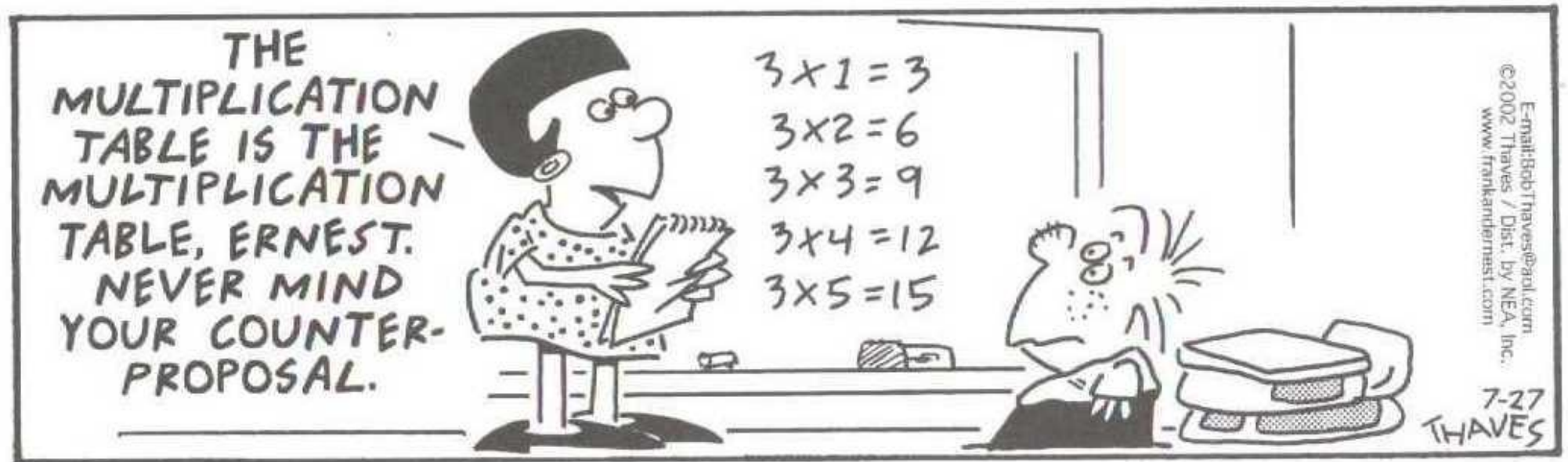


# **TOK lesson: Mathematical knowledge**

... the “truth” about math:



Identify the next three numbers or figures:

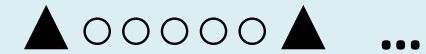
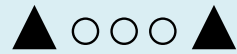
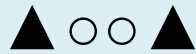
2

5

8

11

14 ....



