

Palacky University Olomouc
Petroleum Engineering Program
Mathematics Entrance Exam Model
2023

1/

Number $\log_5 \frac{\sqrt{3}}{\sqrt{27} + \sqrt{12}}$ is equal to

a/2

b/1

c/0

d/ -1

e/another value

2/ The set of all real numbers for which holds $\log_{\frac{1}{7}}(x-2) < 0$

Is equal to the set of real numbers

a) (2;3),

b) (2; ∞),

c) (3; ∞),

d) (4; ∞)

, e) or another value

3/

The direction of a straight line $p : x = 1 - 6t, y = 3 + 5t$, where $t \in \mathbb{R}$, is equal to

- a) $-\frac{5}{6}$, b) $\frac{5}{6}$, c) $\frac{6}{5}$, d) $-\frac{6}{5}$
e) or another value
-

4/

The set of all real numbers for which holds $\frac{1}{6^x} + 6 > 0$, is equal to

- a) \emptyset , b) $(-\infty; \infty)$, c) $(0; \infty)$, d) $(-\infty; 0)$
e) or another value
-

5/

Number

$\binom{28}{25} - \binom{27}{25}$ is equal to

a) $\binom{27}{23}$;

c) $\binom{27}{24}$;

b) $\binom{28}{24}$;

d) $\binom{28}{26}$

e) or another value

6/

The number of all real solutions to the equation $x^2 + 6|x| - 16 = 0$ is equal to number

- a) 0, b) 4, c) 3, d) 2, e) or another value
-

7/

If $\sin \alpha = \sqrt{\frac{7}{13}}$ and $\alpha \in \left(0; \frac{\pi}{2}\right)$, then $\operatorname{tg} \alpha$ is number

- a) $\sqrt{\frac{7}{6}}$, b) $\sqrt{\frac{6}{7}}$, c) $\sqrt{\frac{6}{13}}$, d) $\sqrt{\frac{7}{13}}$

e) or another value

8/

The set of all real numbers for which holds $11^x - 6 < 5$, is equal to:

- a) $(-\infty; 1)$,
b) $(-1; 0)$,
c) $(0; 1)$,
d) $(1; \infty)$,
e) or another value
-

9/.

The general equation of a straight line that passes through the centres of circles k_1 and k_2 ,

$$k_1 : x^2 + y^2 + 8x - 14y + 49 = 0, \quad k_2 : x^2 + y^2 + 12x + 16y + 91 = 0,$$

can be written:

a) $15x - 2y + 74 = 0,$

b) $15x + 2y + 46 = 0,$

c) $2x - 15y - 113 = 0,$

d) $2x + 15y - 97 = 0,$

e) or another value

10/

Calculate

$$25,6 : 0,2 - 10^2 \cdot 0,029 =$$

11/

$$\frac{\sqrt{1,2^2}}{0,01} - \frac{(\sqrt{0,01})^2}{10} \cdot 3\,600 =$$

$$\frac{\frac{1}{4} + \frac{2}{3}}{\left(3 - \frac{9}{4}\right) \cdot \frac{8}{3}} =$$

