MATH 7 HOMEWORK 25: APRIL 14, 2019

1. Radians

We are introducing a new way to measure an angle.

A radian is the angle subtended at the center of a circle by an arc equal in length to the radius.

Remember that it doesn't matter how big or small a circle is, the angle at the center of a circle is always proportional to the arc subtended by the angle. The circumference of a circle $(2\pi R)$ divided by the length of the radius is a constant = 2π . So $\frac{2\pi R}{R} = 2\pi$ We say that the entire 360° angle at the center of the circle has 2π radians. Half of it, π radians is 180°, then 1 radian= $\frac{180}{\pi} = 57.2958^{\circ}$ (approximately)

We can easily convert from radians to degrees and from degrees to radians. We can easily convert non radians to degrees and non d $180^{\circ} = \pi$ radians, $1^{\circ} = \frac{\pi}{180}$ radians, $\theta^{\circ} = (\theta \times \frac{\pi}{180})$ radians For example an angle of $90^{\circ} = \frac{\pi}{2}$, $45^{\circ} = \frac{\pi}{4}$, $60^{\circ} = \frac{\pi}{3}$, $30^{\circ} = \frac{\pi}{6}$ Observe that we don't evaluate π , we carry it along.

2. Length and Area of a Sector of a Circle

A sector of a circle is a part of a circle in the shape of a pizza slice. If a = length of an arc and $\theta =$ number of radians in the angle subtending the arc, then $\frac{arc}{radius} =$ number of radians the arc subtends. So $\frac{a}{r} = \theta$ and $a = r\theta$

To find the area of a sector A, if θ_1 is the angle in degrees $\frac{A}{\pi r^2} = \frac{\theta_1}{360}$, $A = \frac{\theta_1 \pi r^2}{360^o}$, where θ (in radians) = $\frac{\theta_1 \pi}{180}$, $A = \frac{\theta r^2}{2}$, $A = \frac{ar}{2}$

3. Problems

- 1. What is the number of degrees in each of the following angles: $\frac{\pi}{3}, \frac{\pi}{12}, \frac{3\pi}{2}, \frac{3\pi}{3}, \frac{3\pi}{4}$ 2. Express the following angles in radians, using fractions of π : 15°, 72°, 66°, 105°
- 3. A circular arc is 154 cm, the radius is 252 cm. What is the angle subtented at the center of the circle in radians and degrees?
- **4.** The angle of a triangle are in the ratio 3 : 4 : 5. Express them in radians.

5. In an arcade game, the monster is the sector of a circle of radius 1 cm. The missing piece (the mouth) has central angle 60°. What is the perimeter of the monster in



 cm^2 ?

6. A semicircle of diameter 1 sits on top of a semicircle of diameter 2. The shaded area inside the smaller semicircle and outside the larger semicircle is called a lune. What



is the area of this lune?

7. What is the perimeter of the figure which consists of three congruent tangent circles



of radius 6cm?

4. Review Problems

8. Review homeworks 1 to 4 about exponents and radicals.

9. Simplify
$$(2(x^2)^{-2})^2$$

10. Simplify: $\frac{\sqrt{13}}{\sqrt{56}} \times \frac{\sqrt{7}}{\sqrt{26}}$
11. Simplify: $\frac{1}{\sqrt{1} + \sqrt{2}} + \frac{1}{\sqrt{2} + \sqrt{3}} + \dots + \frac{1}{\sqrt{49} + \sqrt{50}}$