

Geometry · Geometric Constructions · Worksheet

Common Core G-CO.D.12, G-CO.D.13 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 24 problems practice formal constructions from Common Core standards G-CO.D.12 and G-CO.D.13. Copy segments and angles, bisect, build perpendicular and parallel lines, and inscribe an equilateral triangle, a square and a regular hexagon in a circle.

Use a compass and an unmarked straightedge on separate paper. The last six problems are word problems that combine constructions with lengths and angle measures, so keep your arcs visible to show your steps.

GeometryCommon Core: G-CO.D.12 · G-CO.D.13

Problem 1: Copy a segment

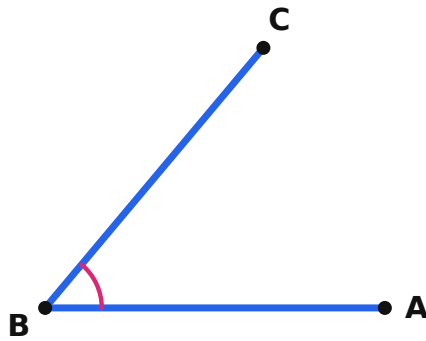
Segment $\overline{AB}$ is shown. Use a compass and straightedge to construct segment $\overline{CD}$ congruent to $\overline{AB}$.



Segment AB.

Problem 2: Copy an angle

Copy $\angle ABC$ using a compass and straightedge. Explain why the copy is congruent to the original.



Angle ABC.

Problem 3: Bisect a segment

Construct the midpoint of $\overline{AB}$ using a compass and straightedge.



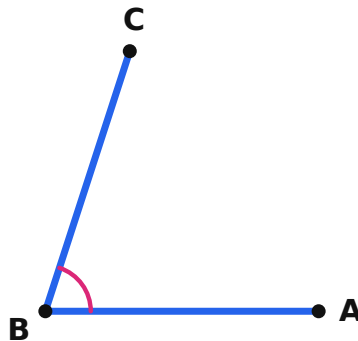
Segment AB.

Problem 4: Measurements on a bisector

Maya constructs the perpendicular bisector of $\overline{AB}$, where $AB = 14$ in. It meets $\overline{AB}$ at M . Find AM , MB and the measure of the angle formed at M .

Problem 5: Bisect an angle

Construct the bisector of $\angle ABC$ using a compass and straightedge.



Angle ABC.

Problem 6: Angle bisector with a variable

Ray $\overrightarrow{QS}$ bisects $\angle PQR$. (a) If $m\angle PQR = 84^\circ$, find $m\angle PQS$. (b) If $m\angle PQS = (3x+6)^\circ$ and $m\angle SQR = (5x-10)^\circ$, find x and $m\angle PQR$.

Problem 7: Perpendicular through a point on a line

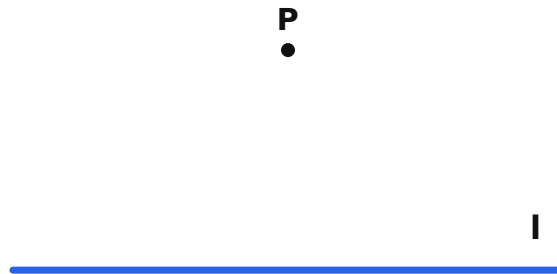
Construct the line perpendicular to l through point P on the line.



Line l with point P on it.

Problem 8: Perpendicular from a point not on the line

Construct the line through P perpendicular to l .



Line l and point P not on l .

Problem 9: Distance between the arc crossings

To bisect $\overline{AB}$ with $AB = 16$ cm, Jamal uses arcs of radius 10 cm centered at A and B . The arcs cross at P and Q . Find PQ .

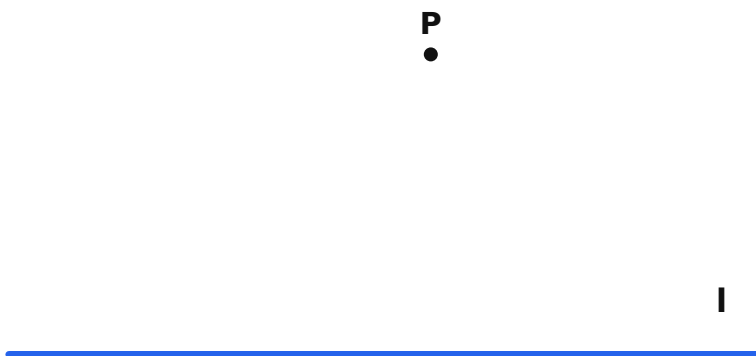
Problem 10: Why the perpendicular bisector works

Arcs of equal radius centered at A and B cross at P and Q . (a) Explain why quadrilateral

$APBQ$ is a rhombus. (b) Use a property of a rhombus to explain why PQ is perpendicular to AB and bisects it.

