Name: _____ Group: _____

THE PROBLEM

Montreal, May 7, 2009

Mrs. Denise Lemieux
Vice-President, Human Resources
PLG Construction
140 Beaumont
Montréal (Québec) H2X 2W3

Dear Mrs. Lemieux,

Please be advised that we will be administering a new pre-employment test starting in June.

This highly original test will provide a better evaluation of a candidate's skills and team spirit.

Candidates will work in teams of eight to manufacture a coin sorting machine from thermoplastic in accordance with the specifications and drawings we supply. They will receive exploded view and detail drawings.

Each candidate tested will draw a design plan for the coin sorting machine. He or she will draw up a list of equipment and materials, as well as a manufacturing procedure for making the component parts according to the dimensions and tolerances on the drawings.

Candidates will work in teams to assemble the parts of the coin sorting machine, but will individually verify that the machine functions properly.

We will inform you of the test results for the 32 candidates in July.

Yours truly,

Louis Laberge
Account Manager,
Lebel Employment Agency

In this situation, you are to play the role of a candidate taking part in a pre-employment testing.

Name: _____ Group: _____

THE PROBLEM (*continued*)

Specifications for the coin sorting machine

Overall function
- The object must sort coins.

Material constraints
- The object must be made from the materials provided.
- Every part of the object must meet the dimensions and tolerances specified on the detail drawings.
- The object must be made of the exact number of parts shown on the exploded view drawing.
- The assembled object must function properly.

Human constraint
- The object must be made as quickly as possible.

Esthetic constraint
- The object must look good.

Safety constraint
- No parts may have any sharp edges.

Financial constraint
- The materials must be used as efficiently as possible so as to prevent waste.

Environmental constraint
- The materials must be recyclable after the test.

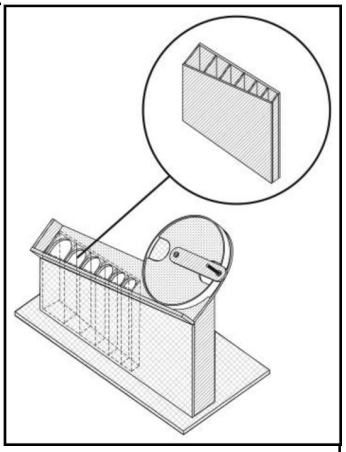
Name: _____ Group: _____

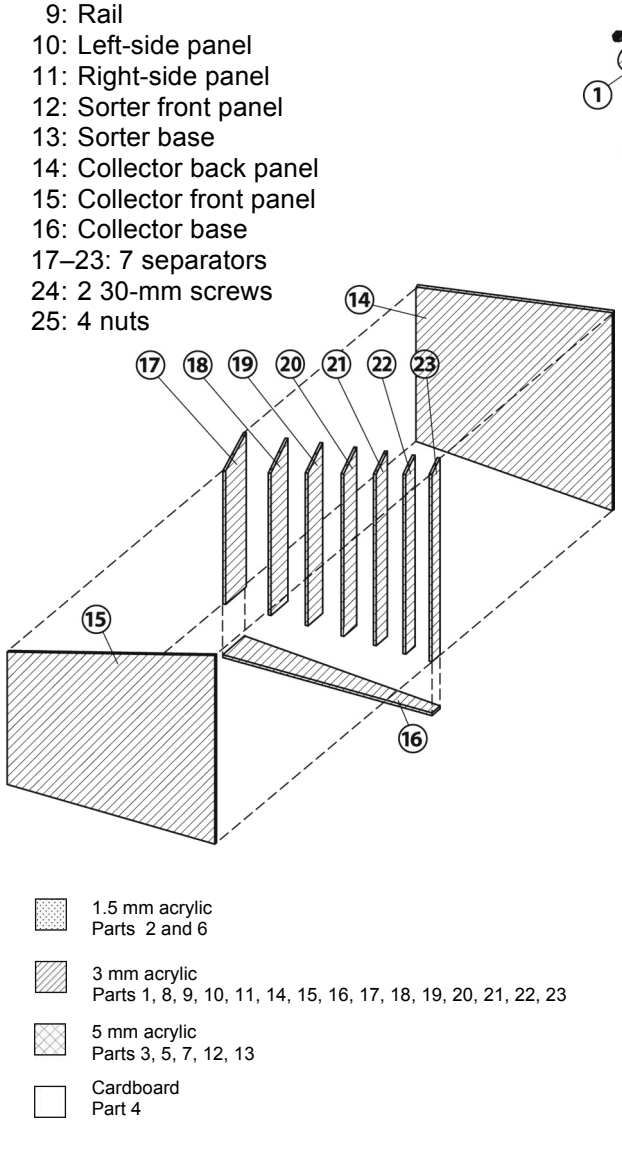
THE PROBLEM (*continued*)

