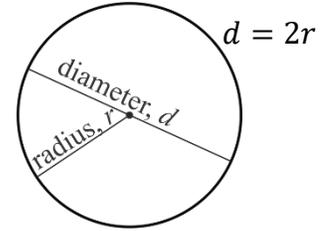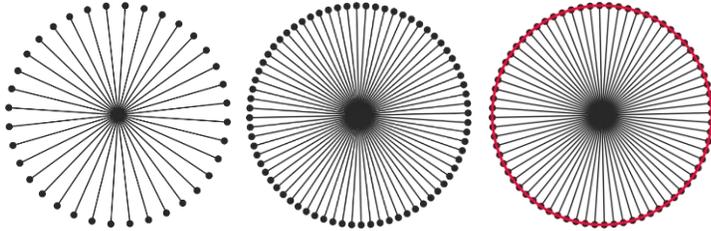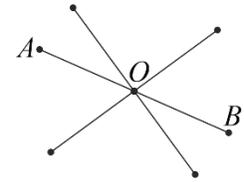Math 4b. Class work 19.

Circles.

Take a look on the picture:
Point O is a midpoint (center) of a segment [AB], as well as all other segments.
All segments are equal, so the distance from the points (A, B, and other) to point
O is the same. Let's draw more such segments, equal to [AB] and having point O
as their center:

If we continue to draw segments infinitely, we will mark all the points equidistant from O, such shape
we call a circle.

Distance from center to the circle is called radius and the segments, connecting two points on a circle
and passing through the center is called diameter, the length of the diameter is equal to two radii.

Perimeter and area of some polygons can be calculated relatively easy, area of a rectangle is the
product of its two adjacent sides, and perimeter is a twice the sum of these sides.

$$P = 2 \cdot (2 + 5); \quad S = 2 \cdot 5$$

Or, for general
rectangle:

$$P = 2 \cdot (a + b); \ S = a \cdot b$$

a cm

b cm

2 cm

5 cm
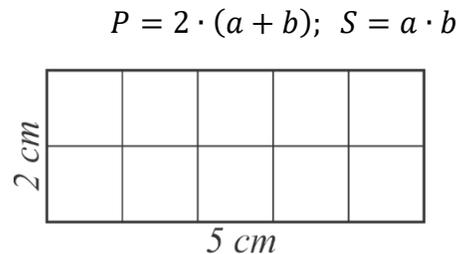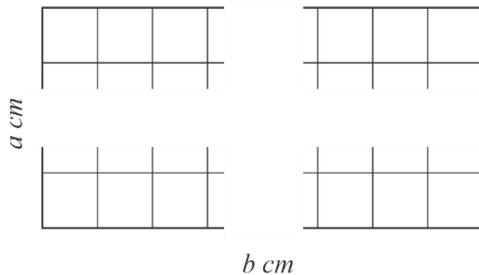
Find the perimeter and area of the shape, limited by the
closed curve is much more difficult problem. Without
using calculus, we can only do it with certain precision.
The area of the shape on the picture is
$22 < S < 49$ square units.
Each square the curved line divided into parts can be
divided into 100 (10×10) smaller squares and we can
find the area more accurate, but still not exactly. This
process can be continued forever.
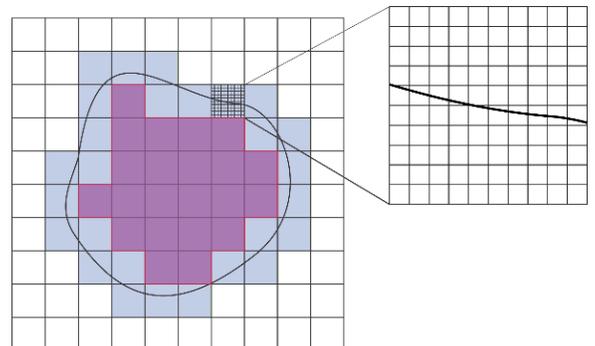
Let's do the experiment: take a paper strip, put it around a mug, a can of beans, or something similar. Cut the paper so that the length of the paper strip is equal to the circumference. Measure the diameter with the ruler, then divide the circumference by the diameter. What did you get? Try to do the same trick with a few more other similar objects. Write down the result of the division of the circumference by a diameter. If you did your measurements accurately, you should get a number close to 3.1 (more exactly, 3.14). Congratulations, you found out, that such ratio is always the same and equal to π ($\approx$ 3.14). π is an infinite, non-periodical decimal, the ratio of a circumference to a diameter of any circle. Using π we can find the circumference and the area of a circle:

$$L = 2\pi r = \pi d; \quad S = \pi r^2$$

were r being a radius of a circle, d is a diameter.

