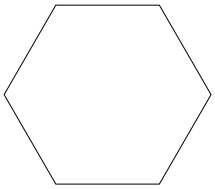
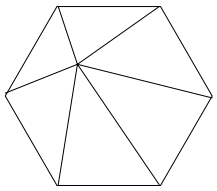
Proofs Without Words

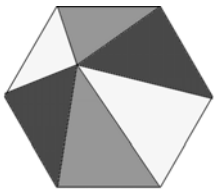
Ben has a cake in the shape of a regular hexagon. He decides to share it with his friends Ali and Celia

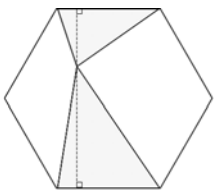


Ben puts the knife in at a random point on the cake and cuts to each corner

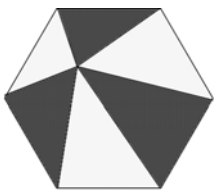


They take opposite slices. Do they each get an equal amount of cake?

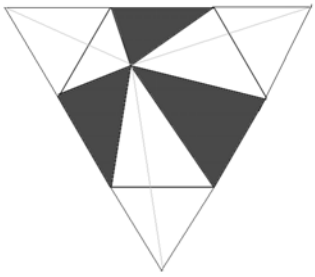




How does this show that each pair of slices has the same total area?



When the cake has been cut, Celia decides she doesn't want any so Ali and Ben take alternate slices. Do they get an equal amount of cake each?



Celia draws this diagram. She has continued 3 of the sides of the hexagon to make a triangle.

What sort of triangle is it?

How can you tell that the area of the hexagon is ⅔ of the area of the triangle?

How does this show that Ali and Ben get equal shares of cake?

What does this have to do with Viviani's theorem?

For an equilateral triangle, for any point inside the triangle, the sums of its perpendicular distances from the sides of the triangle equals the altitude of the triangle.

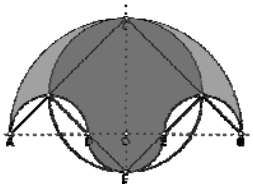
Work out in terms of *p* and *q*

$$\int_0^1 \left(t^{\frac{p}{q}} + t^{\frac{q}{p}} \right) \mathrm{d}t$$

http://www.math.ubc.ca/~morey/talk/proofwowords.html

$$\int_0^1 \left(t^{\frac{p}{q}} + t^{\frac{q}{p}} \right) \mathrm{d}t = 1$$

The Salinon (introduced by Archimedes)



Picture by Pbroks13 at en.wikipedia

Proof without words:

http://legacy.lclark.edu/~mathsci/salinon.pdf

AB is the diameter of a semicircle, centre O.

AD = EB

Semicircles with diameter AD and EB are drawn above AB

A semicircle with diameter DE is drawn below AB.

The salinon is bounded by the 4 semicircles.

The area of the salinon is equal to the area of the circle with diameter CF.

F is the point of intersection of CO produced with the semicircle with diameter DE.

Resources

- Proofs without words by Roger B Nelsen (books)
- http://www.usamts.org/About/U_Gallery.php
- http://gurmeetsingh.wordpress.com/2008/10/24/mathematical-recreations-proofs-without-words/