Seasons of the Sun

A dicy sun spot game for two observers from 7 years up; by Ingo Althofer, Copyright 2007/08.
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In the center of our planetary system we find the sun. She gives light and warmth. However, the sun is not a uniform and static yellow ball, but has a lot of (internal) structure and dynamics. The best known outer signs of the fierce dynamic processes within the sun are the dark sun spots.

These spots are not at all eternal, but come and go over and over again. Already in the early 19th century (1825-1843) amateur astronomer Samuel Heinrich Schwabe from Dessau (near Berlin, in Germany) observed and discovered pattern in the development of the sun spots. Especially, he identified a cycle (in the average eleven earth years long) in which sun spots are originally almost absent, then become more and more frequent. Their number reaches a maximum plateau, and then decreases again, until a new cycle starts. (Astro-Physicists knows that the eleven years are indeed only one half of a 22 year cycle in which the magnetic field of the sun switches twice.)

Very nice articles on sun spots may be read in Wikipedia, for instance both in the English and in the German section. (At least this was the case in 2007 and 2008. Maybe, Wikipedia will also develop some x-year cycle of quality ;-)

"**Seasons of the Sun**" is based on the cyclic frequency of sun spots. When rolling the dice each eye of a die counts for one sun spot. Each sector of the round playing board stands for one year in the eleven year cycle. In this cycle, an area with six sectors stands for the years with many sun spots. In the opposing five year area players should strive for as few spots as possible.

Originally, the game was a contribution to the International Heliophysical Year 2007, http://www.ihy2007.org/ . A computer version of the game is in preparation (with computer opponents of adjustable strength) and will be downloadable from http://www.3-hirn-verlag.de/games.html, when completed. "Seasons of the Sun" will also be made available online at http://www.devilplay.de as a multi-player game. The game is a bit similar to dice rolling games like Yahtzee (TM, Hasbro) or Kniffel (TM, Schmidt Spiele), however with more interactivity.

Playing Material In the original edition of the game the board is a long-playing record (older readers will still remember how to use such records in a traditional way). On the upper side of the record, two cycles with eleven wooden discs each are arranged in such a way that eleven sectors are marked. The inner cycle has yellow discs, the outer discs are reddish. To each sector

belongs a value, indicated by a number in golden digits. There are 36 small dice for rolling and counting the sun spots.

Preparation for the Game The small dice are collected on a heap in the center of the record, such that both players can easily grasp them. Two of the dice are used to make a random decision who gets the first move. This player becomes the owner of the outer cycle of discs, his opponent gets the inner cycle.

Course of the Game (simplified basic version) The two players move in turn - but with a few exceptions. The player to move rolls with three "new" dice. Then he puts the outcome on a free disc in his cycle. Two different cases can happen.

(i) The dice are put in a sector, which was completely empty. Then the next move is executed by the other player.

(ii) The dice are put in a sector, where the opponent had placed already his dice. Three subcases are distinguished, depending on the eye-sums of the two players in this sector.

(ii-a) Losing a sector: When the eye-sum of the opponent is larger, he has won the sector and has to make the next move.

(ii-b) Neutralising a sector: When the eye-sums of both players are identical, all dice (from both players) in this sector are taken back on the heap. So, the sector is completely free again, and players will put dice there again in later turns.

(ii-c) Winning a sector: When a player wins a sector by completing it, the turn order is changed: he has to roll another three dice. The new turn order remains valid until another sector is won by a completing player.
(Observe: The order is NOT changed when a player loses a sector by completing it. The order is also not changed in case of neutralization.)

When near the end of a game one player has occupied already all eleven discs in his cycle this player has to pass until either there comes to being a free disc for him again (by neutralization through the opponent) or until the opponent also has completed his cycle. When all 22 discs are occupied, the final counting is done.

Why do 36 dice suffice? When a sector is complete, it contains six dice (three from each player). But for indicating both completeness and winner status of this sector, two dice are enough. In a Max sector: the disc of the winner is marked by a single die with six eyes, the loser's disc by a single die with one eye. Vice versa, in a Min sector the disc of the winner is marked by a single die with one eye and the loser's disc by a single die with six eyes. The other four dice are put back into the big heap.

End of the Game and Final Counting Because of the "neutralization rule", at the end of the game each sector will have a unique winner: the one with the highest score in a Max sector; the

one with the lowest score in a Min sector. The value of a sector is given to that player who has the best score in it. Overall winner is the player with the highest sum of values, summed over all sectors.

Here is a table with an example for the final scores. In the first row the sectors and their values are listed. In row "EyeSum-A" the scores of player A are given. Row "EyeSum-B" contains the scores of player B.

