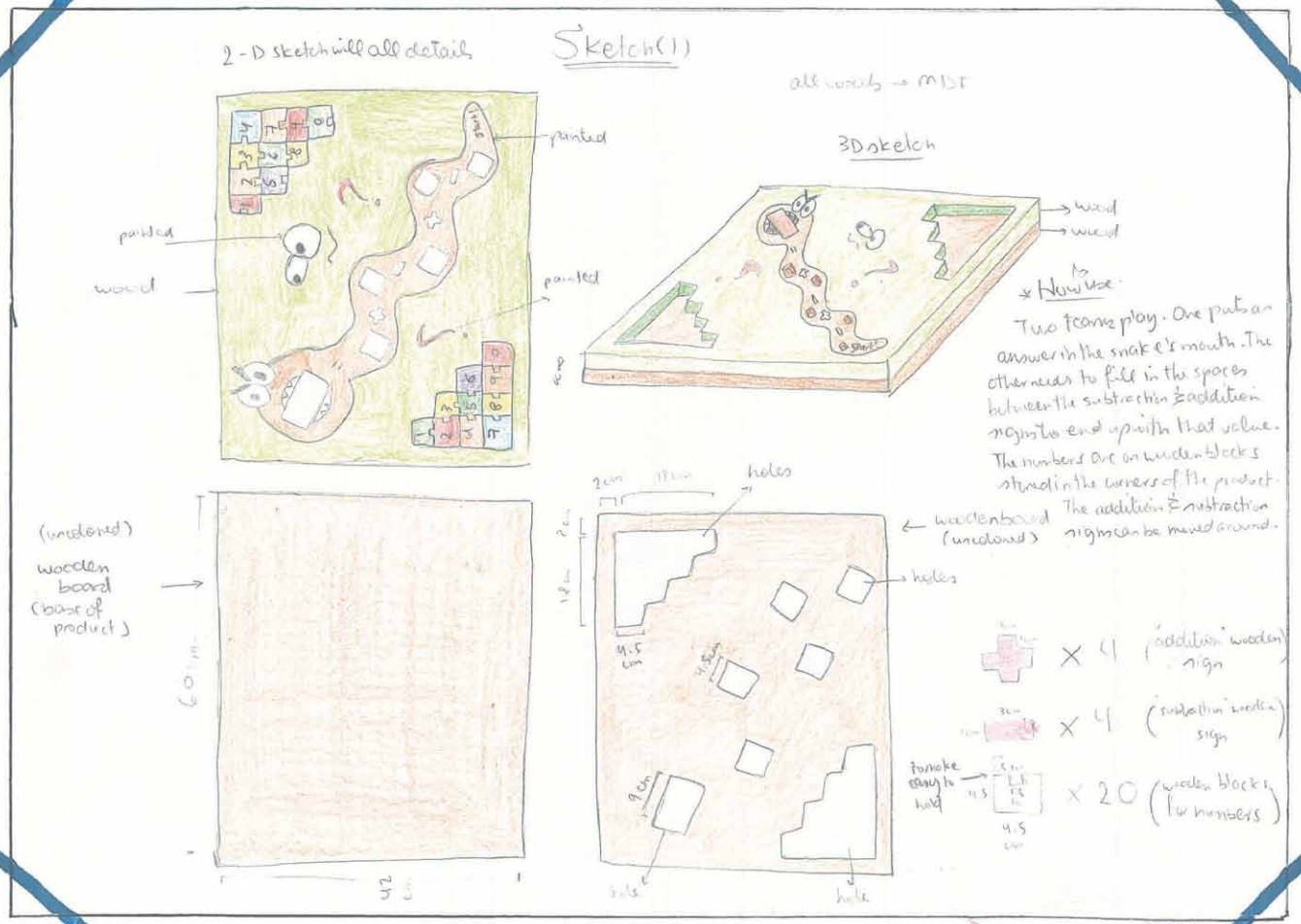