Exercises:

1. Find the area of a shaded shapes (area of a grid unit is 0.25 square centimeter). All lines are drawn along the grid or between the grid nodes. Curved lines are half circles.
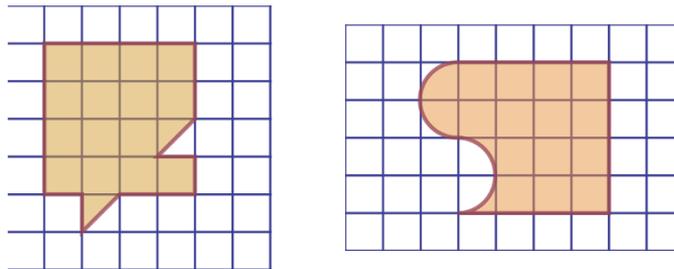
2. Points A, B, and C lie on the same straight line. The distance between points A and B is 20 cm, and the distance between points B and C is 5 cm. Find the distance between points A and C.

3. On a figure, there are 13 points. How many squares with vertices at these points can be drawn? (All points are located in the nodes of the grid)
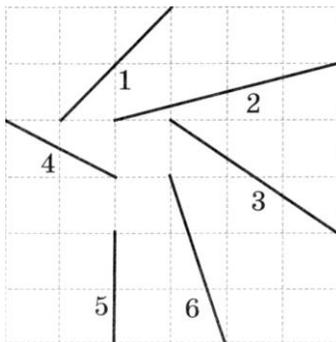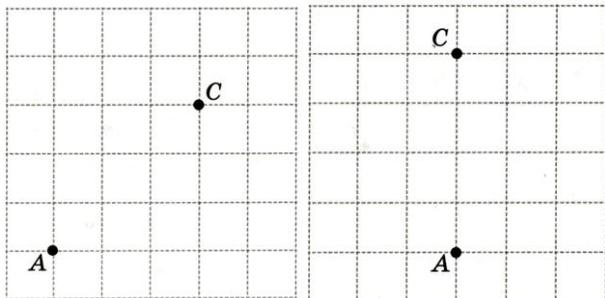
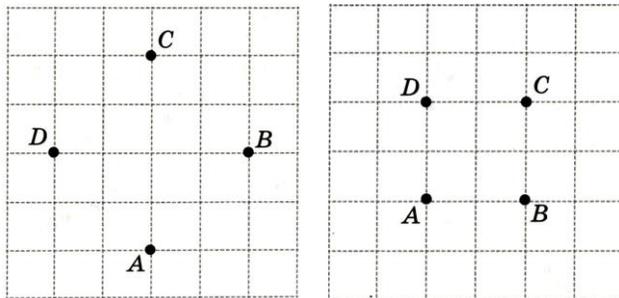4. Arrange the numbers in increasing order of the lengths of the corresponding segments, without measuring them.
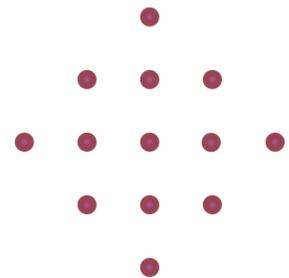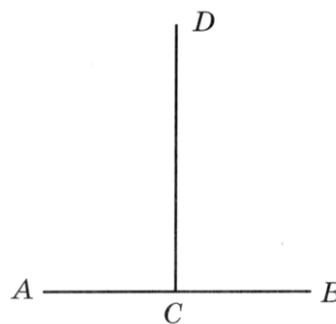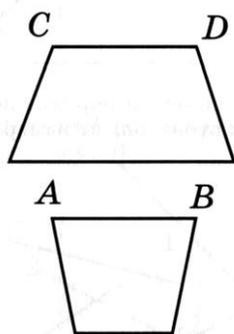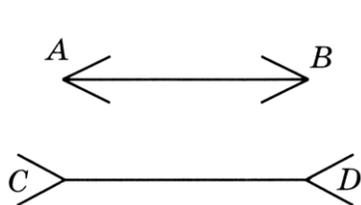
5. Draw a rectangle with the three vertices A, B, and C.
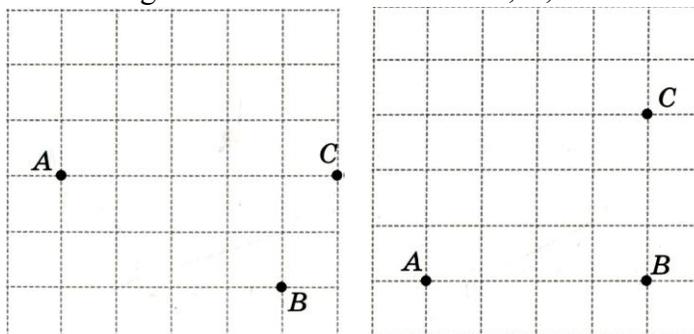
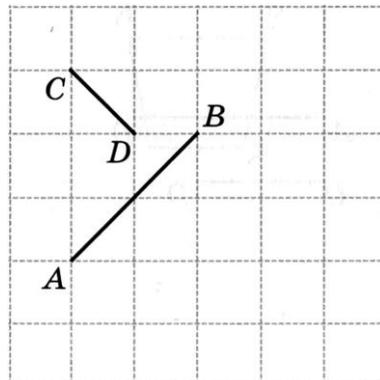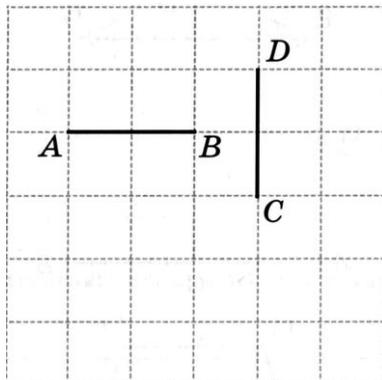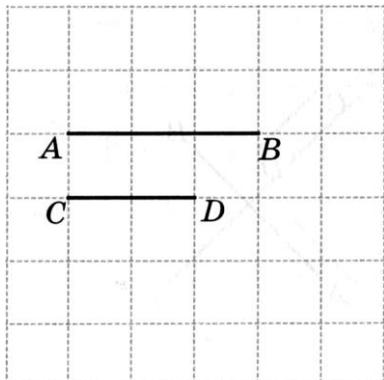6. Draw a square with the opposite vertices A and C.

