Classwork 15.

Test

1. $a.\ \dfrac{(2^3 \cdot 2^4)^6}{(2 \cdot 2^8)^4}$; $b.\ \dfrac{12^9}{9^4 \cdot 2^{16}}$;

2. Represent as decimal:

$a.\ \dfrac{3}{32}$; $b.\ \dfrac{5}{9}$;

3. Represent as fraction:

$a.\ 0.32$; $b.\ 0.3\overline{2}$; $c.\ 0.\overline{32}$;

4. The ratio of the number of boys to the number of girls in the school is 5 to 6.
What fraction of all the students in the school are boys, and what fraction are girls?

5. During the year, the prices of strudels were increased twice by 50%, and before New Year they started being sold at half price.
How much does one strudel cost now, if at the beginning of the year it cost 4 dollars?

6. Evaluate:

$a.\ -18 - 10 \cdot (-0.1)^2$; $b.\ 5 \cdot (-1)^3 - 4 \cdot (-0.2)^2 - 8$;

7. If Anna walks to school and takes the bus on the way back, she spends a total of 1.5 hours on the trip. If she takes the bus both ways, the whole journey takes 30 minutes. How much time will Anna spend on the trip if she walks both to and from school?

8. It is known that the numbers $\boldsymbol{a}$ and $\boldsymbol{b}$ are negative, with $\boldsymbol{a} > \boldsymbol{b}$, and the numbers $\boldsymbol{m}$ and $\boldsymbol{n}$ are positive, with $\boldsymbol{m} < \boldsymbol{n}$.

Compare the following:

a. $\boldsymbol{m} - \boldsymbol{b}$ *and* $\boldsymbol{n} - \boldsymbol{b}$;

b. $\boldsymbol{a} + \boldsymbol{n}$ *and* $\boldsymbol{b} + \boldsymbol{m}$;

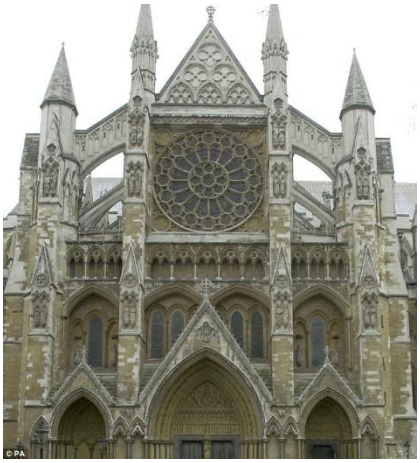
c. $|\boldsymbol{a}|$ *and* $|\boldsymbol{b}|$

9. Evaluate:

$$\frac{3.6 \cdot 1\frac{13}{15} \cdot 0.3}{4\frac{1}{5} \cdot 0.16}$$

Circle.

Circle is a very basic shape but at the same time it inspires admiration for its beauty and simplicity. During the human history circle became a symbol of unity and infinity, it is used in the art and architecture since beginning of time. One of the most important human inventions was the invention of the wheel, which made it possible to improve the transportation of people and goods.

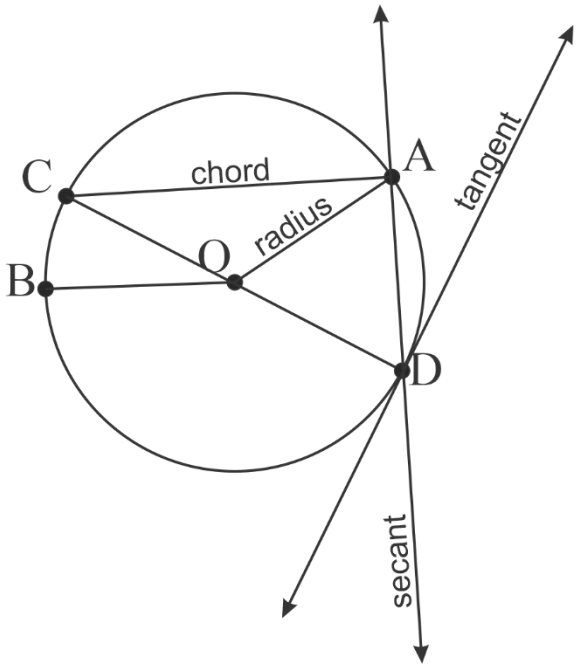


Circle is the set of all points in a plane that are at a same distance from a given point, the center.

