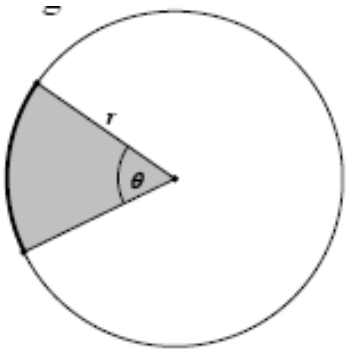
Grade 8 Mathematics Worksheet

Measurement and area

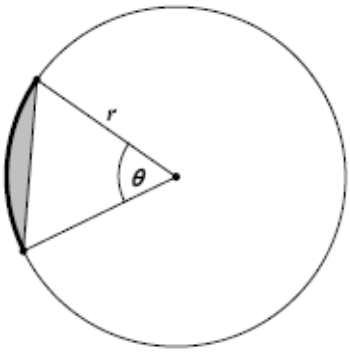
Questions:

1. i) The shaded region in the circle is called a sector. Define a sector of a circle.



ii) The length of the arc and the area of the sector may be related to the length of the circumference and the area of the circle, respectively. Find the length of the arc and the area of the sector in terms of the radius of the circle, r, and the central angle, ϑ, measured in degrees, which determines the sector.

iii) The shaded region is a segment of a circle. Define a segment of a circle. Explain how to find the area of the segment of a circle.



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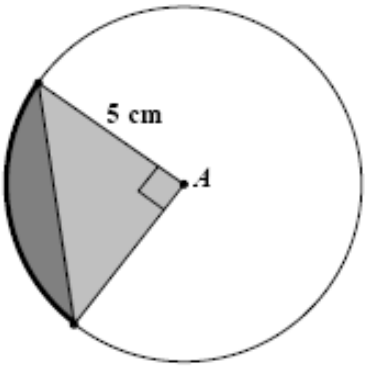
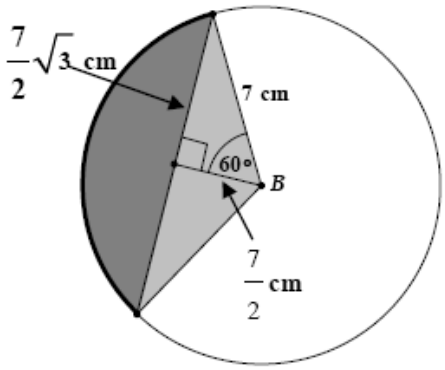
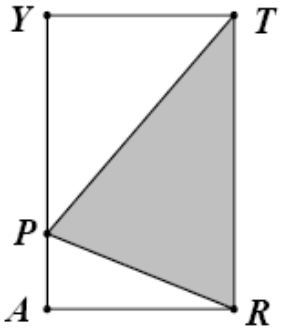
iv) Determine the areas of the shaded segment and the sector for each circle A and B.

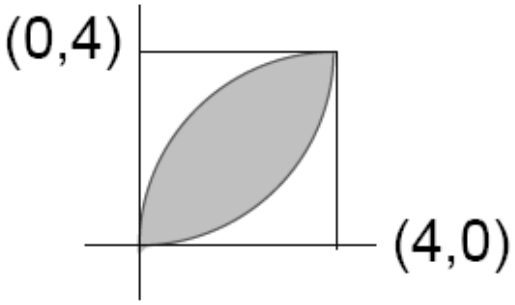




v) *P* is a random point on side *AY* of rectangle *ARTY*. The shaded area is what fraction of the area of the rectangle?



vi) Circles of radius 4 with centres at (4,0) and (0,4) overlap in the shaded area shown in the figure. Find this area in terms of π.



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Solution

1. i) A sector is the region bounded by an arc and the two radii to the endpoints of the arc.

ii) The ratio of the measure of the central angle to 360° is equal to the ratio of the arc length to the length of the circumference, and also to the ratio of the area of the sector to the area of the circle.

$$\frac{\theta}{360°} = \frac{arc\,length}{2\pi r} = \frac{area\,of\,sector}{\pi r^2}.$$

Arc length = $\frac{\theta}{360°} 2\pi r$.

Area of sector = $\frac{\theta}{360°} 2\pi r$.

iii) The area of a segment can be determined by subtracting the area of the triangle bounded by the two radii and the chord from the area of the sector.

iv) **Circle A:**

Area of sector = $\frac{90°}{360°} \pi .5^2 = \frac{25\pi}{4} cm^2$.

Area of segment = Area of sector – Area of triangle.

Area of segment = $\frac{25\pi}{4} - \frac{25}{2} cm^2$.

Circle B:

Area of sector = $\frac{120°}{360°} \pi .7^2 = \frac{49\pi}{3} cm^2$.

Area of segment = Area of sector – Area of triangle.

Area of triangle = $\frac{7}{2}\left(\frac{7}{2}\sqrt{3}\right) = \frac{49}{4}\sqrt{3}\,cm^2$.

Area of segment = $\frac{49\pi}{3} - \frac{7}{2}\left(\frac{7}{2}\sqrt{3}\right)$.

= $\frac{49\pi}{3} - \frac{49\sqrt{3}}{4} cm^2$.

v) The altitude of the triangle, h, is equal to the height of the rectangle. The base of the triangle is equal to the base of the rectangle. So, the area of the triangle = $\frac{1}{2}$ *bh* or $\frac{1}{2}$ area of the rectangle.

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vi) One way to find the area of the shaded region is to draw the diagonal of the square. $\frac{1}{2}$ Area of shaded region = Area of quarter circle – Area of triangle.

$$\frac{1}{4}\pi r^2 - \frac{1}{2}bh$$

Area of sector: $\frac{1}{4}\pi 16 - \frac{1}{2}16$

$$2(4\pi - 8)$$

$$8\pi - 16 units^2$$

All assessment activities can be used for assessing different aspects or skills. Use the mathematical tools to design a rubric for assessment purposes.