Problem 11: Parallel line through a point

Construct the line through P that is parallel to l .



Line l and point P .

Problem 12: Why the lines are parallel

In the parallel-line construction, the angle at P is a copy of the angle at Q , which measures 65° . (a) Name the theorem that proves the new line is parallel to l . (b) Find the measure of the angle that forms a linear pair with the copied angle at P .

Problem 13: Equilateral triangle on a segment

Construct an equilateral triangle on $\overline{AB}$ with $AB = 7 \text{ cm}$. Then find its perimeter and the measure of each angle.



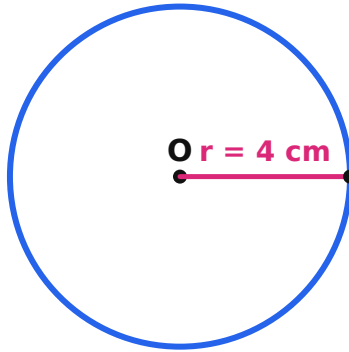
Segment AB , 7 cm long.

Problem 14: Why the triangle is equilateral

An arc centered at A with radius AB and an arc centered at B with radius AB cross at C . Explain why $AC = AB = BC$.

Problem 15: Regular hexagon in a circle

Circle $\mathcal{O}$ has radius 4 cm. Construct an inscribed regular hexagon, then find its side length and perimeter.



Circle $\mathcal{O}$ with radius 4 cm.

Problem 16: Why the radius steps around the circle

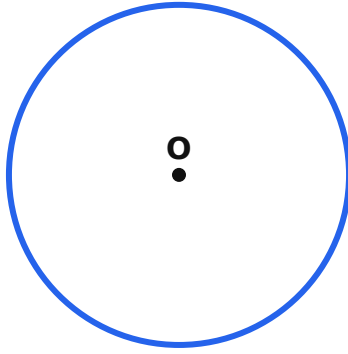
(a) Explain why each central angle of the inscribed hexagon measures 60° . (b) Find the measure of each interior angle of the hexagon.

Problem 17: Equilateral triangle in a circle

Describe how to inscribe an equilateral triangle in circle $\mathcal{O}$ using the hexagon construction. What is the measure of the central angle for each side of the triangle?

Problem 18: Square in a circle

Construct a square inscribed in circle $\mathcal{O}$.



Circle O.

Problem 19: Square in a circle with a radius

A square is inscribed in a circle of radius 5 cm. Find the length of a diagonal, the side length, and the perimeter. Give exact values and decimals rounded to the nearest hundredth.

Problem 20: Fire pit benches

Diego builds six benches around a circular fire pit of radius 6 ft. The benches form a regular hexagon whose corners lie on a circle of radius 6 ft. Find the length of each bench, the total length of all benches, and the angle between two neighboring benches.

Problem 21: Splitting a board

Ethan bisects a 30-inch strip, then bisects each half. How long is each of the resulting pieces, and how many pieces are there?



A 30-inch strip split into four equal pieces by two rounds of bisecting.

Problem 22: Which polygons fit around a point?

Aisha wants to tile a floor with copies of one regular polygon from this chapter (equilateral

triangle, square or regular hexagon) so that the angles fit exactly around each corner point. Which of these polygons work?

Problem 23: Angles you can construct

Starting with a 60 degree angle (equilateral triangle) and a 90 degree angle (perpendicular lines), explain how to construct angles of 30° , 45° , 15° , 22.5° and 75° .

Problem 24: Spotlights on a circular stage

Noah marks six points on the edge of a circular stage of radius 9 ft using the hexagon construction, and places lights on every other point. (a) How far apart are two neighboring marked points? (b) Find the central angle between two neighboring lights. (c) Find each angle of the triangle formed by the three lights.