Problem

Using exactly 12 toothpicks joined together with marshmallows (or licorice bits), how many skeletons of geometric solids can you make? Toothpicks cannot be broken, but two or more toothpicks may be joined to create edges longer than one toothpick, (——●——●——). Sketch each polyhedron skeleton you design. What are the names of your polyhedrons?

Extension :
Make ten different skeletons of polyhedrons using fewer than 12 toothpicks. Name your polyhedrons.

Hints

Hint 1 - What skeletons can you make with a square base?

Hint 2 - What skeletons can you make with a triangular base?

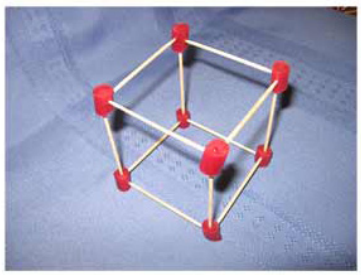
Hint 3 - Can you make a skeleton with a pentagonal base using exactly 12 toothpicks?

Hint 4 - Can you make a skeleton with a hexagonal base? Why, or why not?

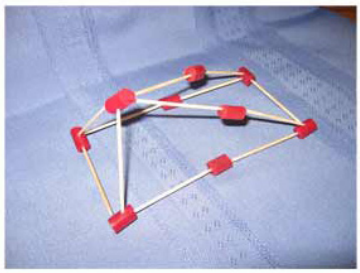
Suggestion: This activity is best done by supplying students with an ample quantity of toothpicks and mini-marshmallows or licorice bits, and letting them construct the skeletons. Note that it will occupy at least one full math period!

Solution

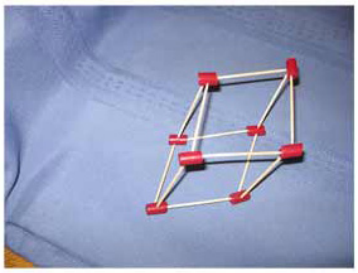
Many polyhedrons are possible. Six actual constructions using licorice vertices are shown in the photos below.



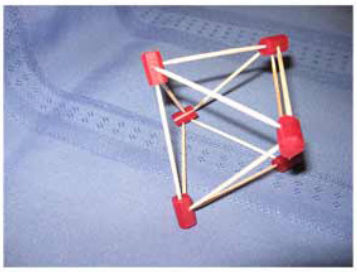
Cube



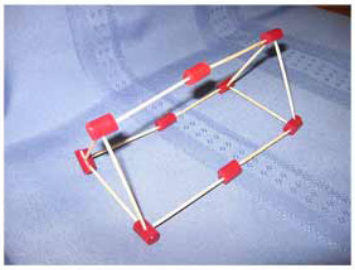
Rectangular- based pyramid



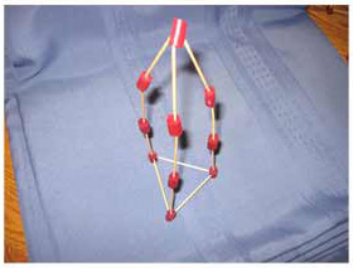
Rhombohedron



Octahedron

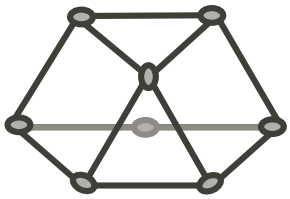


Triangular prism

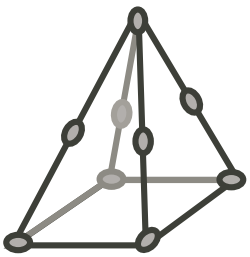


Triangular-based pyramid

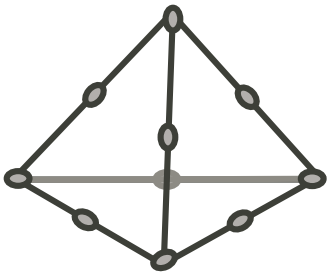
Three others are:



You name it!

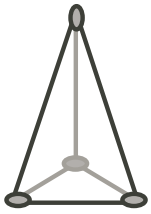


Square-based Pyramid

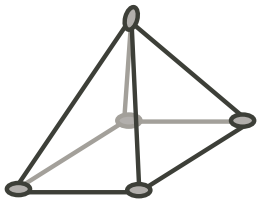


Tetrahedron

Extension:
Again, many are possible. Here are a few; proof is by construction. Some don't have common names; students can have fun inventing names.



6



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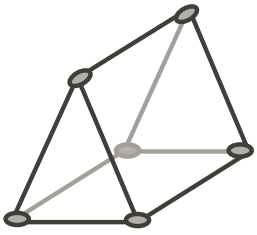
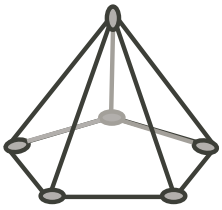


9



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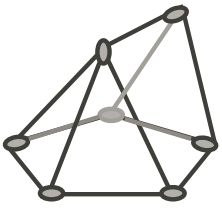

11