

### 2013-2014 Primary Solutions Round III

#### **P3.1.**

The date of the second Thursday of a particular month is a square number. What is the date of the last Wednesday of that month?

**Explain your reasoning.**

*Solution*

The second Thursday is between the 8th and 14th so the square number is 9.

Then 9th, 16th, 23rd, 30th are Thursdays.

The last Wednesday is the 29th except in February in non-leap years when it is the 22nd.

### P3.2.

One family outing last summer included an impromptu sports day with five events in which 4, 2 and 1 points were awarded for the first three places in each event. Douglas and John tied with 8 points each. Jackie came next with 7, and Bill and Colin each had 6.

Colin didn't win any event but gained points in three of them. He beat both Bill and Douglas in the 200 metres but was well behind John in the High Jump.

Jackie won the Long Jump, but was well out of the points in the High Jump.

Bill was the only child who gained points in every event, his best effort being in the 100 metres.

Who were the first three children in the 400 metres event and in what order did they finish?

**Explain your reasoning.**

*Solution*

Jackie won the Long Jump, but came nowhere near a place in the High Jump: 4 in the LJ and 0 in the HJ.

Bill was the only child who gained points in every event, his best effort being in the 100 metres: the only way to get a total of 6 points would be to get 1,1,1,1,2 and he got 2 in the 100 metres.

Colin didn't win any event but was 'placed' in three of them: to get a total of 6 from three events he has 0,0,2,2,2. Bill got 2 in the 100 metres so Colin must be 0.

Colin beat both Bill and Douglas in the 200 metres: so must have got 2 points leaving Douglas with 0.

	200 metres	High Jump	Long Jump	100 metres	400 metres	Total
Douglas	0					8
John						8
Jackie		0	4			7
Bill	1	1	1	2	1	6
Colin	2			0		6

If we look at the 200 metres then John or Jackie must have won but Jackie's total is only 7 so it must have been John. This means for Jackie to have a total of 7 means getting 1 and 2 points for the 100 metres and 400 metres respectively. This means that Colin must have got 0 for the 400 metres leaving him with 2 points in the HJ and the LJ.

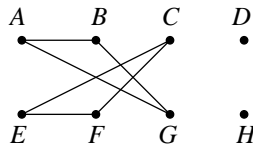
Colin was well behind John in the High Jump: John must have won the High Jump. The rest of John's events must be 0. So Douglas must have won the 100 metres and 400 metres.

In the 400 metres race Douglas, Jackie and Bill came in that order.

	200 metres	High Jump	Long Jump	100 metres	400 metres	Total
Douglas	0	0	0	4	4	8
John	4	4	0	0	0	8
Jackie	0	0	4	1	2	7
Bill	1	1	1	2	1	6
Colin	2	2	2	0	0	6

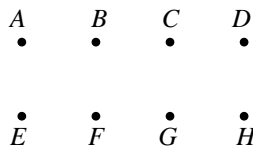
**P3.3.**

Triangles are called 'congruent' when they are identical. This means they are the same size and shape, although they can be in different positions. For example, triangles  $ABG$  and  $EFC$  are congruent.



Non-congruent triangles must be different in some respect.

How many **non-congruent** triangles can be formed by joining the dots on the grid below?



**Explain your reasoning.**

*Solution*

3 with base length 1, for example  $AEF$ ,  $CEF$  and  $DEF$ .  $BEF$  is congruent to  $AEF$ .

3 with base length 2, for example  $AEG$ ,  $BEG$  and  $DEG$ .  $CEG$  is congruent to  $AEG$ .

2 with base length 3, for example  $AEH$  and  $BEH$ .  $AEH$  and  $DEH$  are congruent as are  $BEH$  and  $CEH$ .

Total 8 different triangles.