Name: _____ Group: _____ Date: _____

Tech labs

TECH 5

Developments

PROGRAM:	AST
LAB TYPE:	Technique
CONCEPT:	Developments (prism, cylinder, pyramid, cone)
STUDENT BOOK:	Chapter 12, page 407
TOOLBOX:	Pages 63–65

GOAL

Draw and use a development to make a pencil case.

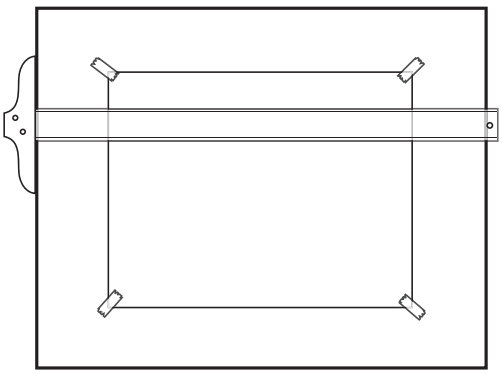
MATERIALS

- piece of cardboard (at least 400 mm × 264 mm)
- T-square
- masking tape
- drawing board
- pencil
- ruler
- 45° set square
- scissors
- sheet of corrugated plastic (at least 400 mm × 264 mm × 2 mm)
- cutting mat
- retractable utility knife
- cork-backed metal ruler
- hot glue gun
- self-adhesive Velcro strips
- various materials for decorating the pencil case (student's choice)

PROCEDURE

Make the pencil case, following the manufacturing process sheets below.

Manufacturing process sheet
Part: pencil case template
Main material: piece of cardboard (at least 400 mm × 264 mm)

No.	Operation	Illustration	Materials
10	**Measuring and laying out the pencil case template**		
11	Tape the cardboard to the drawing board.		• T-square • Masking tape • Drawing board

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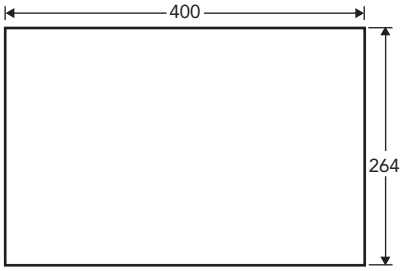
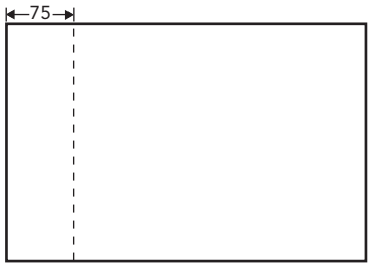
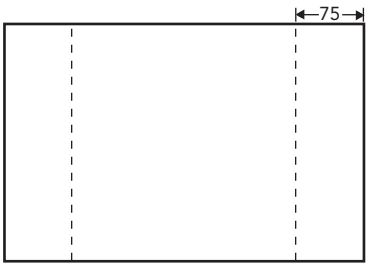
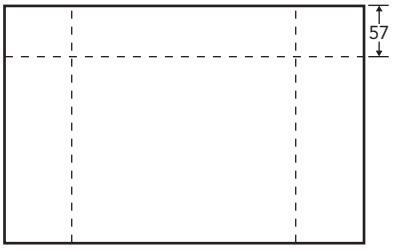
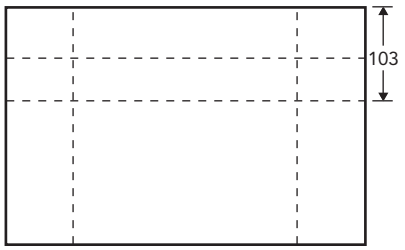
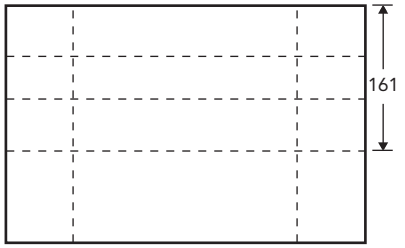
12	If necessary, draw a 400 mm × 264 mm rectangle on the piece of cardboard and trim the excess cardboard.		• Pencil • T-square • Ruler • 45° set square • Drawing board
13	Draw a vertical straight line from the top to the bottom of the rectangle, 75 mm from the left edge.		• Pencil • T-square • Ruler • 45° set square • Drawing board
14	Draw a similar vertical straight line 75 mm from the right edge.		• Pencil • T-square • Ruler • 45° set square • Drawing board
15	Draw a horizontal straight line 57 mm from the top edge of the rectangle.		• Pencil • T-square • Ruler • Drawing board
16	Draw a second horizontal straight line 103 mm from the top edge of the rectangle.		• Pencil • T-square • Ruler • Drawing board
17	Draw a third horizontal straight line 161 mm from the top edge of the rectangle.		• Pencil • T-square • Ruler • Drawing board