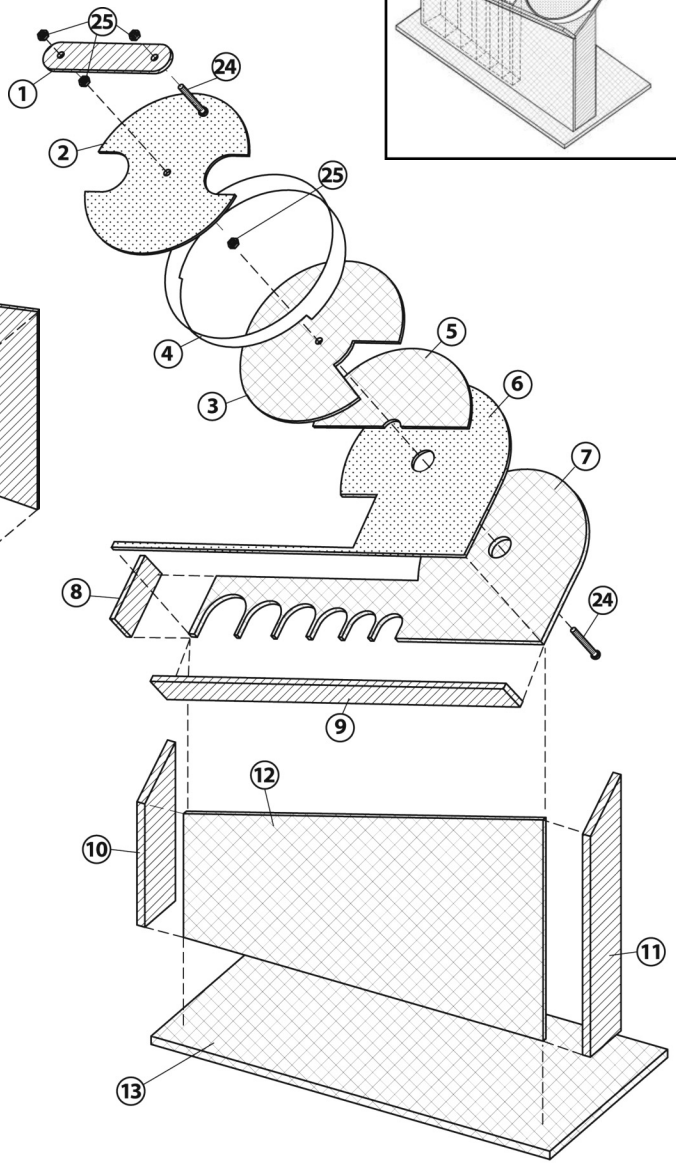
Exploded view drawing of the coin sorting machine

Parts nomenclature

1: Crank
2: Rotating disk
3: Fixed disk
4: Guard plate
5: Spacer
6: End plate
7: Sorter
8: End stop
9: Rail
10: Left-side panel
11: Right-side panel
12: Sorter front panel
13: Sorter base
14: Collector back panel
15: Collector front panel
16: Collector base
17–23: 7 separators
24: 2 30-mm screws
25: 4 nuts







1.5 mm acrylic
Parts 2 and 6

3 mm acrylic
Parts 1, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23

5 mm acrylic
Parts 3, 5, 7, 12, 13

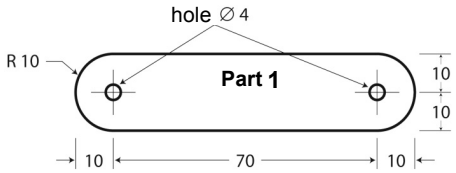
Cardboard
Part 4

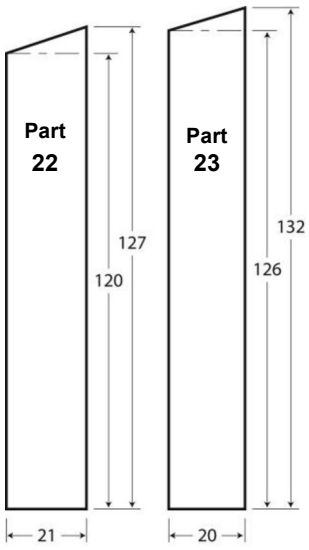
TITLE: Exploded view drawing Coin sorting machine	SCALE: 1:10

Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #1



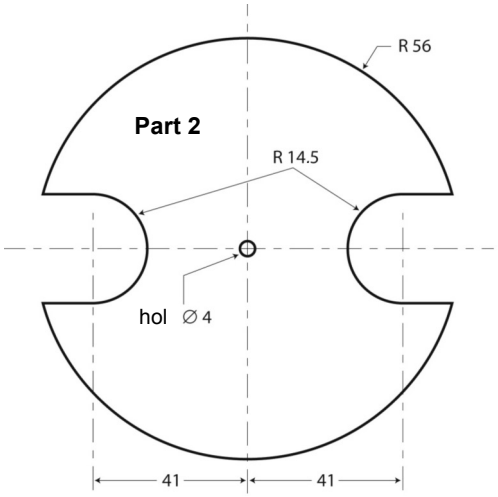


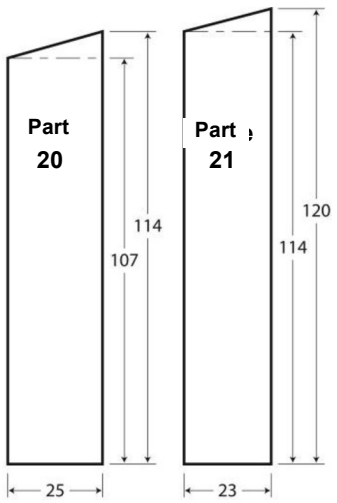
TITLE: Detail drawing, Parts 1, 22 and 23 Coin sorting machine	SCALE: 1:2 ± 2 mm

Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #2



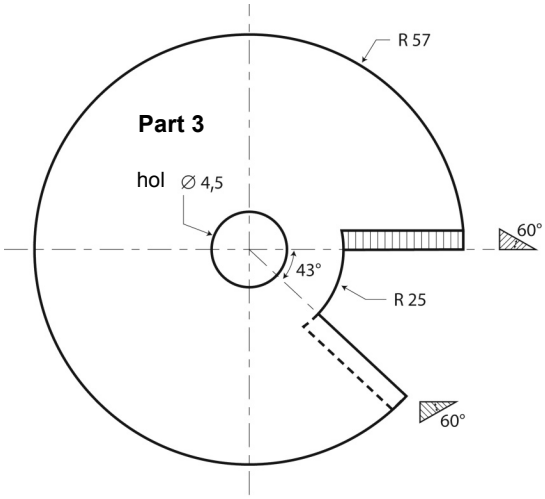


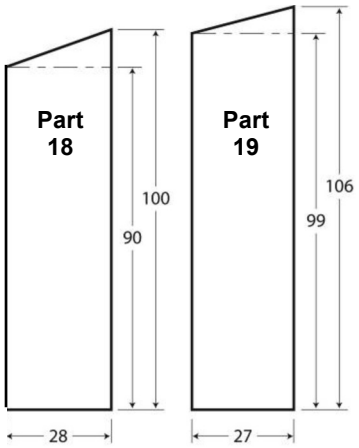
TITLE: Detail drawing, Parts 2, 20 and 21 Coin sorting machine	SCALE: 1:2 ± 2 mm

Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #3



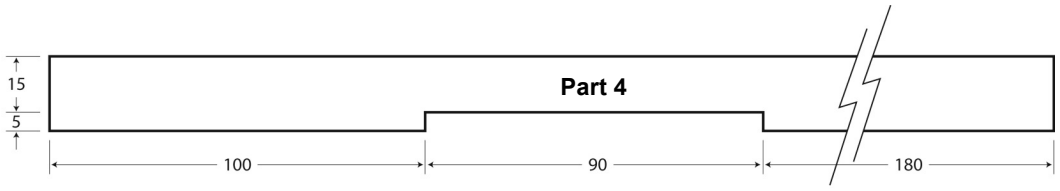


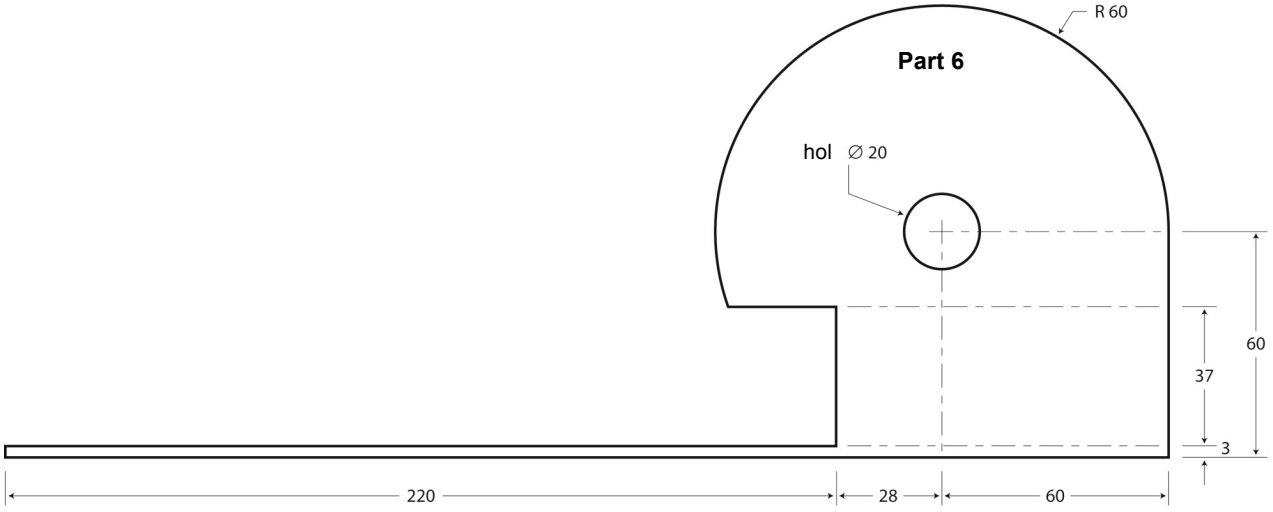
TITLE: Detail drawing, Parts 3, 18 and 19 Coin sorting machine	SCALE: 1:2 ± 2 mm

Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #4



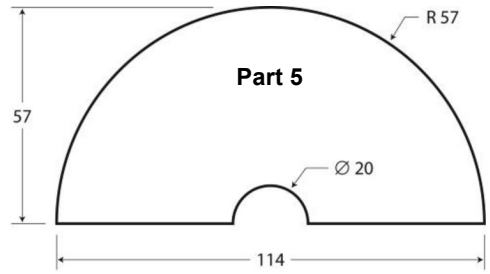


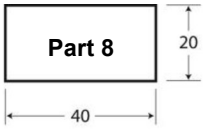
TITLE: Detail drawing, Parts 4 and 6 Coin sorting machine	SCALE: 1:2 ± 2 mm

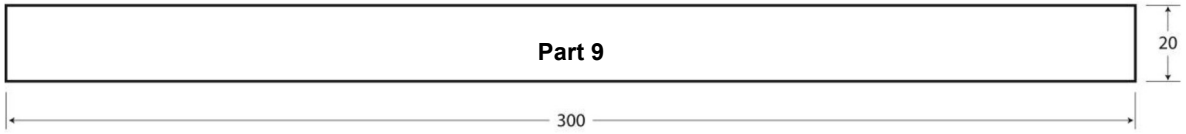
Name: _____ Group: _____

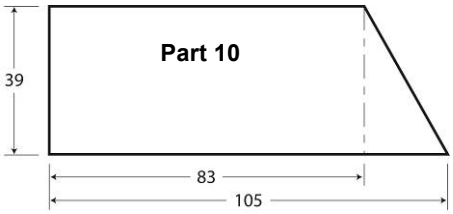
THE PROBLEM (*continued*)

