Combinatorial Analysis of the Organic ScoreCard

Daniël Rutten

TransMind International BV
Research & Development
Hastings, New Zealand
email: daniel.rutten@transmind.me

Abstract. To complete the Organic ScoreCard, respondents are asked to allocate ten points to nine statements, for each of the twelve blocks. Estimates of the total possible ways this can be done run in the 'trillions', but no answer has been provided yet. This paper presents the definitive answer to that question.

Keywords. Combinatorial Analysis, Multiset Permutations, Organic ScoreCard

1 Introduction

The Organic ScoreCard is a 108-item scale, measuring the concept of "consciousness". It was developed by Marcus Andreas Grond, a Dutch philosopher, business consultant and behavioural coach (Grond, 2005). The scale is being used commercially for coaching and consulting purposes within different industries in the Netherlands, South Africa and other parts of the world.

The question has arisen on how large the number of possible Organic ScoreCards really is. Estimates run in the 'trillions' but no definitive answer has been provided yet.

The paper begins with an overview of the Organic ScoreCard. Section 3 outlines the combinatorial analysis, and the results are presented in section 4.

2 Background

The Organic ScoreCard questionnaire is completed by respondents in their own time and the findings are presented as an automated report. Customised feedback sessions can be arranged with individual clients or groups of clients.

The questionnaire consists of 108 statements, grouped in twelve blocks of nine statements each. Respondents complete the Organic ScoreCard one set at the time and are asked to allocate a total of ten points to each of the statements that apply to them. Statements that are more applicable should be allocated more points.

3 Analysis

Respondents are asked to allocate ten points to nine statements, for each of the twelve blocks, so the problem can be simplified to finding the number of permutations for a single block, and raising the answer to the twelfth power.

Our first task is to find the number of ways ten points can be distributed over nine statements, which is equivalent to finding all unique multisets. Figure 1 lists all 41 possible multisets.

10									{(10,1),(0,8)}
9	1								{(9,1),(1,1),(0,7)}
8	2								{(8,1),(2,1),(0,7)}
8	1	1							{(8,1),(1,2),(0,6)}
7	3								{(7,1),(3,1),(0,7)}
7	2	1							{(7,1),(2,1),(1,1),(0,6)}
7	1	1	1						{(7,1),(1,3),(0,5)}
6	4								{(6,1),(4,1),(0,7)}
6	3	1							{(6,1),(3,1),(1,1),(0,6)}
6	2	2							{(6,1),(2,2),(0,6)}
6	2	1	1						{(6,1),(2,1),(1,2),(0,5)}
6	1	1	1	1					{(6,1),(1,4),(0,4)}
5	5								{(5,2),(0,7)}
5	4	1							{(5,1),(4,1),(1,1),(0,6)}
5	3	2							{(5,1),(3,1),(2,1),(0,6)}
5	3	1	1						{(5,1),(3,1),(1,2),(0,5)}
5	2	2	1						{(5,1),(2,2),(1,1),(0,5)}
5	2	1	1	1					{(5,1),(2,1),(1,3),(0,4)}
5	1	1	1	1	1				{(5,1),(1,5),(0,3)}
4	4	2							{(4,2),(2,1),(0,6)}
4	4	1	1						{(4,2),(1,2),(0,5)}
4	3	3							{(4,1),(3,2),(0,6)}
4	3	2	1						{(4,1),(3,1),(2,1),(1,1),(0,5)}
4	3	1	1	1					{(4,1),(3,1),(1,3),(0,4)}
4	2	2	2						{(4,1),(2,3),(0,5)}
4	2	2	1	1					{(4,1),(2,2),(1,2),(0,4)}
4	2	1	1	1	1				{(4,1),(2,1),(1,4),(0,3)}
4	1	1	1	1	1	1			{(4,1),(1,6),(0,2)}
3	3	3	1						{(3,3),(1,1),(0,5)}
3	3	2	2						{(3,2),(2,2),(0,5)}
3	3	2	1	1					{(3,2),(2,1),(1,2),(0,4)}
3	3	1	1	1	1				{(3,2),(1,4),(0,3)}
3	2	2	2	1					{(3,1),(2,3),(1,1),(0,4)}
3	2	2	1	1	1				{(3,1),(2,2),(1,3),(0,3)}
3	2	1	1	1	1	1			{(3,1),(2,1),(1,5),(0,2)}
3	1	1	1	1	1	1	1		{(3,1),(1,7),(0,1)}
2	2	2	2	2					{(2,5),(0,4)}
2	2	2	2	1	1				{(2,4),(1,2),(0,3)}
2	2	2	1	1	1	1			{(2,3),(1,4),(0,2)}
2	2	1	1	1	1	1	1		{(2,2),(1,6),(0,1)}
2	1	1	1	1	1	1	1	1	{(2,1),(1,8)}