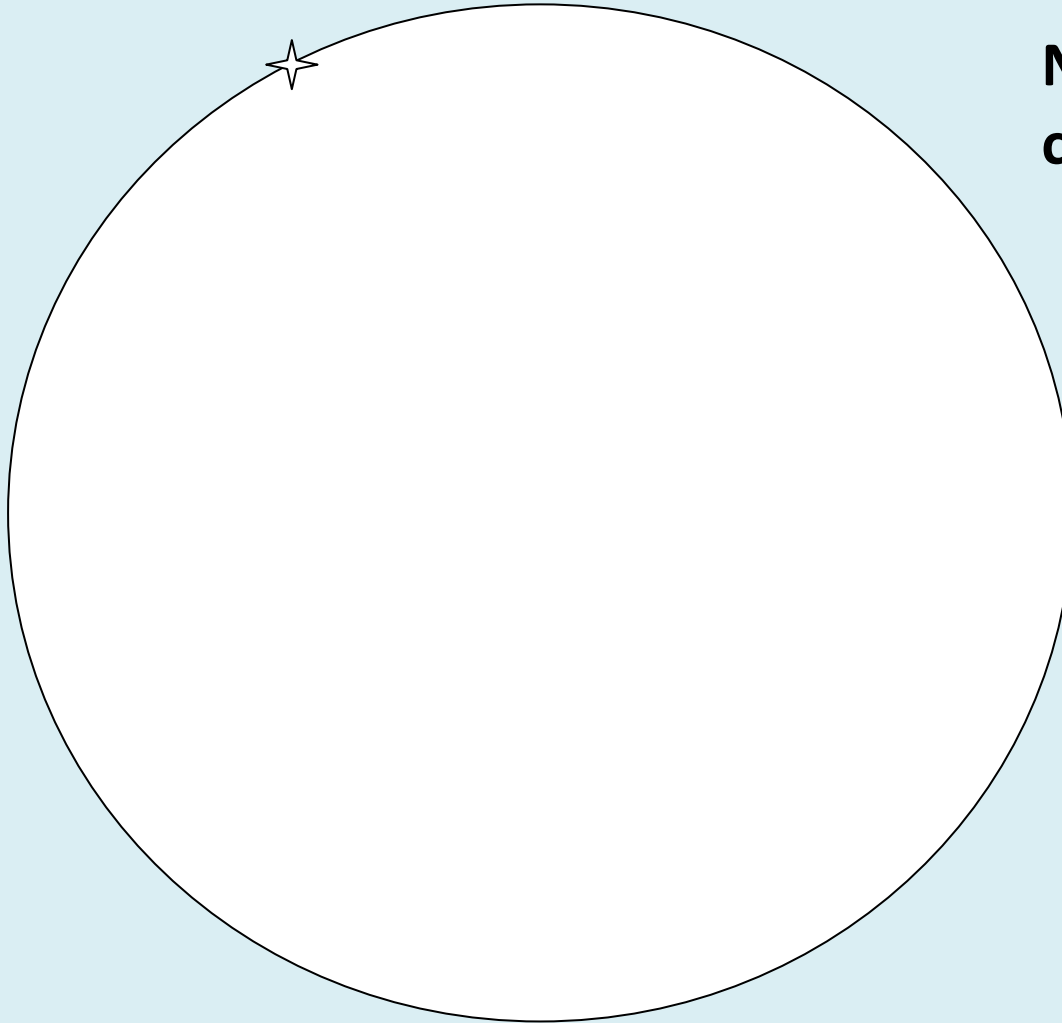
2

4

6

....

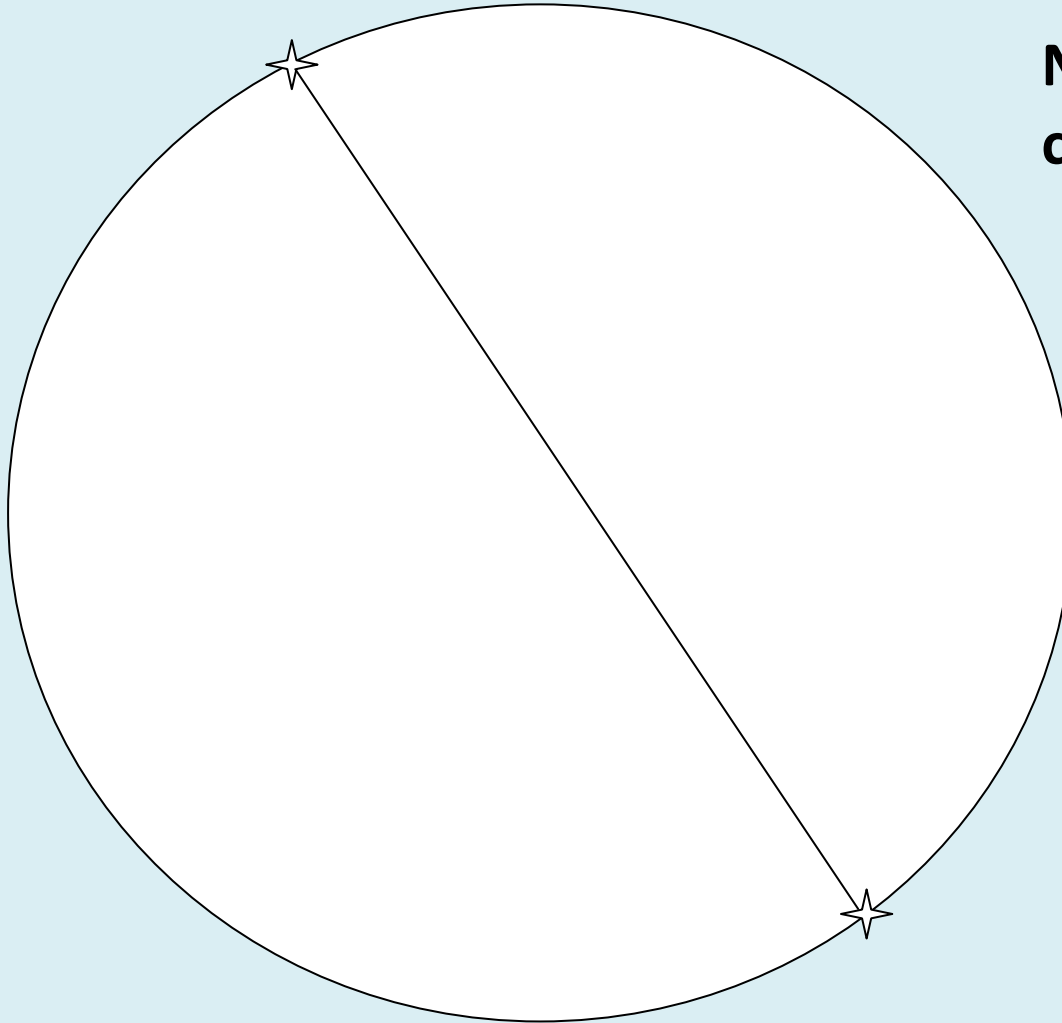
**How many regions do we get by adding more points?**



