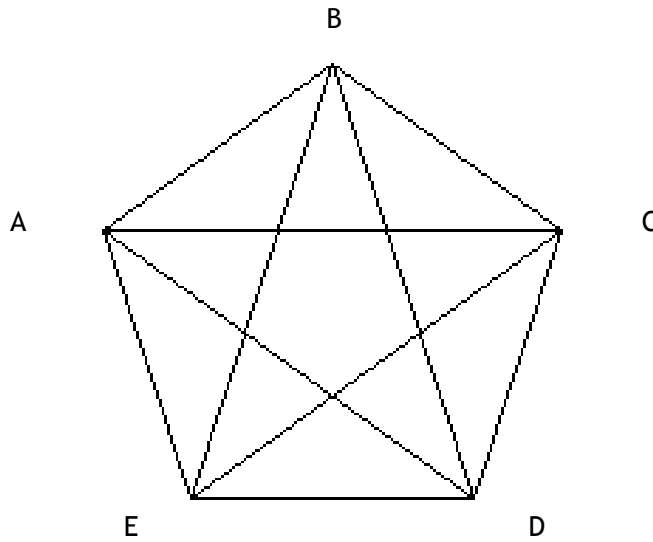


THE GOLDEN SECTION AND PENTAGONS AND PENTAGRAMS



The diagram above shows a regular pentagon with its diagonals drawn in to create a pentagram (or 5-pointed star). Notice the smaller pentagon created by the diagonals.

1. Measure the side length of the larger pentagon
2. Measure the length of a diagonal
3. What is the ratio of these lengths (diagonal : side)?
4. Calculate the internal angle (eg. angle ABC) of a regular pentagon (Hint: it may be easier to start with the external angle)

5. Calculate angle ABE (Hint: what kind of triangle is ABE?)

6. Calculate the length of BE if AB = 1 (Hint: you will need trigonometry for this, so you need to add a line which will give you a right-angled triangle).

7. How well does this agree with the value you obtained in question 3? What value do you think this should be?

8. With your compasses centred on E, and with radius equal to the length of DE, draw an arc which passes through D and then cuts DB in a point K. What type of triangle is EDK?
9. If the length of a diagonal (eg. BD) is d , what are the lengths of the sides of triangle EDK in terms of d ? (NB: we are assuming that the side length of the pentagon is 1 still).
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10. What are the angles in triangle BED?
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11. What are the angles in triangle EDK?
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12. So what is the relationship between these two triangles?
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13. Because of this relationship, the sides are proportionate to each other. Satisfy yourself that this means that $\frac{BE}{ED} = \frac{ED}{DK}$. Now substitute values for each side in terms of d and 1.
Can you use the expression you obtain to explain why the values you have obtained earlier in this project appear to be equal to phi?
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