Dobble – Brilliant but flawed

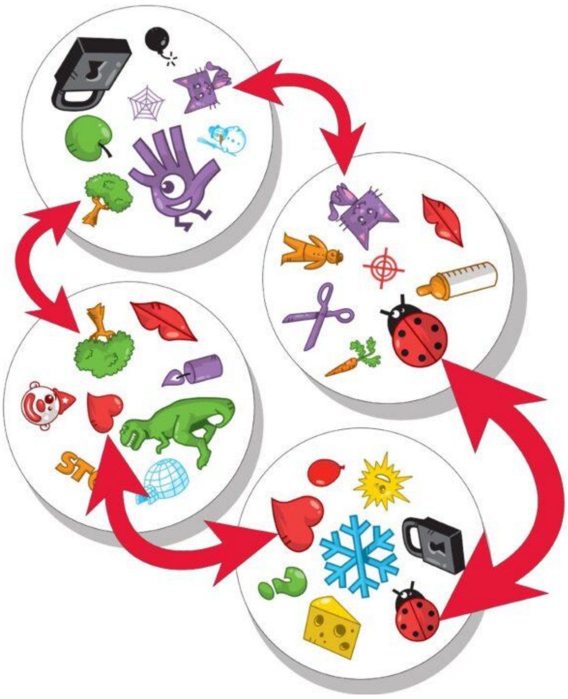
By Leo Shaw, February 2025.

Introduction

Back in October of 2024, my family and I were on holiday. Accompanying us was the game of Dobble, from which my research began. In particular, my father and I became quite intrigued by the nature of the game, the 'mono-match' principles of it, and how it was constructed. Over the course of my investigations, I discovered an unexpected flaw within the game!

What is a 'mono-matching' game (i.e. Dobble)?

Included in a tin of Dobble, there are 55 cards. Each card has 8 symbols illustrated on it. Furthermore, **all cards have exactly 1 symbol in common with every other card,** and the aim of the game is for players to be the quickest to identify which is the matching symbol with the previous card when a new card is played**.** Surprisingly, there are only a total of 57 different symbols used. Here are some Dobble cards:



Q1 How is Dobble Constructed?

There are many ways to create a 'mono-matching' game like Dobble, a couple of which are listed below:

1.1 Find the Carrot.

One remarkably straightforward way of making a 'mono-matching' game is to firstly, pick a number of cards, and a number of symbols to be drawn on each card. Next, establish a common symbol or link running through every card, such as the carrot symbol in Dobble. Finally, fill in the remaining symbols with unique images. Technically, this does create a usable 'mono-matching' game; however, it would become fairly boring and monotonous after a few rounds (since the only symbol being sought after would be the carrot), and we could call it "Spot the Carrot"!

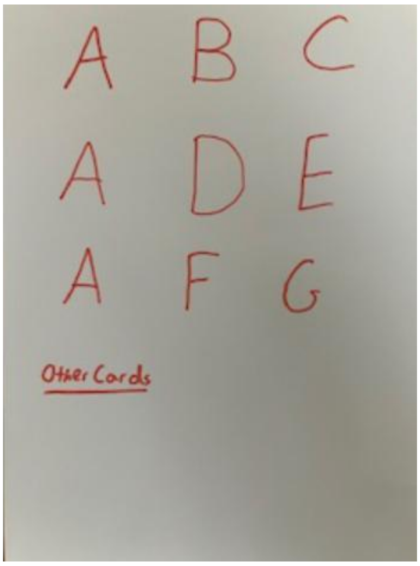
1.2 How Dobble does it.

Dobble is a much more compact, efficient, 'mono-matching' game than "find the carrot". As just previously established, method **1.1** is quite inefficient and monotonous, whereas Dobble's method is largely the opposite. Consider a game with n symbols allocated to each card. To make explaining easier, I will use $n = 3$, although $n = 8$ is used in the actual game of Dobble. Since $n = 3$, set the first card to **'ABC'** (I will use letters to represent symbols on cards).