Figure 1: list of multisets

The next step is to find all possible permutations for each of the multisets. If the multiplicities of the elements of M (taken in some order) are $m_1, m_2, m_3, \ldots, m_l$, then the number of multiset permutations of M is given by the multinomial coefficient:

$$\frac{(\sum_{i=1}^{l} m_i)!}{\prod_{i=1}^{l} m_i!} \tag{1}$$

If we apply (1) to the list of multiset in Figure 1, this gives us the number of permutations per multiset:

{(10,1),(0,8)}	9
{(9,1),(1,1),(0,7)}	72
{(8,1),(2,1),(0,7)}	72
{(8,1),(1,2),(0,6)}	252
{(7,1),(3,1),(0,7)}	72
{(7,1),(2,1),(1,1),(0,6)}	504
{(7,1),(1,3),(0,5)}	504
{(6,1),(4,1),(0,7)}	72
{(6,1),(3,1),(1,1),(0,6)}	504
{(6,1),(2,2),(0,6)}	252
{(6,1),(2,1),(1,2),(0,5)}	1512
{(6,1),(1,4),(0,4)}	630
{(5,2),(0,7)}	36
{(5,1),(4,1),(1,1),(0,6)}	504
{(5,1),(3,1),(2,1),(0,6)}	504
{(5,1),(3,1),(1,2),(0,5)}	1512
{(5,1),(2,2),(1,1),(0,5)}	1512
{(5,1),(2,1),(1,3),(0,4)}	2520
{(5,1),(1,5),(0,3)}	504
{(4,2),(2,1),(0,6)}	252
{(4,2),(1,2),(0,5)}	756
{(4,1),(3,2),(0,6)}	252
{(4,1),(3,1),(2,1),(1,1),(0,5)}	3024
{(4,1),(3,1),(1,3),(0,4)}	2520
{(4,1),(2,3),(0,5)}	504
{(4,1),(2,2),(1,2),(0,4)}	3780
{(4,1),(2,1),(1,4),(0,3)}	2520
{(4,1),(1,6),(0,2)}	252
{(3,3),(1,1),(0,5)}	504
{(3,2),(2,2),(0,5)}	756
{(3,2),(2,1),(1,2),(0,4)}	3780
{(3,2),(1,4),(0,3)}	1260
{(3,1),(2,3),(1,1),(0,4)}	2520
{(3,1),(2,2),(1,3),(0,3)}	5040
{(3,1),(2,1),(1,5),(0,2)}	1512
{(3,1),(1,7),(0,1)}	72
{(2,5),(0,4)}	126
{(2,4),(1,2),(0,3)}	1260
{(2,3),(1,4),(0,2)}	1260
{(2,2),(1,6),(0,1)}	252
{(2,1),(1,8)}	9

Figure 2: The total number of permutations per multiset

Note that that the multiplicities in this case alway add up to the number off statements, so $(\sum_{i=1}^{n} m_i)! = 9!$

4 Results

The total number of permutations for a given block is the product of all the permutations of the multisets in *Figure 2*:

$P_i =$
2505931006078651635155525860021971897230195630191589029885068334270502287
60027082388718466730295296000000000000

or $\pm 2.5 \times 10^{109}$

The total number of permutations for all twelve blocks is:

$$P = P_i^{12} \tag{2}$$

$P =$
6132383643639869134804666394899450893070698811363013700431816744176698894
9831448335271834431747993947666744853694521967769520166830139854371148135
7759400200799263584129296158900921372450856312748006071938347125081683794
5800619822195046474308018167394342304185262881429862019000873672958313287
2480165853581564563778139080274444865023853661428722452463818339476578476
3153869148483221078389910403889058827895873551650229295792391163910810887
7408588307589187041139143648295862936922410177054805195194804841175812722
9304254965689541462034961523649010575102970164361643320016849708249267790
7784269069652276180157447751002761376323098195366925257388171832207711115
9069837022029089818927702639512054992879044123700790874250327097077502637
4459128298735475767543916373174695048081134415808008446751327290740800004
7711789331384399167355547712682424462328962254892140900060535648512920551
7949620031508857078427404364855151344917227851233017072736269782380845148
7149655725863689663779980468212678814411159661671180819414460363203869871
7489112809751121821134088770630333239703566759330037358657383576905737554
2084945697030459142793450971734571158260973259379404034299489541040085357
5614454562816000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000

or $\pm 6.1 \times 10^{1308}$

5 Conclusion

To complete the Organic ScoreCard, respondents are asked to allocate ten points to nine statements, for each of the twelve blocks. Estimates of the total possible ways this can be done ran in the ‘trillions’, but this paper show that this couldn’t be further from the truth. The actual number is $\pm 6.1 \times 10^{1308}$.

For comparison, the number of atoms in the universe is estimated at $\pm 6 \times 10^{79}$, the number of possible chess games is $\pm 10^{120}$ and the number of possible Go games is estimated at $\pm 2.1 \times 10^{170}$.

Acknowledgements

Special thanks to James Blyth for posing the question.

References

Marcus Andreas Grond. *De organisatie Burnout.* Kerk Avezaath: Management Book International, 2005.