

## Primary Division 2018-2019 Round 2 Solutions

**P2.1.** The village pantomime this year involved Humpty Dumpty and the King's men. At that disastrous point of the fall, all the King's men ran on stage to put Humpty back together again. Being soldiers, not one of them was without either a sword or a rifle.

One third of those with rifles had swords as well.

One fifth of those with swords had also rifles.

Those with both swords and rifles were the officers and wore red uniforms.

The rest of the men wore white.

Twelve of those in white had rifles.

How many of the King's men did not have a rifle?

*Solution*

The number of officers in red uniforms (the only ones with swords and rifles)

= one third of men with rifles = one fifth of men with swords.

Two thirds of men with rifles were not officers and so wore white. From the final statement this is 12 men.

So one third of men with rifles is 6 men and, being officers, they have swords also.

So one fifth of men with swords is 6 men.

So four fifths of those with swords is 24 men. These men were not officers and so had only swords.

Every man had either a sword or a rifle.

**24 of the King's men did not have a rifle.**

**P2.2.** Mr. Thompson has 4 identical pairs of black gloves and 3 identical pairs of brown gloves jumbled up in a drawer: he did not pair them up when he put them away. The gloves are not interchangeable between hands: each glove will fit only his right hand or only his left hand.

One evening, after dark, the light bulb fails! What is the minimum number of gloves Mr. Thompson will have to pick to be certain to pick a pair of gloves of the same colour?

What difference would it make if he only wanted a pair of brown gloves?

*Solution*

We have to consider left and right gloves separately. To get a pair of gloves, at worst Mr. Thompson could take all the left gloves first say, and then he would need just one right glove to be sure of having a pair. So  $7 + 1 = 8$  is the minimum number of gloves required. (Since there is the same number of right gloves as left gloves, the minimum number of gloves required is also 8 if he takes all the right gloves first.)

If he wanted brown gloves, at worst he could select all the black gloves and all the left (or right) brown gloves before taking a right (or left) brown glove to complete the pair of brown ones he wanted. So he would need to take  $8 + 3 + 1 = 12$  gloves out to be sure of getting a pair of brown ones.

**P2.3.** Four girls arrived in the school together and have been in the top four positions of the chess tournament in each year since they came. No girl has ever been in the same position more than once.

In second year Dawn was third.

In fourth year Cassie was third.

Anne was second in third year.

In first year Brenda was fourth.

Only once has Cassie beat Dawn.

Who was second in their fourth year?

*Solution*

{#: information given in question. @: information deduced from the only options. }

First we show the first four rows of initial data in a table

Position	1st Year	2nd year	3rd year	4th year
First				
Second			A#	
Third		D#		C#
Fourth	B#			

Neither B nor A can appear twice in the same column, so the third positions can be filled in.

Also, C beats D only once, which must be when D comes 4th. Hence C must come 4th in year 2.

Position	1st Year	2nd year	3rd year	4th year
First				
Second			A#	
Third	A@	D#	B@	C#
Fourth	B#	C		

C is fourth in year 2 and cannot be fourth twice so she must be first in year 3 and second in year 1.

Position	1st Year	2nd year	3rd year	4th year
First			C	
Second	C		A#	
Third	A@	D#	B@	C#
Fourth	B#	C		

So Dawn was first in year 1, fourth in year 3 and second in year 4.

Position	1st Year	2nd year	3rd year	4th year
First	D		C	
Second	C		A#	D
Third	A@	D#	B@	C#
Fourth	B#	C	D	

So Dawn was second in their fourth year. (The other slots can be filled but do not matter.)