
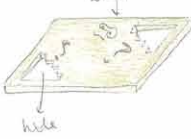
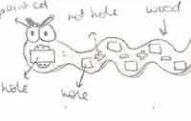





Deviations

There are two main changes and modifications I have made to my original idea:

1. The hole on the edge of the small wooden pieces (used for the numbers) used to help lift the pieces was originally a square of dimensions 1.5cmx1.5cm. Nevertheless, I have found a better solution that is easier to create and is more practical. I will instead create half a circle of radius 1cm. This will be done using a bench drill which is easier and faster than cutting it in a square shape using a saw, especially since I will be creating 20 pieces of these.
2. In the original plan, the snake was supposed to be painted on the top 60x42cm wooden piece, with the holes for the number pieces being in it. Nevertheless, I have found a better solution which is to cut out the snake (with the dimensions listed in the 'Part's List' page) and create the holes in the snake itself. This would not only make the product more attractive, it would additionally make its creation more practical and easier since it would be easier to rotate the snake than the whole board when creating the holes.

Parts list

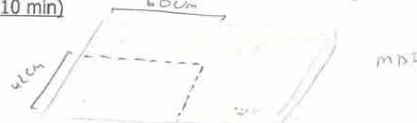
Part	Sketch	dimensions	Comments	Quantity	Use
1 bottom of product		60 X 42 X 8 cm cm mm	MDF wood. Will be used as a base to have small pieces inserted onto it.	X 1	As a base for product. Holes of piece & over it will allow for small pieces to be inserted onto it.
2 top of product		60 X 42 X 8 cm cm mm holes: 1 P X 18 X 4.5 X 4.5 X 8 cm cm mm	MDF wood painted green. The holes made 2cm away from edges & 18cm in length with the stair cuttings 4.5cm x 4.5cm. Will have paintings & drawings on it.	X 1	to store the pieces in. The snake will be inserted over it.
3 Snake on top of product		55 (total length) 8mm (thick) head → 13 X 12 cm cm body → 8.5 X 8.5 for each part P.S 8.5 8.5 8.5	MDF wood painted brown. With holes to insert small wooden pieces. The areas for the + & - signs are not holes.	X 1	to insert wooden pieces with numbers & symbols in. Made as a snake, as if snake is eating the answer. Players play by having one group put an answer, while the other uses the numbers & symbols to answer the end up with that answer.
4 number pieces		4.5 X 4.5 X 1 cm cm mm	MDF wood. Diff color for each piece (5 colors almost). Put diff number on each piece	X 20	The hole numbers to solve the equation.
5 addition sign		1 X 1 X 3 cm cm mm	MDF wood. Red color. Not inserted in hole. merely placed on snake between holes	X 4	Addition sign used in equation.
6 subtraction sign		3 X 1 X 3 cm cm mm	MDF wood. Red color. Not inserted in hole. merely placed on snake between holes.	X 4	subtraction sign used in equation.

Production Plan

1. Bring a large piece of MDF wood 8mm thick (5 min)



2. Use a pencil, rubber, and ruler to draw a rectangle onto it 60x42cms in size (10 min)



3. Use the table saw to cut out this 8mm MDF wood according to the sizes of step 2. (Process: Wasting. Technique: Sawing using the table saw) (20 min)



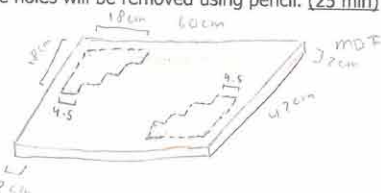
4. Repeat steps 1-3 on another piece of MDF wood to create the top part of the product (40 min)



5. Check that the pieces are of same size by placing them one over the other. (2 min)



6. To create the stair-like holes for the storage of the wooden number pieces on the top wooden board, draw holes on the corners of these areas where the holes will be removed using pencil. (25 min) (18 X 18 X 4.5 cm)



7. Use the drill machine to drill through these holes. (The holes will make it possible to cut out the staircase holes later on, since the saw used would be placed inside these holes to cut around them). (Process: Wasting. Technique: Drilling using the drill machine). (10 min)



8. Use the table jigsaw to cut out these storage areas. (Process: Wasting. Technique: Sawing using the table jigsaw). (60 min)



9. Get a piece of MDF wood 8mm thick. (5 min)



10. Use a pencil and ruler to draw a 4.5x9cm rectangle. (5 min)



11. Draw a line in the middle of this rectangle (to end up with two 4.5x4.5cm squares side by side) (1 min)



12. Draw a circle between the two squares, having its radius 1cm long (half of the circle would be on one square while the other half would be on the other one). (2 min)



13. Use the drill machine to drill this hole. (Process: Wasting. Technique: Drilling using the drill machine). (5 minutes)



14. Cut out this MDF board into the two 4.5x4.5cm squares (ending up with each having a side with a half circular hole in it). (Process: Wasting. Technique: Sawing using the table saw) (20 min)

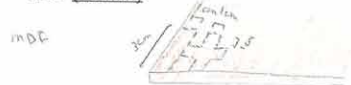


15. Repeat steps 9-14 to create 9 more of these wooden pieces. (30 minutes/piece=270 min in total) (ending up with 20 pieces).