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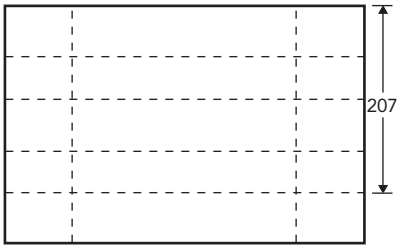
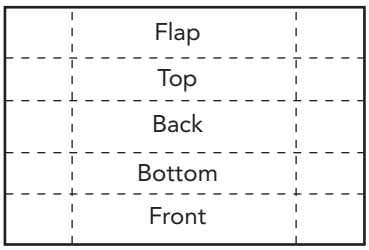
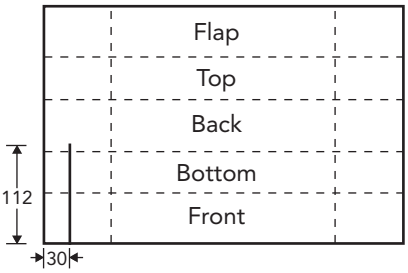
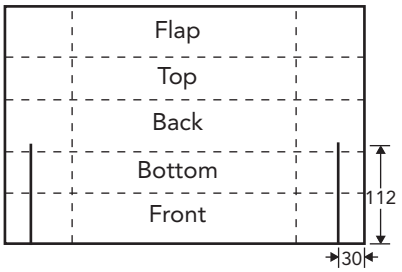
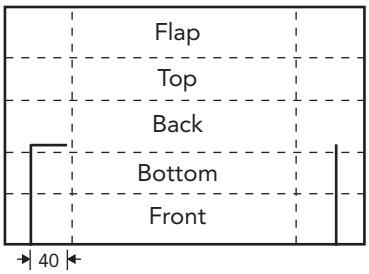
18	Draw a fourth horizontal straight line 207 mm from the top edge of the rectangle.		• Pencil • T-square • Ruler • Drawing board
19	Label each part of the pencil case on the cardboard.		• Pencil • Drawing board
20	**Measuring and laying out the side tabs**	**Illustration**	**Materials**
21	Draw a 112-mm vertical straight line starting from the bottom of the rectangle, 30 mm from the left edge.		• Pencil • T-square • Ruler • 45° set square • Drawing board
22	Draw a similar vertical straight line starting 30 mm from the bottom right edge.		• Pencil • T-square • Ruler • 45° set square • Drawing board
23	Draw a 40-mm horizontal straight line toward the right, starting at the top of the vertical line drawn in step 21.		• Pencil • T-square • Ruler • Drawing board