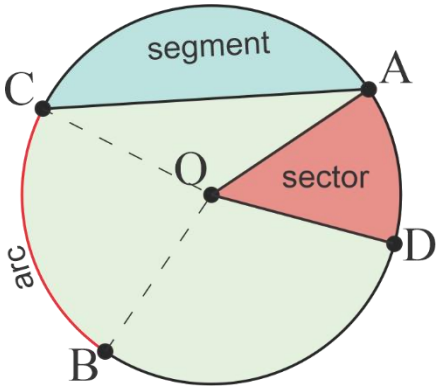
Or we can regard a circle as a shape, limited by such line.

Let's define a few new words, we will use them when we will be talking about circle.

All points of a circle (without part of the plane inside it) are on the same distance from center. On the picture above, points A, B, C, and D are marked on the circle, they are on the same distance from point O, the center, as well as all other points on circle. This distance is called radius (plural radii). Through any two points of a circle, we can draw a line, this line will cut the circle into two parts, such line is called secant (line $\overleftrightarrow{AD}$ on the picture). The line got its name from Latin word "secare", which means "to cut".

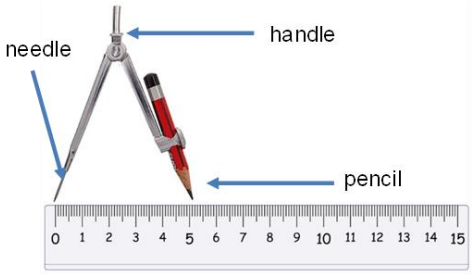


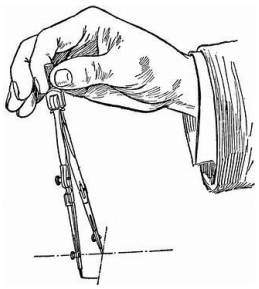
The segment of this line between points of its intersection with the circle is called chord. On the picture a few chords ([CA], [CD] and [AD]) are drawn. Also, in a circle there are special kind of chords, diameters. Diameter is a chord passing through the center of the circle. On the picture, chord [CD] goes through the center O. The length of any dimeter is twice the radius. Straight line can be drawn in a way that it has only one (not two) common point with a circle. Such line is called tangent line, it touches (intersects) the circle in only one point. (Of course, we can draw a circle and a straight line so, that they will not have common points, but this situation is simple).



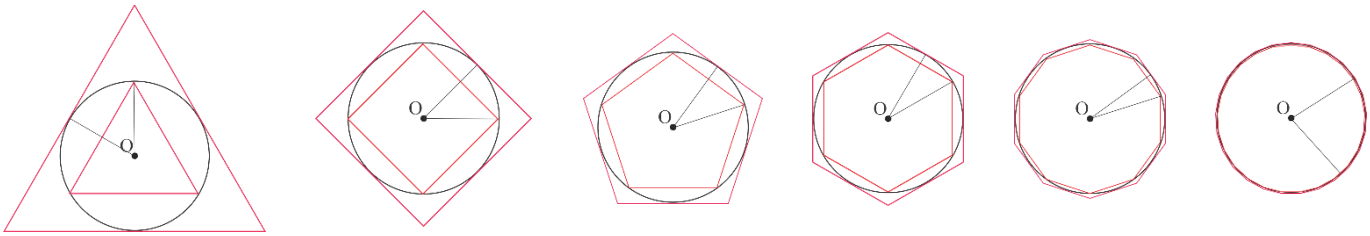
The part of the circle (with the part of the plane inside it) limited by two radii is called a sector. Very good example of a sector is a slice of pizza. The part of a circle which is cut off from the circle by a secant and less than half of the circle, is called a circular segment. (Secant divides a circle into two parts, one is less than half and another is greater than half. Sometime, when a secant goes through the center, it divides a cercle into two equal parts, half-circles). Part of the circular line (circle without the part of the plane inside) between two points is called an arc. Arc $\overset{\frown}{BC}$, arcs $\overset{\frown}{CA}, \overset{\frown}{AD}$ are on the picture above. Central angle between radii for sector and arc can be measured and will be the measure for sector or arc. Angle $\angle AOD = 39°, \angle COB = 83°$, Arc $\overset{\frown}{BC} = 83\,°$

Problem 1. Draw a circle with the radius of 5 cm. Use compass. Open the compass for 5 cm. Put the needle of the compass into paper, holding the compass by its handle rotate the pencil around the needle.