**Number of regions in  
circle =**

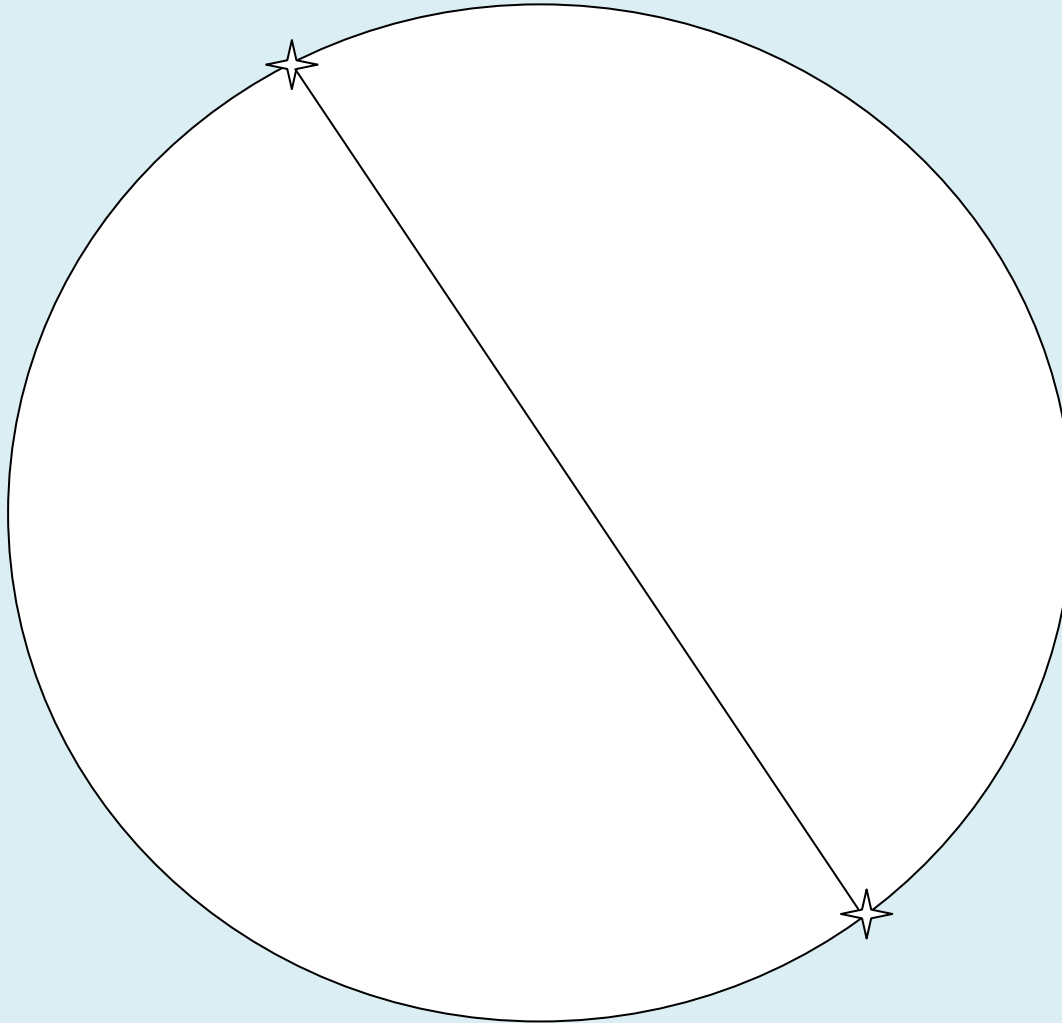
<b>Number of points on circle</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Number of regions in circle</b>						