$$3 : \frac{2 \cdot 6}{2 + 6} - \frac{12}{3} \cdot \frac{5}{8} =$$

$$a - a^2 + 2 - 2 \cdot (a + 1) \cdot (1 - a) =$$

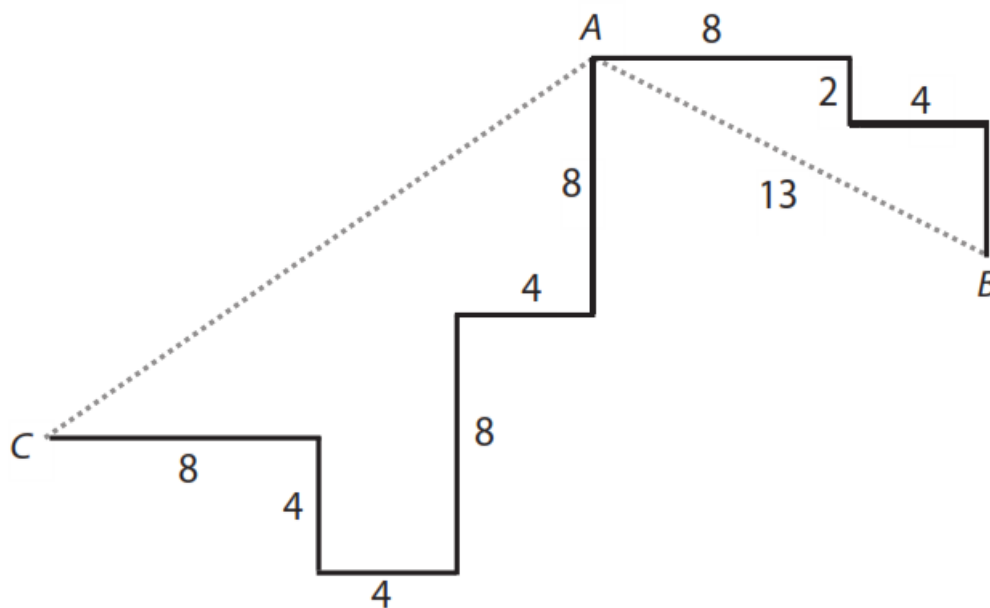
$$\left(n - \frac{5}{2}\right) : 2 + \left(\frac{1}{2} - n\right)^2 =$$

$$0,4 + \frac{4x}{5} - 1 = 0,2x - \frac{3}{2}$$

$$\frac{3y - 1}{3} - \frac{5y - 2}{6} = \frac{3}{4}y + 2$$

12/

The paths in the maze are composed of straight sections drawn with thick lines, all intersections are right-angled. The direct distance between points A, B is 13 m.



Numbers are in meters

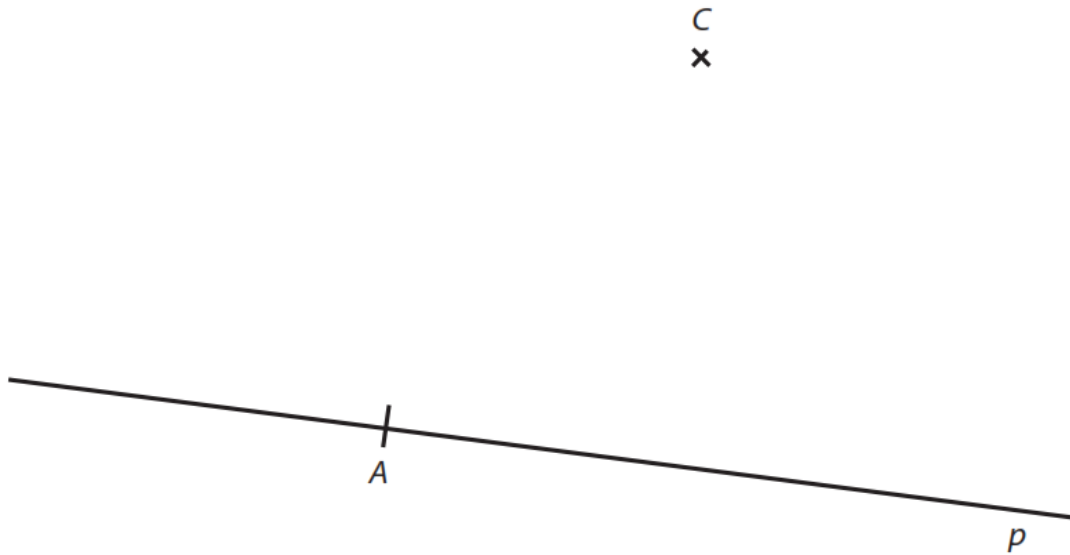
8 Calculate in meters

8.1 the length of the marked path in the maze from point A to point B;

8.2 direct distance of points A, C.