Detail drawings for team member #5







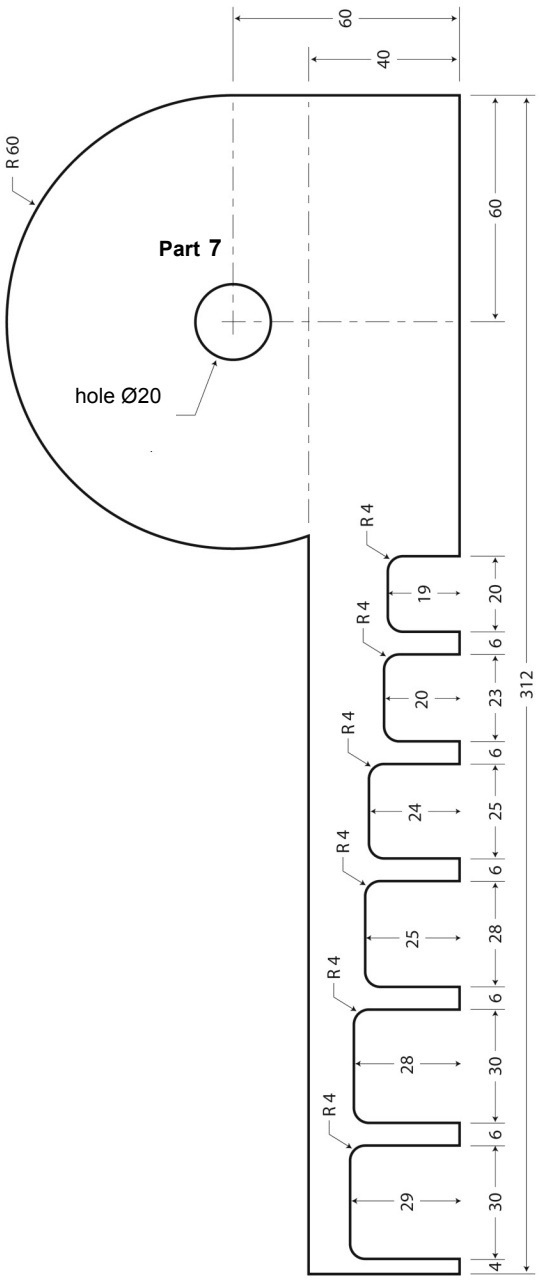


TITLE: Detail drawing, Parts 5, 8, 9 and 10 Coin sorting machine	SCALE: 1:2 ± 2 mm

Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #6

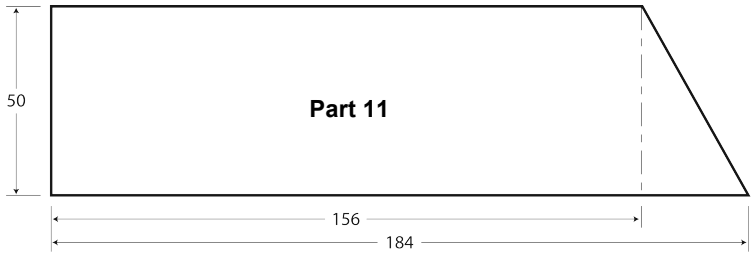


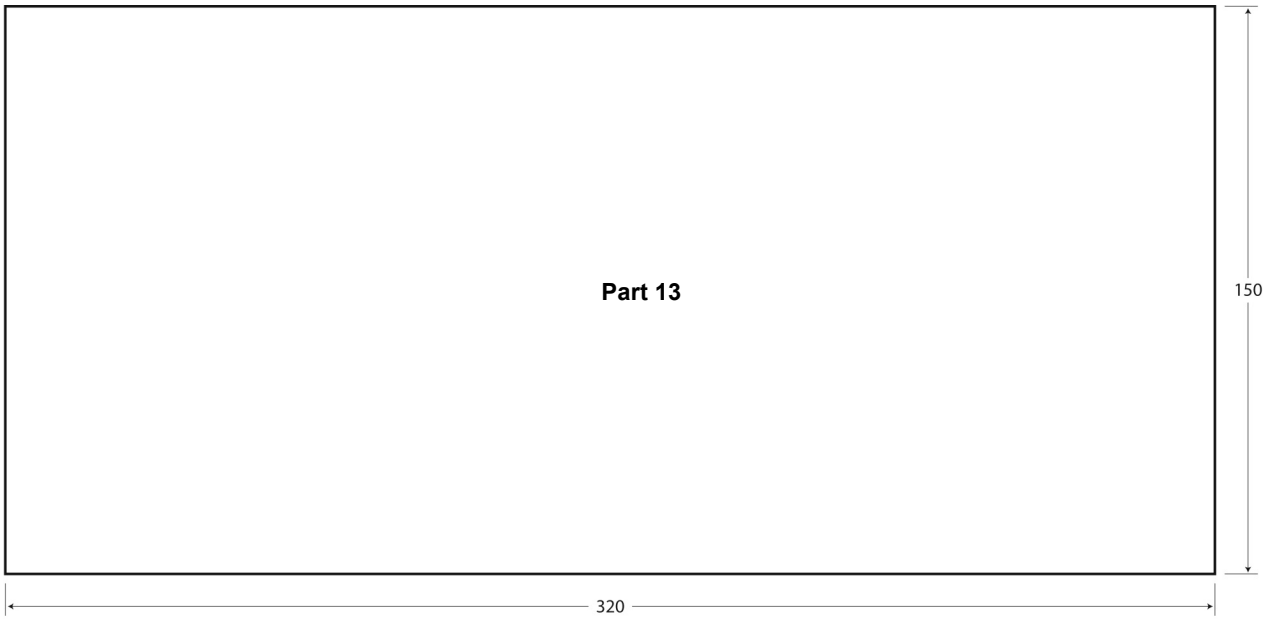
TITLE: Detail drawing, Part 7 Coin sorting machine	SCALE : 1:2 ± 2 mm

Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #7





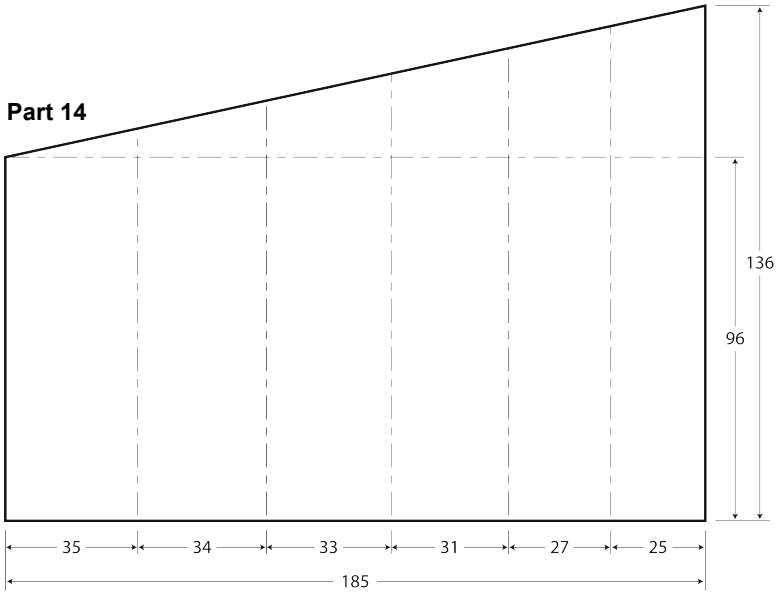
TITLE: Detail drawing, Parts 11 and 13 Coin sorting machine	SCALE: 1:2 ± 2 mm

Name: _____ Group: _____

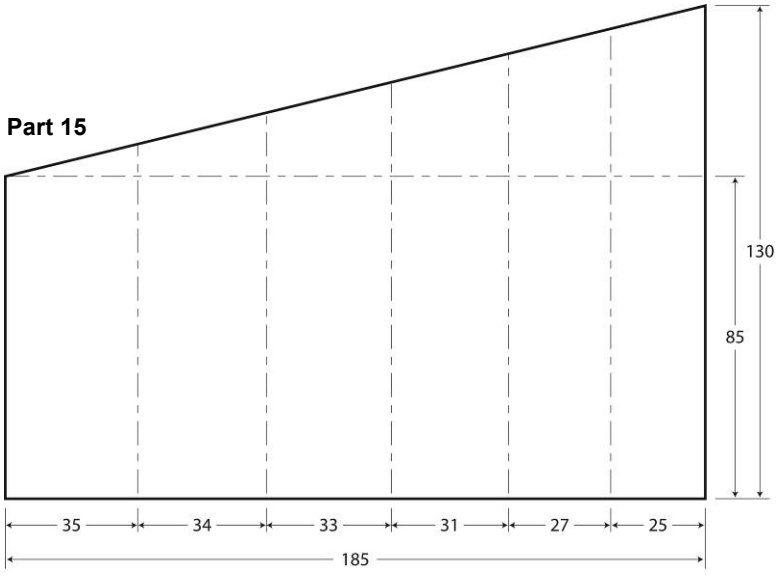
THE PROBLEM (*continued*)

