5. Analytic Geometry

Task 5.1. (T 6.2015)

The points $K = (1,3)$, $L = (-3,2)$, $M = (-2,-2)$, $N = (2,-1)$ are the vertices of a square. The area of the square is

A. $\sqrt{17}$ **B.** 17 **C.** $\sqrt{34}$ **D.** 34

Task 5.2. (T 8.2015)

The line k passes through the point $S = (-3,1)$ and is perpendicular to the line l with the equation $y = -\frac{1}{3}x + 12$. The line k has the following equation:

A. $y = -\frac{1}{3}x$ **B.** $y = 3x$ **C.** $y = -\frac{1}{3}x - \frac{8}{3}$ **D.** $y = 3x + 10$

Task 5.3. (T 11.2016)

The straight lines $2x + 3y - 11 = 0$ and $y = ax$ are perpendicular when

A. $a = -\frac{1}{2}$ **B.** $a = \frac{2}{3}$ **C.** $a = \frac{3}{2}$ **D.** $a = 2$

Task 5.4. (T 10.2017)

Line k with the equation $y = -\frac{1}{3}x + 11$ is parallel to the line l which contains $K = (-3,9)$. The equation of the line l is:

A. $y = -\frac{1}{3}x + 10$ **B.** $y = -\frac{1}{3}x + 8$ **C.** $y = 3x + 18$ **D.** $y = 3x$

Task 5.5. (T 19.2017, 0 – 3 pts)

Two points, $M = (-5,-3)$ and $N = (3,11)$, are located on the Cartesian plane. Complete the following sentences.

a) The equation of the line MN is …….

b) The distance of point M from point N is …….

c) The midpoint of the segment MN is $S = (x_S, y_S)$, where x_S = ... and y_S = ...

Information for task 5.6 – 5.8

Given are points $A(-2,1)$ and $B(3,4)$.

Task 5.6. (T 1.2018)

The length of the line segment AB is equal to

A. $\sqrt{34}$ **B.** $\sqrt{50}$ **C.** $\sqrt{10}$ **D.** $\sqrt{26}$

Task 5.7. (T 2.2018)

Points A and B lie on the line

A. $y = \frac{3}{5}x + \frac{1}{5}$ **B.** $y = \frac{3}{5}x + \frac{11}{5}$ **C.** $y = \frac{5}{3}x + \frac{11}{3}$ **D.** $y = \frac{5}{3}x + \frac{7}{3}$

Task 5.8. (T 3.2018)

The centre of the line segment AB is the point

A. $S = \left(\frac{1}{2}, \frac{3}{2}\right)$ **B.** $S = \left(\frac{5}{2}, \frac{3}{2}\right)$ **C.** $S = \left(\frac{5}{2}, \frac{1}{2}\right)$ **D.** $S = \left(\frac{1}{2}, \frac{5}{2}\right)$

Task 5.9. (T 4.2018)

The line l passes through the point $A = (-5,6)$ and is parallel to the line k given by the equation $y = 2x - 7$. The line l has the following equation:

A. $y = -\frac{1}{2}x + \frac{7}{2}$ **B.** $y = -\frac{1}{2}x + \frac{17}{2}$ **C.** $y = 2x - 4$ **D.** $y = 2x + 16$

Task 5.10 (T 7.2019)

The line m passes through the point $K = (-2,19)$ and is perpendicular to the line l given by the equation $y = \frac{1}{8}x + 2019$. The equation of the line m is:

A. $y = -8x + 3$ **B.** $y = -8x + 150$

C. $y = -\frac{1}{8}x + \frac{75}{4}$ **D.** $y = -\frac{1}{8}x + \frac{3}{8}$

Task 5.11 (T 18.2019, 0 – 4 pts)

Points $A = (8, -1)$, $B = (-4, -23)$, and $K = (1, 9)$ are located on a Cartesian plane. The point S is the midpoint of the line segment AB. The line m is parallel to the line AB and passes through the point K.

Complete the following sentences. Enter the correct numbers in sentences a) and b), and write the equation of the line in sentences c) and d).

a) The first coordinate of the point S equals ……., and the second coordinate of this point is …… .

b) The distance between points A and B equals …… .

c) The line AB has the equation …… .

d) The line m has the equation …… .

Task 5.12 (T 20.2020, 0 – 3 pts)

Point $A = (-1, 2)$ is the end point of a line segment AB, whereas point $S = \left(1, \frac{1}{2}\right)$ is the midpoint of the line segment AB. Complete the following sentences.

a) The coordinates of point B are: …… .

b) The line segment AB is reflected in x-axis. The coordinates of the endpoints of the image of AB after reflection are: $A' = (\ldots\ldots , \ldots\ldots)$, $B' = (\ldots\ldots , \ldots\ldots)$.

c) The length of the line segment AB is …… .

Task 5.13 (T 17.2021, 0 – 5 pts)

The triangle ABC is a right-angled triangle. The length of the hypotenuse AC is equal to 65. The vertex A has coordinates $(-15, 20)$, the vertex B is at the origin of the coordinate system, and the vertex C has both coordinates positive.

Complete the sentences a–c below by writing the correct numeric values in the blanks.

a) The length of the shortest side of the triangle ABC is equal to ..... .

b) The area of the triangle ABC is equal to ..... .

c) The radius of the circle circumscribed on the triangle ABC is equal to ..... .

Write the equation of the straight line BC.

d) The straight line BC has the equation ..... .

Write the coordinates of the centre of the circle circumscribed on the triangle ABC.

e) The centre of the circle circumscribed on the triangle ABC has coordinates ..... .

Task 5.14 (T 12.2023)

In the Cartesian coordinate system (x, y), a circle is given by the equation

$$(x-2)^2 + (y-1)^2 = 4.$$

Decide whether the following statements are true or false. Select 'T' if the statement is true or 'F' if the statement is false.

The centre of this circle is the point $(-2, 1)$.	T	F
The length of the circumference of this circle is equal to 8π.	T	F

Task 5.15 (T 13.2023, 0 – 3 pts)

Points $A = (-3, 6)$ and $B = (7, -18)$ are adjacent vertices of a rhombus $ABCD$.

The diagonals of this rhombus intersect at the point $S = (14, -11)$.

Complete the following sentences so that they are true.

1. The length of the diagonal AC of this rhombus is equal to ..... .

2. The point D that lies at the end of the diagonal BD of the rhombus has the coordinates

$D = (\ldots\ldots\ , \ldots\ldots)$.

3. The slope-intercept form of the equation of a straight line that includes the diagonal BD is: ..... .

Task 5.16 (T 10.2024)

In the Cartesian coordinate system (x, y), the equation of a circle is given by

$$(x-2)^2 + (y-5)^2 = 16$$

Decide if the following statements are true or false. Select 'T' if the statement is true, or 'F' if it is false.

The length of the longest chord of this circle is equal to 4.	T	F
The length of the circumference of this circle is equal to 8π.	T	F

Task 5.17 (T 11.2024, 0 – 3 pts)

In the Cartesian coordinate system (x, y), the equation of a circle $\mathcal{C}$ is $(x-3)^2+(y+3)^2=9$ and the equation of a straight line k is $y=x-3$.

Complete the sentences so that they are true.

1. A straight line that is perpendicular to k and passes through the centre of the circle $\mathcal{C}$ is given by the equation ..... .

2. The distance between the straight line k and the centre of the circle $\mathcal{C}$ is equal to ..... .

3. The area of the triangle whose vertices are the origin of the coordinate system and the points of intersection of the straight line k with the axes of the coordinate system is equal to .....