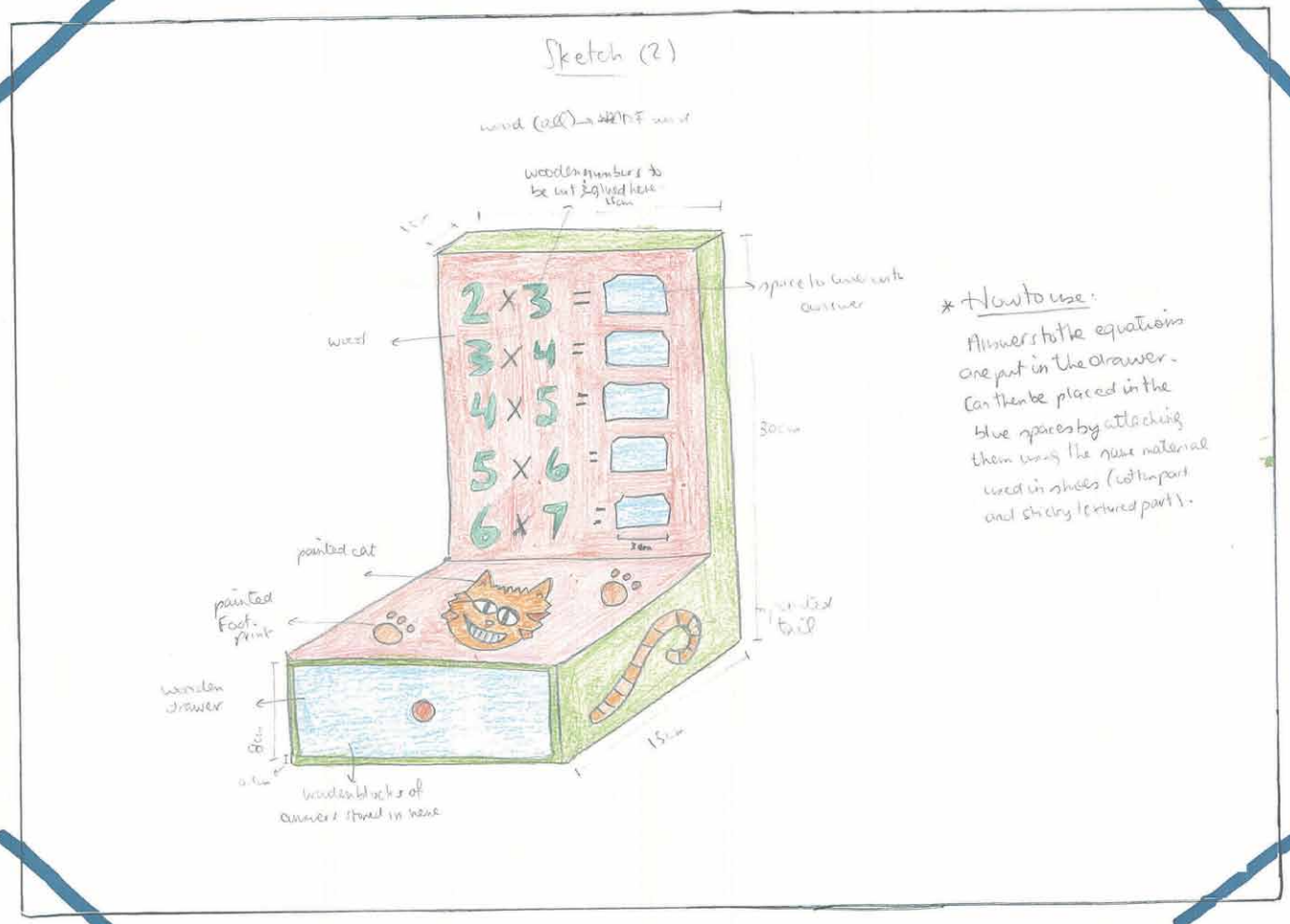