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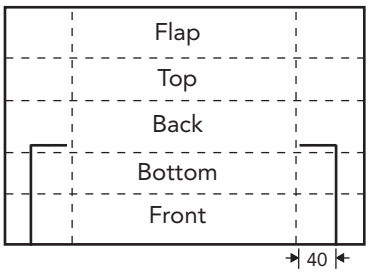
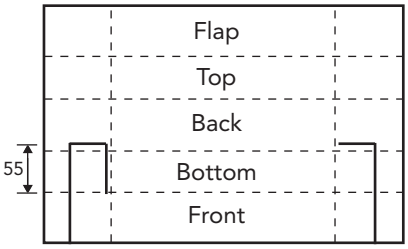
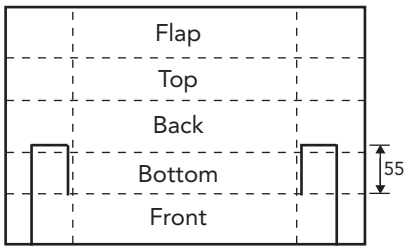
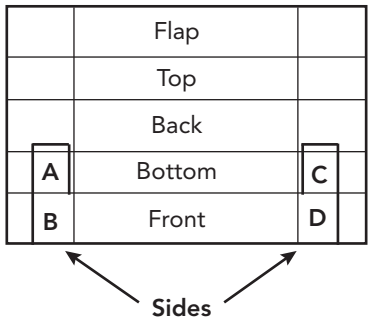
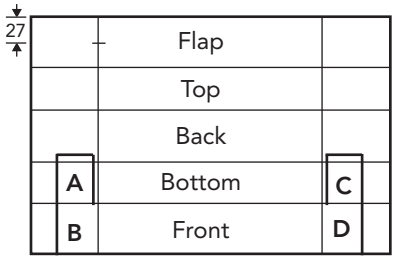
24	Draw a 40-mm horizontal straight line toward the left, starting at the top of the vertical line drawn in step 22.		• Pencil • T-square • Ruler • Drawing board
25	Starting at the right end of the line drawn in step 23, draw a 55-mm vertical straight line downward.		• Pencil • T-square • Ruler • 45° set square • Drawing board
26	Starting at the left end of the line drawn in step 24, draw a 55-mm vertical straight line downward.		• Pencil • T-square • Ruler • 45° set square • Drawing board
27	Label each tab with a capital letter on the cardboard.		• Pencil • Drawing board
30	**Measuring and laying out cutting lines: flap**	**Illustration**	**Materials**
31	Make a small mark 27 mm from the top edge of the rectangle, along the line drawn in step 13.		• Pencil • Ruler • Drawing board

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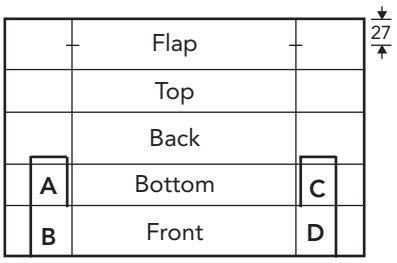
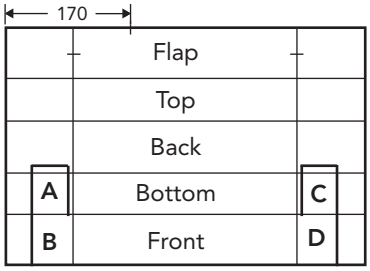
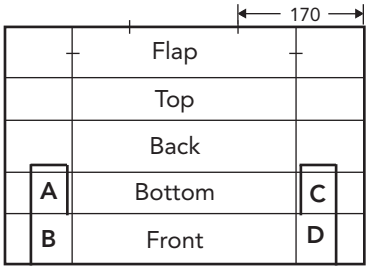
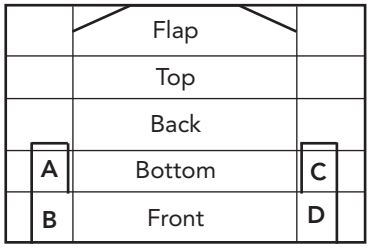
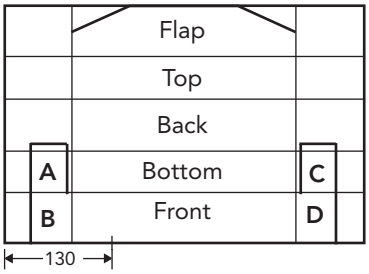
32	Make a similar mark 27 mm along the line drawn in step 14.		• Pencil • Ruler • Drawing board
33	Make a small mark along the top of the rectangle, 170 mm from the left edge.		• Pencil • Ruler • Drawing board
34	Make a similar mark 170 mm from the right edge.		• Pencil • Ruler • Drawing board
35	Draw a straight line between the marks on the left side (steps 31 and 33) and another between the marks on the right (steps 32 and 34).		• Pencil • Ruler • Drawing board
40	**Measuring and laying out cutting lines: front**	**Illustration**	**Materials**
41	Make a small mark along the bottom of the rectangle, 130 mm from the left edge.		• Pencil • Ruler • Drawing board

