

Arc Length, Sector Area and Radian Measure

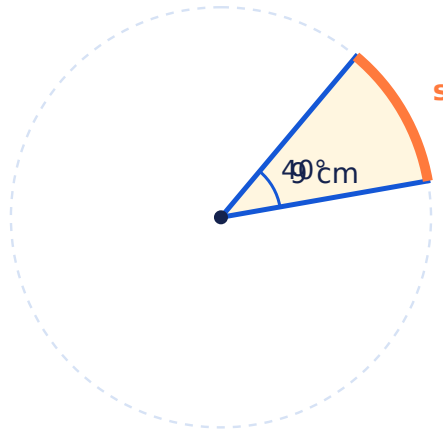
Grade 10 – Geometry math · Worksheet · Standards: G-C.B.5

Name: _____ Date: _____ Class: _____

These problems build arc length and sector area from the central angle and introduce radians as arc divided by radius (G-C.B.5). Early problems use degrees; later problems convert to radians and combine formulas. Pizza, wipers, sprinklers and clocks provide the contexts.

Standards: G-C.B.5 · **Level:** Grade 10 Geometry

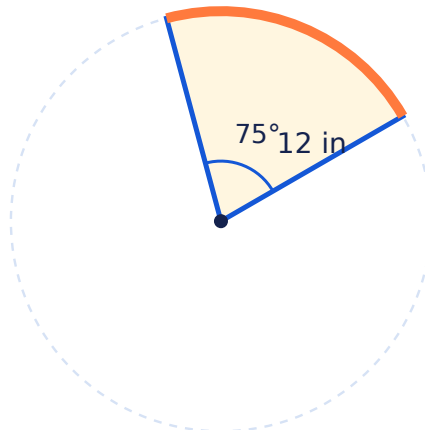
Problem 1 Arc Length in Degrees (easy)



Radius 9 cm, $\theta = 40^\circ$.

Find the exact length of the arc, and then round to the nearest hundredth of a centimeter.

Problem 2 Sector Area in Degrees (easy)



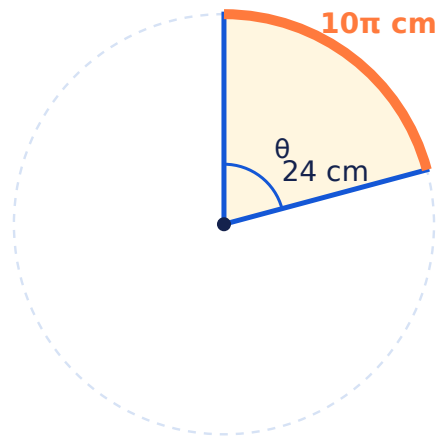
Radius 12 in, $\theta = 75^\circ$.

Find the area of the sector. Give an exact answer and a decimal to the nearest hundredth.

Problem 3 Arc Length of a Wide Angle (easy)

A circle has radius 15 feet. Find the length of the arc that subtends a central angle of 132° . Round to the nearest tenth.

Problem 4 Central Angle from an Arc (medium)



Find θ .

In a circle of radius 24 centimeters, an arc is 10π centimeters long. Find the central angle in degrees.

Problem 5 Degrees to Radians (medium)

Convert to radians in terms of π : (a) 135° (b) 210° (c) 80° .

Problem 6 Radians to Degrees (medium)

Convert to degrees: (a) $5\pi/6$ (b) $3\pi/10$ (c) 2 radians (nearest tenth).

Problem 7 Radian Measure from Arc and Radius (medium)

An arc of length 14 inches lies on a circle of radius 8 inches. Find the central angle in radians and in degrees (nearest tenth).

Problem 8 Arc Length with Radians (medium)

A circle has radius 6.5 meters. Find the arc length for a central angle of 2.4 radians.

Problem 9 Sector Area with Radians (medium)

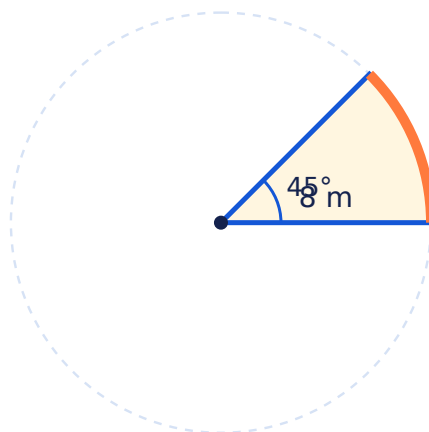
Find the area of a sector with radius 10 feet and central angle 1.2 radians.

Problem 10 Radius from a Sector Area (hard)

A sector with a central angle of 120° has area 54π square inches. Find the radius, exactly and as a decimal to the nearest tenth.

Problem 11 Radius from an Arc Length (hard)

An arc of length 7π centimeters subtends a central angle of 84° . Find the radius of the circle.

Problem 12 Perimeter of a Sector (hard)

Radius 8 m, $\theta = 45^\circ$.

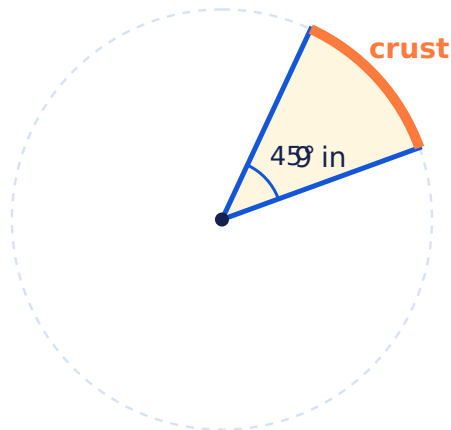
Find the perimeter of the sector: two radii plus the arc. Round to the nearest hundredth.

Problem 13 Similar Sectors (hard)

Two sectors both have a central angle of 60° . One has radius 5 inches and the other has radius 15 inches. Find the ratio of their arc lengths and the ratio of their areas (larger to smaller).

Problem 14 Area of a Circular Segment (hard)

A chord in a circle of radius 10 centimeters subtends a central angle of 60° . Find the area of the region between the chord and the arc (the segment), to the nearest hundredth.

Problem 15 Pizza Slice (medium)

One of 8 equal slices.

An 18-inch diameter pizza is cut into 8 equal slices. Find the area of one slice and the length of its crust, each to the nearest hundredth.

Problem 16 Windshield Wiper (hard)

A wiper arm pivots at a point 6 inches from the start of the blade, and the blade ends 24 inches from the pivot. It sweeps through 110° . (a) How far does the tip of the blade travel along its arc? (b) What area does the blade clear? Round to the nearest tenth.

Problem 17 Lawn Sprinkler (hard)

A sprinkler on a corner of a lawn rotates through 220° and sprays water 14 feet. Find the area watered and the length of the curved edge of the watered region, to the nearest tenth.

Problem 18 Bicycle Wheel (hard)

A bicycle wheel has radius 13 inches. (a) How far does a point on the tire travel when the wheel turns through 2.5 radians? (b) Through how many radians must the wheel turn to roll 100 inches? Round to the nearest hundredth.

Problem 19 Minute Hand (hard)

A minute hand is 9 inches long. From 12:00 to 12:35, find the angle it turns through, the distance its tip travels, and the area it sweeps. Round to the nearest tenth.

Problem 20 Pie Chart Slice (hard)

A pie chart has radius 5 centimeters. The "Rent" category is 35% of the data. Find the central angle of its slice, the area of the slice and the length of its curved edge, to the nearest hundredth.