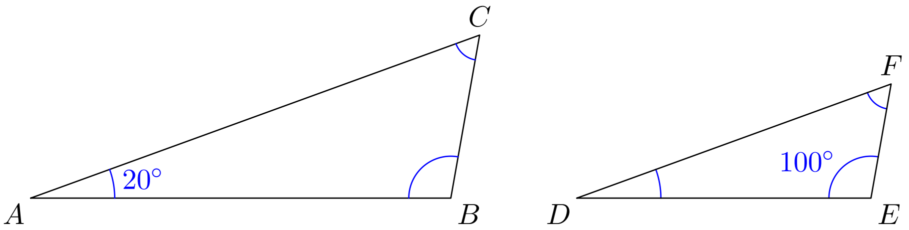
Exercises for Chapter 0

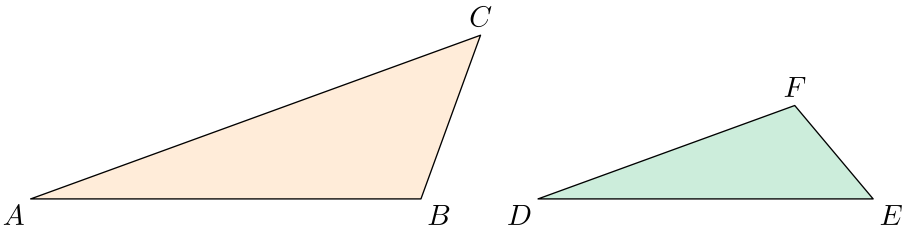
0.1.1

The triangles are similar. Find the value of $\angle ACB$.



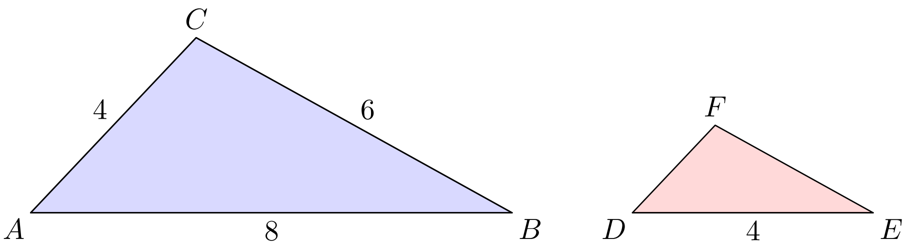
0.1.2

The triangles are similar. Find the three pairs of corresponding sides.



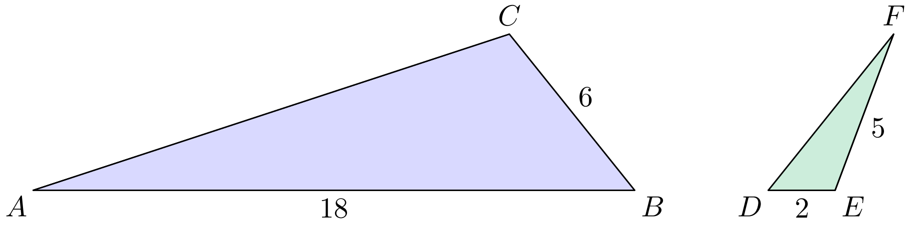
0.1.3

The triangles are similar. Find the length of EF and the length of DF.



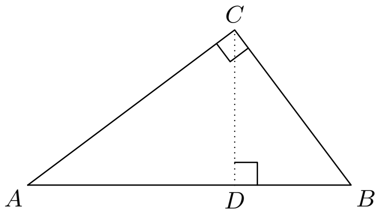
0.1.4

The triangles are similar. Find the length of AC and the length of DF.



0.1.5

Find all the similar triangles defined by A, B, C og D.

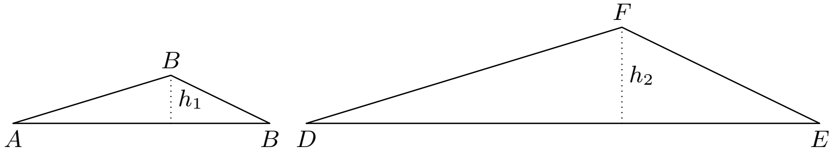


0.1.6

$\triangle ABC$ and $\triangle DEF$ are similar.

a) What is the ratio of the area of $\triangle DEF$ to the area of $\triangle ABC$ if $h_1 = 2$ and $h_2 = 6$?

b) Given a number a. What is the ratio of the area of $\triangle DEF$ to the area of $\triangle ABC$ if $h_2 = ah_1$?



0.1.7

En kjegle has radius 10 and height 4.

a) Find the surface area of the cone.

b) Find the volume of the cone.5

0.1.8

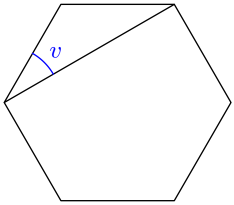
a) Two spheres have radii 2 and 6, respectively. What is the ratio of the volume of the larger sphere to the volume of the smaller sphere?

b) A sphere has radius r, and a another sphere has radius ar, where $a > 1$. What is the ratio of the volume of the larger sphere to the volume of the smaller sphere?

Gruble 1

(GV21D1)

The polygon is a regular[1] hexagon. Find the value of v.

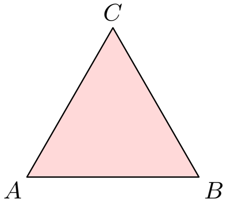


Gruble 2

Given an isosceles triangle $\triangle ABC$, with $AC = BC$. Prove that[2] the bisector of $\angle ACB$ is the perpendicular bisector of AB.