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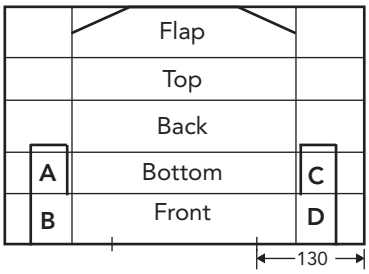
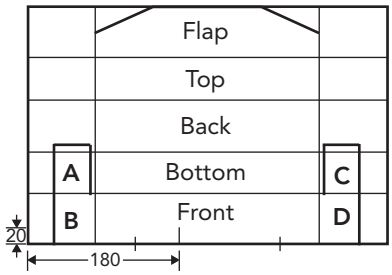
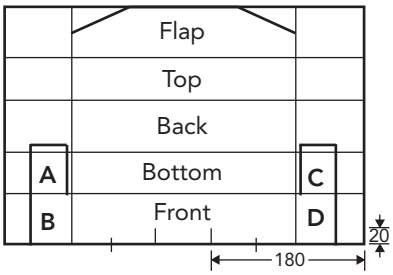
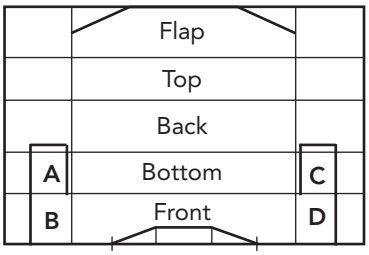
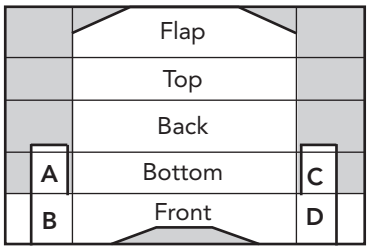
42	Make a similar mark 130 mm from the right edge.		• Pencil • Ruler • Drawing board
43	Starting at the bottom of the rectangle, 180 mm from the left edge, draw a 20-mm vertical straight line upward.		• Pencil • Ruler • T-square • 45° set square • Drawing board
44	Draw a similar vertical straight line 180 mm from the right edge.		• Pencil • Ruler • T-square • 45° set square • Drawing board
45	Draw a series of straight lines connecting the marks made in steps 41 to 44.		• Pencil • Ruler • Drawing board
50	**Machining**	**Illustration**	**Materials**
51	Cut out the area shown in grey.		• Scissors
52	Inspecting the drawing: Ask your teacher or lab technician to check your template.	(See Transparency Tech 5.1.)	• Transparency of template

