# GEOMETRIC LINES

| STUDENT BOOK | Chapter 11, page 340 |
|---|---|
| TOOLBOX | Pages 62–67 |

## GOAL

Practise techniques for creating various types of geometric lines by constructing and reproducing figures.

## MATERIALS

- drawing board
- T-square
- 30°/60° set square
- 45° set square
- circle template or compass
- ruler
- sheet of letter-sized white paper (216 mm × 279 mm)
- masking tape
- pencil
- eraser

## PROCEDURE

***Part 1: Creating a drawing frame and a title block using geometric lines***

1. Tape the sheet of paper short-side horizontally onto the drawing board.
2. Using the T-square and the ruler, draw a 180-mm horizontal straight line to the right starting 15 mm from the top of the sheet and 19 mm from the left side of it.
3. With the T-square, the ruler and a set square, draw a 249-mm vertical straight line downward starting at the left endpoint of the horizontal line.
4. Starting at the bottom endpoint of the vertical line, draw a second 180-mm horizontal line to the right.
5. Draw a second 249-mm vertical line between the open endpoints of the horizontal lines, creating a rectangle that will serve as the frame of your drawing.
6. Starting at the left side of the frame and 30 mm from the bottom of it, draw a 180-mm horizontal line to the right. This rectangle at the bottom of the frame will serve as the title block of your drawing.
7. Divide the title block into two equal parts by drawing a horizontal line.
8. Starting at the bottom of the title block and 55 mm from the right side of it, draw a 30-mm vertical line upward.
9. Write the data indicated in the example below in CAPITAL LETTERS.

| NAME: | DATE: |
|---|---|
| TITLE: PARTS 1 AND 2 – FIGURES A AND B | SCALE: 1:1 |

10. Enter the information that is missing in the title block (name, date) in CAPITAL LETTERS.
11. Divide the drawing zone above the title block into two equal parts by drawing a 180-mm horizontal line starting at a point 109.5 mm from the top of the frame.
12. Use this frame and this title block for Part 2 of this lab.

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*Part 2: Creating figures using geometric lines*

**Note**
To construct Figures A and B, first draw thin lines (called *construction lines*). Wait for further instructions before darkening lines and erasing unnecessary lines.

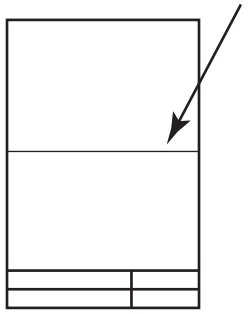
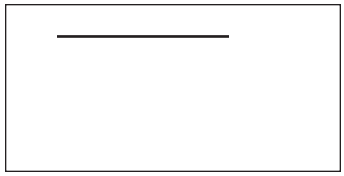


**Figure A:**

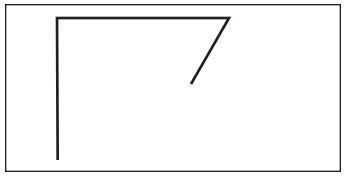
**1.** At the bottom right corner of the upper drawing zone in the frame you created in Part 1 of this lab, write the title "FIGURE A" in CAPITAL LETTERS.

**2.** With the T-square and the ruler, draw a 120-mm horizontal straight line to the right starting at a point 5 mm from the top of the frame and 30 mm from the left side of it.

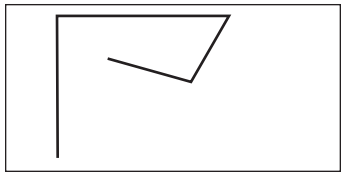


**3.** Starting at the left endpoint of the horizontal line you drew in Step 2, use the T-square, the ruler and a set square to draw a 100-mm vertical straight line downward (at a 90° angle to horizontal).

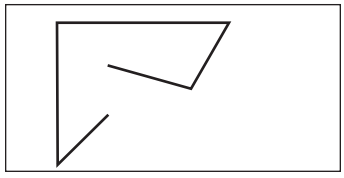
**4.** Starting at the right endpoint of the horizontal line, use the T-square, the ruler and the 30°/60° set square to draw a 52-mm oblique line downward to the left at a 60° angle to horizontal.



