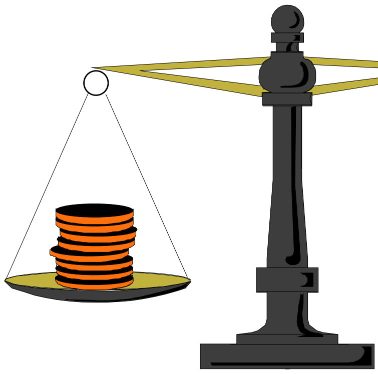
2008 Primary Set 2 solutions

P2.1.



The local greengrocer has a set of balance scales for weighing fruit and vegetables. Over the years, some of his weights have been lost until now only some 2kg, 3kg and 5 kg weights remain which have a total weight of 14 kg. Using these weights, the greengrocer maintains he can weigh any number of whole kilograms up to 14kg other than 1kg. Is he correct?

Solution

He has 2kg, 3kg and 5 kg weights. He must have at least one of each so can achieve 10 kg.
We are told that he can weigh 14 kg so he must have and extra two 2 kg weights.
So the weights he has are: 2, 2, 2, 3, 5.
The table below checks each target weight in turn.

Target	Weights	
2	2	OK
3	3	OK
4	2 + 2	OK
5	5	OK
6	2 + 2 + 2	OK
7	5 + 2 (or 2 + 2 +3)	OK
8	5 + 3	OK
9	5 + 2 + 2	OK
10	5 + 3 + 2	OK
11	5 + 2 + 2 + 2	OK
12	5 + 3 + 2 + 2	OK
13		
14	5 + 3 + 2 + 2 + 2	OK

No – unable to make 13kg. (A statement will suffice but a reason such as the largest odd number which can be made from the set of weights is 2 + 2 + 2 + 5 = 11 would be excellent.)

P2.2. Recently, instead of watching grass growing, I watched a convoy of 10 identical snails cross a small path and measured the length of time the whole process took. This was precisely 50 minutes and was the time from when the first snail slithered onto the path until the last snail left the path. The snails travelled nose-to-tail in single file and the path could only accommodate 8 snails at any one time. The snails travelled at the same speed and each snail was on the path for the same length of time. For how long was each snail on the path, from the time it first made contact with the path until the instant its tail left the path?

Solution 1:

The path is 8 snail lengths across. So in 50 minutes, the first snail had travelled the length of the path plus 10 snail lengths beyond that i.e. 18 snail lengths. To get across the path, the snail must cover 9 snail lengths and, since 18 snail lengths takes 50 minutes, 9 snail lengths will take half as long i.e. 25 minutes.

Solution 2:

The path is 8 snail lengths across. Thus in 50 minutes, the first snail had travelled the length of the path plus 10 snail lengths beyond that i.e. 18 snail lengths. So a snail travels at $\frac{18}{50}$ snail lengths per minute. To clear the path, it must cover 9 snail lengths and the time this will take is

$$\frac{9}{\frac{18}{50}} = 25 \text{ minutes.}$$

P2.3. "How old are you, Jack?" asked his friend. "I am three times my son's age and my father is 4 years more than twice my age. Together, the three of our ages add to 124 years." How old is Jack?

Solution

The age of Jack's son is one third of Jack's age

The age of Jack's father is (4 + 2 × Jack's age)

Thus

$$(\text{Jack's age}) + (\text{one third of Jack's age}) + (4 + 2 \times \text{Jack's age}) = 124$$

$$\frac{10}{3} \times \text{Jack's age} = 124 - 4$$

$$\frac{1}{3} \times \text{Jack's age} = \frac{120}{10} = 12$$

which gives Jack's age as 36.