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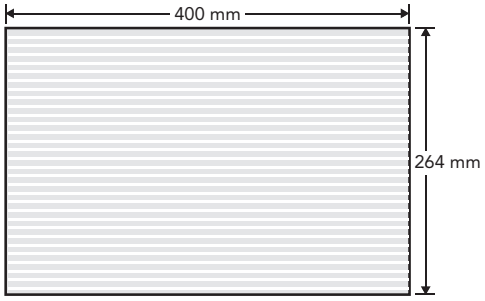
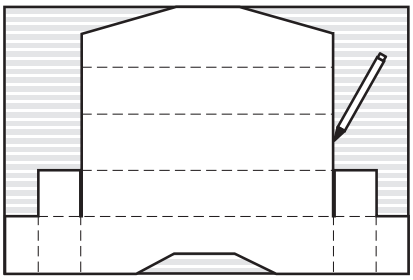
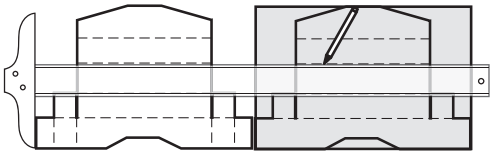
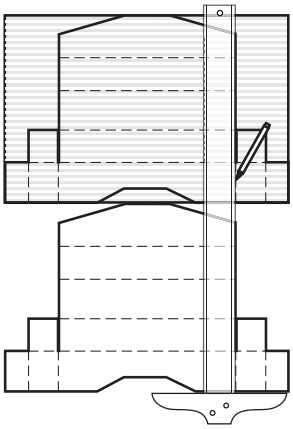
Manufacturing process sheet
Part: pencil case
Main material: sheet of corrugated plastic (400 mm × 264 mm × 2 mm)

No.	Operation		
10	**Laying out**	**Illustration**	**Materials**
11	Tape the cardboard template in place on the sheet of corrugated plastic. Make sure the corrugations run horizontally.		• Cardboard template • Masking tape
12	Use the template to trace the outline of the pencil case onto the corrugated plastic.		• Pencil • Cardboard template
13	Place the template directly beside the shape you have just drawn on the corrugated plastic. Transfer the horizontal fold lines onto the plastic. (The fold lines are the dashed lines in the illustration.)		• Pencil • T-square • Ruler • Cardboard template
14	Place the template directly below the shape you have just drawn on the corrugated plastic. Transfer the vertical fold lines onto the plastic.		• Pencil • T-square • Ruler • Cardboard template • 45° set square

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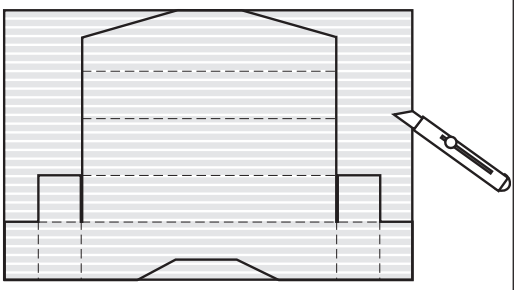
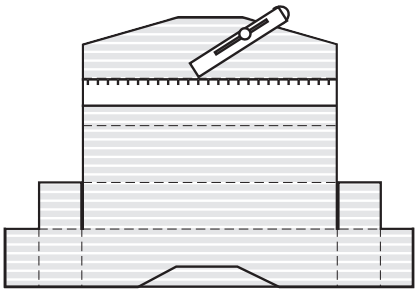
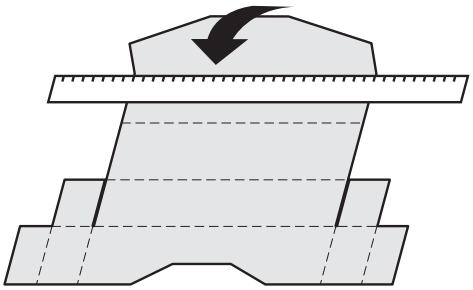
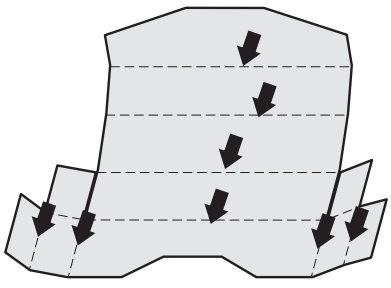
20	Machining	Illustration	Materials
21	Cut out the pencil case, following the outline you have drawn.		• Cutting mat • Retractable utility knife • Cork-backed metal ruler
22	Lay the ruler along the fold line between the flap and the top. With the tip of the utility knife (not the blade), press down firmly along the length of the fold line. This pressure will crush the corrugations and ensure proper folding.		• Ruler • Retractable utility knife (blade retracted)
23	Leave the ruler in place and bend the plastic along the fold line to obtain the first fold.		• Ruler
24	Repeat steps 22 and 23 along all the remaining fold lines.		• Ruler • Retractable utility knife (blade retracted)