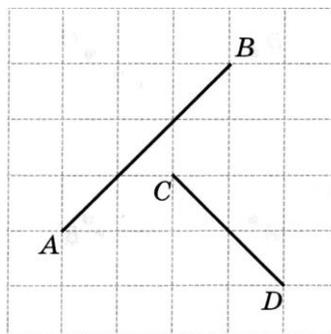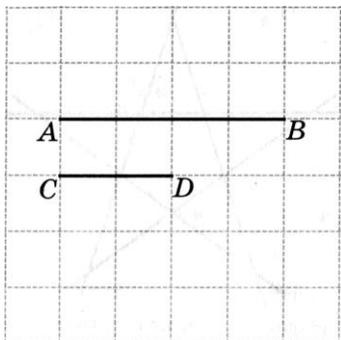7. Draw a square where points A, B, C, D are midpoints of the side of the square.

8. Compare the lengths of segments AB and CD without measuring them.

9. Draw a segment equal to the sum of segments AB and CD.

10. Draw a segment equal to the difference of segments AB and CD.

11. There are 11 wagons on the train, 350 passengers are traveling in them. In any three consecuti ve wagons there are 99 passengers. How many passengers are in the sixth wagon?

(A) 32   (B) 33   (C) 39   (D) 46   (E) 53 .

25. The cardboard in the figure is a net, which can be folded into a 2×1×1 boxFor which of the pictures can we be certain that it does NOT show this box?

(A)   (B)   (C)   (D)   (E)
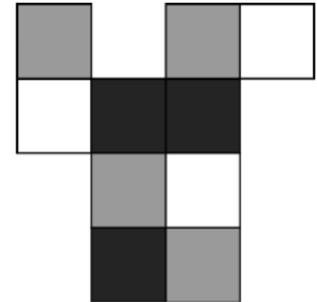
24. Benjamin writes an integer in the first circle and then fills the other five circles by following he instructions. How many of the six numbers in the circles are multiples of 3?
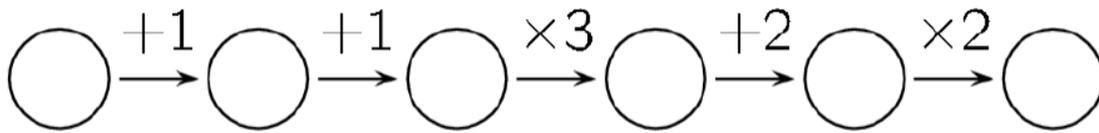
Jonte glued these three pieces of paper on top of .

What figure can he NOT obtain?

(A)   (B)   (C)   (D)   (E)