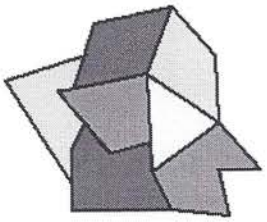
Tessellations

What are tessellations?

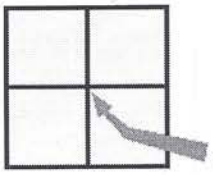
Basically, a tessellation is a way to tile a floor (that goes on forever) with shapes so that there is no overlapping and no gaps. Remember the last puzzle you put together? Well, that was a tessellation! The shapes were just really weird.

Example: 

We usually add a few more rules to make things interesting!

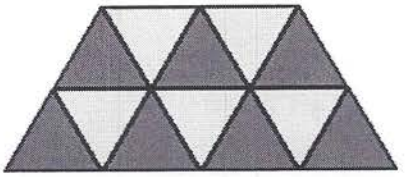
REGULAR TESSELLATIONS:

- RULE #1: The tessellation must tile a floor (that goes on forever) with no overlapping or gaps.
- RULE #2: The tiles must be regular polygons - and all the same.
- RULE #3: Each *vertex* must look the same.

What's a vertex?  where all the "corners" meet!

What can we tessellate using these rules?

Triangles? Yep!

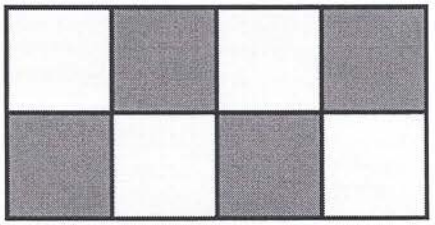


Notice what happens at each vertex!

The interior angle of each equilateral triangle is 60 degrees.....

60 + 60 + 60 + 60 + 60 + 60 = 360 degrees

Squares? Yep!



What happens at each vertex?

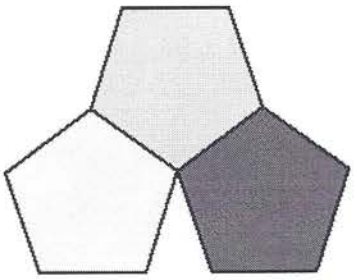
90 + 90 + 90 + 90 = 360 degrees again!

So, we need to use regular polygons that add up to 360 degrees.

Will pentagons work?

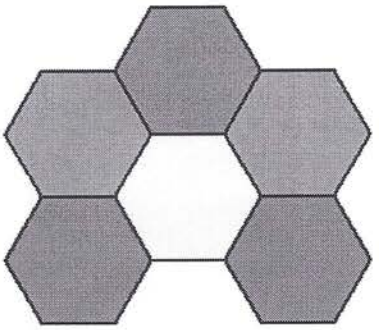
The interior angle of a pentagon is 108 degrees. . .

108 + 108 + 108 = 324 degrees . . . Nope!



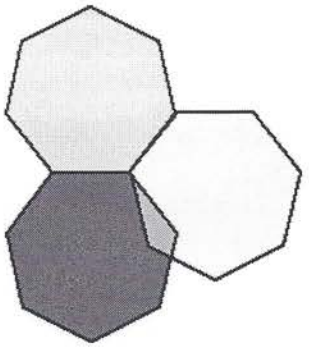
Hexagons?

120 + 120 + 120 = 360 degrees Yep!



Heptagons?

No way!! Now we are getting overlaps!



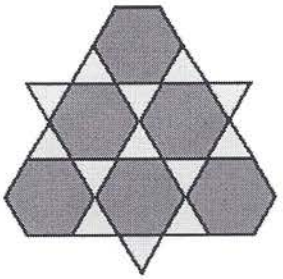
Octagons? Nope!

They'll overlap too. In fact, all polygons with more than six sides will overlap! So, the only regular polygons that tessellate are triangles, squares and hexagons!

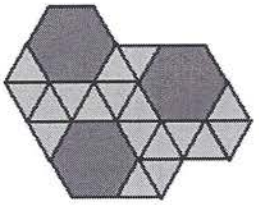
SEMI-REGULAR TESSELLATIONS:

These tessellations are made by using two or more different regular polygons. The rules are still the same. Every vertex must have the exact same configuration.

Examples:



3, 6, 3, 6



3, 3, 3, 3, 6

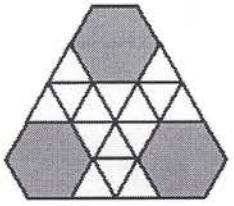
These tessellations are both made up of hexagons and triangles, but their vertex configuration is different. That's why we've named them!

To name a tessellation, simply work your way around one vertex counting the number of sides of the polygons that form that vertex. The trick is to go around the vertex in order so that the smallest numbers possible appear first.

That's why we wouldn't call our 3, 3, 3, 3, 6 tessellation a 3, 3, 6, 3, 3!

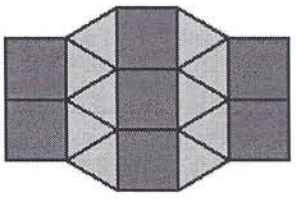
Here's another tessellation made up of hexagons and triangles.

Can you see why this isn't an official semi-regular tessellation?

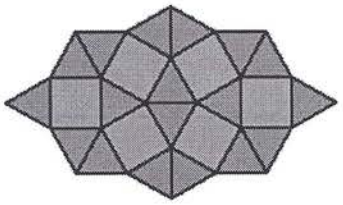


It breaks the vertex rule! Do you see where?

Here are some tessellations using squares and triangles:

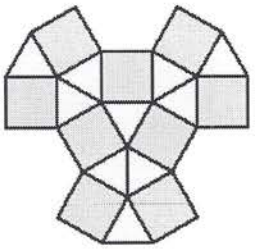


3, 3, 3, 4, 4

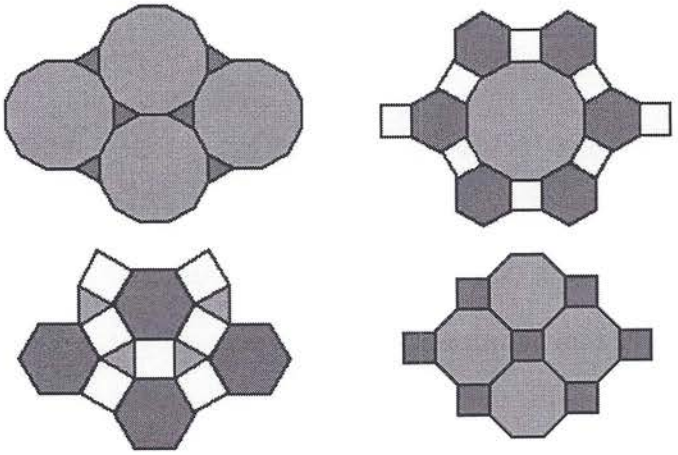


3, 3, 4, 3, 4

Can you see why this one won't be a semi-regular tessellation?



MORE SEMI-REGULAR TESSELLATIONS



What others semi-regular tessellations can you think of?