

Agenda:

1. Return exams. Discuss solutions.
2. Wrap up Sec. 4.1 Semi-regular tilings.
3. Move into Sec. 4.2 Irregular tilings.

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Wrap up 4.1 - Regular and Semi-regular

What are the eight semi-regular tilings?

- Show student sketches of some of these.

regular tilings:

3.3.3.3.3.3

4.4.4.4

6.6.6

semi-regular tilings:

3.3.3.3.6

3.3.3.4.4 or 3.3.4.3.4

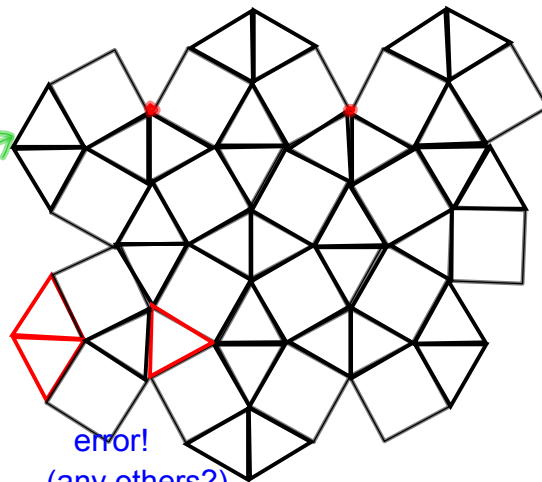
3.4.6.4

3.6.3.6

4.8.8

3.12.12

4.6.12



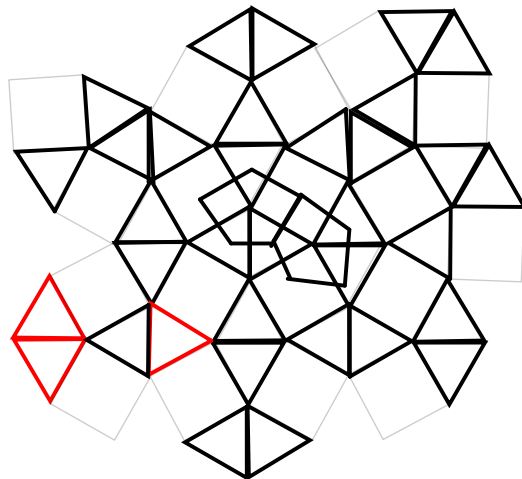
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Vertex Configurations for Possible Tilings (p. 88)

Symbol:	# Polygons	Comment
X 3.3.3.3.3.3	6	#3
☺ 3.3.3.3.6	5	#7 (lots of triangles)
☺☺ 3.3.4.4	5	#7
X 4.4.4.4	4	#1
☺ 4.4.3.6 = 3.6.4.4 ⊗ + try 3.4.6.4	4	#8
☺ 6.6.3.3 → 3.6.3.6	4	#8 (remember rule 3)
X 3.3.4.12 → 3.3.6.6	4	#8
X 6.6.6	3	#1
☺ 4.8.8	3	from text
X 3.7.42	3	#9
☺ 12.12.3	3	#9a
X 5.5.10 ← 10.5.5	3	#9a (contain duplicate polygons)
X 4.5.20	3	#9b
☺ 4.6.12	3	#9b (contain a square)
X 3.9.18	3	#9c
X 3.8.24	3	#9c
X 3.10.15	3	#9c (contain one equilateral triangle)

Oct 2-1:55 PM

Review #20-25 on dual tilings.



24. Why must the dual tiling always have only one type of polygon?

25. Which tilings have duals formed by triangles? squares? pentagons? Give a rule for the type of polygon in the dual.

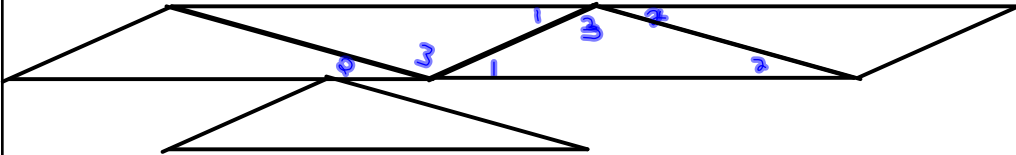
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3.2 - Irregular Tilings

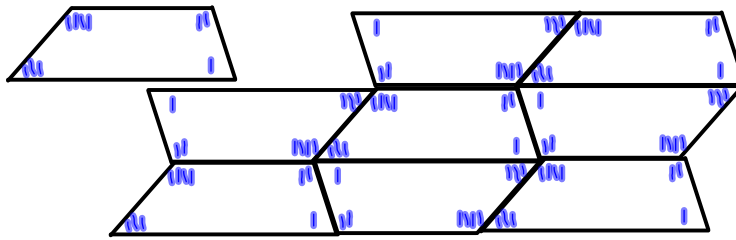
Irregular tilings do not have restrictions about the type of tile used. They may be irregular polygons, for example.