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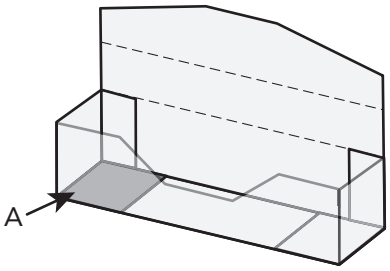
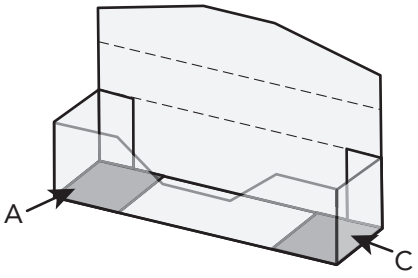
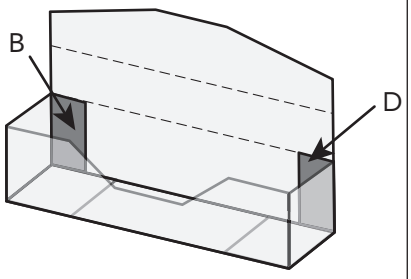
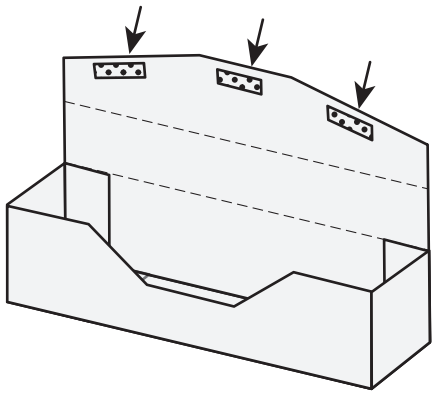
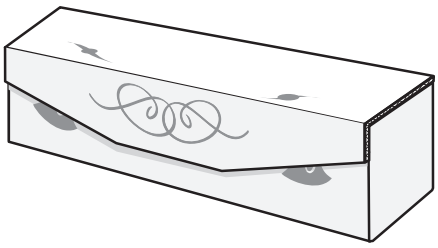
25	With the glue gun, apply glue under tab A and press it down onto the bottom part of the pencil case.		• Hot glue gun
26	Repeat step 25 for tab C.		• Hot glue gun
27	Repeat steps 25 and 26 for tabs B and D, pressing them against the back part of the pencil case.		• Hot glue gun
28	Apply Velcro strips at the places indicated. To align the strips properly, keep the two parts of the Velcro together. Once the strips are in place on the flap, remove the backing from the other side of the strips and close the flap. The other part of the strips will now stick to the front of the pencil case.		• Self-adhesive Velcro strips
30	**Finishing**	**Illustration**	**Materials**
31	Personalize your pencil case by decorating it.		• Various materials (student's choice)

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REFLECTING ON THE LAB TECHNIQUE

1. What is a development?

_____

_____

2. How many development drawings did you make in this lab? What types of materials did you make them on?

_____

_____

_____

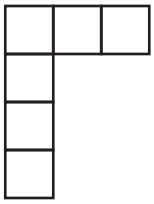
3. How many parts does your object contain? For each part, explain how you shaped it.

_____

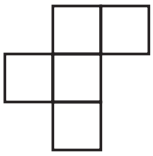
_____

4. **a)** Look at the developments below. Which would be a suitable template for making the cube to the left? Circle the correct answer.

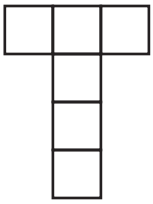
A



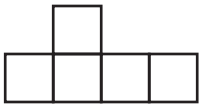
B



C



D



b) To make this cube with sides measuring 200 mm, what surface area of material would you need?

_____

5. Name at least two examples of objects that are made by folding and that could require the use of developments for their manufacture.

_____