## Problems and solutions

### Week Forty-nine

### Question 1.

A square lawn is reduced in area by 50% by digging up some of the lawn for flowers. This created a new 1m wide border on each of the four sides and a 2m-by-2m centre plot. What was the original size of the lawn?

### Solution

Let the original side length of the lawn be L
Then, $(L - 2)^2 - 2^2 = 0.5L^2$
$0.5L^2 - 4L = 0$
$L^2 - 8L = 0$
$L(L - 8) = 0$
$L = 8m$

### Question 2.

Sajid travels 15 miles at 30 mpg and a further 60 miles at 40 mpg. What was Sajid's average mpg?

### Solution

Total distance travelled = 15 + 60 = 75 miles.
Total petrol consumption = 15/30 + 60/40 = ½ + 1½ = 2 gallons.
So, average mpg = 75/2 = 37.5 mpg

### Question 3.

Adam and Eve are teenagers. Adam is 50% older than Eve was when Adam was the same age as Eve is now. What are their ages?

### Solution

Let a (for Adam) and e (for Eve) be their ages now and suppose it is y years since Adam's age equalled e.
We can write a = 1.5 x (e – y)
and e = a – y or a = e + y (1)
Thus e + y = 1.5 x (e – y)
Rearranging gives 2.5y = 0.5e or 5y = e
e must therefore be a multiple of 5, and as they are both teenagers, this means e is 15 Hence, y is 3.
So, a is 18 from (1)
Eve is 15 and Adam is 18.

**Question 4.**

The positive integer N has five digits. The six-digit integer P is formed by appending 2 to the front of N. The six-digit integer Q is formed by appending 2 to the end of N. Given that Q = 3P, what are the possible values of N?

**Solution**

$$P = N + 200000$$
$$Q = 10N + 2$$
$$3P = Q$$
$$3N + 600000 = 10N + 2$$
$$599998 = 7N$$
$$N = 599998/7 = 85714$$