

4 1/2 minutes

Public Class Work: Reviewing previous work

The teacher reminds students about what they did in the previous class—talked about circumference and circles and solved the relationship between the plane of a line and circumference of a circle by geometrical construction. He says that today they will take a look at calculating numerical tasks and asks them to write the headline “Length of the circumference”.

They spend a few minutes reviewing perimeter and its symbol “O”.



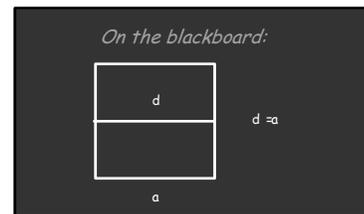
22 minutes

Public Class Work: Discussing circumference of a circle**I. Figuring out perimeter of a circle by using a square:**

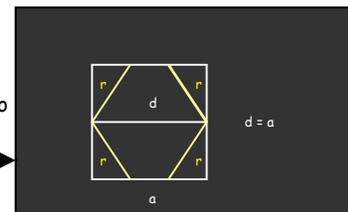
The teacher asks about the “perimeter of a circle or the distance of a circumference? Mr. Archimedes figured out the perimeter of a circle formula. Do you have an idea?”

John says to draw a square and comes to the board to draw it.

He suggests that the diameter of the circumference compares to the side of a square. Michael responds that it is not accurate. A student suggests inscribing the circle within the square.

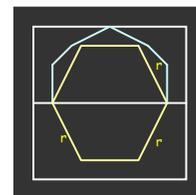
**II. Using a hexagon to figure out the perimeter of a circle:**

A student suggests using an octagon; the teacher replies that you will not be able to determine the sides. Another student suggests a hexagon. The teacher replies: “Do you remember? You take a radius, mark it here and here, you place the radius here as well and mark it. What is the length of one side?” SN: “radius.” Another student replies that it is still not accurate. A student suggests a 12-sided polygon.



The teacher says that means he will mark points here.

The students begin to respond with more angles and the teacher replies that “the more angles we have, the more likely it will start to look like a circumference. Then the perimeter can be applied to the length of the circumference. That’s the formula Mr. Archimedes created. We can write a note: Archimedes used for his calculations the 96th angle.”

**III. Concluding the lecture:**

The perimeter of a square has four diameters; the perimeter of a hexagon has six radiuses. From this picture, the diameter and radius are in what condition? SN: “The radius is half of the diameter.” T: “I can write 3 times 2 times r (and the 2 times r is the diameter). So it came out to 3 times d. You can see that the length of the circumference is somewhere between the 4th diameter and the 3rd diameter. It is not very accurate.”

T: “You know from your 7th grade the proportionality, the length of the circumference is proportional to the diameter.” The students recall the formula $y = k \text{ times } x$. “Take a look at our drawing—we can consider that the length of the circumference will be proportional as to k times the diameter. We don’t know what k is. But from our reasoning we found out that $3 < k < 4$. This is not an accurate number.” The teacher introduces π as 3.14 or 22/7 rounded off, noting that k is π and its called Ludolf formula. Note that this number looks like it could be replaced with a fraction but you would find out that 22/7 and 3.14 are similar but not equal—you cannot place an equal sign between them. So, to wrap things up, “did we discover a direct proportion?” Paul says O equals π times d . Martin says O equals 2 times π times r or $2\pi r$.



11 minutes

Optional Public/Private Class Work: Working on practice problems

The teacher assigns some practice problems.

He calls Martin to the board to work a practice problem on the board. While Martin is solving the problem, the teacher asks him questions about his method and reasoning. The other students in the class have a choice of attending to Martin and the teacher or working on their assignment individually.

The teacher then calls Nik to the board. While attending to Nik’s work on the board, the teacher asks several students about their individual work.



6 minutes

Public Class Work: Working on more practice problems

The teacher gives more practice problems that are worked through as a class. Several students are called up to work out the problems on the board as the teacher makes comments. The rest of the class attends to the students at the board and the teacher.