



## 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.

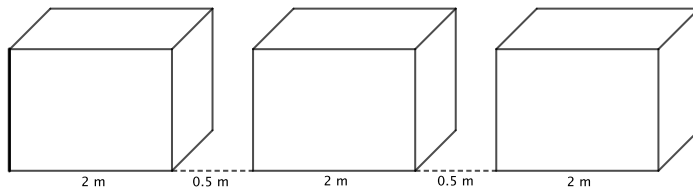
- Determine the length of row of 20 hay bales.
- What is the total area, in  $\text{m}^2$ , of the ground underneath the 20 hay bales?

#### Solution

- 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  $50 \text{ cm} = 0.5 \text{ m}$ ).



The first bale is 2 m long, and each new bale after adds  $2 + 0.5 = 2.5 \text{ m}$  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:

$$\begin{aligned} 2 \times 20 + 0.5 \times 19 &= 40 + 9.5 \\ &= 49.5 \end{aligned}$$

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  $2 \times 2 = 4 \text{ m}^2$ .

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