

Primary Division: Problems I: Solutions

P1.1

The houses on Dunbar Avenue now have three different bins. The recycling bin is green, the bin for garden rubbish is brown and general waste bin is black.

The council have decided that some bins need to be collected more often than others and so have set up a new system rather than using days of the week.

The recycling waste is collected every three days.

The garden waste is collected every six days.

The general waste is collected every fourteen days

The residents were not happy as they insisted that this would mean having to put out all three bins on the same day at least once a month.

On 4th January, all three bins were collected. Was the residents' claim correct?

Explain your answer.

Solution

4th January: green, brown and black

Green: 3, 6, 9, 12, 15, days after 4th January

Brown: 6, 12, 18, 24, days after 4th January

Black: 14, 28, days after 4th January

So we see that on the days when the Brown bins are collected, Green bins are collected too.

So that means looking for the days when Brown and Black bins are both collected.

As all multiples of 14 are even, we only need to check for ones which are multiples of 3. And the first of these is 42. So the resident's claim was not correct.

P1.2

The owner of some stables has to fill in yet another form and so he writes:

“My herd consists of horses and foals.

A fifth of the herd is in the yard and a third of the herd is out to pasture. These are all horses.

Three times the difference are the foals, which are in the barn. The remaining two horses, in the paddock, belong to my daughter.”

How many animals are in the herd altogether?

Solution 1

A fifth are in the yard and a third are in the pasture

Difference is $1/3 - 1/5 = 2/15$

Foals in barn are three times the difference which is $6/15 = 2/5$

So pasture, yard and barn are $1/5 + 1/3 + 2/5 = 3/15 + 5/15 + 6/15 = 14/15$

This means that the two horses in the paddock are $1 - 14/15 = 1/15$ of the total

So the total number of animals is $2 \times 15 = 30$

Solution 2

The answer must divide by 3 and 5 so it must be a multiple of 15.

If the answer is 15, then 3 are in the yard and 5 are in the pasture so there are $3 \times (5 - 3) = 6$ foals

Total in yard, pasture and barn is $3 + 5 + 6 = 14$, leaving only one in the paddock, so 15 is not the answer.

If the answer is 30, then 6 are in the yard and 10 are in the pasture so there are $3 \times (10 - 6) = 12$ foals

Total in yard, pasture and barn is $6 + 10 + 12 = 28$, leaving two in the paddock, so answer could be 30.

I can see now that if it's more than 30, then too many will be left in the paddock, so 30 is the only possible answer.

Solution 3

Let there be x animals. The difference between those in the barn and those out to pasture is

$\frac{1}{3}x - \frac{1}{5}x = \frac{2}{15}x$ so there are $\frac{6}{15}x$ foals.

Total number of animals:

$$\frac{1}{3}x + \frac{1}{5}x + \frac{6}{15}x + 2 = x$$

$$\frac{14}{15}x + 2 = x$$

$$\frac{1}{15}x = 2$$

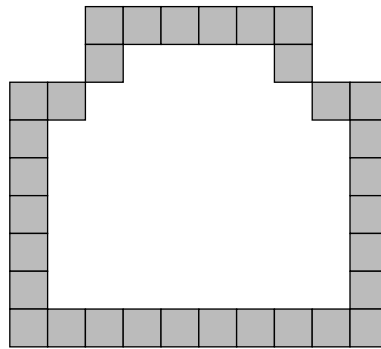
$$x = 30$$

There are 30 animals altogether.

P1.3

The floor of a rectangular room is covered with square tiles. The room is 10 tiles long and 7 tiles wide. In addition, there is a bay window in the middle of a long wall of the room which is 2 tiles deep and 6 tiles across. How many of the tiles have at least one edge which touches a wall of the room?

Solution



In the diagram, the tiles which have at least one edge which touches a wall of the room are shaded grey.

There are 7 tiles along each short edge of the room.

Also 8 *extra* tiles along the long straight wall.

And 10 extra tiles along the wall with the bay window.

So there are $7 \times 2 + 8 + 10 = 32$ tiles which have at least one edge which touches a wall of the room.