**How many regions do we get by adding more points?**



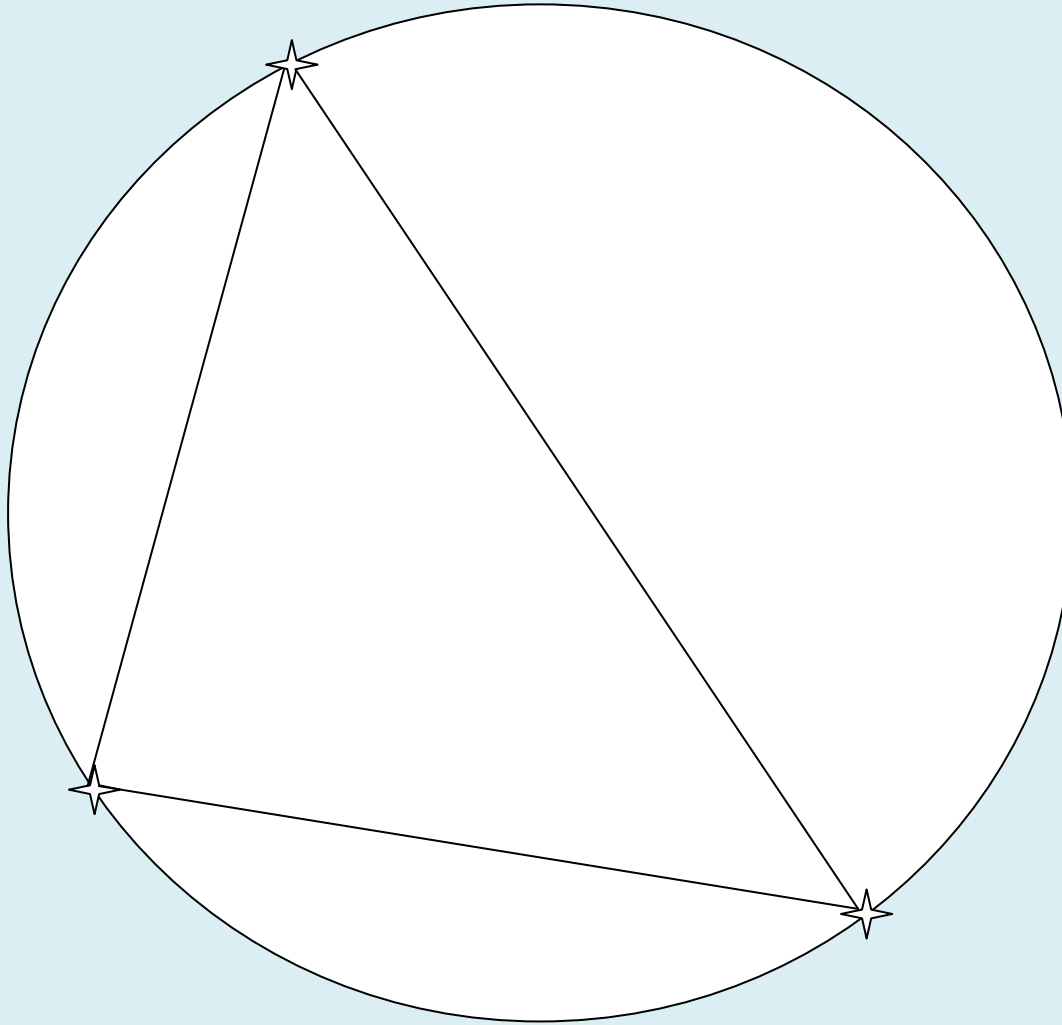
**Number of regions in  
circle =**

**How many regions do we get by adding more points?