6. Planimetry

Information for tasks 6.1 – 6.2.

The acute angle of a rhombus is $45°$ and the area of the rhombus is $100\sqrt{2}$.

Task 6.1. (T 9. 2015)

The height of the rhombus is

A. $20\sqrt{2}$ **B.** 20 **C.** $10\sqrt{2}$ **D.** 10

Task 6.2. (T 10.2015)

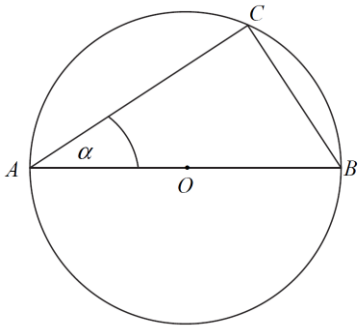
The tangent of the obtuse angle of the rhombus is equal to

A. -1 **B.** 1 **C.** $\frac{\sqrt{2}}{2}$ **D.** $-\frac{\sqrt{2}}{2}$

Task 6.3. (T 11.2015)

The triangle ABC is circumscribed by a circle with a radius of 7 cm. (see illustration).

The centre O of a circle lies on the side AB, and the cosine of the angle BAC is equal to $\frac{2\sqrt{10}}{7}$



The length of the line segment BC is equal to

A. $\frac{\sqrt{10}}{49}$ **B.** 6 **C.** $\frac{2\sqrt{10}}{49}$ **D.** 3

Task 6.4. (T 7.2016)

In a right-angled triangle, one of the shorter sides is $\sqrt{3}$ long, and the angle opposite that side is α . The length of the hypotenuse of this triangle is $2\sqrt{2}$.

The value of the expression $\frac{1}{\sin\alpha}$ is

A. $\frac{\sqrt{11}}{8}$ **B.** $\frac{2\sqrt{2}}{3}$ **C.** $\frac{2\sqrt{6}}{3}$ **D.** $\frac{\sqrt{22}}{4}$

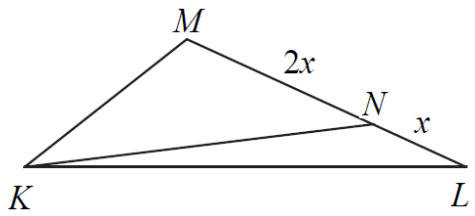
Task 6.5. (T 8.2016)

The points K, L, and M are colinear, and point M is located between points K and L. It is also known that $|KL| = 11$ and $|LM| = 5|KM|$. In that case, the length of the line segment LM is

A. $\frac{55}{6}$ **B.** $\frac{11}{6}$ **C.** $\frac{11}{5}$ **D.** $\frac{33}{5}$

Task 6.6. (T 9. 2016)

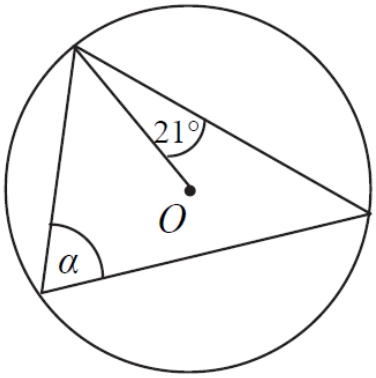
On the side LM of the triangle KLM the point N was selected so that the length of the line segment MN is twice the length of the line segment LN. The area of the triangle KLN equals 7.5. Thus, the area of the triangle KLM equals



A. 15 **B.** 18,75 **C.** 22,5 **D.** 30

Task 6.7. (T 10.2016)

A triangle was inscribed into a circle with the centre point O as shown in the illustration. The angle α of this triangle is



A. 28° **B.** 42° **C.** 63° **D.** 69°

Task 6.8. (T 17.2016, 0 – 2 pts)

In an isosceles trapezium, the internal acute angle is 60°. The side and the shorter base are equal. The perimeter of the trapezium equals 50. Complete the following sentences.

a) The shorter base of the trapezium equals …… .
b) The area of the trapezium equals …… .

