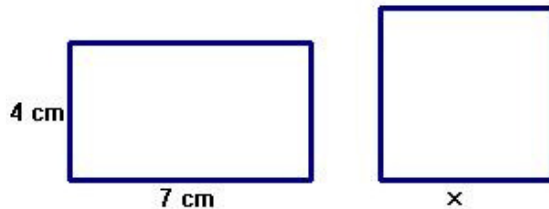GEOMETRY 2 (RIGHT TRIANGLES)

1. Calculate the area of a regular hexagon of side 12 cm.

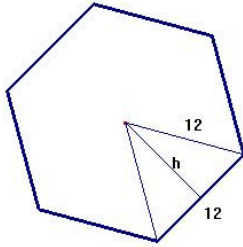2. The square and the rectangle have the same length diagonal. Find x.

4 cm

7 cm

x

3. A ship sails 20 km due north and then 35 km due east. How far it is from its starting point?

4. An isosceles triangle has sides 10 cm, 10 cm and 4 cm. Find the height of the triangle.

5. Find the area of the right triangle ABC

C

A   4 m   12 m   B
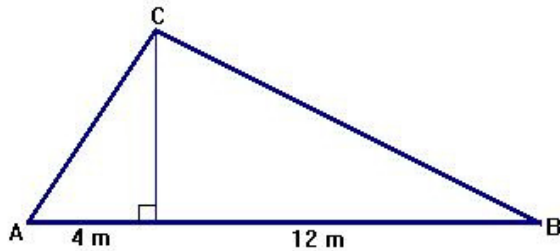
6. Find the length of the diagonal of a cube of side 3 dm.

7. The diagonal of a rectangle exceeds the length by 2 cm. If the width of the rectangle is 10 cm, find the length.

8. Find the height of a rectangular box of length 8 cm and width 6 cm, where the length of a diagonal is 11 cm.

9. If the height of a triangle is five inches less than the length of its base, and if the area of the triangle is 52 square inches, find the base and the height.

10. An equilateral triangle has a base of 7 m. What are the altitude, the area and the perimeter of the triangle?

SOLUTION

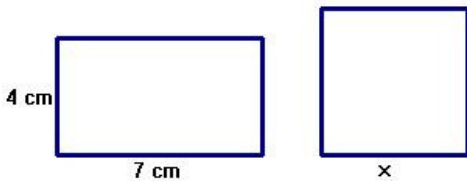1. Calculate the area of a regular hexagon of side 12 cm.

$$h^2 = 12^2 - 6^2 = 108 \rightarrow h = \sqrt{108} \text{ cm}$$

$$A_t = \frac{12 \cdot \sqrt{108}}{2} = 6\sqrt{108} \text{ cm}^2$$

$$A_h = 6 \cdot 6\sqrt{108} = 36\sqrt{108} \text{ cm}^2$$

2. The square and the rectangle have the same length diagonal. Find x.

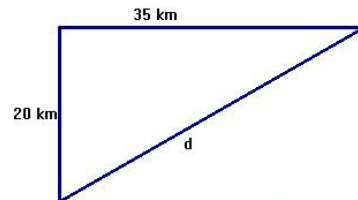$$d^2 = 4^2 + 7^2 = 65 \rightarrow d = \sqrt{65} \text{ cm}$$

$$d^2 = x^2 + x^2 = 2x^2 = 65$$

$$2x^2 = 65 \rightarrow x^2 = \frac{65}{2} \rightarrow x = \sqrt{\frac{65}{2}} \text{cm}$$

3. A ship sails 20 km due north and then 35 km due east. How far it is from its starting point?
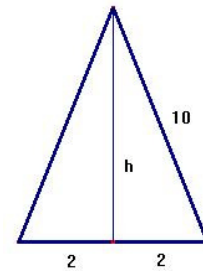
$$d^2 = 20^2 + 35^2 = 1625 \rightarrow d = \sqrt{1625}$$
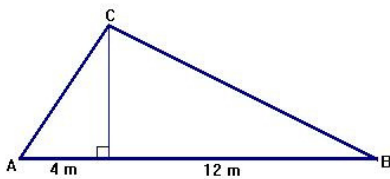
Distance from the starting point 40.3 km

