Problem of the Week
Problem B and Solution
Farmer Mac's Bales

Problem

Farmer Mac's hay bales are in the shape of rectangular prisms. Each hay bale is 2 m long by 2 m wide by 1.5 m high. The hay bales lie in rows in a field with one of the square sides of each hay bale on the ground and the rectangular sides of the hay bales facing each other. Farmer Mac leaves a 50 cm space between each hay bale.
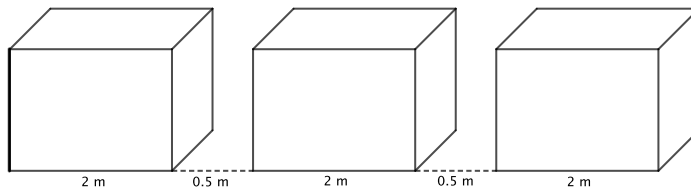
a) Determine the length of row of 20 hay bales.

b) What is the total area, in m², of the ground underneath the 20 hay bales?

Solution

a) We will look at two ways to determine the length of a row of 20 hay bales.

The first way is by using a table.
The diagram below illustrates the first three bales, with 0.5 m between them (since 50 cm = 0.5 m).

The first bale is 2 m long, and each new bale after adds $2 + 0.5 = 2.5$ m to the length. We will show this in the following table.

bales	length		bales	length
1	2		11	27
2	4.5		12	29.5
3	7		13	32
4	9.5		14	34.5
5	12		15	37
6	14.5		16	39.5
7	17		17	42
8	19.5		18	44.5
9	22		19	47
10	24.5		20	49.5

Therefore, the length of a row with 20 hay bales is 49.5 m.

The second way we will find the length of a row with 20 bales is by setting up an algebraic expression.

If we let b represent the number of bales and s represent the number of spaces, then an algebraic expression for the length of a row of bales, in m, is

$$2 \times b + 0.5 \times s$$

Now, when there are 20 bales and 19 spaces the length becomes:

$$2 \times 20 + 0.5 \times 19 = 40 + 9.5$$
$$= 49.5$$

Therefore, the length of a row with 20 hay bales is 49.5 m.

b) The base of each hay bale is 2 m by 2 m.
   So the area under each hay bale is $2 \times 2 = 4$ m^2.

   There are 20 hay bales in the row, so the total area of the ground underneath the 20 hay bales is $20 \times 4 = 80$ m^2.