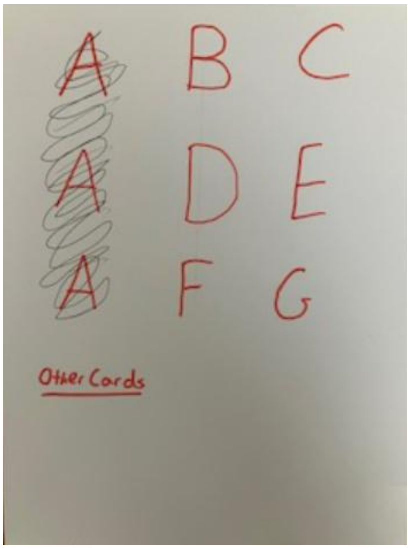
After having constructed ABC, to make a functioning 'mono-matching' game where $n = 3$, more symbols will need to be added. However, the next card to be constructed must have exactly one similar symbol to card ABC. Without loss of generality, a reasonable next card to formulate would be the card **'ADE'**, as it has the common link of symbol 'A' to card ABC.

In Dobble, each symbol has 8 appearances across all the cards. Helpfully, this figure also equates to the number of symbols on any one card. As I illustrate in the next section, **if we want to create a 'mono-match' game like Dobble (where $n = 3$), each symbol must occur precisely 3 times throughout all cards.** Now that we know this, we simultaneously know that another card incorporating 'A' must be crafted: **'AFG'**. To find the remaining cards, one must continue to logically construct cards that include 3 of the symbols A-G until no more can be assembled. To help you visualise this, I have created a step-by-step guide below.

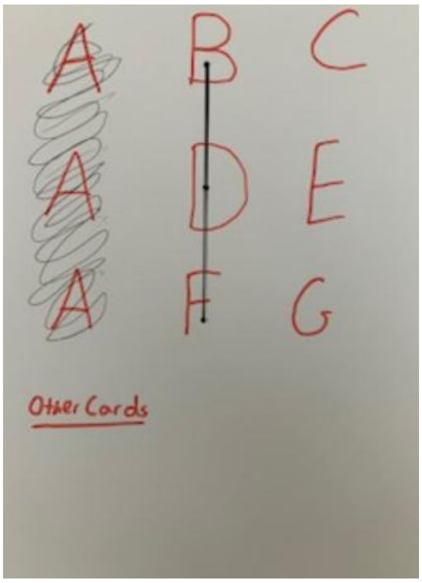
0. For context, this is what the sheet of paper looks like at the start of the guide with the three rows representing our first three cards:



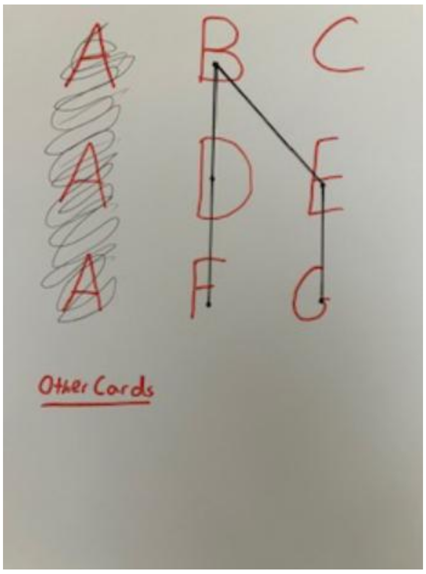
1. Since we already have 3 'As' in our pack, we will not be needing to use them further to construct new cards:



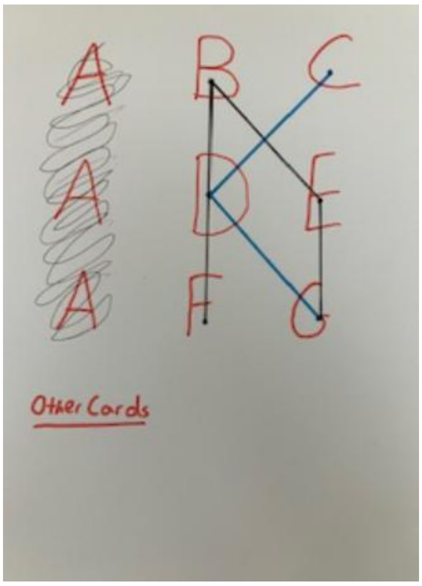
2. Firstly, one must pick a set of 3 letters, one from each row, to ensure that there is no 'double links' (Where two cards have two common symbols). I have picked the combination **'BDF'**:



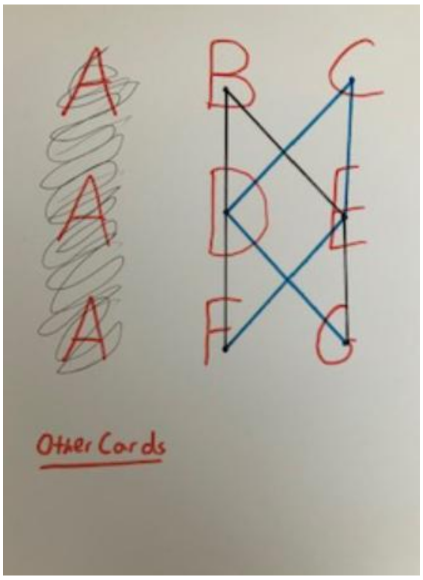
3. Next, another card needs to be visualised, so that all three cards including the symbol 'B' have been found. The singular other card with 'B' (which only has 'B' in common with the other cards) is the card **'BEG'**:



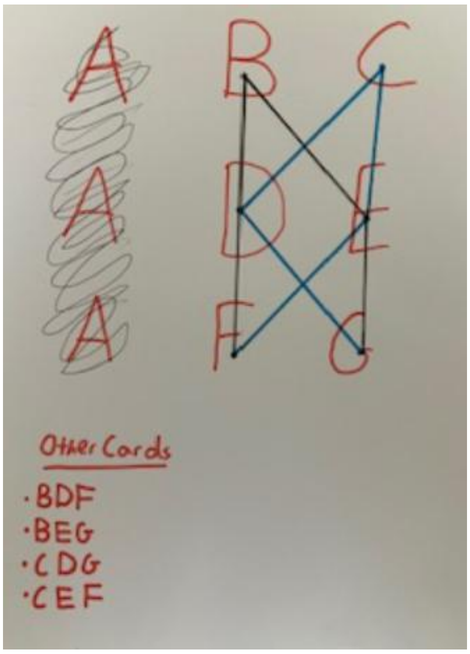
4. Since all permutations incorporating 'B' have been identified, we must now find all permutations incorporating **'C'**. To ensure that each card maintains exactly 1 symbol in common with each of the other cards, the last two symbols of each 'C-Card' must firstly be dissimilar to the last two symbols of each 'B-Card' and secondly, must not be situated on the same row. One combination that follows both rules is **'CDG'**:



5. For this set of cards, it is now clear to see that the only other ‘C-Card’ permutation which follows the rules is **‘CEF’**, as any other combination would result in a ‘double link’:



6. Now every symbol appears 3 times throughout our deck, indicating that the hunt has concluded:



7. Therefore, when creating a 'mono-match' game where *n* = 3, the 7 cards needed are: **ABC, ADE, AFG, BDF, BEG, CDG,** and **CEF.** Each pair of these cards has exactly one letter in common.

Q2 How does this vary as *n* changes?

To start off, I realised that the number of symbols on each card set a limit in terms of how many cards I was able to make. To investigate this, I carried out a few experiments, setting 2, 3, and 4 as the number of symbols on each card. As above, I substituted symbols for letters (A, B, C, etc..). Each string of letters represents a card. My results are shown below:

Number of symbols on each card.	All combinations of letters (cards).	Number of different symbols in total across all the cards.	Maximum number of cards.	Number of times any one symbol occurs throughout all the cards.
1	A	1	1	1
2	AB, AC, BC.	3	3	2
3	ABC, ADE, AFG, BDF, BEG, CEF, CDG.	7	7	3
4	ABCD, AEFG, AHIJ, AKLM, BEHK, BFIL, BGJM, CEIM,	13	13	4

	CFJK, CGHL, DEJL, DFHM, DGIK.			