Design
Stage

Mathematical Game for the Physically Challenged

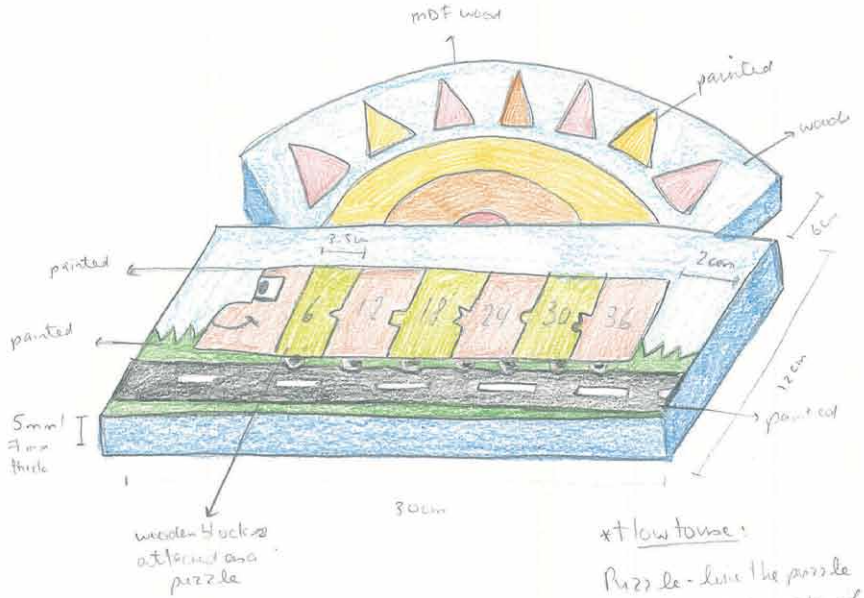


Answering Math Equations for the physically Challenged



Multipliers of "6" for the physically Challenged

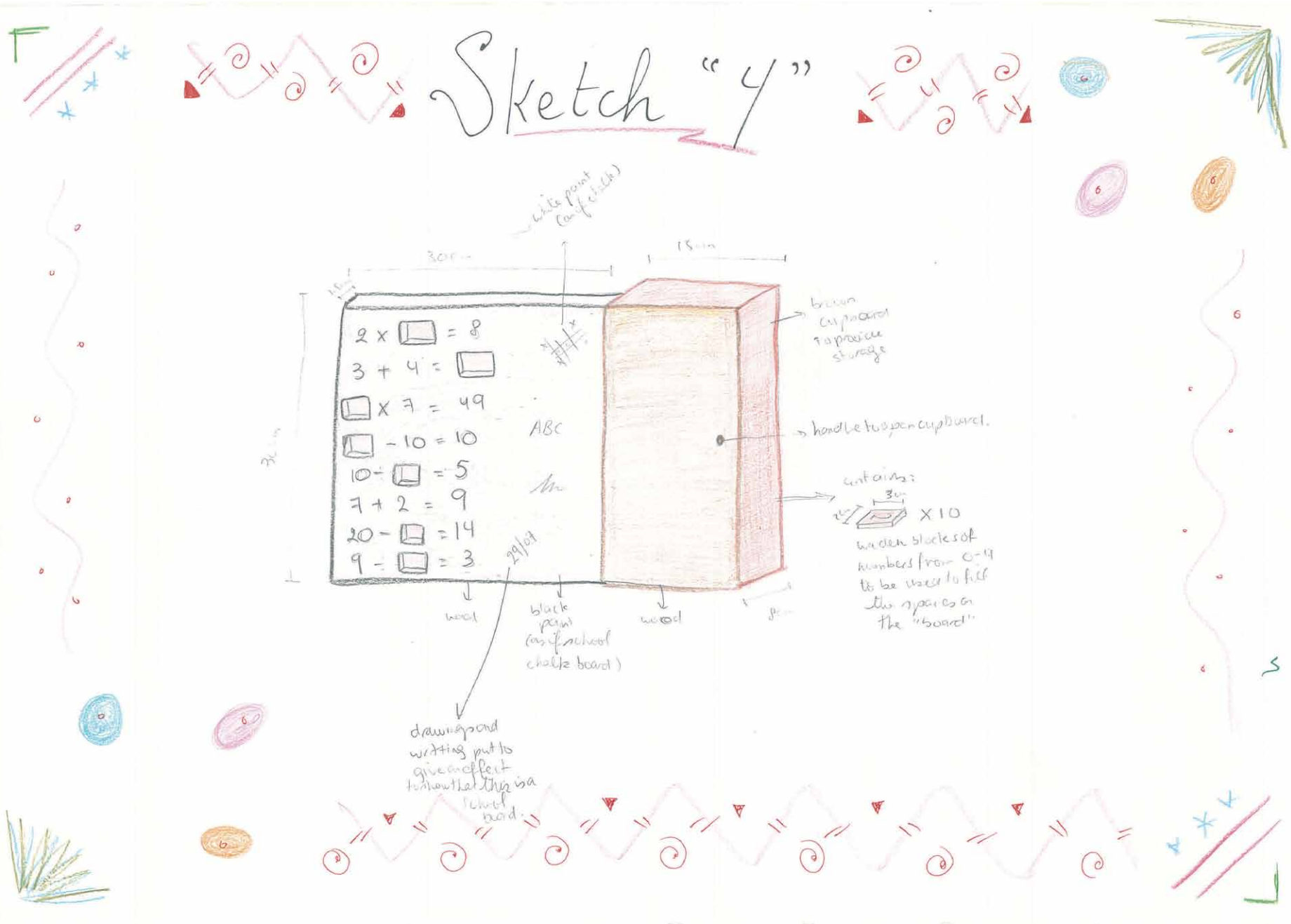
Sketch (3)

