### Identification type of numbers

**ARITHMETIC**

09

### **Numerical properties of the golden number**

Be a segment $\overbar{AB}$ and an interior point E that divides it into two segments$\overbar{ AE}$ and $\overbar{EB}$. It is said that point E divides the $\overbar{AB}$ segment in golden proportion (or in average and extreme ratio) if it is fulfilled that:

The ratio of proportionality Φ is known as a gold number or a golden number. To perform the golden division of an $\overbar{AB}$ segment, proceed as follows:

1. Draw segment $\overbar{BC}$ perpendicular to $\overbar{AB}$ such that $\overbar{BC}=\frac{1}{2}\overbar{AB}$
2. Draw segment $\overbar{AC}$
3. Draw an arc with radius $\overbar{BC}$ from C and mark the point of intersection D with the segment to $\overbar{AC}$.
4. An arc is drawn from A of radius $\overbar{AD}$ and is considered the point of intersection, E, with segment $\overbar{AB}$.

You can check that $\frac{\overbar{AB}}{\overbar{AE}}=\frac{\overbar{AE}}{\overbar{EB}}=Φ with Φ=\frac{1+\sqrt{5}}{2}$





Show the following properties of the gold number:

 It is the positive solution of the quadratic equation *x*2 – *x* – 1 = 0.

**1**



 Verify the following equalities: Φ2 = 1 + Φ and

**2**

 Its successive powers form a succession of Fibonacci.

**3**

lim = Φ

**4**

+ + + ...

lim 1 + = Φ

**5**

1 +

1 +

1 + 1 + ...

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