Detail drawings for team member #7 *(continued)*

Part 14



Part 15

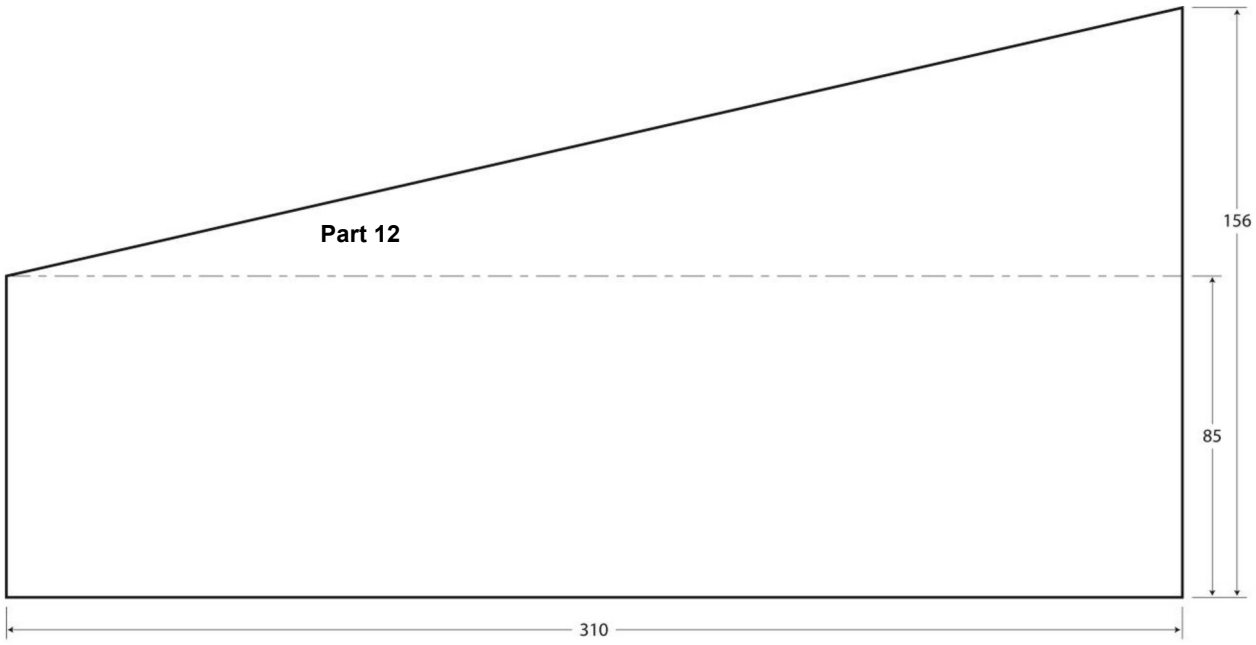


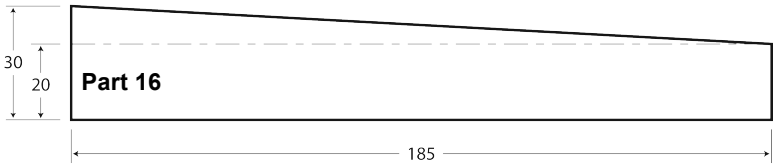
TITLE: Detail drawing, Parts 14 and 15 Coin sorting machine	SCALE: 1:2 ± 2 mm

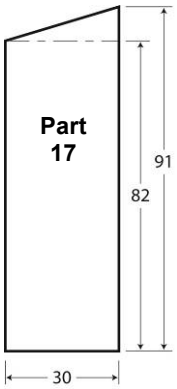
Name: _____ Group: _____

THE PROBLEM (*continued*)

Detail drawings for team member #8







TITLE: Detail drawing, Parts 12, 16 and 17 Coin sorting machine	SCALE : 1:2 ± 2 mm

Name: _____ Group: _____

CREATING THE CONTEXT

I ask myself questions

1. What is a general drawing?

_____

_____

2. What is an exploded view drawing?

_____

_____

3. Which projection is normally used to produce an exploded view drawing?

_____

_____

4. What is a detail drawing?

_____

_____

5. What is dimensioning?

_____

_____

6. What is tolerance?

_____

_____

7. What are thermoplastics?

_____

_____

8. What are the advantages of using thermoplastics?

_____

_____

Name: _____ Group: _____

CREATING THE CONTEXT (*continued*)

I must

9. In your opinion, what is the goal of the problem you have to solve?

_____

_____

I think

10. Draw the design plan of the coin sorting machine from the exploded view drawing. Use symbols to mark the force applied to the object and the movement of its parts.

Reflection

Have I clearly understood the following:	Yes	No
• axonometric projection: exploded view (reading)?	☐	☐
• dimensioning and tolerances?	☐	☐
• plastics (thermoplastics)?	☐	☐

Name: _____ Group: _____

PLANNING THE PROBLEM SOLVING

I plan

1. Draw up a list of the equipment and materials required to manufacture the parts.

- _____
- _____
- _____
- _____
- _____
- _____
- _____

- _____
- _____
- _____
- _____
- _____
- _____
- _____

2. Write the procedure you must use to make each part.

Name: _____ Group: _____

PLANNING THE PROBLEM SOLVING (*continued*)

2. Procedure (*continued*)

3. What are the safety requirements for manufacturing your parts?

Reflection

	Yes	No
Have I considered various possibilities for making the parts?	☐	☐

Approved by the teacher

Name: _____ Group: _____

INITIATING THE PROBLEM SOLVING

I design

1. Make the parts according to the dimensions and tolerances shown on the detail drawings. If you change your plan of action, include those changes on the drawings, the list of equipment and materials and in the manufacturing procedure.