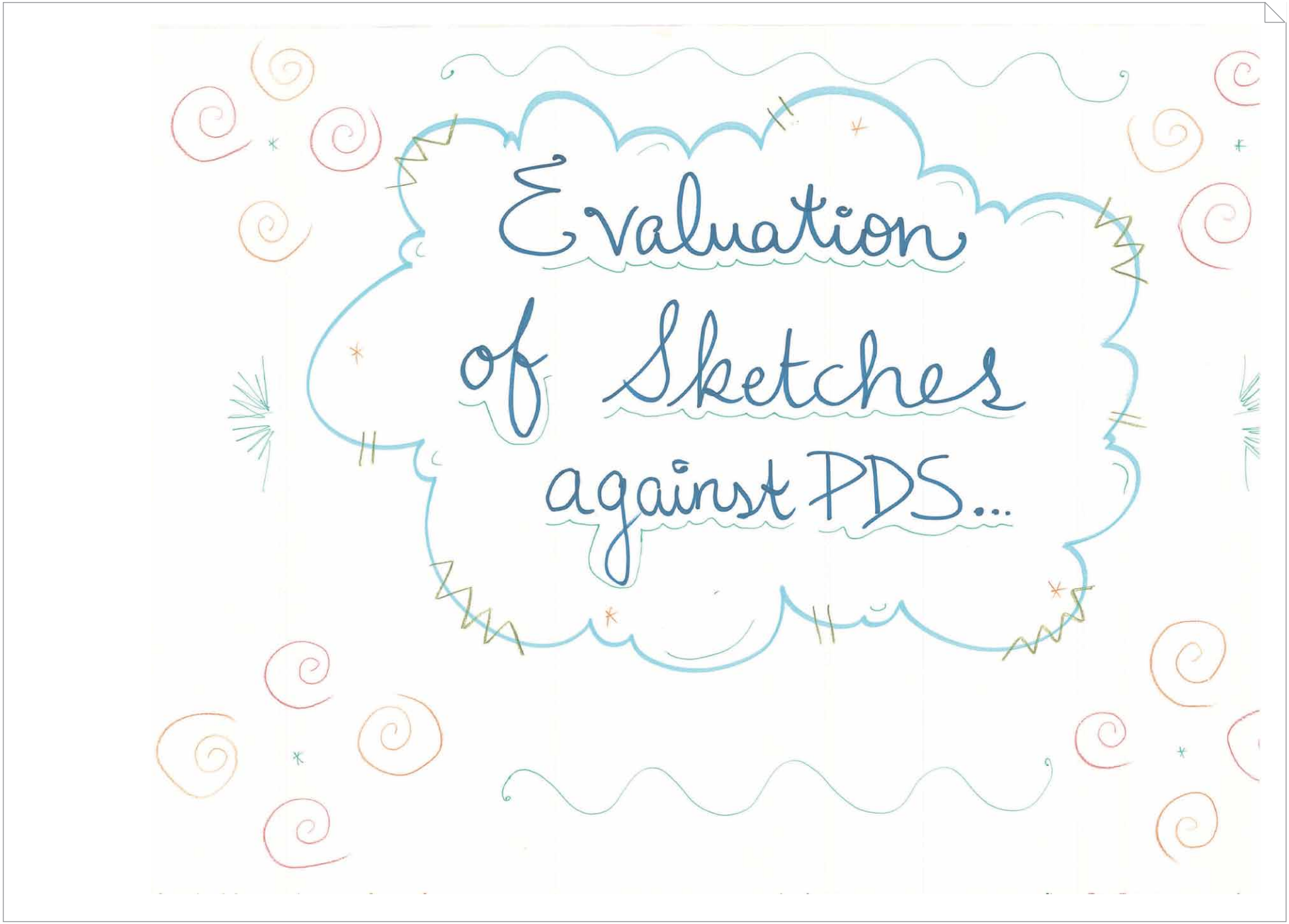


* Low tones:

Puzzle - have the puzzle pieces arranging to order of multiplication of "6"

Aim → giving children.


Sketch "4"
white paint (as if chalk)
30cm
15cm
2 x ☐ = 8
3 + 4 = ☐
☐ x 7 = 49
☐ - 10 = 10
10 ÷ ☐ = 5
7 + 2 = 9
20 - ☐ = 14
9 ÷ ☐ = 3
ABC
brown cupboard to provide storage
handle to open cupboard.
contains:
3cm
2cm
X 10
wooden blocks of numbers from 0-9 to be used to fill the spaces on the "board"
29/04
wood
black paint (as if school chalk board)
wood
drawing pad writting put to give an effect to show that this is a school board.


