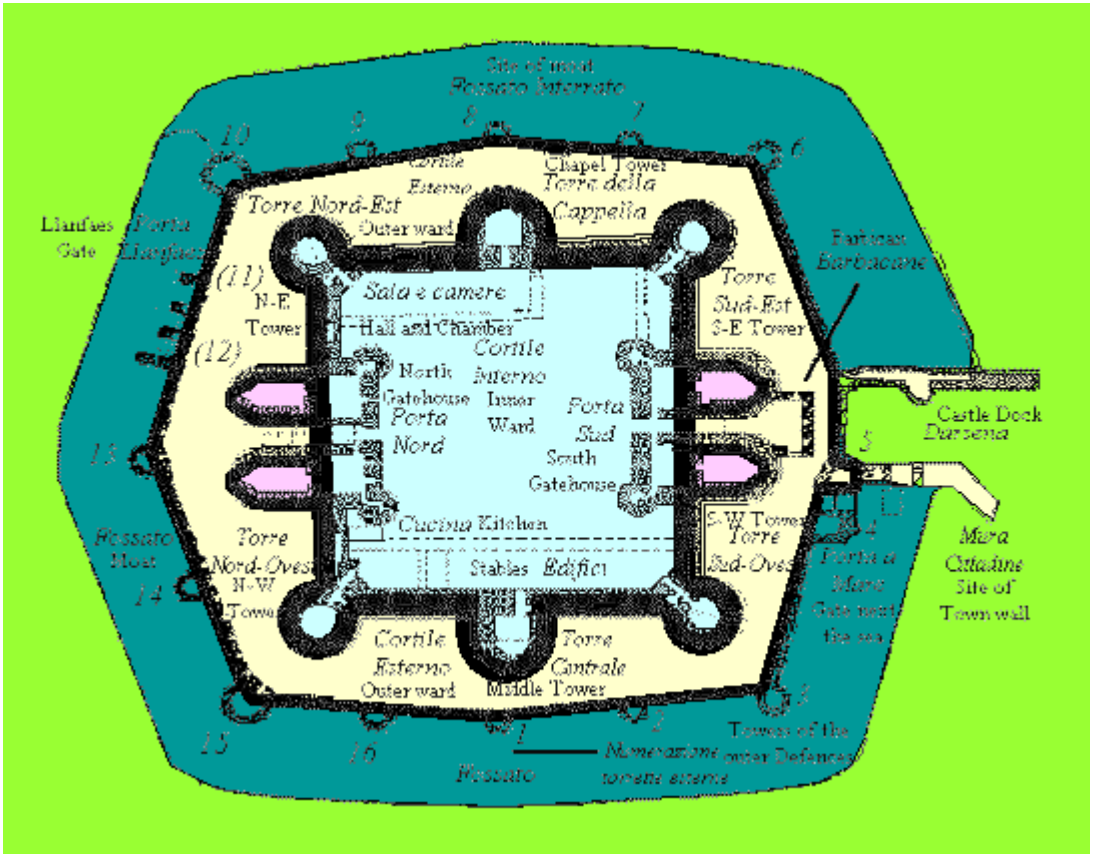
Walls of Rock

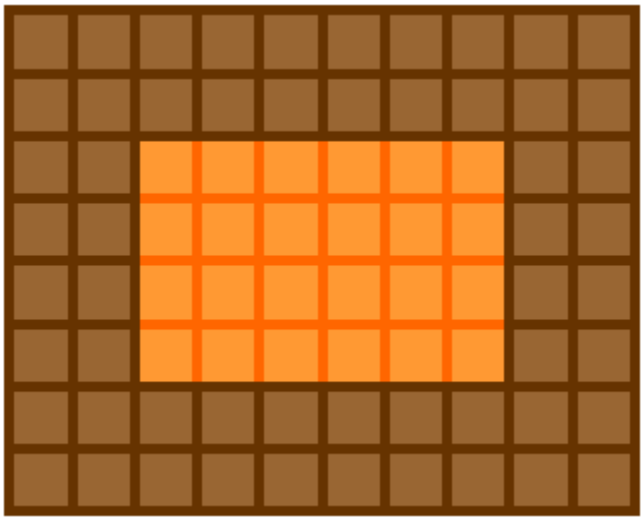
Beaumaris castle in Wales was the largest of the Welsh castles built by King Edward I (r. 1272-1307) Construction began in 1295, but was never completed according to the original plans.



Medieval castles like Beaumaris were often built with a roughly rectangular design.

Generally, a larger area was worth protecting with thicker walls, so the larger castles tend to have thicker walls.

Below, a castle's courtyard of area 24 meters squared is protected by rock walls of thickness 2 meters. The walls cover 56 meters squared.



Is it possible for the area of the rock walls to equal the area of the castle's courtyard if the thickness of the castle walls is constant?

Extensions:

- Is there more than one such castle?
- Is there a solution for any thickness of wall?
- Is there a solution for any ratio of length to width?
- If you know the perimeter of the castle and the thickness of the walls, can you calculate the area of the courtyard?

3D Extension:

- Design and solve similar problems for a space station.

The Math in This Problem:

The Walls of Rock puzzle proposes the problem of constructing a large castle, including thick walls as well as a big courtyard area. Using the knowledge they have of areas and other mathematical operations, students are challenged to find a way to reconstruct the castle to have the two areas equal, while keeping the thickness of the walls constant.