Following this data, I created a sequence from the 'Maximum number of cards' column, which would go: 1, 3, 7, 13. Now I sought to find the nth term of this sequence, and so conjecturing **a formula for determining the maximum number of cards in a 'mono-match game' when given n (the number of unique symbols on each card).**

<u>2.1 The Formula</u>

From the table in section 2, we can see that the number of unique symbols in total across every card is equal to the maximum number of cards. When we take $n = 3$, for instance, every symbol is included in the 3 cards **ABC, ADE**, and **AFG**. On these cards there are n^2 symbols in total (not necessarily different). When one omits every similar symbol (every 'A') from the 3 cards, we are left with $n^2 - n$ symbols (since the number of As = n = 3). Lastly, one 'A' needs to be added back to the number of total unique symbols, otherwise the total will be 1 less than it is. Therefore, the conjectured formula for the nth term is $n^2 - n + 1$, where n = the number of unique symbols on each card. When substituting the values of 1, 2, 3, and 4 for n, the outcomes are as expected (1, 3, 7, and 13)

<u>Q3 Does this mean that there are 2 missing cards in Dobble?</u>

In Dobble, there is 8 symbols illustrated on each card. When 8 is inputted into the formula, the result is 64-8+1, which equates to **57**. However, as I mentioned earlier, there are 55 cards in Dobble. If the maximum number of cards that Dobble could include is **57**, why are there only 55 cards included in a tin? What are the two extra cards? Is there a specific reason as to why Dobble is 'Incomplete'? I will answer these burning questions in due course.

Almost immediately after I had theorised that Dobble was 'Incomplete, I found myself subconsciously on the hunt for the remaining 2 cards. To satisfy my curiosity, I created an excel spreadsheet to investigate the included 55 cards, and how that would help me find the missing 2 cards. A small excerpt of the spreadsheet is shown below (Although it does extend to row 69 and column CF):

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Dobble																	
2																		
3			Card	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4		Symbol																
5		Anchor																
6		Apple					1								1	1		
7		Baby Bottle									1		1		1			
8		Bird							1		1			1				1
9		Bomb		1										1			1	
10		Cactus		1					1									
11		Candle											1	1				
12		Car						1										1
13		Carrot																
14		Cat			1													1
15		Cheese					1							1				
16		Clock		1														
17		Clover		1						1					1			1
18		Clown				1	1											1
19		Cobweb																
20		Daisy				1								1	1			
21		Dobble Hand				1		1										
22		Dog																1
23		Dolphin																
24		Dragon													1			
25		Droplet					1		1	1							1	
26		Exclamation Mark														1		
27		Eye												1				

3.1 How the Spreadsheet Functions

From the table in section **2**, it is clear to see that, the number of symbols on each card = the number of times that any specific symbol appears throughout all the cards. This means that, because Dobble uses 8 symbol cards, the number of appearances of any symbol is also 8.

Since there are 2 missing cards, I knew that when adding up all the symbols, 14 would only have 7 occurrences; and one symbol would have a mere 6 occurrences (as the two cards must have a common/matching symbol). These missing appearances tell me the symbols on the unknown 2 cards.

I used '1s' within the spreadsheet so I could simply sum up the number of occurrences. Once I had summed up all the symbols on the provided cards, the symbols drawn on the missing 2 cards were revealed. However, it was still necessary to find the correct permutations of the symbols between the two cards, as an incorrect placement of them on the cards could lead to some cards sharing more than one symbol, completely invalidating the game.

3.2 SUMPRODUCT to find Cards 56 and 57

To determine which symbols to assign to which cards, I used a SUMPRODUCT formula. A SUMPRODUCT formula is **the addition of the products of the elements of two (or more) arrays.** For instance:

	2	2		
	3	1		
	3	6		

The SUMPRODUCT of the first and second columns would be; **(2 x 2) + (3 x 1) + (3 x 6)**, which is equal to **4 + 3 + 18** (= **25**). SUMPRODUCT can be used for more than 2 columns of data.

However, before, utilising the SUMPRODUCT function, I allocated the 15 symbols between the two cards (I made a column titled ‘Card 56’ and one titled ‘Card 57’). Once I had assigned the 15 symbols, I used the SUMPRODUCT function separately for each card column and the Card 56 column, and for each card column and the Card 57 column.

The target SUMPRODUCT calculation result is 1 for every combination. This is because, to achieve the result of 1, the multiplication of ‘1 x 1’ would need to take place exactly once. Since there are only blanks (zeroes) and 1s written on the spreadsheet, this multiplication would show that there is precisely one symbol in common between the two selected cards, **as every other multiplication apart from ‘1 x 1’ would result in 0 (i.e. ‘0 x 1 = 0’ and ‘0 x 0 = 0’).** Also, multiple matches would give a result of 2 or more.

