



Gymnázium, Brno, Slovanské nám. 7

WORKBOOK

<http://agb.gymnaslo.cz>



Subject: Mathematics

Student:

School year:/.....

Topic: Trigonometry

Angle orientation

Types of angles

90° **right angle** - pravý

less than 90° **acute angles** ("acute" meaning "sharp")- ostrý

90° and 180° **obtuse angles** ("obtuse" meaning "blunt") - tupý

180° **straight angles** - přímý

Draw: Convex angle

Non-convex angle



Úsečka - **line segment** is a part of a line that is bounded by two end points

Orientation of angle

positive angles if measured anticlockwise, and **negative angles** if measured clockwise

Size of an angle

half line = polopřímka

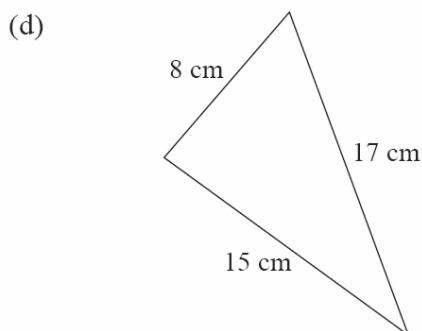
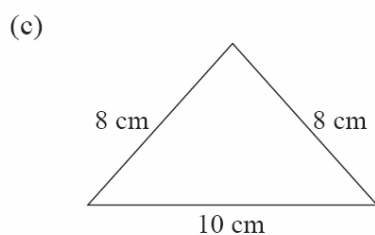
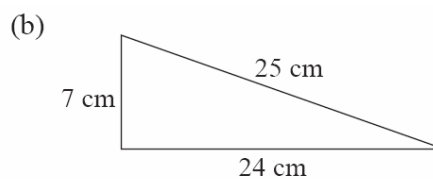
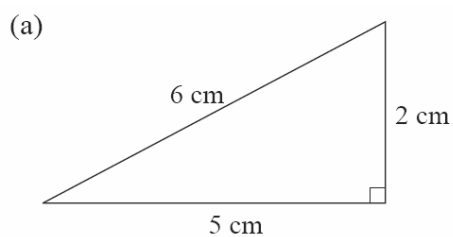
základní velikost úhlu *basic angle size* × velikost úhlu *angle size*

Draw some examples:

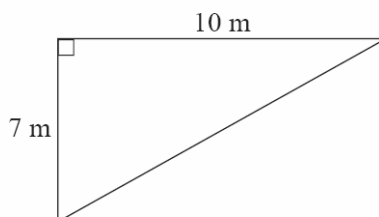
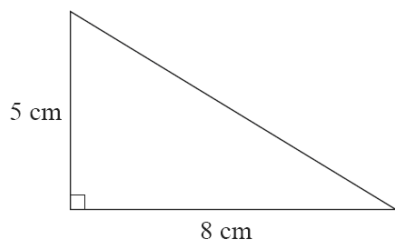
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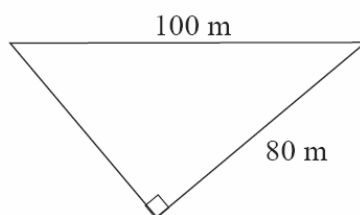
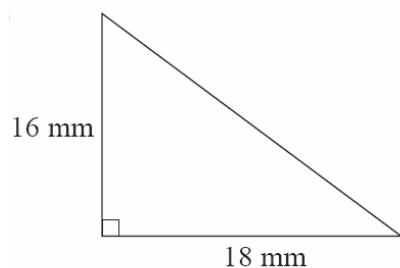
1. Decide whether each of the following triangles contains a right angle:



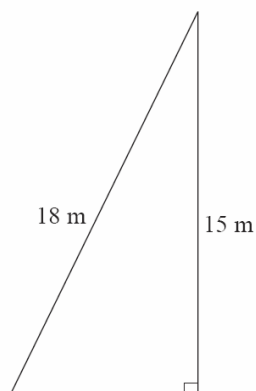
2. Calculate the length of the hypotenuse of each the following triangles, giving your answers correct to 1 decimal place:



3. Calculate the length of the unknown side in each the following triangles:



4. Calculate the perimeter of each the following triangles, giving your answers correct to 1 decimal place:



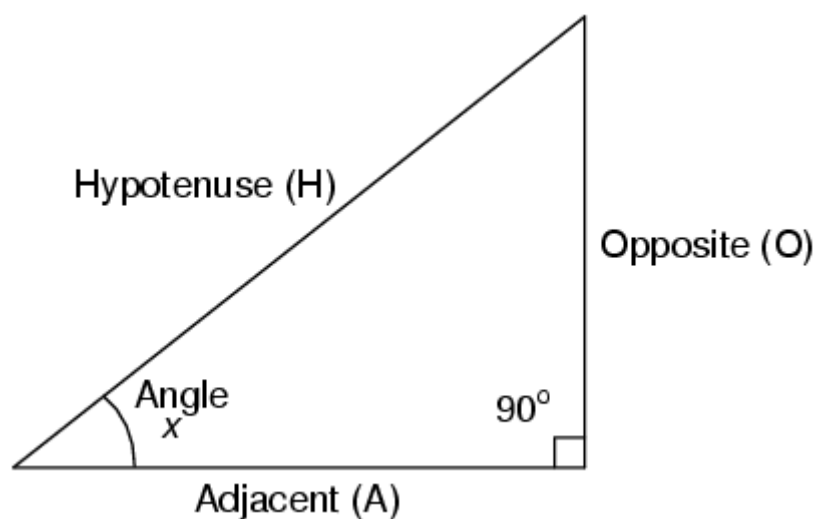
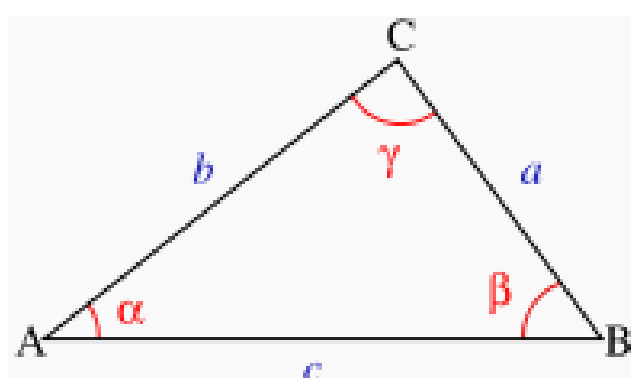
5. Rovnoramenný trojúhelník ABC má ramena délky $a = b = 9,1$ cm a výška k základně je $v = 8,4$ cm. Vypočítejte délku základny c .
- $c = 7$ cm
6. Délky stran obdélníku jsou v poměru 5:12 a obvod obdélníku je 238 cm. Vypočítejte délku úhlopříčky.
- přibl. 90 cm
7. Vypočítejte délku strany kosočtverce, jehož úhlopříčky mají délky $e = 96$ cm, $f = 40$ cm.
- $a = 52$ cm

Right-angle triangle

- Solve sides and size of acute (=sharp) angles in a right-angle triangle ABC (the longest side – hypotenuse is AB)
 - $c = 35$ m, $b = 20$ m
- Solve sides and size of acute (=sharp) angles in a right-angle triangle ABC (the longest side – hypotenuse is AB)
 - $a = 15$ cm, $\beta = 42^\circ$
- Solve sides and size of acute (=sharp) angles in a right-angle triangle ABC (the longest side – hypotenuse is AB)
 - $b = 18$ dm, $\beta = 33^\circ$

4. Solve sides and size of acute (=sharp) angles in a right-angle triangle ABC (the longest side – hypotenuse is AB)
- a. $a = 5,8 \text{ dm}$, $\alpha = 37^\circ 30'$

Sine, cosine and tangent



The **sine** of an angle is the ratio of the length of the opposite side to the length of the hypotenuse. In our case

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{a}{h}$$

Note that this ratio does not depend on the particular right triangle chosen, as long as it contains the angle A , since all those triangles are similar.

The **cosine** of an angle is the ratio of the length of the adjacent side to the length of the hypotenuse. In our case

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{b}{h}$$

The **tangent** of an angle is the ratio of the length of the opposite side to the length of the adjacent side. In our case

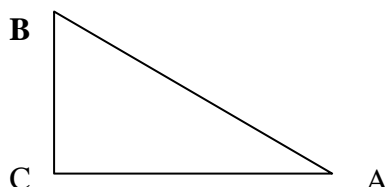
$$\tan A = \frac{\text{opposite}}{\text{adjacent}} = \frac{a}{b}$$

The acronym "SOH-CAH-TOA" is a useful mnemonic for these ratios.

Solution of a right-angled triangle

Given one angle and one side

The hypotenuse of right-angle triangle is 18,1 cm and one of the angles is 32° . Find the other sides. [9,59 and 15,3 cm]



In the triangle ABC, angle $\alpha = 28^\circ$ and $a = 8\text{cm}$. Find b and c , given that the angle $\gamma = 90^\circ$. [17,0 and 15,0 cm]

Exercises:

Find the other sides of the triangle given that angle $\beta = 90^\circ$.



1. $a=13,6$ cm, $\alpha=72^\circ$
2. $b=4,7$ cm, $\alpha=62^\circ$
3. $c=8,3$ cm, $\gamma=20^\circ 40'$
4. $b=12$ m, $\gamma=28^\circ 32'$
5. $c=22,6$ cm, $\alpha=30^\circ$

Given two sides

Given that angle $\gamma=90^\circ$ $b=18,1$ cm and $c=15,0$ cm, find the angle α .

[$34^\circ 2'$]

Given that angle $\gamma=90^\circ$ $a=8,1$ cm and $c=7,9$ cm, find the angle α .

[$47^\circ 12'$]

Exercises:

Find the angles of the following triangle, given that angle $\beta=90^\circ$.

1. $a=12,6$ cm, $b=18,0$ cm
2. $a=2,4$ cm, $c=3,2$ cm
3. $b=7,2$ cm, $c=2,43$ cm
4. $a=8,2$ cm, $b=9,1$ cm
5. $c=24,6$ cm, $b=28,3$ cm

The isosceles triangle

To solve an isosceles triangle of given sides, draw the perpendicular from vertex to the opposite side

Find the angles of the triangle ABC, given that $a=8,2$ cm, $b=8,2$ cm and $c=9,6$ cm
[$54^\circ 10'$ and $71^\circ 40'$]