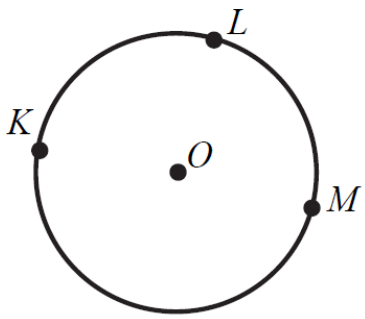
Task 6.9. (T 8.2017)

α is a positive acute angle. The cosine value of α is three times greater than its sine value. Therefore, the tangent value of α is:

A. $\frac{1}{3}$ **B.** 3 **C.** $\sqrt{10}$ **D.** $\frac{\sqrt{10}}{10}$

Task 6.10. (T 9.2017)

K, L and M are three points which lie on a circle with centre O (see the illustration). The obtuse angle KOM is 170°.



A. 85° **B.** 80° **C.** 75° **D.** 70°

Task 6.11. (T 10.2017)

The acute angle of a rhombus is 30° and the length of one side of the rhombus is 30. The area of the rhombus is:

A. 900 **B.** 90 **C.** 450 **D.** 45

Task 6.12. (T 14.2018, 0 – 3 pts)

ABC is a triangle with $|AC| = |BC| = 13$ and $|AB| = 10$. Complete the following sentences.

a) The area of the triangle ABC equals ……..
b) The sine of the angle ACB equals ……..
c) The sine of the angle ABC equals ……..

Task 6.13 (T 8.2019)

The acute angle of a rhombus is 30° , and the area of the rhombus is $\frac{361}{2}$. The side length of this rhombus is

A. 76 **B.** $76\sqrt{2}$ **C.** 19 **D.** $19\sqrt{2}$

Task 6.14 (T 9.2019)

The sine of an obtuse angle α is: $\sin\alpha = \frac{2\sqrt{2}}{3}$. Therefore the cosine of this angle equals

A. $\cos\alpha = \frac{1}{9}$ B. $\cos\alpha = \frac{1}{3}$ C. $\cos\alpha = -\frac{1}{3}$ D. $\cos\alpha = -\frac{1}{9}$

Task 6.15 (T 13.2019)

Triangles KLM and PQR are similar. The area of the triangle KLM is 6, and the area of the triangle PQR is 90 units greater than the area of the KLM triangle. The perimeter of the triangle KLM equals 12. Hence, the perimeter of the triangle PQR equals:

A. 102 **B.** 48 **C.** 768 **D.** 192

Task 6. 16 (T 15.2019, 0 – 3 pts)

A rectangle with sides measuring 3 and 4 is the base of a pyramid *ABCDS*. One of the side edges of the pyramid is perpendicular to the base, while its length is the same as the length of the diagonal of the base.

Complete the following sentences with the correct numbers.

a) The volume of the pyramid equals …… .
b) The angle between the longest side edge and the base of the pyramid measures ……°
c) The pyramid has five faces, and the number of faces which are right-angled triangles equals …… .

Task 6.17 (T 7.2020)

The length of the side of a square is reduced by 10 percent. Then, the area of the square will be reduced by:

A. 9% **B.** 10% **C.** 19% **D.** 81%

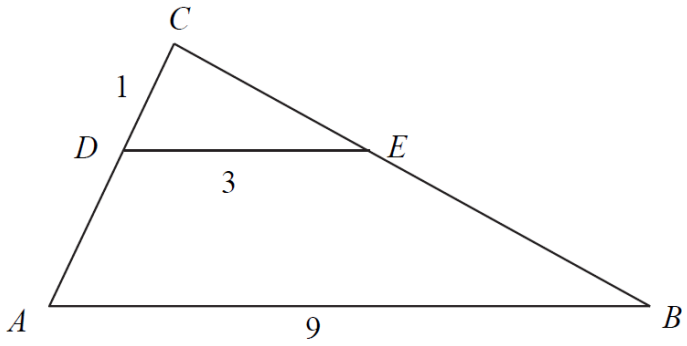
Task 6.18 (T 11.2020)