**



**Number of regions in  
circle =**

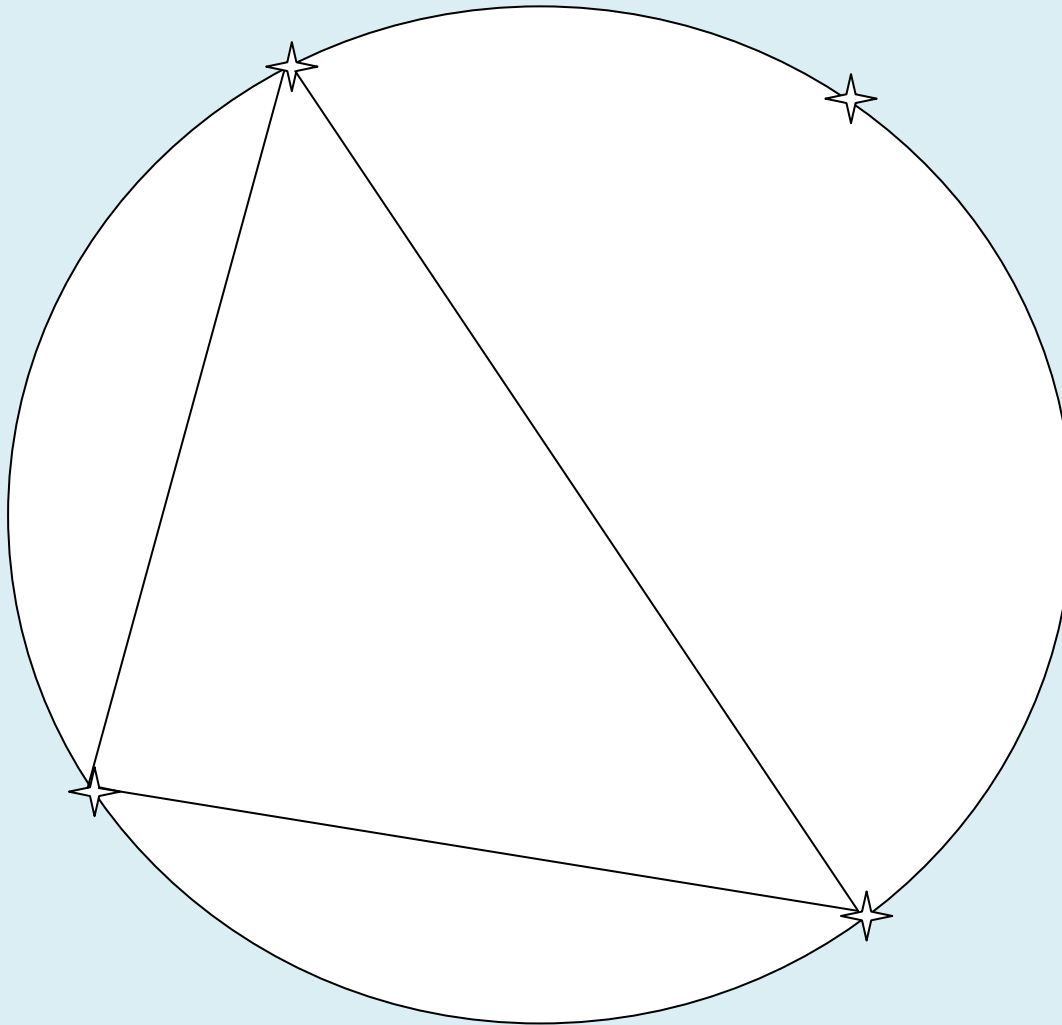
**How many regions do we get by adding more points?**