16. Get another piece of MDF wood 8mm thick. (5 min)



17. Use a pencil and ruler to draw out an addition sign and a subtraction one. The addition sign should be 1x1x1x1x1x1x1x1x1x1cm (all sides same size=1cm). On the other hand, the subtraction sign should be 3x1cm in size. (10 min)



18. Use the table jigsaw to cut out these pieces. (Process: Wasting. Technique: Sawing using the table jigsaw). (50 min)



19. Repeat steps 16-18 to create 3 more of each of these two wooden pieces. (60 min/piece= 180 min in total)

20. Get a cardboard piece (no specifications) and draw the snake with the holes for the numbers on it using a pencil. (The total length of the snake should be 55cm. The length of its head should be roughly 12cm while its width should be about 13cm. As for the tail, each curve should be 8.5cm long and 8.5cm wide. All the holes except the one in the snake's mouth should be 4.5x4.5cm in size and should be put in the middle of each tail curve. As for the mouth hole, it should be 4.5x9cm in size to fit two number pieces). This cardboard will be used as a template for the snake piece. (40 min)



21. Cut out the outline of the snake using scissors. (Process: Wasting. Technique: Cutting using a scissor). (10 min)



22. Use a scalpel to cut out the holes in the snake template. (Process: Wasting. Technique: Cutting using a scalpel). (15 min)



23. Put the template against an 8mm thick MDF board and trace the template using a pencil. (5 min)



24. Draw a hole in each of the number holes in the wooden snake. (1 min)



25. Use the drill machine to drill through these holes. (Process: Wasting. Technique: Drilling using the drill machine). (5 min)



26. Use the table jigsaw to cut out the wooden snake. (Process: Wasting. Technique: Sawing using the table jigsaw). (50 min) including holes



27. Use sand paper and the sanding machine to smoothen the pieces (Process: Wasting. Technique: Sanding). (30 min)



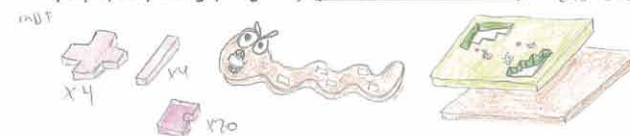
28. Draw the question mark and smile designs on the top 42x60cm wooden board in the right position using pencil. (5 min)



29. Draw the details of the snake using pencil. (5 min)



30. Painting: Paint the snake brown with black and white eyes. Paint the top large wooden board light green, with the thickness of the holes dark green. Paint the smile black and white and the bottom wooden board brown. Paint the question marks and subtraction and addition marks red. Finally, paint each of the number pieces a different color (yellow, blue, purple, red, orange, or green). (150 min - three lessons) (not to scale)



cleaning
done by
painting

31. Use a marker to write out the numbers on the small 4.5x4.5cm wooden pieces. (30 min)



32. Gluing: Glue the two 42x60cm boards together (with the brown one at the top and the green one at the bottom). Glue the snake onto the middle of the green board. (50 min)



33. Time for editing. (50 min - one lesson)

Evaluating Production Plan

I created a production plan that includes all the tasks I plan to achieve step by step in order to reach to my final goal, which is to create a creative and useful product in the form of a math game in order to aid the physically challenged. In this production plan, I included the time (in minutes) I estimated would be enough for each task. Over all, according to my production plan, the time I would be working on building my product turned out to be about 1170 minutes (19.5 hrs), meaning I would need to use up some breaks and come after school as well in order to guarantee that I terminate my product on time.

Over all, my production plan should be easy to follow. This is due to my clear and detailed description of the steps, my thorough specifications (size, time, materials, processes and techniques), and my labeled and colored sketches. I therefore believe that I have divided my tasks logically and in a clear consecutive manner. All these elements contributed in creating a successful production plan that should be followed by any capable person with no troubles or confusion.

Over all, I think that the time I have allocated for each step is fair enough. This is due to the fact that I have ensured that I take into consideration the time that will be lost due to over-crowdiness, waiting in turn to use tools, and any other obstacles and changes that I might face throughout the creation stage. I have therefore made rough estimations of how much time is needed or each task according to its difficulty and situation, while making sure I am generous enough to successfully follow it.

Despite all this, after I have taken a closer look at my plan (with the feedback of a colleague), I noticed that, although most of the steps are given a fair amount of time, there were nevertheless a few that were either over generous or the opposite. For example, in step two, I have given 10 minutes to merely draw two lines. This is too generous and therefore 5 minutes should be more than enough. As for step three, it was given 20 minutes, but this is additionally over-generous since this piece will most probably be cut by the workshop teacher himself, since the machine used is too dangerous for the use of students. Therefore, 20 minutes is too much for this task, despite the probability of overcrowdiness. Another example is step 27, where I allocated 30 minutes for the sanding process. Although sanding is not a major stage, since I will be using both sanding paper and the sanding machine, I will most probably need more time, especially since I would need to sand 31 pieces of wood of different sizes. I therefore believe it would be fairer to allocate 60 minutes for this task at the very least.

Over all, I believe that I was able to provide enough time for each stage, in order to climb the steps easily and reach the top. Nevertheless, I should always be ready for any obstacles that may come my way and lead to changes in my plan.