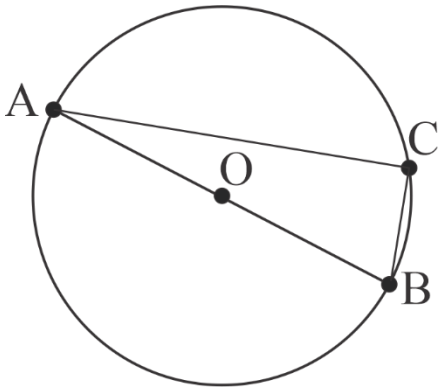
The ratio of the circumference to the diameter is known as π:

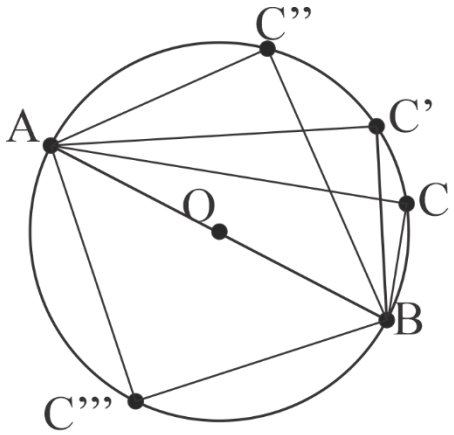


$$\pi = \frac{l}{d}$$

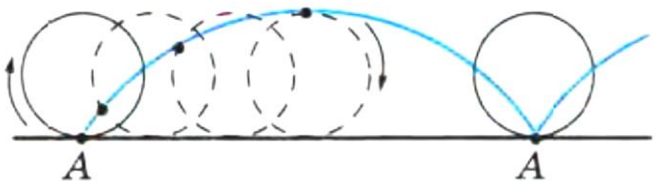
π can be estimated by computing the ratio of the perimeters of circumscribed and inscribed polygons to the doubled radius.

Draw a circle. Draw a diameter. Mark the ends of the diameter with letters A and B. Mark an arbitrary point C on the cercle and connect points C and A, as well as C and B, as shown on the picture. Measure the angle ∠ACB. Mark a few other points on the circle. Measure all angles ∠AC(C', C'', C''')B. What can you say? Try to explain your finding. Hint: Draw the diameter from point C (you have to draw line $\overleftrightarrow{CO}$).



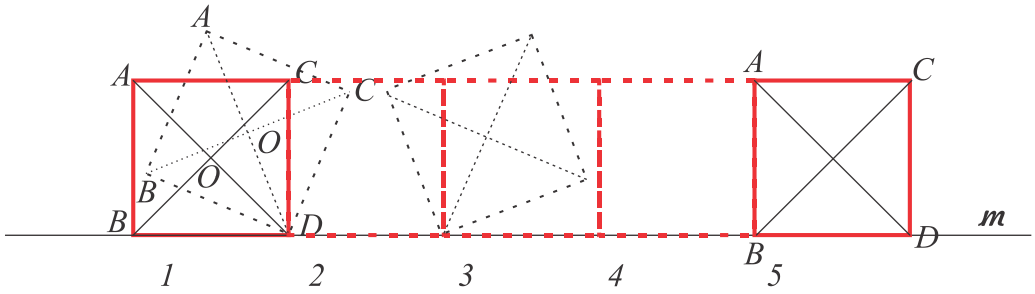


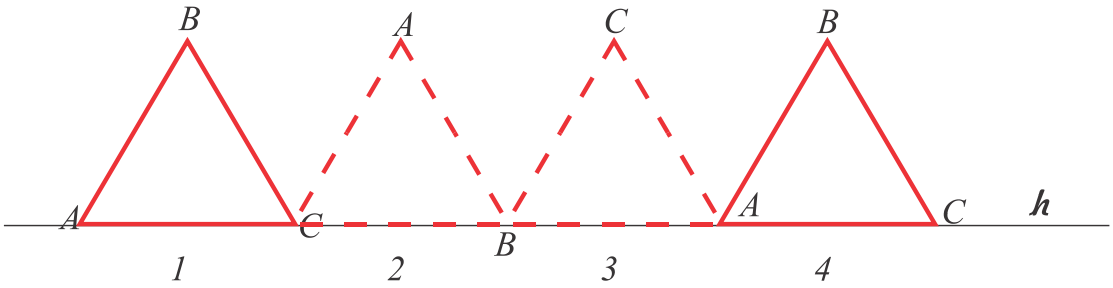
Circle is running along the line. At a starting time, point A was the point of contact of the circle and the line. The curve which point A will trace is called cycloid.