**Number of regions in  
circle =**



**How many regions do we get by adding more points?  
Try to find the rule!!**

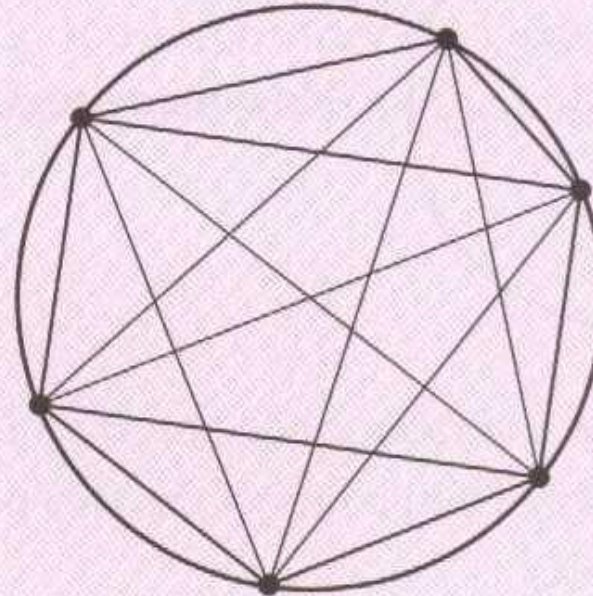
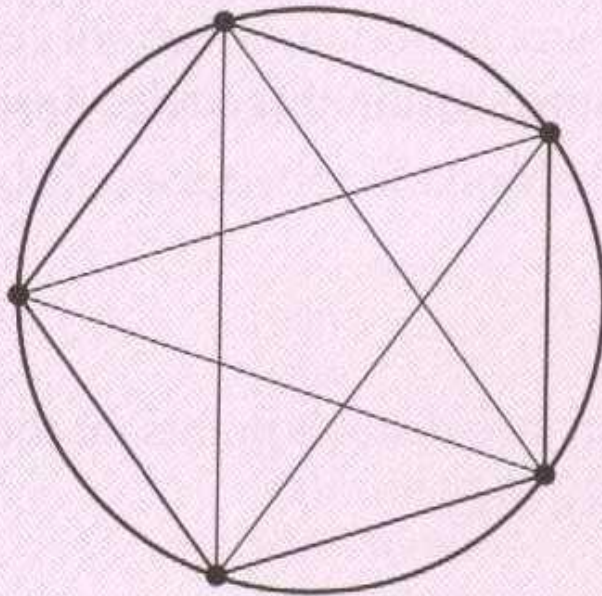


**Number of regions in  
circle =**

<b>Number of points on circle</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Number of regions in circle</b>						

## Exercise

At this point, how many regions would you expect with a circle having five distinct points on the circle? What would you expect to happen in a circle with six distinct points? Now go to the figures below and make a count.



**Surprised by the outcome?**

**Don't trust seemingly obvious generalizations!**

**(Five circles might not be enough for generalization!)**

## Definitions...

### **Mathematics: definitions and playing by the rules**

A farmer called an engineer, a physicist, and a mathematician and asked them to fence the largest possible area with the least amount of fence.

The engineer made the fence into a circle, and proclaimed that he had the most efficient design.

The physicist built a long, straight line of fence and proclaimed "If we were to extend this length around the Earth, we would have the largest possible area."

The mathematician just laughed at them. He built a tiny fence around himself and said, "I declare myself to be on the outside."

**Discuss in class:**

**What is  $\pi$ ?**

**Where is  $\pi$  to be found??**

**Was it discovered or invented?**

**Continue the following sequence:**

**1, 1, 2, 3, 5, 8, 13, 21..... 34, 55, 89, 144**

**Continue the following sequence:**

**1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...**

**This sequence is called a *Fibonacci sequence*.**

**Can we find Fibonacci sequences *in nature*?**

**Fibonacci sequences as *algorithms*.**



**Monday**  
**14.35-16.00**

**IB 1**

**TOK work shop with Bill Roberts**  
**Exam hall**

## The family tree of a male bee

### *Algorithm:*

- Male bees hatch from eggs, which have not been fertilized, while female bees hatch from fertilized eggs. Consequently, a male bee has only one parent, his mother.

### *Exercise:*

- Draw the family tree of a male bee with parents, grandparents, great grandparents.... up to his great-great-great grandparents!
- How does the number of ancestors increase?