The area of a rectangle is 27. One side of this rectangle is 3 times the length of the other side. The perimeter of the rectangle is:

A. 12 **B.** 18 **C.** 24 **D.** 27

Task 6.19 (T 14.2020)

In the triangle ABC, the line segments AB and DE are parallel (refer to the figure below), and $|CD| = 1, |DE| = 3$ and $|AB| = 9$.



Hence

A. $|AD| = 2$ **B.** $|AD| = \frac{7}{3}$ **C.** $|AD| = 3$ **D.** $|AD| = \frac{10}{3}$

Task 6.20 (T 10.2021)

The area of the parallelogram $ABCD$ is equal to P. Points E and F are the midpoints of the sides BC and CD respectively. The area of the triangle AEF is equal to

A. $\frac{1}{8}P$ **B.** $\frac{1}{4}P$ **C.** $\frac{3}{8}P$ **D.** $\frac{1}{2}P$

Task 6.21 (T 11.2021)

We are given a circle $\mathcal{O}$ and a point P outside the circle. Lines k and l pass through the point P. The line k crosses the circle $\mathcal{O}$ at points A and B (where $|PA| < |PB|$) and passes through its centre. The line l is a tangent to the circle $\mathcal{O}$ at point C. The angle between the lines k and l is 60°. The angle CBA is equal to

A. 15° **B.** 30° **C.** 45° **D.** 60°

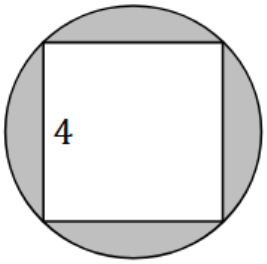
Task 6.22 (T 12.2021)

The arithmetic mean of the lengths of the bases of an isosceles trapezium is equal to 9, and the area of the trapezium is equal to 36. The tangent of the angle between the diagonal of the trapezium and the base of the trapezium is equal to

A. 20 **B.** 24 **C.** 30 **D.** 36

Task 6.23 (T 9.2023)

A square is given with a side length of 4. The square is inscribed in a circle. (See the figure below.)



Complete the sentence. Select the correct answer from the options given below.

The area of the shaded region is

A. $4\pi - 4$ **B.** $8\pi - 16$ **C.** $16\pi - 16$ **D.** $32\pi - 16$

Task 6.24 (T 10.2023)

A right-angled triangle is given with the leg lengths 2 and 4.

Complete the sentence. Select the correct answer from the options given below.

The shortest height of this triangle is equal to

A. 2 **B.** $\frac{4\sqrt{5}}{5}$ **C.** $2\sqrt{2}$ **D.** $\frac{4\sqrt{10}}{5}$

Information for tasks 6.25 and 6.26

The lengths of the legs of a right triangle are 21 and 72.

Task 6.25 (T 8.1.2024)

Complete the sentence so that it is true. Write the correct number in the blank.

The product of the sines of the acute angles of this triangle is equal to ..... .

Task 6.26 (T 8.2.2024, 0 -2 pts)

Complete the sentences so that they are true. Write the correct numbers in the blanks.

1. The length of the median of this triangle joining the vertex of the right angle to the hypotenuse is equal to ..... .

2. The distance between the centroid of this triangle and the vertex of the right angle is equal to ..... .

Task 6.27. (T 9.2024)

The length of the side of a rhombus is $\sqrt{2}$, and the area of this rhombus is 1.

Complete the sentence. Choose the correct answer from the options given below.

One of the angles of this rhombus is

A. 30° B. 45° C. 60° D. 90°