

4. Let X be a random variable that can take values from $\{9, 10, \dots, 57\}$, representing the difficulty of the 2013/2014 pick.

This is because there are 20 teams in the premier league, and with Manchester taking 1st the possible finishing positions of their opponents in the previous season can take values from $\{2, 3, \dots, 20\}$.

Given the total number of ways of writing the numbers 9 to 57 as the sum of 3 of the numbers from $\{2, 3, \dots, 20\}$, we can determine a probability for each "difficulty" appearing.

I had tried to do this combinatorially but after writing pages of sums and mostly nonsense, decided to do it in 5 minutes on a computer.

The results are on the reverse, with $P(x) = (\text{probability of } x) \times 17 \times 18 \times 19$.

We can use this to calculate the

X	P(x)
9	1
10	1
11	2
12	3
13	4
14	5
15	7
16	8
17	10
18	12
19	14
20	16
21	19
22	21
23	24
24	27
25	30
26	32
27	35
28	36
29	38
30	39
31	40
32	40
33	41
34	40
35	40
36	39
37	38
38	36

X	P(x)
39	35
40	32
41	30
42	27
43	24
44	21
45	19
46	16
47	14
48	12
49	10
50	8
51	7
52	5
53	4
54	3
55	2
56	1
57	1

These total 5814 = 19 x 18 x 17

So from this the standard deviation
 $\sqrt{\text{Variance}} \approx 3$. So 2 standard
deviations below the mean is about
15, so ~~although~~ this is higher than
the observed outcome of 17 for
Manchester. This means it is out
of the ordinary, but not absurdly so.