Evaluation
of Sketches
against PDS...

Sketch 1

		Specification	Check/13	Justification
Essentials	1	Environmentally Friendly	√	Will use MDF wood which is energy and money saving since it recycles wood
	2	User friendly	√	With the aid of the instruction paper, it can be clear what the product is about. It only requires moving pieces from place to place so it is not a difficult task
	3	Done independently	√	Though there are a lot of pieces to cut out, with my previous experience, I can easily cut them out, especially since they are regular uncomplicated shapes
	4	Done in school	√	All the pieces can only be cut using the workshop machines. If face time problems, can use up breaks and work after school.
	5	Durable	√	As an end product, it's durable since the base (the wooden bottom) makes it thicker. The wooden pieces at the edges (near storage area) are thick enough to avoid breaking when creating the product.
	6	Done within the time limit	√	Pieces not too complicated to create. If face time problems, can use up breaks and work after school.
	7	Clear theme	√	It is clear that it's a math game due to the numbers. The snake will be drawn clearly. An instruction paper will be added for extra clarifications.
	8	Uses the available materials	√	The only material used here is MDF wood, which is available at good quantities in the workshop
	9	Safe to use	√	Since it contains no real sharp edges
	10	Suitable for the end user (handicapped/ supervisors)	√	Made if a suitable size for it to be large enough for their use. Added storage area to avoid losing the items
	11	Light weight		Since it is made of two wooden boards stuck together. Although this will make it more durable, it will also make it heavier.
	12	Simple and to the point		Since at first glance, it is not clear how the game should be played. Nevertheless, I will be adding an instruction sheet which should clearen things up
	13	Suitable size	√	It is large enough for the easy use of the physically handicapped.
			10/13	

		Specification	Check/6	Justification
Desirables	1	Output: Visible/audible		No circuit is available (which would make the product more complex and time consuming) since there is no need for it.
	2	Have more than one function		It has only one aim (which is to create a mathematical game that would challenge the disabled children's minds) There is only one solution per product for the aim.
	3	For more than one end-user	√	Yes, since two teams of (2+) people can play against each other. It can additionally be used for than once, since different questions and solutions can be found.
	4	Add instructions of use (if necessary)	√	Instructions are needed since the product's use is unclear at first glance (can therefore be added for clarification). There are also rules for the game, which should be played in the instructions sheet.
	5	Colorful	√	Has 7 different colors- adding attraction and making it more suitable for children
	6	Creative	√	Since the idea is unique and un-traditional, with a snake as the line of the equation and the mouth as the answer zone. Number pieces are given small inner slits to make them easier to pick up.
			4/6	

When I evaluated the first sketch against the design specifications, it achieved a score of 10/13 in the essentials and 4/6 in the desirables. These are the highest scores obtained out of the three sketches. As we can see from this evaluation, its main flaws are lacking a visible/audible output and having only one function (as desirables) and being heavy and un-straightforward (as essentials). On the other hand, its strongest points are that it is the most creative and can be used more than once and by more than one end-user. I think I will be choosing this sketch since its benefits outweigh its flaws and it is made suitable for children, with colors and designs.

Sketch "2"

		Specification	Check/13	Justification
Essentials	1	Environmentally Friendly	√	Will use MDF wood which is energy and money saving since it recycles wood
	2	User friendly	√	It only requires moving pieces from place to place so it is not a difficult task
	3	Done independently		Difficult to do independently, since some pieces are delicate and dangerous to be done on my own (the numbers) while others are more complicated to do and I haven't experienced working with them before (drawer)
	4	Done in school	√	All the pieces can only be cut using the workshop machines.
	5	Durable		Since the vertical board is too long and wouldn't be thick enough (about 5mm thick) and would therefore be at risk of breaking
	6	Done within the time limit		May not be done within the limited time since some parts are too difficult to create and would therefore need extra time (e.g. the numbers and drawer)
	7	Clear theme	√	The equation is clear and the aim is therefore obvious since the space after the "equals" sign indicates that it should be filled with an answer. I added a cat theme to increase its attraction to children.
	8	Uses the available materials	√	The only material used here is MDF wood, which is available at good quantities in the workshop
	9	Safe to use	√	Since it contains no real sharp edges
	10	Suitable for the end user (handicapped/ supervisors)	√	Has a storage area to avoid losing the small objects.
	11	Light weight		The drawer will increase the weight and make it heavy. Especially since pieces of metal will be needed to create it.
	12	Simple and to the point	√	Everything is clear with no complications. The aim is obvious and the drawer clearly indicates storage area. The colors used are additionally simple, preventing any distractions.
	13	Suitable size		Too small for the handicapped to use with ease
			8/13	

