

Primary Division 2019-2020 Round 1 Solutions

P1.1. Harry wants to make a magic potion using these instructions provided by his teachers:

- You need to use at least three of the following five ingredients: Lacewing flies, Bat tongue, Hairy fungus, Moondew and Dragon blood.
- If you use Lacewing flies you cannot use Hairy fungus or Moondew.
- If you use Bat tongue you cannot use Moondew.

What are the ways that Harry can make the potion?

Solution

For convenience use initials L, B, H, M and D

If Harry uses L he cannot use H or M so he is left with L, B, D

Otherwise there are two cases:

If he uses B he cannot use M so he is left with **B, H, D**

Otherwise he is left with **H, M, D**

The three combinations (in bold) are the only possibilities.

P1.2. A farmer has packed several baskets either with chicken eggs or with duck eggs. The number of eggs in each basket is 5, 6, 12, 14, 23 and 29. Her daughter says “If we sell one basket then we will have twice as many chicken eggs as duck eggs left”.

Which basket was the daughter thinking about?

Solution

The number of eggs in each basket is 5, 6, 12, 14, 23 and 29 but we don't know which basket has chicken eggs and which has duck eggs.

If we remove one basket then the remaining numbers must split into twice as many chicken eggs as duck eggs ie the total would have to be a multiple of 3.

The total number of eggs is $5 + 6 + 12 + 14 + 23 + 29 = 89$.

If we remove one basket at a time we get:

$89 - 5 = 84$	possible
$89 - 6 = 83$	not possible
$89 - 12 = 77$	not possible
$89 - 14 = 75$	possible
$89 - 23 = 66$	possible
$89 - 29 = 60$	possible

Out of the four possible options left:

Selling 5 leaves 84 split into 56 chicken eggs and 28 duck eggs:

only way to make 28 is with $23 + 5$ but we don't have the basket with 5 eggs so not possible.

Selling 14 leaves 75 split into 50 chicken eggs and 25 duck eggs:

$14 + 5 + 6 = 25$ but we no longer have the basket with 14 so not possible.

Selling 23 leaves 66 split into 44 chicken eggs and 22 duck eggs:

not possible to make the total 22.

Selling 29 leaves 60 split into 40 chicken eggs and 20 duck eggs:

$14 + 6 = 20$ duck eggs and $23 + 12 + 5 = 40$ chicken eggs.

So the basket sold was the one with 29 eggs.

P1.3. Three rugs have a combined area of 200 m^2 . By overlapping the rugs to cover a floor area of 140 m^2 , the area which is covered by exactly two layers of rug is 24 m^2 . What is the area of floor that is covered by three layers of rug?

Solution

The extra amount of rug laid on top of the first layer is $200 - 140 = 60 \text{ m}^2$.

Of this extra rug, 24 m^2 is laid in exactly two layers. So there are $60 - 24 = 36 \text{ m}^2$ of extra rug laid in the second and third layers i.e. 18 m^2 in each layer.

Hence 18 m^2 of floor is covered by exactly 3 layers.