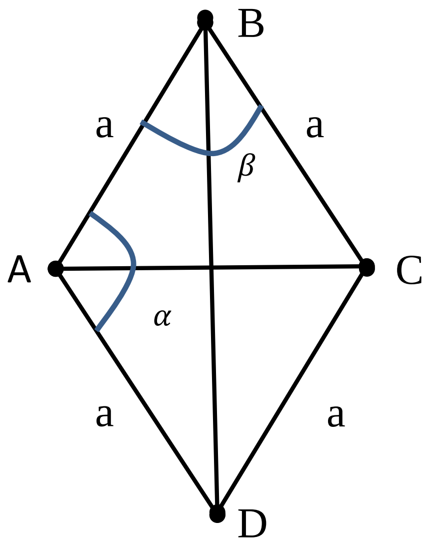
Answer on Question #57003 – Math – Geometry

Question

1. A rhombus has diagonals of 32 and 20 inches. Find the area and the angle opposite the longer diagonal.

Solution



It is given that $BD = 32, AC = 20$. The length of side a can be found by means of Pythagorean Theorem:

$$a = \sqrt{16^2 + 10^2} = \sqrt{256 + 100} = \sqrt{356}$$

The area of rhombus is equal to

$$S = \frac{1}{2} BD \cdot AC = \frac{1}{2} \cdot 32 \cdot 20 = 320$$

The other formula of area is

$$S = \sin \beta \cdot a^2,$$

hence

$$\sin \beta = \frac{S}{a^2} = \frac{320}{356} = \frac{80}{90}$$

$$\beta \approx 64°$$

So we can find α:

$$2\alpha + 2\beta = 360°$$

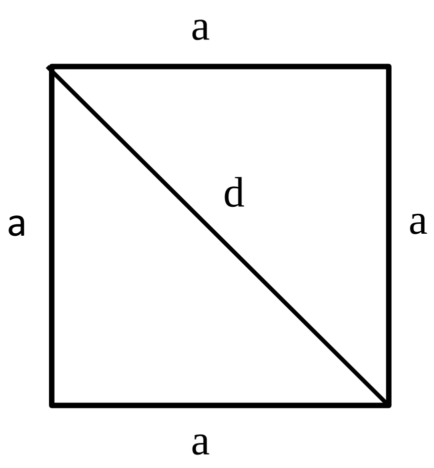
$$\alpha = 180° - \beta \approx 116°$$

Answer: $320\ \text{in}^2$, $116°$.

Question

2. If the diagonal length of a square is tripled, how much is the increase in the perimeter of that square?

Solution



The formula of diagonal length is

$$d = \sqrt{2}a, \qquad a = \frac{\sqrt{2}d}{2}$$

The formula of square perimeter is

$P = 4a$, hence $P = 4 \cdot \frac{\sqrt{2}d}{2} = 2\sqrt{2}d$

So if $d_1 = d$ and $d_2 = 3d_1 = 3d$, then

$$P_1 = 2\sqrt{2}d_1 = 2\sqrt{2}d, \qquad P_2 = 2\sqrt{2}d_2 = 2\sqrt{2} \cdot 3d = 6\sqrt{2}d$$

Ratio of perimeters is

$$\frac{P_2}{P_1} = 3$$

Difference of perimeters is

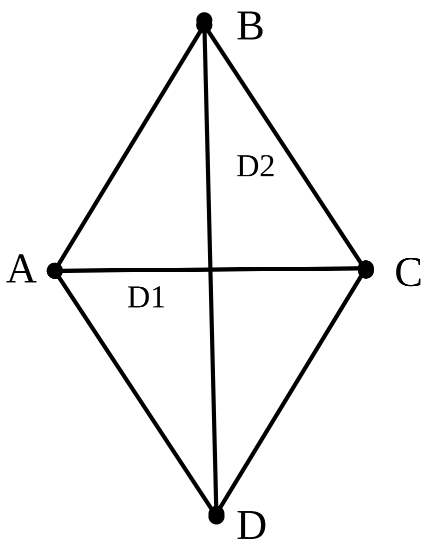
$$P_2 - P_1 = 4\sqrt{2}d$$

Answer: 3 times; by $4\sqrt{2}$ multiplied by the length of initial diagonal.

Question

3. The area of the rhombus is 156 m^2. If its shorter diagonal is 13 meters, find the length of the longer diagonal.

Solution



$$S = 156, D1 = 13$$

To find D2 we will use the formula of area of rhombus:

$$S = \frac{1}{2} \cdot D1 \cdot D2$$

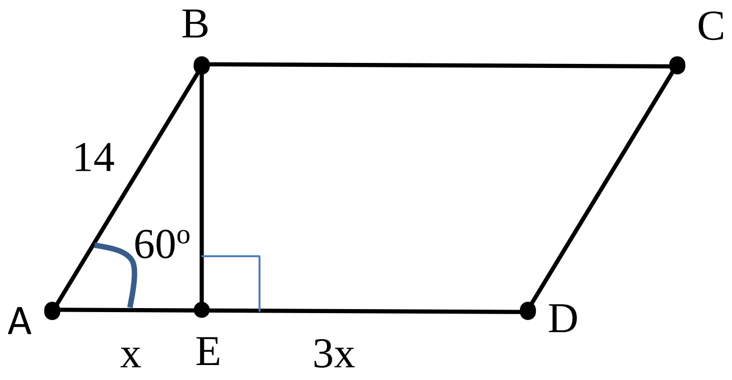
$$D2 = \frac{2S}{D1} = 2 \cdot \frac{156}{13} = 24$$

Answer: 24 m

Question

4. The altitude BE of a parallelogram ABCD divides the side AD into segments in the ratio 1 is to 3. Find the area of the parallelogram if the length of its shorter side is 14 cm, and one of its interior angle measures 60 degrees.

Solution



From the triangle *ABE* we can find *x*:

$$\cos 60° = \frac{x}{14}$$

$$x = 14\cos 60° = 7$$

Now we can find *AD*:

$$AD = 4x = 28$$

The area of parallelogram is equal to

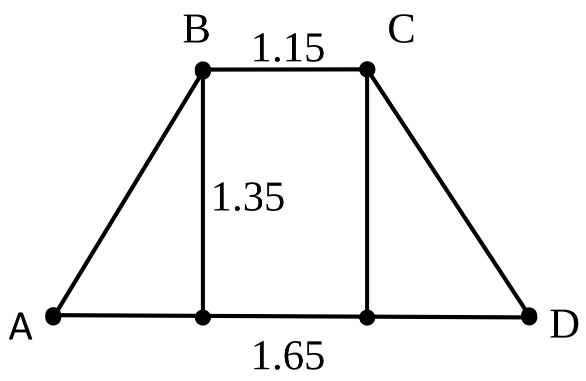
$$S = 14 \cdot 28 \cdot \sin 60° \approx 339.48$$

Answer: 339.48 cm^2.

Question

5. The vertical end of a trough, which is in the form of a trapezoid, has the following dimensions: width at the top is 1.65 meters, width at the bottom is 1.15 meters, and depth is 1.35 meters. Find the area of this section of the trough.

Solution



Area of trapezoid is given by

$$S = \frac{1}{2}(a+b) * h = \frac{1}{2}(1.15 + 1.65) * 1.35 = 1.89$$

Answer: 1.89 m^2.