		Specification	Check/6	Justification
Desirables	1	Output: Visible/audible		No circuit is available (which would make the product more complex and time consuming) since there is no need for it.
	2	Have more than one function	√	Since although it is aimed as a math game for the children, if not used for that purpose, the drawer can be used to store not only wooden pieces but anything else that fits in.
	3	For more than one end-user		No, since although different children can use it, it is not a team work type of game. Moreover, it cannot be used more than once, since there is only one solution for each question.
	4	Add instructions of use (if necessary)		Not necessary since all is clear and to the point
	5	Colorful	√	Has 6 different colors- adding attraction and making it more suitable for children
	6	Creative		Idea is traditional and no real touch is given to the mathematical part of the product. Answering 5 equations isn't entertaining or special for the children.
			2/6	

When I evaluated the 2nd sketch against the design specifications, it achieved a score of 8/13 in the essentials and 2/6 in the desirables. By comparing these scores to the ones of the other sketches, I can conclude that it achieved the lowest score. Despite it having good storage area and including attractive designs, its flaws outweighed its benefits. Some of its main flaws are lacking creativity, being used only once, having an unsuitable size, and being too difficult to be completed individually and in the restricted time. As a result, I don't think I will be using this sketch since its weaknesses outweigh its strengths ad because its idea lacks creativity and originality.

Sketch "3"

		Specification	Check/13	Justification
Essentials	1	Environmentally Friendly	√	Will use MDF wood which is energy and money saving since it recycles wood
	2	User friendly	√	It only requires moving pieces from place to place so it is not a difficult task. With the help of the uniquely shaped sides, it is easy to solve (therefore is aimed at younger children)
	3	Done independently	√	Though there are a lot of pieces to cut out, with my previous experience, I can easily cut them out, especially since they are regular uncomplicated shapes
	4	Done in school	√	All the pieces can only be cut using the workshop machines. If face time problems, can use up breaks and work after school.
	5	Durable	√	Since there are no thin parts and the board will be thick enough to allow for the number pieces to be inserting within part of its width.
	6	Done within the time limit	√	Easy to create with no real complications.
	7	Clear theme		The drawings are clear, representing a train in the road on a sunny day. It is clear through the puzzle shaped wooden pieces that they need to be attached together forming a certain pattern.
	8	Uses the available materials	√	The only material used here is MDF wood, which is available at good quantities in the workshop
	9	Safe to use	√	Since it contains no real sharp edges
	10	Suitable for the end user (handicapped/ supervisors)		Since it is not large enough to be handled easily and has no storage area for the small objects. They are therefore in risk of getting lost. Also, no handles are put for the wooden numbers, making them difficult to move around.
	11	Light weight	√	Since only one small wooden piece will be used as a base for the product.
	12	Simple and to the point	√	The product's aim is recognizable. The drawings are uncomplicated and straightforward. The uniquely sided wooden pieces make the game simpler and easier to be solved.
	13	Suitable size		Too small for the handicapped to use with ease
			9/13	

		Specification	Check/6	Justification
Desirables	1	Output: Visible/audible		No circuit is available (which would make the product more complex and time consuming) since there is no need for it.
	2	Have more than one function		It has only one aim (which is to create a mathematical game that would challenge the disabled children's minds) There is only one solution per product for the aim.
	3	For more than one end-user		No, since although different children can use it, it is not a team work type of game. Moreover, it cannot be used more than once, since there is only one solution for each question.
	4	Add instructions of use (if necessary)		Not necessary since all is clear and to the point
	5	Colorful	√	Has 9 different colors- adding attraction and making it more suitable for children
	6	Creative	√	Although the game is simple, it is aimed for younger children. Having the numbers be lined in a way to create a bus with a large sun on the top is creative and fun. In addition, giving the puzzle sides unique shapes instead of the usual puzzle shapes makes the product distinctive.
			2/6	

When I evaluated the 3rd sketch against the design specifications, it achieved a score of 9/13 in the essentials and 2/6 in the desirables. It therefore achieved the second best score out of the three. Despite its attractiveness and colorfulness, it lacks some essences like having a storage area for the pieces and being challenging for the children. Its small size makes it unsuitable for the handicapped since it would make it difficult for them to hold the pieces and –for some- to see the wooden pieces clearly. I therefore don't suppose I will be using this sketch, especially since it is too simple to create (being unchallenging for my abilities).

