

Problem

- a) Make a list of all the factors of 24. How many different triangles can be formed using any three of these numbers as the side lengths?
- b) Write a sentence explaining why not all combinations of any three numbers from your list in a) will form a triangle.



Hints

Hint 1 - Can you form a triangle with sides of lengths 2, 3, and 6? Why or why not?

Suggestion: Supply students with about 30 toothpicks each, with a single toothpick having unit length, and suggest they try to form the triangles.

Solution

a) The factors of 24 are 2, 3, 4, 6, 8 and 12. Thus the five combinations which can form triangles are $\{2, 3, 4\}$, $\{3, 4, 6\}$, $\{3, 6, 8\}$, $\{4, 6, 8\}$ and $\{6, 8, 12\}$.

b) The key idea is that the sum of the lengths of any two sides must be greater than the third side.

For example, $\{2, 4, 6\}$ can't form a triangle because $2 + 4 = 6$, so the sides $\frac{2 \cdot 4}{6}$ do not

'contain' any area. Similarly for the set $\{2, 8, 12\}$, $2 + 8 = 10 < 12$ $\frac{2 \cdot 8}{12}$, so no triangle can be formed.

This is a famous mathematical theorem known as the 'Triangle Inequality': If a , b , c are the lengths of the sides of a triangle, then $a + b > c$.