The first trial of the SUMPRODUCT function showed that my arrangement of symbols of the 15 symbols was wrong, as some cards resulted in having 0, 2, and even more than 2 matching symbols to Cards 56 and 57. So, after trial and error of the composition of the last 2 cards, I had done it. It was at that moment when every SUMPRODUCT calculation resulted in 1, I knew what the missing 2 cards were.

<u>3.3 The Moment you have all been waiting for!</u>

By means of my extensive data sheet; I had now finally deciphered the last 2 cards, complete with correctly placed symbols. They are as follows:

	Card 56	Card 57
Symbols	• Cactus • Daisy • Ice Cube • Maple Leaf • Person • Question Mark • Snowman • T - Rex	• Dog • Exclamation Mark • Eye • Hammer • Ladybug • Lightbulb • Skull • Snowman

<u>Q4 Why is Dobble incomplete?</u>

It bemused me as to why Dobble appeared to be incomplete. Upon researching the internet, there seemed to be numerous theories as to why Dobble only includes 55 cards instead of the maximum 57. However, some of the theories, when examined, seem completely irrational. In this paper, I will only discuss the somewhat feasible theories, in order of credibility.

4.1 The Playing Card Theory

Out of all the speculations on this topic, this argument seems the most likely. It revolves around the idea that playing card printers use 55 cards sheets. Therefore, for Dobble to print all 57 cards, the manufacturers would have to use extra sheets, raising the production cost. This is simply not worth it for a mass manufactured game.

However, the single flaw in this theory is that Dobble cards are not rectangular like playing cards, but circles. Circular cards might not be printed in the same number and formation as rectangular cards because of their cumbersome shape. This means that, for instance, the cards could potentially be printed in 3 sheets of 19, which would render this theory invalid as no extra sheets would need to be used. Overall, this hypothesis is relatively attractive, if not for one modest flaw.

4.2 Was it Dobble's intentions?

Perhaps the creators and manufacturers of Dobble believed that the game would flow more smoothly with only 55 cards? The omitted cards certainly make dealing easier, as 54 is divisible by 1, 2, 3, 6, and 9 (in Dobble, one card is taken out at the start of every game). Although, 56 (the number of cards being dealt if the game was complete) is divisible by 1, 2, 3, 4, 7, and 8, which is arguably an even better selection of numbers, based on regular gathering sizes. On the whole, this postulation is largely reasonable but does, again, have a puzzling fault, ultimately leading to its downfall.

4.3 Packaging

Some people (however few) take an alternate perspective on this topic. According to them, the tin/packaging is simply too small. I myself find this argument extremely hard to sympathise with, as 2 playing cards maintain almost no volume whatsoever, not to mention the minuscule vertical height they would adopt. Hence, this theory is last on the list of credibility for me.

4.4 Kids Dobble

Aside from the original game, there are several other variants of Dobble. Some examples are Dobble Disney, Dobble Animals, and Dobble 1 2 3. However, there is one version which adds a further example of incompleteness: Kids Dobble.

Instead of having 8 symbols printed on each card like the original game, Kids Dobble has just 6. When substituting 6 for n in our formula for maximum card count from earlier *(n^2 – n +1),* we achieve the result of **36-6+1** (or **31**). Therefore, the greatest number of cards that Kids Dobble can include is 31. But alas, the Dobble manufacturers again do not encompass every card in the game, **as it contains only 30!**

Interestingly, in Dobble Disney and Dobble Animals, there are also only 55 cards included inside the tin (like the original game). This fact leads me to believe that the first theory I covered earlier is prevalent, considering that leaving out 2 cards appears to be a common theme through every version, possibly due to some sort of manufacturing constraint.

5 Conclusion

Dobble, at first glance, is nothing more than a simple matching game. However, when examined at a deeper level, the intricacies and complexities of the game's construction began to reveal themselves. I was surprised that my research took an unexpected turn and led me to discover that whilst being 'efficient' Dobble is also incomplete; and I am now glad to have found the missing cards!

Bibliography

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2. Why are there only 55 cards in a deck of spot it and not 57? | BoardGameGeek.
3. Dobble Jeu De Carte ▷ Promotion et meilleur prix 2025, Image Link : dobble-jeu-de-carte-678x381.jpg (678×381).