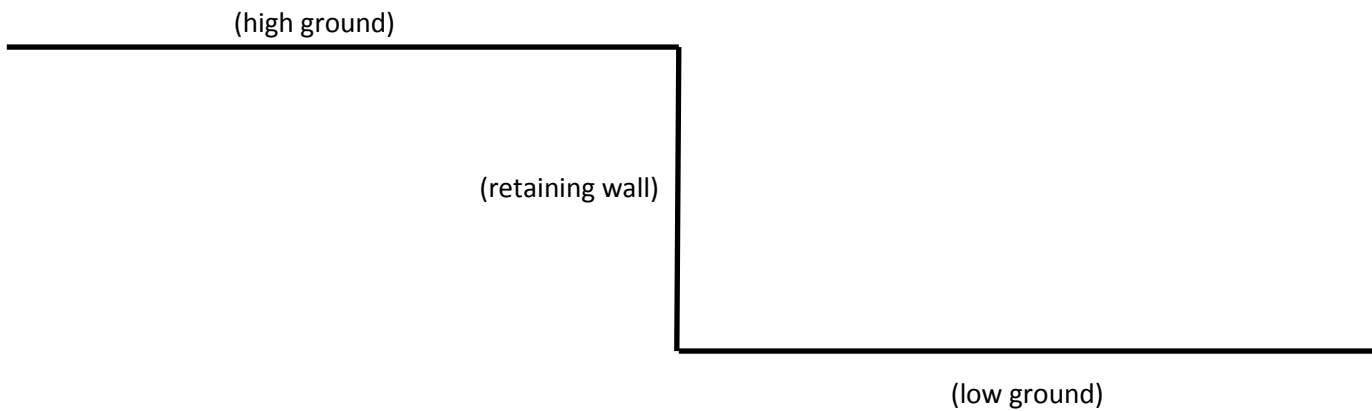Math Geometry Unit 2 Task 1

The need of the school is to place a single staircase joining the low ground to the high ground. Currently there is a retaining wall separating the two grounds (see side view below). The distance between grounds will be given to you by your teacher.

(high ground)

(retaining wall)

(low ground)

According to the Stairway Manufactures Association (SMA), the maximum rise of a stair is 7.75 inches (photo 6) while the minimum depth is 10 inches (photo 8).

MAXIMUM
RISE
7-3/4"

PHOTO 6

MINIMUM DEPTH
10"

PHOTO 8
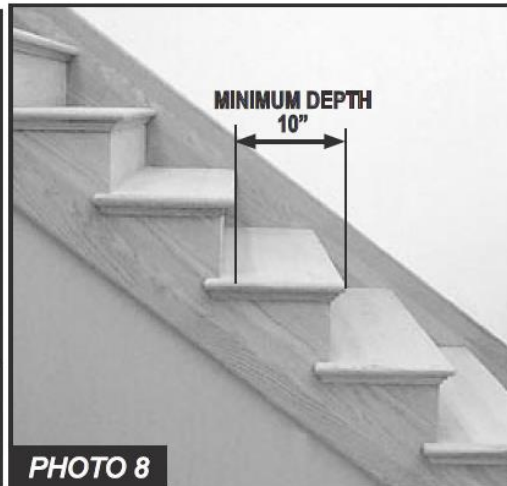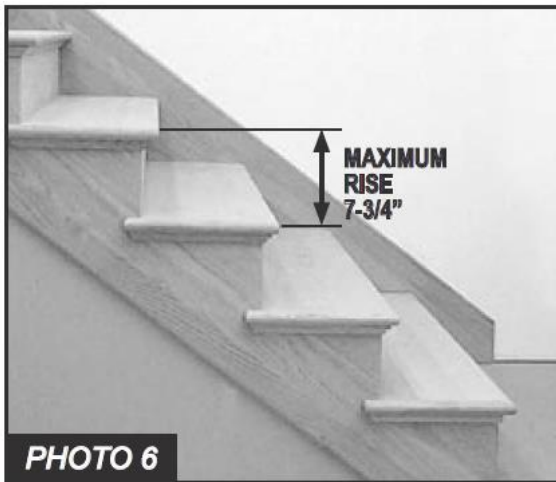
1. Given a retaining wall height specified by your teacher and using the SMA specifications, what is the minimum distance from the retaining wall the staircase must start?

2. On the diagram above, place the point where the staircase must start. Next, using a straight edge, draw a line segment joining the start of the staircase to the end of the staircase on the high ground. You should now have a right triangle, which will be referred to as "overall triangle" whose legs will be referred to as "retaining wall" and "low". Using the Pythagorean Theorem, determine the hypotenuse of your triangle.
3. In reference to the triangle in part 2, use a trigonometric ratio to find the angle of elevation of the staircase. (Show all work)
4. Repeat part 3 using a different trigonometric ratio. (Show all work)
5. Now consider the first stair of the entire staircase (see detailed side view below)

height
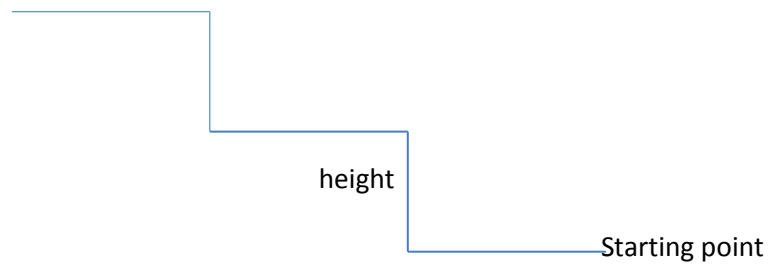
Starting point

Draw a line segment from the starting point to the top of the first stair. You should now have a right triangle which will be referred to as "first stair triangle". Prove that the "first stair triangle" is similar to the "overall triangle" in part 2.

6. Next, consider in a similar method in part 5, the right triangle formed by the second stair, referred to as "second stair triangle". Prove that the "first stair triangle" is congruent to the "second stair triangle". Find the trigonometric ratios associated with the "first stair triangle". How do these ratios compare to those of the "overall triangle"?