A research problem: Euler bricks **Math21a, Fall 2006, Oliver Knill**

An **Euler brick** is a cuboid of dimensions a,b,c such that the face diagonals are integers.

One can construct Euler bricks as follows: If $u^2 + v^2 = w^2$, then

$$(a, b, c) = (u(4v^2 - w^2), v(4u^2 - w^2), 4uvw)$$

leads to an Euler brick.

For example $(a, b, c) = (240, 117, 44)$ leads to an Euler brick.

If also the space diagonal is an integer, an Euler brick is called a **perfect cuboid**.

It is an open mathematical problem, whether a perfect cuboid exists. Nobody has found one, nor proven that it can not exist. One has to find integers (a, b, c) such that

$$\sqrt{a^2 + b^2}, \sqrt{a^2 + c^2}, \sqrt{b^2 + c^2}, \sqrt{a^2 + b^2 + c^2}$$

are integers.

The figure shows an old Swiss 10 Frank bill, which featured Leonard Euler (1707-1783).

Problem: you are in front of a mirror and you want to see as much as possible of yourself. What is better: beeing close to the mirror, being far away from the mirror, or does it not matter at all?