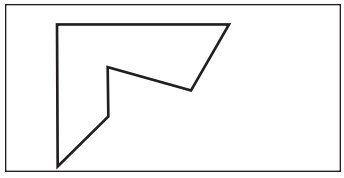
**5.** Starting at the bottom endpoint of the line you drew in Step 4, use the T-square, the ruler and the set squares to draw a 61-mm oblique line upward to the left at a 15° angle to horizontal.



**6.** Starting at the bottom endpoint of the vertical line you drew in Step 3, draw a 50-mm oblique line upward to the right at a 45° angle to horizontal.



**7.** Join the open endpoints of the lines with a 35-mm vertical line to complete the figure.



**8.** Go over each line to darken the outline of the figure.

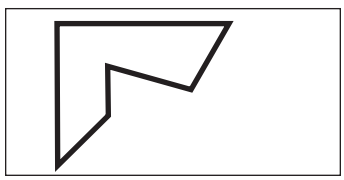


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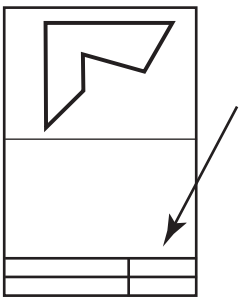
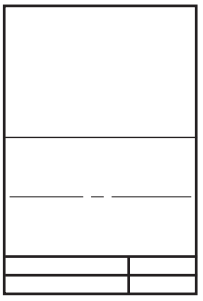
**Figure B:**

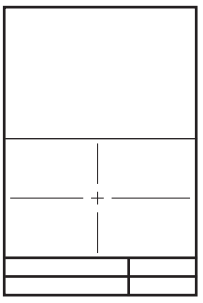
1. At the bottom right corner of the lower drawing zone just above the title block, write the title "FIGURE B" in CAPITAL LETTERS.



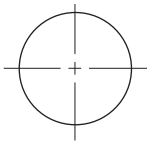
2. With the T-square and the ruler, draw a horizontal centre line 55 mm from the top of the drawing zone.



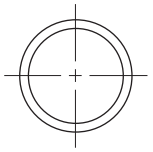
3. With the T-square, the ruler and a set square, draw a vertical centre line 90 mm from the left side of the drawing zone.



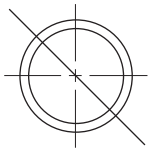
4. Using a circle template or a compass, draw a circle with a diameter of 100 mm and its centre point at the intersection of the centre lines.



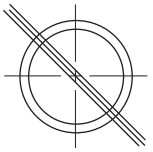
5. Inside this circle, draw a second circle with a radius of 37.5 mm and the same centre point.



6. With the 45° set square and the T-square, draw an oblique line from the upper left to the lower right at a 45° angle to horizontal that passes through the centre point and extends about an equal distance on each side of it. This oblique line will be your reference point for Steps 7–10.

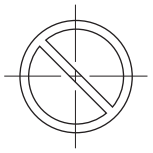


7. Draw a line parallel to and the same length as the line you drew in Step 6 at a point 6.5 mm above it.

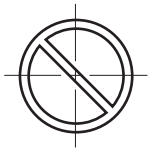


8. Draw another line parallel to and the same length as the line you drew in Step 6 at a point 6.5 mm below it.

9. Erase the line you drew in Step 6 as well as both arcs of the inner circle within the two parallel lines and the segments of the two parallel lines beyond the inner circle.



10. Darken each line, each circle and each arc so the outline of the figure is darker than its centre lines.



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*Part 3: Reproducing figures using geometric lines*

**Note**

In technical drawing, the conventional unit of measurement used is the millimetre. Usually only the numerical value is written when marking dimensions on a drawing since adding the unit of measurement would crowd the drawing and make it difficult to understand.

1. Tape the sheet of paper with the title block PART 3 – FIGURES C AND D (see the next page) onto the drawing board.
2. In CAPITAL LETTERS, enter the information that is missing in the title block (name, date).
3. Using the data written on geometric Figure C (see page 6) and Figure D (see page 7), reproduce each figure at a scale of 1:1.
4. Below Figure C on page 6 and Figure D on page 7, write down the steps you took to reproduce these figures.
5. Reproducing Figure E is optional. See the procedure below Figure E on page 8.