Sketch "4"

Essentials

	Specification	Check/13	Justification
1	Environmentally Friendly	√	Will use MDF wood which is energy and money saving since it recycles wood
2	User friendly	√	It only requires moving pieces from place to place so it is not a difficult task. Its function is clear and to the point so it shouldn't be difficult to handle or understand.
3	Done independently		Difficult to do independently, since although the pieces most pieces are very basic and easy to cut, others are more complicated to do and I haven't experienced working with them before (e.g. cupboard since there are metal parts needed to be attached and special techniques to create it)
4	Done in school	√	All the pieces can only be cut using the workshop machines. If face time problems, can use up breaks and work after school.
5	Durable	√	As an end product, it's durable since the wooden pieces are thick enough (board is 1.5 cm thick while cupboard is 8cm wide) to avoid breaking when creating the product.
6	Done within the time limit		May not be done within the limited time since some parts are too difficult to create and would therefore need extra time (e.g. the cupboard and spaces for numbers, due to the possibility of room congestions)
7	Clear theme	√	It is clear that it's a math game due to the numbers. In addition, it has been given a specific theme being school board due to the small graffiti's and writings which give an effect
8	Uses the available materials	√	The only material used here is MDF wood, which is available at good quantities in the workshop
9	Safe to use	√	Since it contains no real sharp edges and is stable enough to avoid falling over
10	Suitable for the end user (handicapped/ supervisors)		Despite having storage area to avoid losing the items, it is too small for their use and the wooden numbers have no handle to be held from. This will make it difficult for the children to play with it.
11	Light weight		Although having a wide base by using thick wood will make it more durable, it will also make it heavier.
12	Simple and to the point	√	Everything is clear with no complications. The aim is obvious and the cupboard clearly indicates storage area. The colors used are additionally simple, preventing any distractions.
13	Suitable size		It isn't large enough for the easy use of the physically handicapped and would therefore make it difficult for their use as the wooden numbers would also be too small for them to handle.
		9/13	

Desirables

	Specification	Check/6	Justification
1	Output: Visible/audible		No circuit is available (which would make the product more complex and time consuming) since there is no need for it.
2	Have more than one function	√	Since although it is aimed as a math game for the children, if not used for that purpose, the cupboard can be used to store not only wooden pieces but anything else that fits in.
3	For more than one end-user		No, since although different children can use it, it is not a team work type of game. Moreover, it cannot be used more than once, since there is only one solution for each question.
4	Add instructions of use (if necessary)		Not necessary since all is clear and to the point
5	Colorful		Only has three different colors. Although the use of less colors would avoid distractions, this would also make it un-attractive or motivating
6	Creative	√	Since a specific theme is used for it (being school) which would motivate learning as it would put them in the right environment to work and learn. The added graffiti and writing also adds a spark to the product.
		2/6	

Conclusion:

When I evaluated the 4th sketch against the design specifications, it achieved a score of 9/13 in the essentials and 2/6 in the desirables. By comparing these scores to the ones of the other sketches, I can conclude that it achieved a mediocre score which isn't too bad. Despite it having good storage area, having a unique theme, and including attractive designs, its flaws outweighed its benefits. Some of its main flaws are lacking color, being used only once, having an unsuitable size, and being too difficult to be completed individually and in the restricted time. As a result, I don't think I will be using this sketch since its weaknesses outweigh its strengths and basically because its idea is too difficult and is too straight forward with no real challenge for the end users, since the product is typical (being merely a set of equations) with nothing attractive enough to motivate using it.

Chosen product: Sketch"1"

Justifying Choice by Analyzing each point in the PDS

I can justify my choice of this product by analyzing it according to each of the essentials and desirables. As for the negative points in the essentials, they are basically being complicated (not simple or to the point) and being too heavy to carry around. The only reason I said that it looks complicated is because when first looked at, the way the game is to be played is not vivid. Despite this, I will be using an instruction sheet to clarify how to use the game. As for being too heavy, this is due to it being made out of two wooden boards stuck together, making it thick and heavy (especially since it is large in size).