## **Second exercise:**

### **Algorithm:**

**Start with a unit square. Insert a quarter-circle arc.**

**Add a second unit square. Insert a second quarter-circle arc.**

**Now always add a new unit square to the longer side of the square. Continue the arc.**

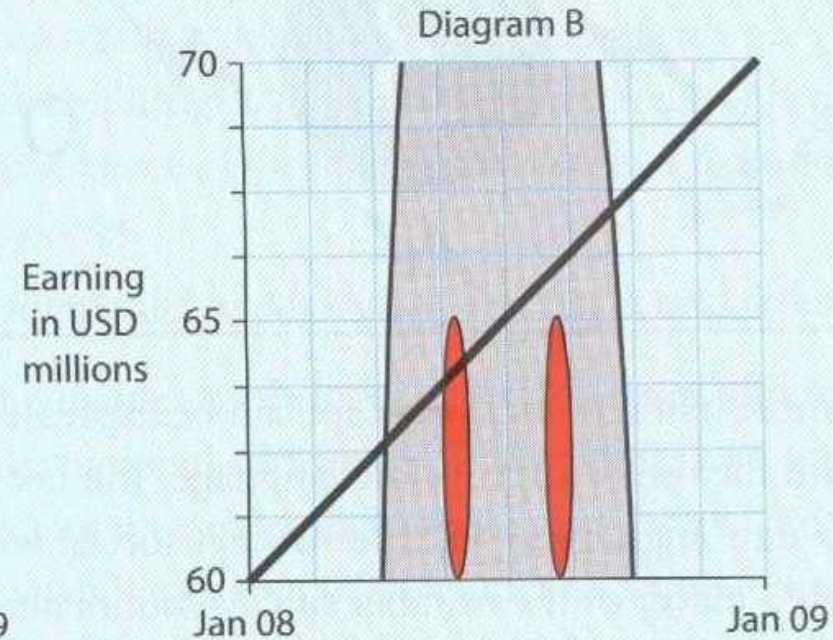
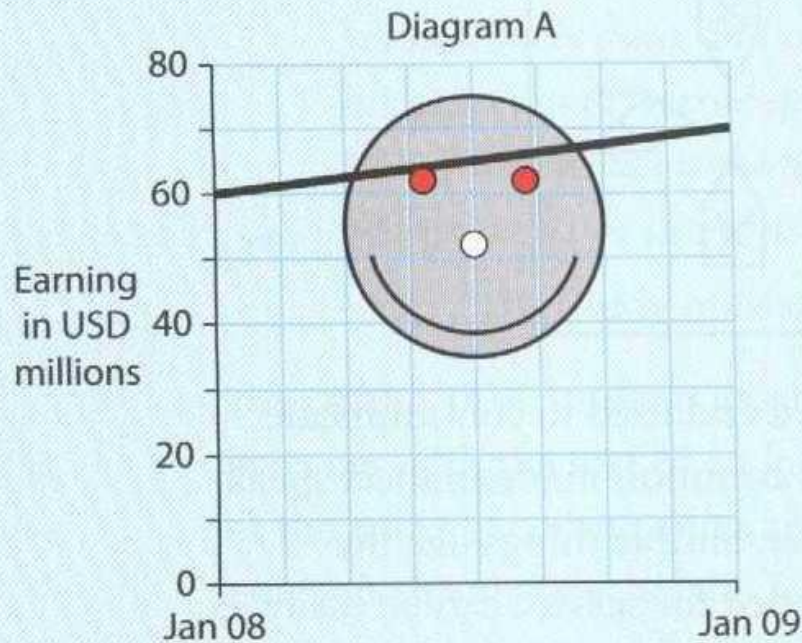
**What kind of figure do we get?**

**Discussion in class:**

**In what ways does the general public (you, your family...) benefit, directly or indirectly, from the products of the mathematical research?**

## Today's world: mathematics and statistics

Various knowledge issues can come into play at practically every level of statistical analysis. Our perception of how information is presented within a context can easily be manipulated by clever use of a diagram scale. Consider the example shown below where two different diagrams represent the growth of earnings made by the Acme Oil Company over a one-year period.



If the Managing Director of Acme Oil shares information concerning growth earnings to his Board of Directors, then which graph might he want to use? What might be his selection if he was to address company customers who complained about recent increases in the price of oil products?



If the Managing Director of Acme Oil shares information concerning growth earnings to his Board of Directors, then which graph might he want to use? What might be his selection if he was to address company customers who complained about recent increases in the price of oil products?

Mathematical terms and concepts can be used to control the way a person thinks about a particular situation. Consider the Fun Sports Shoe Manufacturers who have a payroll consisting of the following:

**Fun Sports Shoes – annual salaries:**

Chief Executive Officer (1)	£250,000
Director of Sales and Marketing (1)	£80,000
Director of Distribution (1)	£60,000
Manufacturing Management (2)	£40,000
Manufacturing Labour (20)	£8000

What is the average salary of employees working for Fun Sports Shoes? Average might normally mean the statistical mean, and in this case that would be £25,200 per employee. But it might also refer to one of two other measures of central tendency as well. The median, i.e. the middle score, or the mode, the most frequently occurring score, could also be used as an 'average'. Each of those central tendencies is calculated to be £8000 per employee.