Session 4.3

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Recap of last time

1. Suppose I tag and release 80 buffalo. Later, I fly over the grasslands and 20 out of 100 buffalo we see are tagged. How big would you estimate is the size of the buffalo population?

$$\frac{tagged}{total} = \frac{20}{100} \overset{\times 4}{=} \frac{80}{\boxed{400}}$$

2. If Jose can bake 7 cakes in 3 hours, and Nishith can bake 5 cakes in 4 hours, how many **complete** cakes can they, as a team, bake in 15 hours?

$$\frac{cakes}{hour} = \frac{7}{3} + \frac{5}{4} \overset{\times 5}{=} \frac{35}{15} + \frac{5}{4} \overset{\times 4}{=} \frac{35}{15} + \frac{20}{16} \approx \frac{35}{15} + \frac{19}{15} \longrightarrow 35 + 19 = \boxed{54}$$

3. Formulas for *Area* and *Perimeter* for each shape:

   (a) **Rectangle**: $Area = Length * Width$ **and** $Perimeter = 2 * Length + 2 * Width$

   (b) **Right triangle**: $Area = \dfrac{Length * Width}{2}$

   (c) **Circle**: $Area = \pi * (radius)^2$ **and** $Perimeter = 2 * \pi * radius$ **and** $Diameter = 2 * Radius$

4. **Dimensions** means the length and width, or the radius, depending on the context.

   (a) Perimeter and length are in terms of *units*, such as centimeters, inches, feet, etc.

   (b) Area is in terms of $units^2$, such as cm^2, in^2, ft^2, etc.

   (c) Volume is in terms of $units^3$, such as cm^3, in^3, ft^3, etc.

5. Leaving a number in terms of π means to leave it as $9 * \pi$ instead of $9 * \pi \approx 9 * 3.14 = 28.26$

Main problems

1. Assortment of warm-up problems

   (a) Suppose that Yankees outfielders tend to catch 35% of the baseballs hit towards them. In a game, if they catch 56 baseballs, then how many were probably hit towards them?

2. Find the **area** of each of the following figures

   (a) Square with side length 6 cm

   (b) Rectangle with dimensions 7 cm × 8 cm

   (c) Right triangle with dimensions 5 cm × 12 cm

   (d) Circle with radius 2 cm (leave it in terms of π)

   (e) Circle with radius 4 cm (leave it in terms of π)

   (f) Circle with diameter 10 cm (leave it in terms of π)

(g) Circle with diameter 14 cm (leave it in terms of π)

3. Find the dimensions of each figure with the given clues:

   (a) Square with perimeter 12 cm

   (b) Square with area 36 cm^2

   (c) Square with area 144 cm^2

   (d) Rectangle with perimeter 18 cm, where $Width = 2 * Length$

   (e) Rectangle with area 120 cm^2, where $Width = Length + 2$

   (f) Rectangle with area 28 cm^2 and perimeter 22 cm

   (g) Triangle with area 6 cm^2 where $Width = Length + 1$

   (h) Triangle with area 2 cm^2 where $Width = Length$

   (i) Circle with perimeter 8π cm

   (j) Circle with perimeter 12π cm

   (k) Circle with area 25π cm^2

   (l) Circle with area 64π cm^2

4. Explain, in your own words, why each equation for area makes sense to you? Think of how you would break it down for your classmates?

5. What is the area of a square of a 2×2 rectangle? 4×2 rectangle? 4×4 rectangle? As we increase one side, how does the area change? As we increase both sides, how does the area change?

6. What is the are of a circle or radius 2? Radius 4? Radius 6? As we increase the radius, how does the area change?

7. At a restaurant a small burger costs \$9 and a large burger costs \$16. Assuming no discounts and equal heights of the circular burger patties, if the small patty has area 12π, what would you expect to be the area of the larger patty?

8. Suppose the target logo has three concentric circles, with diameters of length 2, 4, and 6 centimeters, respectively. What fraction of the area is red?

Extra problems

1. Problems from 2010 AMC 8