Geometry

Euclidean I Prepared by Mark on May 6, 2025

Section 1: Angles and Lines

Problem 1:

Consider a mechanical clock at 1:00. What is the measure of the angle between the hour and minute hand? *Hint:* Use degrees.

Problem 2: Convert your solution to the previous question into radians.

Problem 3:

On the same clock, what is the angle between the hour and minute hand at 9:45? *Hint:* The answer is *not* 90° .

Section 2: Basic Figures

Problem 4:

Find all sets of equal angles in the following system. Lines A and B are parallel.



Problem 5:

Define the following:

- vertical angles
- acute angle
- obtuse angle
- right angle
- parallel lines
- perpendicuar lines

Problem 6:

What is a circle? What information do we need to construct one?

Example solution:

A "circle" is the set of all points that are a fixed distance away from a "center" point. To construct a circle, we need a center point and a radius. Note that there are many ways to construct a circle. For example, three noncolinear points also define a unique circle.

Problem 7: What is an ellipse? What information do we need to construct one?

Problem 8: Draw a sector of a circle.

Problem 9: Draw an arc of a circle.

Problem 10: Draw a segment of a circle.

Problem 11: What is a triangle?

Section 3: Quadrilaterals

Definition 12:

A "quadrilateral" is a four-sided figure.

Problem 13:

What is a square?

Example solution:

A "square" is a quadrilateral in which all sides are equal and all angles are right.

Problem 14: What is a rectangle?

Problem 15: What is a parallelogram?

Problem 16: What is a trapezoid?

Problem 17: What is an isoceles trapezoid?

Problem 18: What is a rhombus?

Problem 19: What is a kite?

Problem 20:

Consider the following classes of figures:

- quadrilateral
- square
- rectangle
- trapezoid
- isoceles trapezoid
- parallelogram
- rhombus
- kite

Draw a venn diagram that displays these classes' relationships with each other.

Hint: For example, we know that all squares are rectangles and that all rectangles are quadrilaterals.

Section 4: Area and Perimeter

Problem 21:

What is the area of a triangle that has side lengths 5, 5, and 6?

Problem 22:

What is the area of a rhombus with side length 4?

Problem 23:

What is the area of the following trapezoid?



Problem 24:

Consider a circle with a 3mm radius.

- What is this circle's circumference?
- What is this circle's area?

Problem 25:

Consider a circle with a 3mm radius.

- What is the length of a 15° arc on this circle?
- What is the area of a 20° sector of this circle?

Problem 26:

Consider a circle with a 3mm radius.

- What is the length of a π/3 radian arc on this circle?
 What is the area of a 5π/6 sector of this circle?

Problem 27:

Consider the following construction. The circle has a 3mm radius, and the segment spans $\frac{5\pi}{6}$ radians. Find the area of the shaded region.