Warm-up: Verify the following conjectures:

- Any triangle can be used to tile the plane.



- Any trapezoid can be used to tile the plane.



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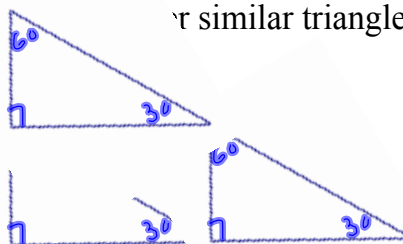
Definition: A reptile is a tile that can be arranged to form a larger copy of itself.

(Homework: #4-8.)

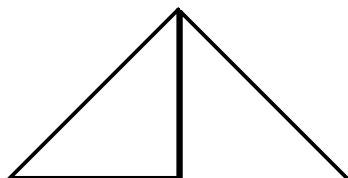
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Try #6 and #7 now.

- Show that this 30° right triangle is a reptile by putting three or similar triangle.



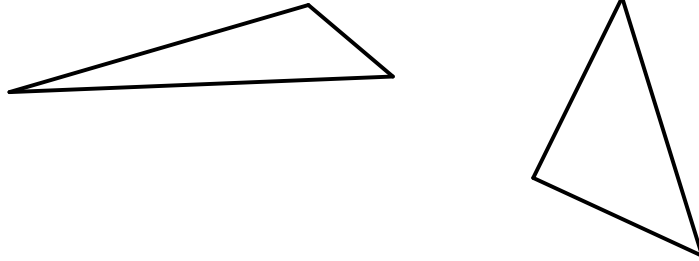
- There is only one triangular reptile such that two repeats of the original forms a larger similar one. Which triangle is this?



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Example: Show that every parallelogram is a reptile.

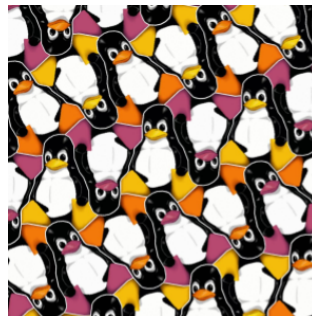
Example: Is every triangle a reptile? Explain.



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Irregular tilings are formed by repeating figures (not necessarily regular, and not necessarily polygons) in the plane.

M.C. Escher was famous for this. (Not all of the following are Escher's!)



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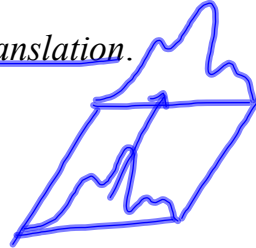
The simplest Escher tiling is based on a square, rectangular, parallelogram, or regular hexagon grid.

- (It exploits the fact that opposite sides are parallel)

1. Start with your base unit, cut it out, and use it to trace a light grid on your paper.

2. Now modify your base unit using a parallel translation.
(See pp. 97-98).

3. Trace your modified unit onto your grid.



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Another Escher-style tiling is formed by using a *glide reflection*.

1. Start with a rectangle as your base unit, cut it out, and use it to trace a light grid on your paper.

2. Now modify your base unit using a *glide reflection*.
(See pp. 99-100). Try glide reflections on both sides.



3. Trace your modified unit onto your grid. You'll need to flip it every other turn to make it fit.

Explore: Could you make a tiling by performing a glide reflection using a parallelogram as your base unit? Try it!

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How was the following Escher tiling formed?



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A third Escher-style tiling is formed by using a *midpoint rotations*.
(see p. 101)

A fourth method is to use *side rotations*.
(see. p. 102)

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For the rest of class, create a piece of art that utilizes some of the techniques we have discussed.

Requirements:

- Your tiling should be artistic.
- You must write a paragraph describing how you transformed your base unit using the methods we have discussed.
- Explore before starting: think about the type of tiling you want to create.

You will present your tiling at the beginning of class on Thursday.

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Summary:

Basic "moves" in Escher art:

- Parallel translation
- Glide reflection
- Midpoint rotation
- Side rotation

Portfolio option:

Present a discussion of the *Conway Criterion*
(p. 106-107, Exercises #20-27)

Homework: (you will have done some of these already)

#1-8

#10, 13, 15

#16-18

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