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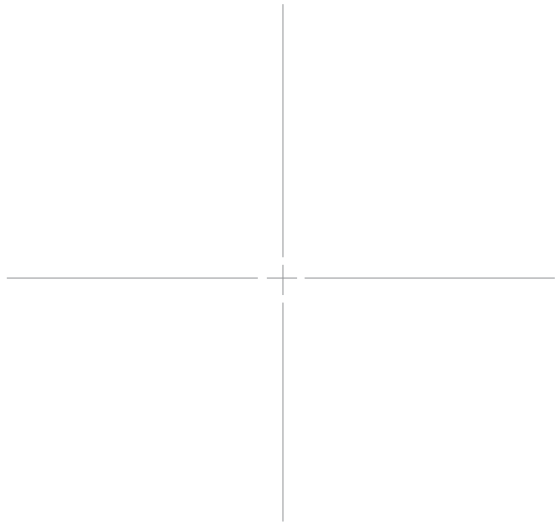

FIGURE C

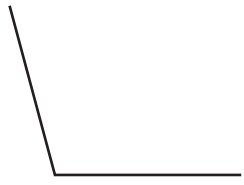

FIGURE D

| NAME: | DATE: |
| --- | --- |
| **TITLE:** PART 3 – FIGURES C AND D | **SCALE:** 1:1 |

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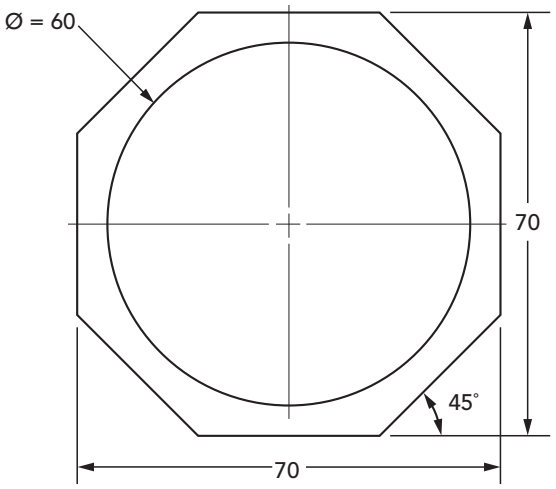
Name: _____ Group: _____ Date: _____

## Figure C (to be reproduced):




## Steps for creating Figure C:

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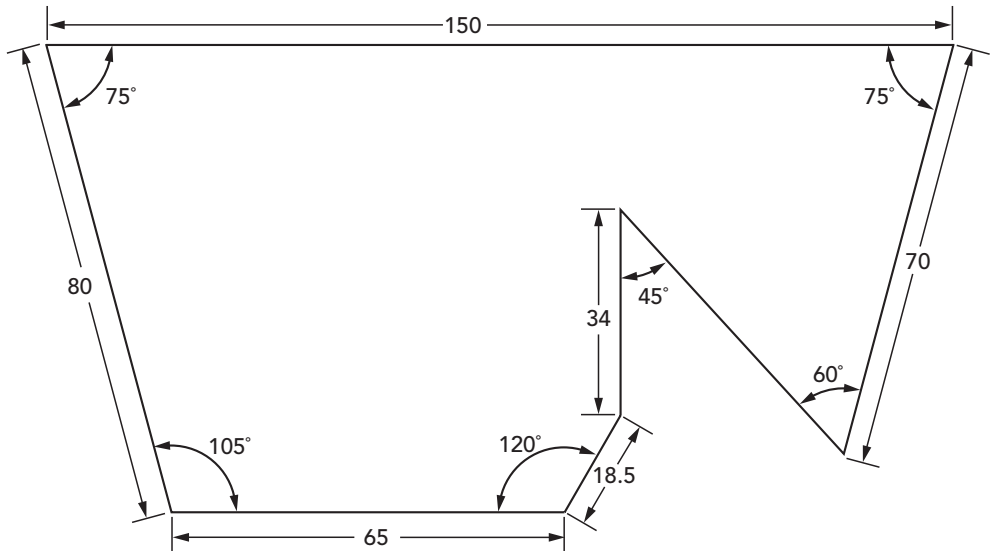
## Figure D (to be reproduced):