Year	Max-8	Max-10	Max-15	Max-13	Max-9	Max-5
EyeSum-A	12**	11	16**	17	14	12**
EyeSum-B	9	14**	13	18**	15**	10

Year	Min-9	Min-11	Min-17	Min-13	Min-10
EyeSum-A	9	5**	3**	6	10**
EyeSum-B	8**	10	5	4**	12

** and the Underlines mark the winner of a sector. So, player A has won the sectors Max-8, Max-15, Max-5, Min-11, Min-17 und Min-10. This gives him a final result of 8 + 15 + 5 + 11 + 17 + 10 = 66 points. Player B has won the sectors Max-10, Max-13, Max-9, Min-9 und Min-13, which gives him a final result of 10 + 13 + 9 + 9 + 13 = 54 points. Hence, player A has achieved a (narrow) win by 66-54 points.

Computation of the final result is simplified when before the counting in all sectors the dice of the non-winning player are taken away. Hint: The sum of all eleven sector values is 120; 60 points in the Max area, and the other 60 points in the Min area. This makes it easy to check if the two final scores have been computed correctly.

Full Version of the Game Often enough a player is not happy with the eye sum he rolled. In the full version of the game the player is allowed to roll again all those dice which he does not like - but once only and simultaneously. An example: the player has rolled (2,3,6) and wants to get a high score. Then it makes sense to throw the first two dice (2 and 3) again.

It is highly recommended to look through the sample game on the website http://www.althofer.de/seasons-sample.html (not just because of the qualitiy of that game, but simply for a better understanding of the rules).

Hints for Strategy and Tactics

* Of course, players should try to put their very good rolls in the Max- and Min-sectors with highest values (Max-15, Min-17, ...). But sometimes it may be better to place a (very) good score in a sector with slightly lower value to win that sector for sure when the opponent had put already his dice in there.

* Sometimes it makes sense to put a mediocre roll (eye sums 10 and 11 are the worst scores, as they are nearest to the expected value of 3*7/2 = 10.5) on a high-value sector which is already almost safe for the opponent because of his very good score.

* The smallest possible eye sum with three dice is 3, the highest possible is 18.
Both scores occur (in a roll without repetition) with probability 1 / 216, so with less than half a percent, each. Taking into account the possibility of onefold repetition for each die, the probabilities for 6-6-6 and 1-1-1 are about 2,85 %, each.

* In her diploma thesis, mathematics student Astrid Irmer (from Jena University) has analysed "Seasons of the Sun" with computer help. One of her most trivial - but nevertheless important - observations was that at least five won sectors are needed to win a game. (The best total value achievable by four sectors is 17+15+13+13 = 58.)

* There is a philosophy behind the "change of turn order" in the rule: It is an advantage to play in the backhand position. By winning a sector, the player shall come in a "more forhand" position.

* In "Seasons of the Sun" late chances occur frequently. When a player has an unfavorable intermediate score he should not resign early. The game may tilt in the last few moves, when either the player in the lead does not roll the eyes he needs (this may happen especially when he has left open sectors in only one area - either Max or Min) or when he has completed already all sectors whereas the opponent still has several discs to fill.

"Seasons of the Sun" with Three Players (69 dice required)

Outside of the two cycles with wooden discs a fictive third cycle is established which belongs to the third player. The three players move in turn. Again, the only exception is when someone directly wins a sector by completing it: this player has to make one more move. Afterwards the game proceeds in normal clockwise order, until again some sector is "won by a completing move". Near the end of the game all players pass who have already all eleven discs filled. Each sector will be won by a single player, giving him the value of this sector. Overall winner is the player with the highest value sum.

Also in this 3-player version neutralisation of sectors may happen, namely when all three discs of a sector are filled, and the best score (among the three scores) is not unique. Then the sector is completely cleared - and free for new moves again. (Beware: Even in the special situation that in a Max-sector two 18-scores or in a Min-sector two 3-scores are there the sector is neutralized only when all three discs are filled.)

Here is a (rather artificial) end position of a three player game and the resulting evaluation.

Sector	Max-8	Max-10	Max-15	Max-13	Max-9	Max-5
EyeSum-A	13**	11	16**	15	14	12**
EyeSum-B	8	14**	12	18**	15**	10
EyeSum-C	11	12	13	17	14	11

Sector	Min-9	Min-11	Min-17	Min-13	Min-10
EyeSum-A	10	5**	3**	6	10**
EyeSum-B	8**	10	5	4**	12
EyeSum-C	9	6	4	5	11

Player A has won the sectors Max-8, Max-15, Max-5, Min-11, Min-17 and Min-10. This gives him a total value of 8 + 15 + 5 + 11 + 17 + 10 = 66 points. Player B got the sectors Max-10, Max-13, Max-9, Min-9 and Min-13, resulting in a total of 10 + 13 + 9 + 9 + 13 = 54 points. Player C must have had a lot of bad luck (or made several poor decisions): He did not win a single sector (resulting in 0 points), but got rank 2 in each sector. But for second ranks no points are given. Hence the hint: Being top in a few sectors is typically much better than having average performance everywhere.