word
05     REPEAT
06         Puzzle(CurrentRow, CurrentColumn) = CurrentLetter
07         CurrentColumn = CurrentColumn + ColumnChange
08         CurrentRow = CurrentRow + RowChange
09         CurrentLetter = next letter from Word
10     UNTIL all letters from Word have been inserted
11 END PROCEDURE
```

Adam tests the program by calling the procedure a number of times. First he makes the procedure call:

Insert("SUGAR",1,1,1,0)

The result is that the word SUGAR is inserted at the top left hand corner of the square, going from left to right. This is shown in the diagram below.

S	U	G	A	R					

- Create the program that will get the correct inputs and then pass the parameters given into the procedure above to add words to the grid Puzzle[10,10].
- When all the words have been entered into the grid, a procedure called FillGrid() fills the remaining squares. This procedure checks whether each square is empty, and if it is, inserts a random letter. Write an algorithm for the procedure FillGrid()
- CHALLENGE – currently there is no validation in the grid. Can you add code to stop:
 - words that are too long being entered
 - words being written into squares which already contain letters from another word