

06. Planimetry

Information for tasks 6.1 – 6.2.

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

**Task 6.01.** (0-1) (2015 – task 09)

The height of the rhombus is

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

**Task 6.02.** (0-1) (2015 – task 10)

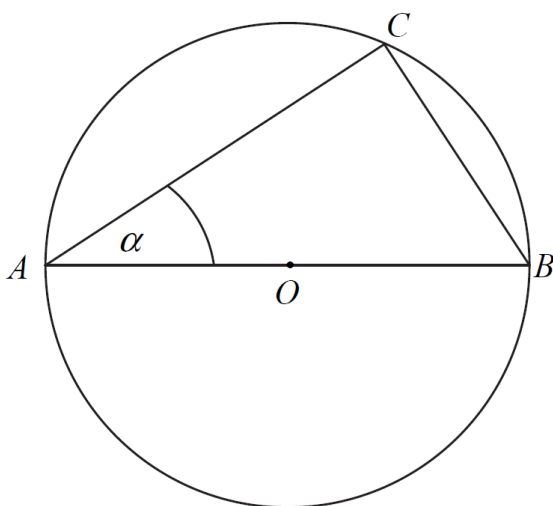
The tangent of the obtuse angle of the rhombus is equal to

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

**Task 6.03.** (0-1) (2015 – task 10)

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

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**Task 6.04.** (0-1) (2016 – task 07)

In a right-angled triangle, one of the shorter sides is  $\sqrt{3}$  long, and the angle opposite that side is  $\alpha$ . 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.  $\frac{\sqrt{22}}{4}$

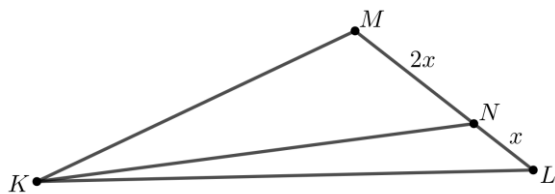
**Task 6.05.** (0-1) (2016 – task 08)

The points  $K, L,$  and  $M$  are collinear, 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 6.06.** (0-1) (2016 – task 09)

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

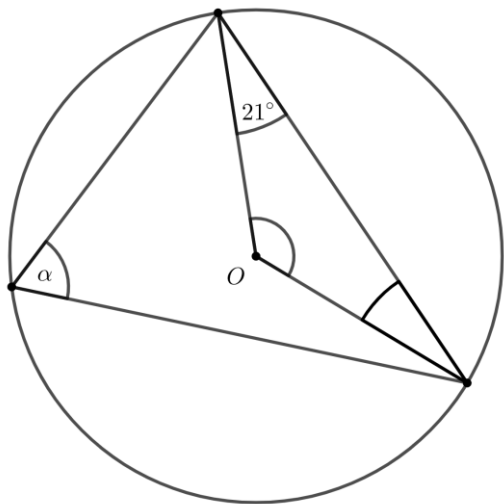


- A. 15                      B. 18.75                      C. 22.5                      D. 30

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**Task 6.07.** (0-1) (2016 – task 10)

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



- A.  $28^\circ$                       B.  $42^\circ$                       C.  $63^\circ$                       D.  $69^\circ$

**Task 6.08.** (0-2) (2016 – task 17)

In an isosceles trapezium, the internal acute angle is  $60^\circ$ . 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 6.09.** (0-1) (2017 – task 08)

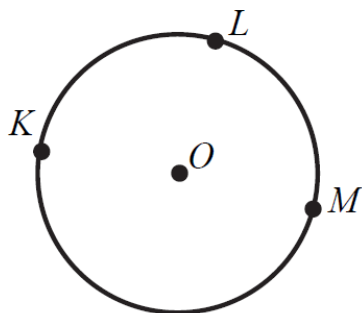
$\alpha$  is a positive acute angle. The cosine value of  $\alpha$  is three times greater than its sine value. Therefore, the tangent value of  $\alpha$  is:

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

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**Task 6.10.** (0-1) (2017 – task 09)

$K$ ,  $L$  and  $M$  are three points which lie on a circle with centre  $O$  (see the illustration). The obtuse angle  $KOM$  is  $170^\circ$ . The acute angle  $KLM$  is:



- A.  $85^\circ$                       B.  $80^\circ$                       C.  $75^\circ$                       D.  $70^\circ$

**Task 6.11.** (0-1) (2017 – task 10)

The acute angle of a rhombus is  $30^\circ$  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.** (0-3) (2018 – task 14)

$ABC$  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** (0-1) (2019 – task 08)

The acute angle of a rhombus is  $30^\circ$ , 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.  $19\sqrt{2}$

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**Task 6.14.** (0-1) (2019 – task 09)

The sine of an obtuse angle  $\alpha$  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.** (0-1) (2019 – task 13)

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.** (0-1) (2020 – task 07)

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%

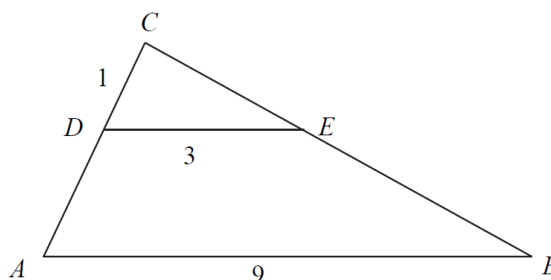
**Task 6.17.** (0-1) (2020 – task 11)

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 6.18.** (0-1) (2020 – task 14)

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



Hence

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

**Task 6.19.** (0-1)      (2021 – task 10)

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 6.20.** (0-1)      (2021 – task 11)

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  $60^\circ$ . The angle  $CBA$  is equal to

- A.  $15^\circ$       B.  $30^\circ$       C.  $45^\circ$       D.  $60^\circ$

**Task 6.21.** (0-1)      (2021 – task 12)

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.  $\frac{9}{4}$       B.  $\frac{4}{9}$       C.  $\frac{1}{4}$       D.  $\frac{1}{9}$