## Steps for creating Figure D:

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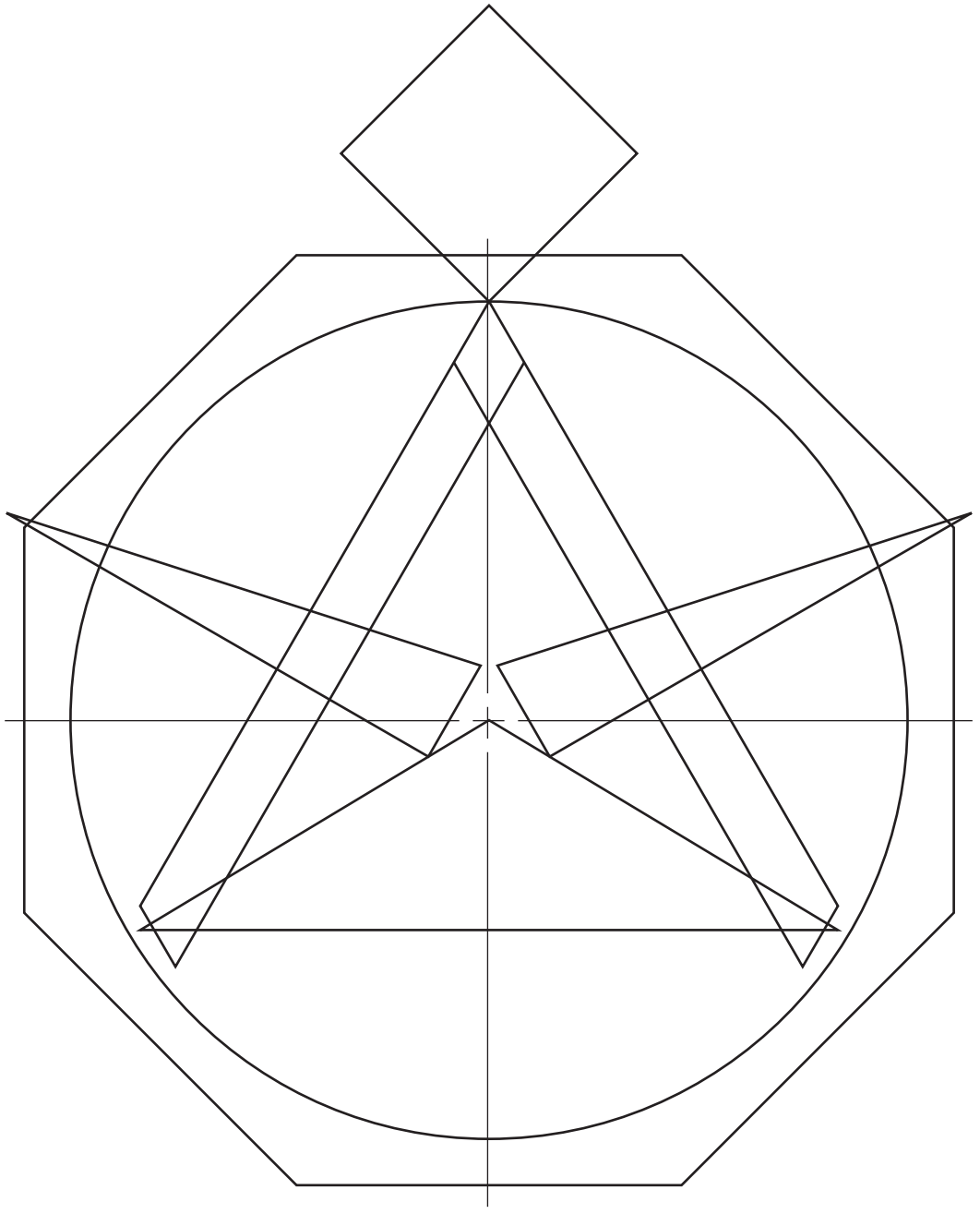
Name: _____ Group: _____ Date: _____

**Figure E *optional* (to be reproduced):**



**Procedure:**

1. Tape the sheet of paper with the title block PART 3 – FIGURE E (see the next page) onto the drawing board.
2. In CAPITAL LETTERS, enter the information that is missing in the title block (name, date).
3. Reproduce the geometric figure shown above using the appropriate drawing instruments.

