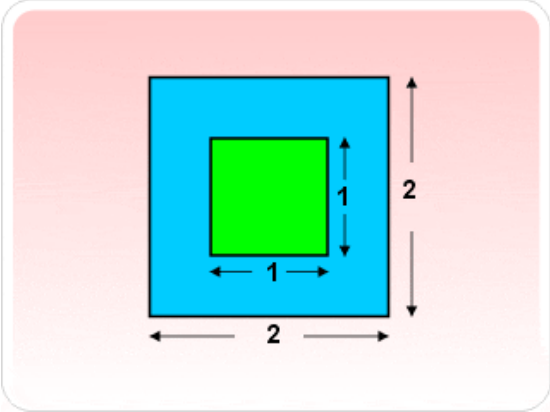
#LEARNING

Today we will calculate geometric probability.

So that we can calculate the probability of landing on a certain length, area or volume.

Keys to Success:

- ✓ **I can determine the desired outcome**
- ✓ **I can determine the total**
- ✓ **I can calculate the probability**



Geometric Probability

Example 1 – silly version

(3 people lying along the edge of the ground…)

Example 1 – "Real" version

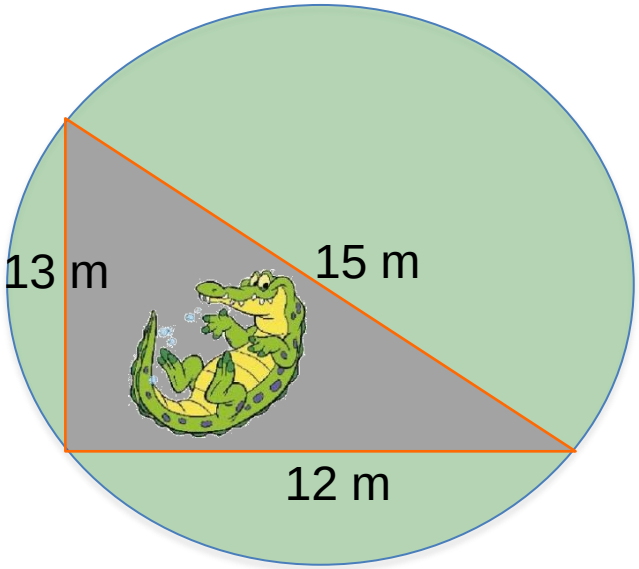
The length of segment AD is 10 cm long.

The length of segment BC is 2.5 cm long.

If you randomly choose a point on line segment AD, what is the chance this point would be on the segment BC?

$$P(\text{point on AD}) = \frac{\text{Length of BC}}{\text{Length of AD}} = \frac{2.5 \text{ cm}}{10 \text{ cm}} = \frac{1}{4} \text{ or } 25\%$$

Example 2



Chuck Norris has to parachute into a circular piece of land in the jungle. The green zone is grass, but the blue zone is a pit of crocodiles. **What is the probability of Chuck landing in the crocodile pit?** (Don't worry, Chuck can defeat a crocodile with his pinky finger!)

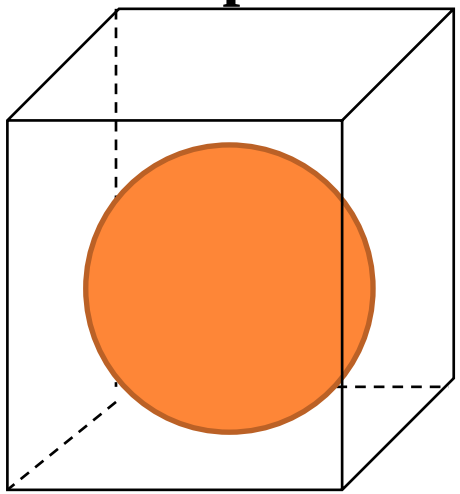
$$P(\text{crocodile}) = \frac{\text{Area of triangle}}{\text{Area of circle}}$$

$$= \frac{(b \times h) / 2}{\pi r^2}$$

$$= \frac{(12 \times 13) / 2}{\pi (7.5)^2} = \frac{78}{176.6} = 0.44 \text{ or } 44\%$$

Example 3

Scotty has to fire a torpedo at a dangerous asteroid (a sphere), but the ship is so far away that he might hit anywhere inside the cube, as shown below. The asteroid fits inside the cube, as shown. **What is the probability that he will actually hit the asteroid?**



$$sphere: r = 5\,km$$

$$cube: \quad l = 15\,km$$

$$P(sphere) = \frac{V_{sphere}}{V_{cube}} = \frac{\frac{4}{3}\pi r^3}{l^3} = \frac{\frac{4}{3}\pi(5km)^3}{(15km)^3} = 0.155$$

Summary

- Geometric probability is just like finding experimental probability

$$P(\text{event}) = \frac{\text{Region of interest}}{\text{Entire region}}$$

- Warning: there is *ALWAYS* a geometric probability question of some type on your final, so we'll spend some time practicing this over the next couple classes!

Practice: Workbook, page 143 and 144

Warm Up

You have 2 Kit Kats, 3 Snickers, and 1 Aero bar in a paper bag. You grab one without looking, eat it, and then reach in and take another.

What is the probability that you take two Kit Kats and a Snickers? (Order doesn't matter)

- Think of the possible outcomes: (K, K, S) or (K, S, K) or (S, K, K)

- Calculate the probabilities for each outcome:

  (K, K, S) = 2/6 x 1/5 x 1/4 = 2 / 120

  (K, S, K) = 2/6 x 1/5 x 1/4 = 2/120

  (S, K, K) = 1/6 x 2/5 x 1/4 = 2 / 120

- Add all the probabilities up 6 /120 or 1/20