Reconstructing Half of "*Mona Lisa*"
or...
Extra Construction Problems in Geometry

Berkeley Math Circle – Beginners I-II

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OVERARCHING PROBLEMS

(1) **(Three Squares)** Three identical squares with bases AM, MH, and HB are put next to each other to form a rectangle $ABCD$. Find the sum of the angles $\angle AMD + \angle AHD + \angle ABD$ and prove that your answer is correct.

(2) **(∞-many Squares)** Same problem as above but for infinitely many squares.

(3) **(Farmer and Cow)** During a hot summer day, a farmer and a cow find themselves on the same side of a river. The farmer is $2\,\mathrm{km}$ from the river and the cow is $6\,\mathrm{km}$ from the river. If each of them would walk straight to the river, they would find themselves $4\,\mathrm{km}$ from each other. Unfortunately, the cow has broken its leg and cannot walk. The farmer needs to get to the river, dip his bucket there, and take the water to the cow. To which point on the river should the farmer walk so that his total walk to the river and then to the cow is as short as possible? Prove your claim.

(4) **(Pythagorean Theorem)** Prove that the sum of the squares of the legs in a tight triangle equals the square of the hypotenuse.