

Higher Level Question

(Suggested maximum time: 10 minutes)

Mark works two jobs – he works in Bob's Bakery and in Ciara's Café. He is paid €11 · 50 an hour for his work in Bob's Bakery, and €9 · 30 an hour for his work in Ciara's Café.

In one week he worked a total of 34 hours and was paid a total of €362·40.

Find how many hours he worked in Bob's Bakery in this week.



x is a real number.

One new number is formed by increasing x by 1.

A second new number is formed by decreasing x by 2.

(i) Write down each of these new numbers, in terms of x.

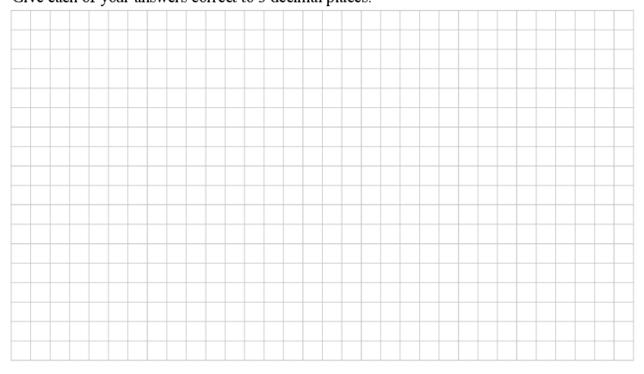
Increase x by 1:										
Decrease x by 2:										

(ii) The product of these two new numbers is 1.

Use this information to write an equation in x.



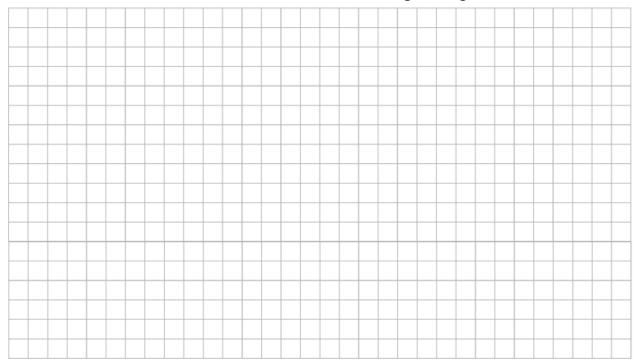
(iii) Solve this equation to find the two possible values of x. Give each of your answers correct to 3 decimal places.



(d) A company employs two drivers, John and David. Each has use of a company car and small van. The company buys €30 worth of Toll Tags for each driver. Each time that a vehicle goes through the M50 Toll, a charge will be deducted from the Toll Tags.

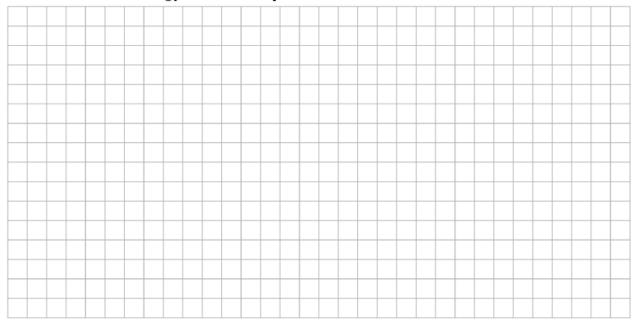
John goes through the M50 toll five times in his car and four times in his small van. He then has €7.90 remaining on his Toll Tags. David goes through the M50 Toll twice in his car and six times in his small van. He then has €8.40 left on his Toll Tags.

Calculate how much it costs for a car and for a small van to go through the M50 Toll.

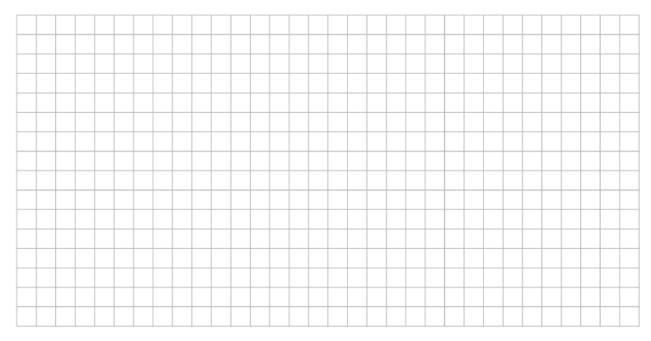


A capacitor is a device which stores electricity. The formula $W = \frac{1}{2}CV^2$ gives the energy stored in the capacitor, where W is the energy, C is the capacitance and V is the voltage, and standard units are used throughout.

(a) Find the amount of energy stored in a capacitor when C = 2500 and V = 32.



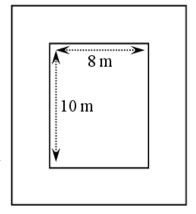
(b) Write V in terms of W and C.



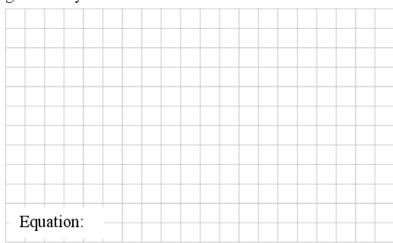
A plot consists of a rectangular garden measuring 8 m by 10 m, surrounded by a path of constant width, as shown in the diagram. The total area of the plot (garden and path) is 143 m^2 .

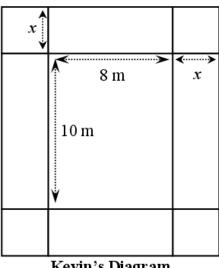
Three students, Kevin, Elaine, and Tony, have been given the problem of trying to find the width of the path. Each of them is using a different method, but all of them are using x to represent the width of the path.

Kevin divides the path into eight pieces. He writes down the area of each piece in terms of x. He then forms an equation by setting the area of the path plus the area of the garden equal to the total area of the plot.



- Write, in terms of x, the area of each section into Kevin's diagram below. (a)
- (b) Write down and simplify the equation that Kevin should get. Give your answer in the form $ax^2 + bx + c = 0$.

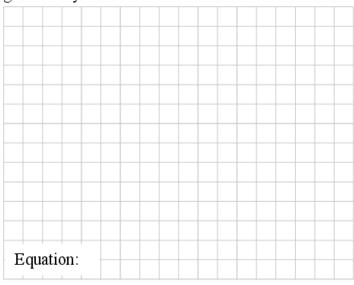


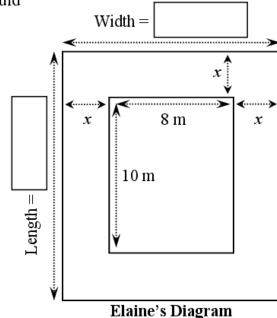


Kevin's Diagram

Elaine writes down the length and width of the plot in terms of x. She multiplies these and sets the answer equal to the total area of the plot.

- Write, in terms of x, the length and the width of the plot in the spaces on Elaine's diagram. (c)
- Write down and simplify the equation that Elaine should (d) get. Give your answer in the form $ax^2 + bx + c = 0$.





(e) Solve an equation to find the width of the path.

(f) Tony does not answer the problem by solving an equation. Instead, he does it by trying out different values for x. Show some calculations that Tony might have used to solve the problem.



(g) Which of the three methods do you think is best? Give a reason for your answer.

