Golf and Negative Numbers

The Italian mathematician Gerolamo Cardano worked at the University of Pavia on finding solutions to algebraic equations. His great work on mathematics, *Ars Magna,* was published in 1545. He was the first European to make systematic use of negative roots and numbers (numbers less than 0). Before him, mathematicians believed that the only possible numbers were positive, though Ancient Chinese and Indian mathematicians had recognised and used negative numbers. But Cardano demonstrated that negative numbers could be possible solutions to equations. *Ars Magna* was also a turning point in the theory of equations because it demonstrated how cubic equations and quartic equations could be solved. You may have heard of quadratic equations, which contain the variable x^2. Cubic (x^3) and quartic (x^4) equations are even more complicated to solve!

We use negative numbers in real life. There are some examples below. Can you think of any more?

- Temperatures below 0 degrees Celcius (°C).
- Elevations below sea level.
- On bank statements when you owe money.

In golf, players use clubs to hit balls into a series of holes on a course, using as few strokes as possible. The winner is the person with the lowest score. Negative points are good!

Each hole is classified by its "par". This is the number of strokes a skilled golfer should require to complete play of the hole. It is classified by distance, grade of land, and amount of hazards or sharp turns. The minimum par of any hole is 3, because it always includes one starting troke and two "putts" (so a player has at least three chances to hit the ball into the hole). This means that each hole in an 18 hole course has a specific "shot limit". If hole #7 was designed to be completed in 5 shots (it had a par score 5), and you did it in 10 hits, you would be a bad golfer and have a score of Par +5. If you used 3 hits, you would be a good golfer and have a score of Par -3. At the end of the course, you would add up your scores for each hole and compare it to the overall par score of the course. A hole in one (or an "ace") occurs when a golfer gets the ball into the hole with the first stroke. Common scores for a hole also have specific terms, which you can find in the table below.

Score	Name	Definition
−4	Condor	four strokes under par
−3	Albatross (Double Eagle)	three strokes under par
−2	Eagle	two strokes under par
−1	Birdie	one stroke under par
E	Par	equal to par
+1	Bogey	one stroke over par
+2	Double bogey	two strokes over par
+3	Triple bogey	three strokes over par

Now, using this score sheet, work in pairs with a die. One of you is player A and the other player B. Roll the die for each turn. This is the number of “hits” it took you to complete the hole. Then look at the “Par” column. Work out what your score should be, and record it. At the end, total your scores, and the par score, to find out who won the match.

Hole	Par	Player A Strokes	Player B Strokes	Player A Score	Player B Score
1	4				
2	3				
3	4				
4	5				
5	3				
6	3				
7	4				
8	4				
9	5				
10	3				
11	4				
12	6				
13	3				
14	4				
15	3				
16	3				
17	4				
18	3				
Total					

When you finish, complete the following tasks

1. Calculate your average score.

2. Calculate the average par score.

3. Draw a graph to compare your scores, your partner's scores, and the par scores. Remember that you may need your axis to go below 0!