What line the center of the circle will trace? That is why the wheel is round. The center of the wheel goes parallel to the surface.

Imagine the "square wheel" – a square which is staying on a road. Draw a line traced by the point B (vertex) in a process of "rolling"? The diagonals' intersection?





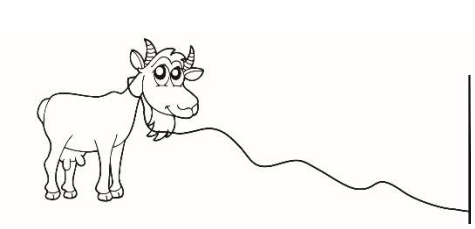
1. Draw a triangle with sides 3 cm, 5 cm and the angle between them 50°.

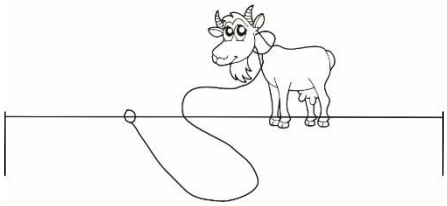
2. Draw a triangle with angles 30° and 50° and the side between them 7 cm. Do we need another information?

3. Each of four countries has a triangular shape. Each of these countries has a border with all three other countries. Can you draw a possible map of these countries?

4. A quoter glides around another quoter. How many times the second quoter will turn around its center?

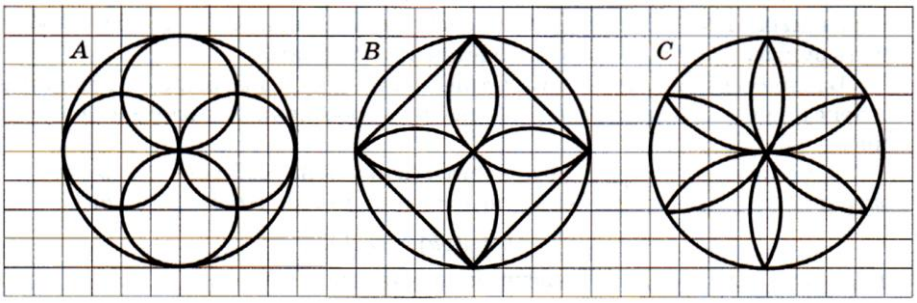
5. A goat is tied to a stake (or 2 poles 9 m apart) with a rope of length (3 m). What shape it will graze? Draw the picture using 1 cm for 1 m.





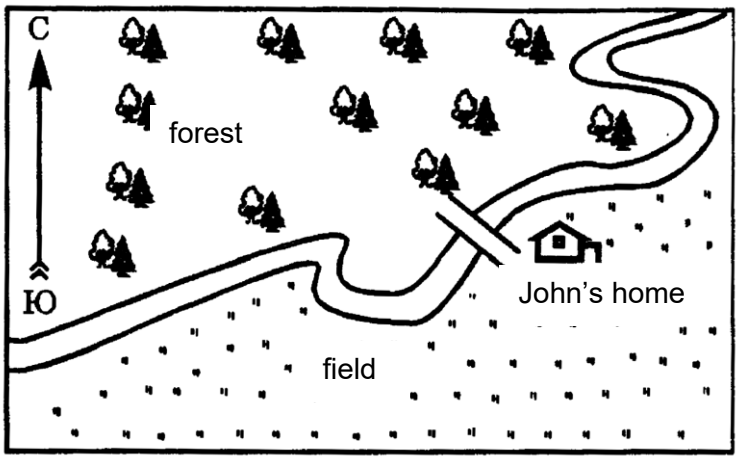
Same goat now attached to the rectangular shape 12 by 8 m.

6. Copy the picture, use compass:



7. There are three round lakes near the small town, big, middle and small. If you are walking straight from the center of the town in any direction you always will come the lake shore, Is it possible and if it is, draw the picture.

8. John knows that he can walk in the field with the speed 4 km/h and in the forest with the speed 2 km/h. He decided to show on the map all places where he can go in 1 hour. Help him to do it! (map is 1:100000, the river is narrow, he doesn't need time to cross it)



9. Draw a circle. Mark a point A on this circle. How many diameters can you draw through the point A? How many chords? Which chord will be the longest?