4. An isosceles triangle has sides 10 cm, 10 cm and 4 cm. Find the height of the triangle.

$$h^2 = 10^2 - 2^2 = 96 \rightarrow h = \sqrt{96} = 4\sqrt{6} \text{ cm}$$
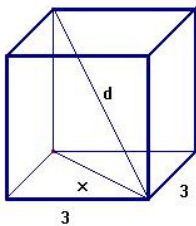

5. Find the area of the right triangle ABC

$$h^2 = 4 \cdot 12 = 48 \rightarrow h = \sqrt{48} = 4\sqrt{3} \text{ m}$$

$$A = \frac{b \cdot h}{2} = \frac{16 \cdot 4\sqrt{3}}{2} = 32\sqrt{3} \text{ m}^2$$

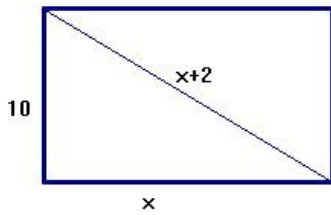6. Find the length of the diagonal of a cube of side 3 dm.

$$x^2 = 3^2 + 3^2 = 18 \rightarrow x = \sqrt{18}$$

$$d^2 = \sqrt{18}^2 + 3^2 = 18 + 9 \rightarrow d = \sqrt{27}$$

The diagonal is $3\sqrt{3}$ dm long

7. The diagonal of a rectangle exceeds the length by 2 cm. If the width of the rectangle is 10 cm, find the length.
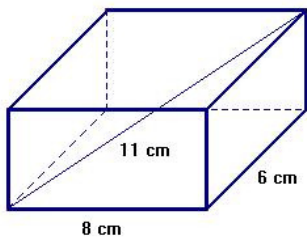
$$(x+2)^2 = x^2 + 10^2 \rightarrow x^2 + 4x + 4 = x^2 + 100$$

$$4x + 4 = 100 \rightarrow 4x = 96 \rightarrow x = 24$$

The length of the rectangle is 24 cm

8. Find the height of a rectangular box of length 8 cm and width 6 cm, where the length of a diagonal is 11 cm.
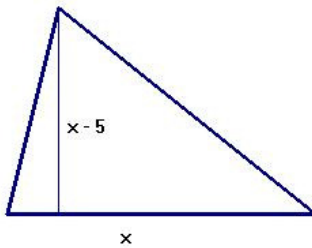
$$d^2 = 6^2 + 8^2 \rightarrow d^2 = 100 \rightarrow d = 10$$

$$11^2 = d^2 + h^2 \rightarrow 121 = 100 + h^2 \rightarrow h^2 = 21$$

$$h = \sqrt{21} \text{ cm}$$

9. If the height of a triangle is five inches less than the length of its base, and if the area of the triangle is 52 square inches, find the base and the height.
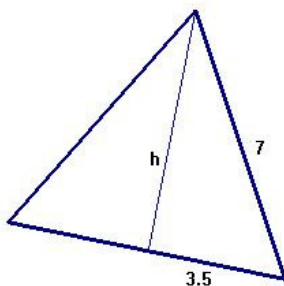
$$A = \frac{x(x-5)}{2} = 52 \rightarrow x^2 - 5x - 104 = 0$$

$$x = \frac{5 \pm \sqrt{25 + 416}}{2} = \frac{5 \pm 21}{2} = \begin{cases} 13 \\ -8 \end{cases}$$

Answer: base 13 inches and height 8 inches

10. An equilateral triangle has a base of 7m. What are the altitude, the area and the perimeter of the triangle?

$$7^2 = h^2 + 3.5^2 \rightarrow h^2 = 7^2 - 3.5^2 \rightarrow h^2 = 36.75$$

$$h = \sqrt{36.75} \text{ m}$$

$$A = \frac{7 \cdot \sqrt{36.75}}{2} = 21.21 \text{ m}^2$$