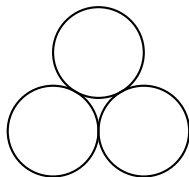
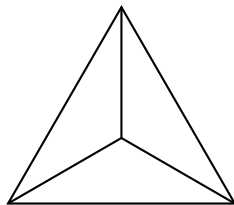


- (1) List five different triplets of numbers that satisfy the Pythagorean theorem.
- (2) Find the altitude and the area of an equilateral triangle of side length 4.
- (3) Find the area and diagonal length of a square with side length 4.
- (4) A regular hexagon is inscribed in a circle of radius 6. Find the area of the hexagon.
- (5) Find the length of the longest diagonal of a cube with side length 2.
- (6) Three congruent circles of radius 3 cm are stacked as shown. Find the total height of the stack.



[Hint: Consider the equilateral triangle formed by connecting the centers of the circles.]

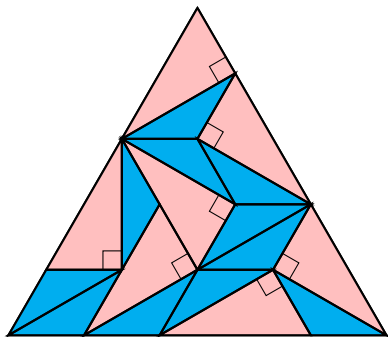
- (7) It is easy to cut an equilateral triangle into three congruent triangles:



Give an example of a *scalene* triangle (all three sides have different lengths and all three interior angles have different measures) that can be divided into three *congruent* triangles.

[Hint: We talked about this triangle in class (a special one, from our Pythagorean theorem discussion)!]

- (8) In trapezoid $ABCD$ with bases AD and BC , $\angle A = 90^\circ$ and $\angle D = 45^\circ$. It is known that $AB = 10$ cm and $AD = 3BC$. Find the area of the trapezoid.
- (9) In right triangle ABC , BC is the hypotenuse. Draw altitude AD perpendicular to BC , with D on BC . If $BC = 13$ and $AB = 5$, find the length of AD .
- (10) An equilateral triangle is made up of congruent right (pink) triangles and congruent isosceles (blue) triangles as shown in the figure below. What is the area of the equilateral triangle if the area of a blue triangle is 1? It's ok to just explain how you could, in principle, measure the area + why it works.



- (11) Can a 3×8 rectangle be placed inside a 5×6 rectangle?
[Hint: What is the longest segment that can fit inside a 5×6 rectangle?]
- (12) (Challenge) The hypotenuse of a right-angled triangle (on a standardized test) is 10 inches, and the altitude dropped to it is 6 inches. Find the area of the triangle. Some kids gave 30 square inches as the answer, right away. But none of the SchoolNova students could solve it! Why not?
- (13) (Challenge) Let AH be an altitude of triangle ABC , and let M be a point on AH . Prove that
- $$AB^2 - AC^2 = MB^2 - MC^2.$$
- [Hint:** Express AB , AC , MB , and MC using Pythagorean Theorem, and compute the right and left hand sides of the identity you have to prove.]