2. What safety rules did you follow in making the different parts?

3. Together with your teammates, assemble the parts of the coin sorting machine. Make sure you record all changes made in your plan of action.

Reflection

	Yes	No
Have I recorded and justified each change I made in the plan of action?	☐	☐

Name: _____ Group: _____

THE FINAL TEST

I check

After assembling the parts and verifying that the coin sorting machine functions properly, answer the following questions.

1. Does the coin sorting machine fulfil its overall function? Explain your answer.

_____

_____

2. Does the coin sorting machine meet all the constraints mentioned in the specifications? If not, explain your answer.

_____

_____

3. Are the dimensions and tolerances of the coin sorting machine right? Justify your answer.

_____

_____

4. Did you make changes in the plan of action? Why? Justify those changes.

_____

_____

5. Did you have any trouble making your parts? If so, explain your answer.

_____

_____

6. Did you have problems working as part of a team? If so, describe them.

_____

_____

_____

7. Did you have problems assembling the parts? If so, describe them.

_____

_____

8. How would you improve the design of the coin sorting machine?

_____

_____

_____

Name: _____ Group: _____

MY EVALUATION

Use the evaluation grid on the next page for your self-evaluation. Write A, B, C, D or E in the appropriate space in this table.

SSC1 Seeks answers or solutions to scientific or technological problems				
Criteria*	**Observable indicators**	**Me**	**Teacher**	**Comments**
1	**Creating the context** Definition of the goal and formulation of the design plan		☐ With help	
2	**Planning the problem solving** Relevance of the elements in the plan of action: list of equipment and materials, and manufacturing		☐ With help	
3	**Initiating the problem solving** Respect for the dimensions, tolerances and safety rules when manufacturing parts		☐ With help	
4	**The final test** Analysis of the operation of the coin sorting machine and suggested improvements		☐ With help	

*** Evaluation criteria**

1 Appropriate representation of the situation
2 Development of a suitable plan of action for the situation
3 Appropriate implementation of the plan of action
4 Development of relevant conclusions, explanations or solutions

EVALUATION GRID

Name: _____ Group: _____

SSC 1 Seeks answers or solutions to scientific or technological problems

Criteria*	Observable indicators	A	B	C	D	E
1	**CREATING THE CONTEXT** Definition of the goal and formulation of the design plan	The goal is very clearly defined and relates to the problem to be solved AND the design plan is complete.	The goal is clearly defined and relates to the problem to be solved AND the design plan contains a few minor errors.	The goal is defined more or less clearly or does not relate to the problem to be solved OR the design plan contains many errors.	The goal is defined more or less clearly or does not relate to the problem to be solved AND the design plan contains major errors.	The work needs to be redone.
2	**PLANNING THE PROBLEM SOLVING** Relevance of the elements in the plan of action: list of equipment, materials and manufacturing procedure	The choice of equipment and materials is appropriate AND the manufacturing procedure is relevant and complete.	The choice of equipment and materials is appropriate AND the manufacturing procedure contains a few minor errors.	The choice of equipment and materials is more or less appropriate OR the manufacturing procedure contains many errors.	The choice of equipment and materials is more or less appropriate AND the manufacturing procedure contains many errors.	The work needs to be redone.
3	**INITIATING THE PROBLEM SOLVING** Respect for the dimensions, tolerances and safety rules when manufacturing parts	The parts meet the dimensions and tolerances on the detail drawings AND the work is performed safely.	The parts include a few elements that do not meet the dimensions and tolerances on the detail drawings AND the work is performed safely.	The parts include many elements that do not meet the dimensions and tolerances on the detail drawings AND the work is performed safely.	The parts do not meet the dimensions and tolerances on the detail drawings OR the work is not performed safely.	The work needs to be redone.
4	**THE FINAL TEST** Analysis of the operation of the coin sorting machine and suggested improvements	The coin sorting machine functions properly and meets all specified constraints. The suggested improvements are relevant.	The coin sorting machine meets most of the specified constraints. Most of the suggested improvements are relevant.	The coin sorting machine meets most of the specified constraints, but the suggested improvements are only more or less relevant.	The coin sorting machine does not meet most of the specified constraints.	The work needs to be redone.

*** Evaluation criteria**

1 Appropriate representation of the situation

2 Development of a suitable plan of action for the situation

3 Appropriate implementation of the plan of action

4 Development of relevant conclusions, explanations or solutions.