Gruble 3

$\triangle ABC$ is equilateral and have sides of length s.



a) Prove that in a triangle with angles $30°$, $60°$, $90°$, the hypotenuse i twice as long as the shortest leg.

b) Prove that the height of $\triangle ABC$ is $\frac{\sqrt{3}}{2}s$.

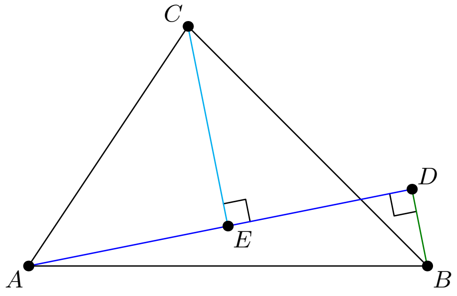
[1]Regular polygons have sides of equal length.

[2]The definition of the bisector of an angle and the perpendicular bisector of a segment is found in TM1.

Gruble 4

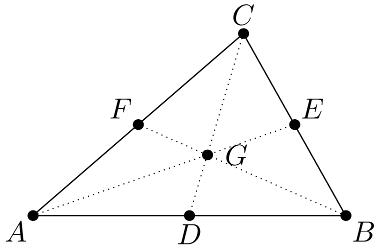
Prove that the double area of $\triangle ABC$ can be written as

$$AE \cdot BD + CE \cdot AD$$



Gruble 5

A **median** of a triangle is a segment joining a vertex to midpoint of the opposite side.



Given $\triangle ABC$ with medians AE, BF and CD.

a) Prove that AE, BF and CD intersect at exactly one point (G in the figure).

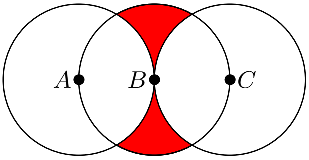
b) Prove that

$$\frac{GC}{DG} = \frac{GB}{FG} = \frac{GA}{EG} = 2$$

Note: Part b) is probably easier than part a).

Gruble 6

The tree circles have radius 2, and A, B and C lie on the same line. Find the area of the red surface.

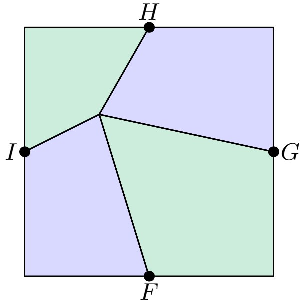


Hint: You could get use of the fact that a sector with angle v makes up $\frac{a}{360^\circ}$ of the area of a circle with equal radius.

Gruble 7

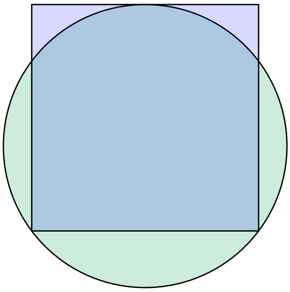
The colored surfaces makes up a square, and F, G, H and I are, respectively, the square's midpoints.

Prove that the area of the blue surface equals the area of the green surface.



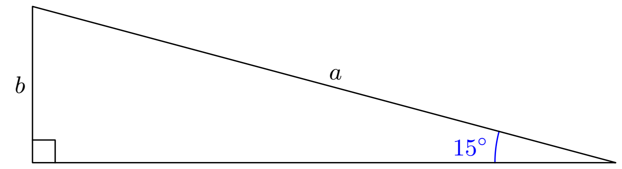
Gruble 8

The square has sides of length 4. Find the radius of the circle.



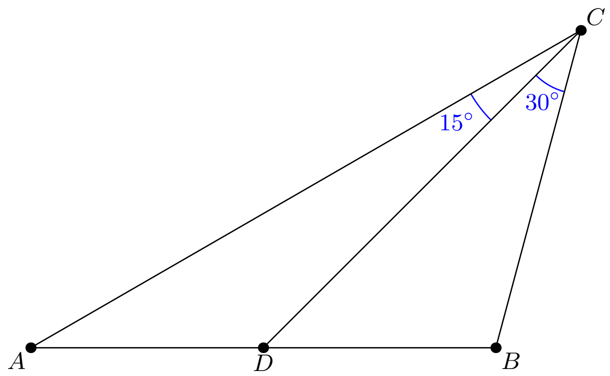
Gruble 9

a) Prove that $\frac{a}{b} = \sqrt{2} + \sqrt{6}$.



Note: To solve this problem you may (bot far from necessarily) need the *abc*-formula found in TM1.

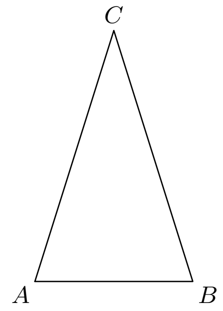
b) $AD = BC$. Find the value of $\angle A$.



Gruble 10

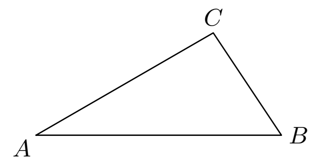
Note: This exercise deals with results that at first seems obvious, but turns out rather har to prove.

a) Prove that if $AC = BC$, then $\angle A = \angle B$.



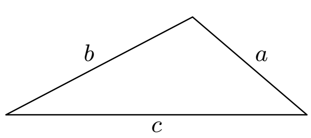
Note: Earlier on, we have declared that an isosceles triangle has two equal angles, but strictly we have to prove it.

b) Prove that if $AC > BC$, then $\angle B > \angle C$.



c) Given $\triangle ABC$, where AB is the longest side. Prove that when AB is the base, the height lies inside the triangle.

d) In the figure below, c is the longest side of the triangle.



Prove that

$$c > a + b \qquad , \qquad b + c > a \qquad , \qquad a + c > b$$

Note: These three inequalities are called the **triangle inequality**.