Despite these minor negative points, there are some positive points in the essentials that can overweigh them. First of all, it is environmentally friendly since I will be using MDF wood which is energy and money saving as it recycles wood (being made of bits of unwanted pieces of wood). Secondly, it is user friendly, as although it looks complicated at first, with the help of the instruction paper, the aim of the product can become clear enough. In addition, it only requires moving pieces from place to place, which contributes to the fact that it is easy to use. It can also be done independently and within the limited time, since although there is a large number of pieces to be cut, I have enough experience to deal with them and they aren't exactly complicated shapes. If I faced time problems, I would hopefully still be able to finish on time by using up my breaks and coming after school to catch up. This product can also be done in school since the materials used are available in the workshop and accessible for my use (being only MDF wood). In addition, this product is durable, since its pieces and parts are made thick enough to avoid breaking while creating the product and while being used by the end users. Also, the theme of the product is clear as using numbers indicated that it has to do with math. The snake would also give a theme on nature. Nevertheless, if the theme is not clear enough, the instruction paper would help improve that. Finally, the product is made suitable for the physically challenged since it is made safe (with no sharp edges) as well as having a suitable size (large enough for their use) and including a cupboard for storage.

Justifications Part "2"

Moreover, I can justify my choice of this product based on the results of evaluating it against the desirables. As for the negative points in these desirables, they are basically lacking a visible/audible output and having only one function. As for the output, there is no circuit available (which would make the product more complex and time consuming) since there is no need for it. Moreover, the product constricts with having only one aim (which is to create a mathematical game that would challenge the disabled children's minds). Nevertheless, these disadvantages are minor and are not important to be included, especially since they would –if included- make the product too complicated and distracting (with noises and light sources...etc).

Despite these points, there are still various positive points in the desirables, which include creativity, colorfulness, including an instruction paper, and being made for the use of more than one person at a time. As for colorfulness, it includes 7 different colors, which add attraction and make it more suitable for children. Its also creative, by having a unique idea, with a snake as the line of the equation and the mouth as the answer zone. Number pieces are given small inner slits to make them easier to pick up as well (helping in making it more suitable for the handicapped). It can be used by more than one end user as two teams of (2+) people can play against each other. Also, it can be used for than once, since different questions and solutions can be found. Finally, instructions which will be added will add clarifications by stating the rules of the game. This will make it all more official and real.

In short, by justifying my choice according to the PDS, I found that the positive points overweigh the negative ones, and by relating it to other products, it was the best and most convenient and will therefore be my choice for a product.

Choice and Justification

Out of the ~~three~~ four sketches, I decided to choose the 1st one. Sketch one shows a product used to work the brains of these physically challenged children through an educational mathematical game. In this game, two teams need to form, having one team on each of the two corners where the number wooden pieces are stored. In the snake, there are six square holes, each to fit a number (with the exception of the one in the snake's mouth, which fits a maximum of two numbers). One team would use the wooden numbers on his side to put an answer in the snake's mouth. The opposing team would need to create an equation to end up with the answer given, by using the mathematical signs (addition, subtraction...etc) and the wooden numbers. A maximum of 5 numbers can be used to solve the equation.

This game will teach enhance and develop the children's team skills and make them feel part of something. It will also allow for an amusing mathematical challenge, designed in a way that would motivate them to play (due to the colors and designs used).

Out of all the sketches, I chose this one for a number of reasons. First of all, it achieved the highest score (by getting 10/13 in the essentials and 4/6 in the desirables). The score it achieved in the desirables was extremely satisfying, since although it didn't achieve a full score, the specifications it lacked were having a visible/audible output and having variety of functions. These specifications –if available in the product- would have made it too difficult to build and time consuming. Having different functions would have also created confusion and distractions. Therefore, the product would be better off without them.

Moreover, I compared the ~~three~~ four different sketches together in relation to their disadvantages. I found that the main disadvantage of the first sketch is being heavy and complex, of the second sketch is being unoriginal, and of the third one is being too simple and not having storage area. As for the 1st sketch, although it is heavy, it is not meant to be carried around and held. Only the small wooden pieces should be held (they are lightweight). As for being complex, I only stated that since at first glance it is difficult to understand how the game is to be played. Despite this, with the addition of an instruction paper, the game will be made clear and simple to use. As we can see, according to this comparison, sketch (1) is the best choice.

On the other hand, I compared the ~~three~~ four different sketches according to their advantage. The main advantage of the 2nd sketch is that it has good storage space for the wooden pieces. As for the 3rd sketch, its main advantage is its simplicity and straightforwardness. Nevertheless, despite these benefits, the 1st sketch is the best since it is the most useful, being suitable to be played more than one time, and by more than one person. It is additionally large, colorful and creative with a proper storage area for the wooden pieces. Therefore, due to its numerous advantages and lack of any major flaws, I chose the 1st sketch as my product.