13/

Point A lies on the line p and point C lies outside it.



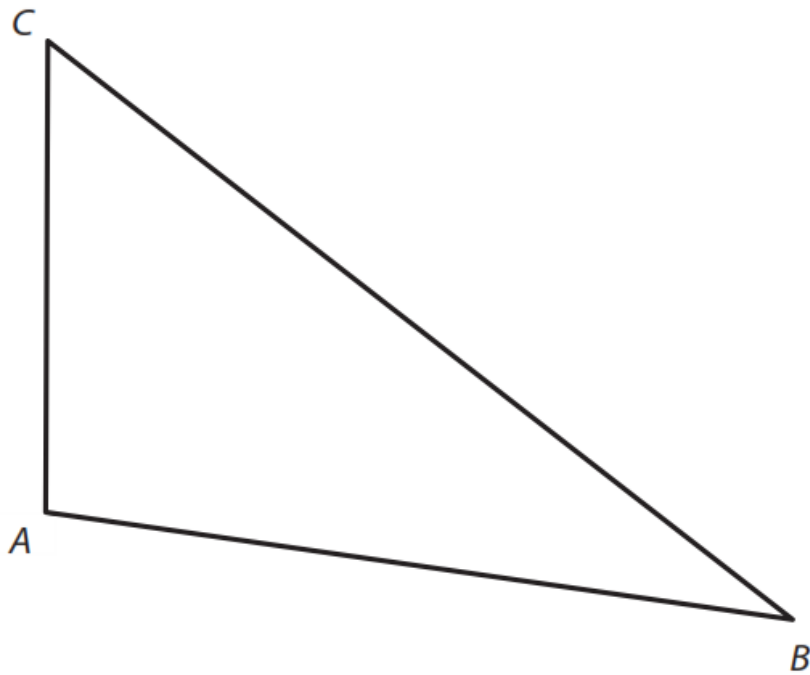
Points A and C are vertices of parallelogram ABCD, whose diagonal BD is twice as long as diagonal AC.

One of the remaining vertices B, D of this parallelogram lies on the line p.

Construct and label the missing vertices B, D of the parallelogram ABCD and the parallelogram draw.

Find all solutions.

14/



10 All vertices of triangle ABC lie on circle k .

10.1 Construct a circle k and mark its center S .

10.2 Point C is the vertex of the square CDEF.

The remaining vertices D , E , F of the square CDEF also lie on the circle k .

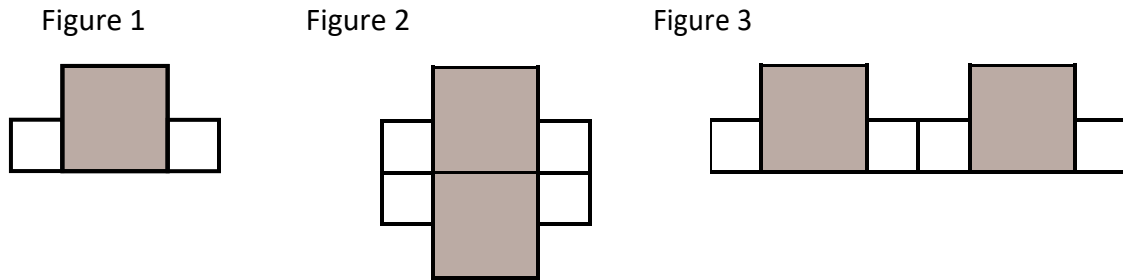
Construct the square CDEF and label its vertices.

15/

The first figure consists of two white squares and one dark square.

The perimeter of the white square is twice the perimeter of the dark square. The circumference of the entire first figure is 96 cm.

The second and third figures are composed of the first two figures



Decide if the statements are true or false

if

11.1 Perimeter of 1 dark square is 48 cm. T, F

11.2 The perimeter of the entire second figure 192 cm, T/F

11.3. Perimeter of 3rd figure is 48 cm bigger than the surface of figure 2, T/F