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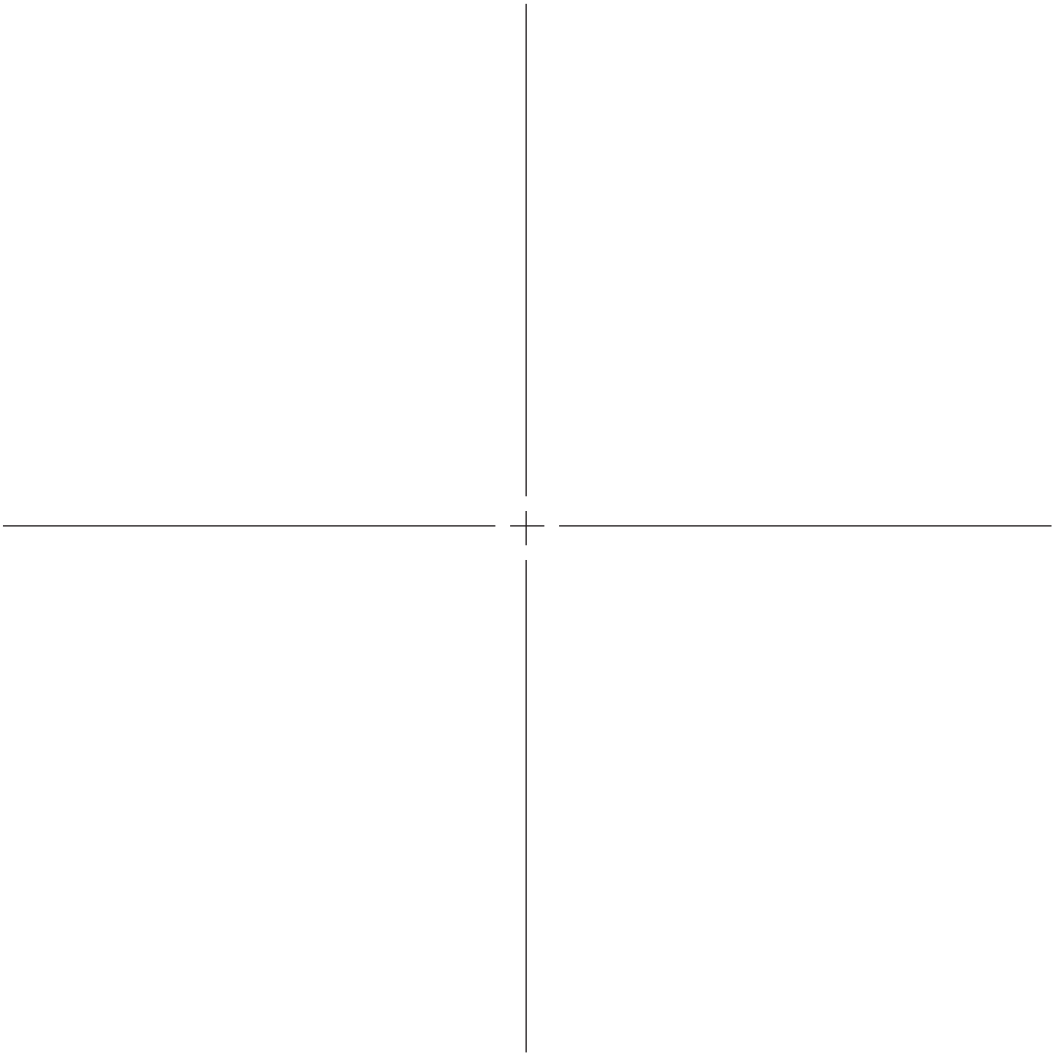

FIGURE E

| NAME: | DATE: |
| --- | --- |
| **TITLE:** PART 3 – FIGURE E | **SCALE:** 1:1 |

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## REFLECTING ON THE LAB TECHNIQUE

1. You are asked to draw an equilateral triangle. What drawing instruments will you use?

2. Your assignment is to draw a circle that has a diameter of 250 mm. You know that circle templates and compasses cannot be used to draw circles this large. Explain how you could draw this circle with a string, a ruler and a pencil.

3. You want to draw a 40-mm vertical straight line that crosses the centre point of a 70-mm horizontal line and extends the same distance on each side of it.

   **a.** What drawing instruments will you use?

   **b.** Describe the method you will use to draw these lines.

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