Playing with Pascal's Triangle

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ICTS-TIFR

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Outline

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Number of chocolates

Problem

Maya brought home chocolates for her 6 children Asha, Bindu, Chaitra, Divya, Esha, and Farah. She gave them to the youngest, Farah and asked her to distribute them among her siblings. Farah ate half of the chocolates and gave the rest to Esha and asked her to distribute them among her younger siblings. Esha did the same, ate half and gave the rest to Divya and so on. In the end, the oldest child Asha got only one chocolate. How many chocolates did Maya bring home?

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What if Maya had 7 children instead of 6, what would be the number of chocolates Maya would have brought home then?

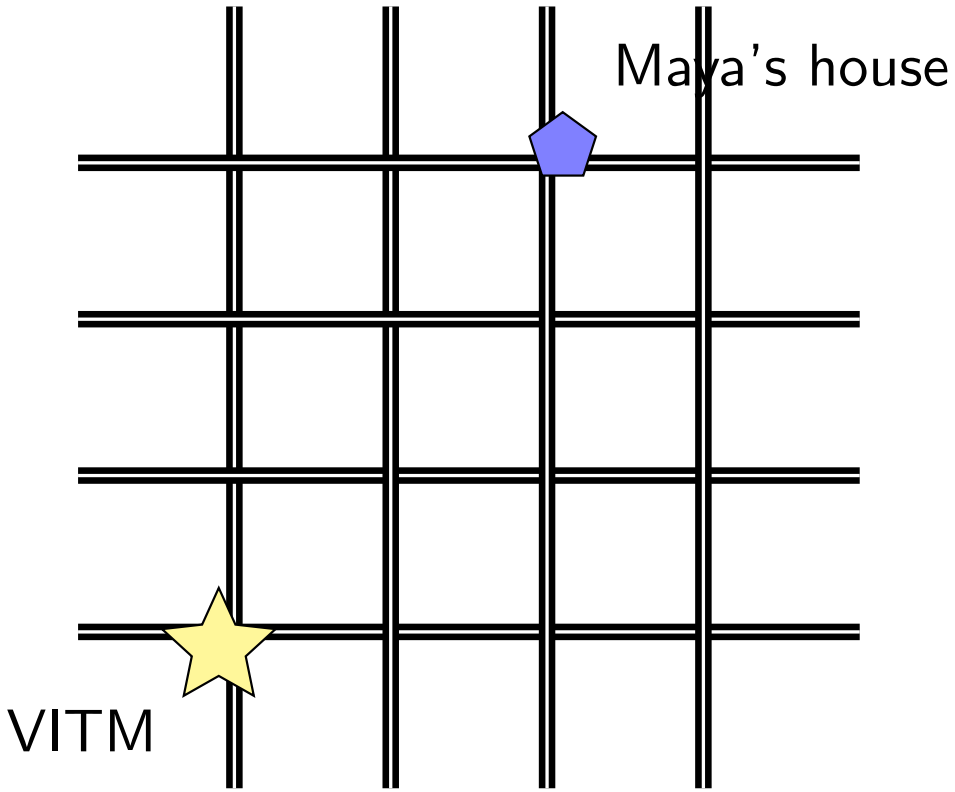
Sum of Numbers

Problem

Find the sum of $1 + 2 + 4 + 8 + \ldots + 1024$.

Number of Routes

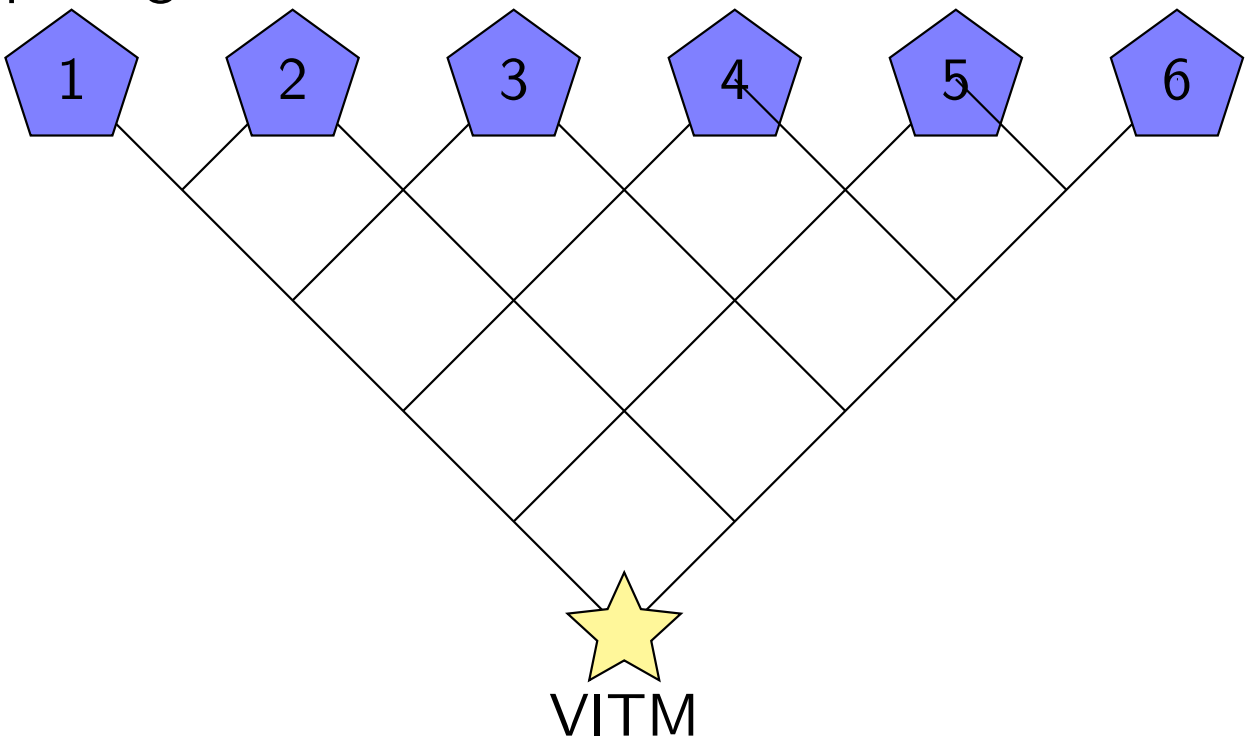
Below is the map of the city showing Maya's house and VITM.
Maya visits VITM taking the shortest possible route.



Maya visits VITM taking the shortest possible route.
How many such routes are there?

Highest number of routes

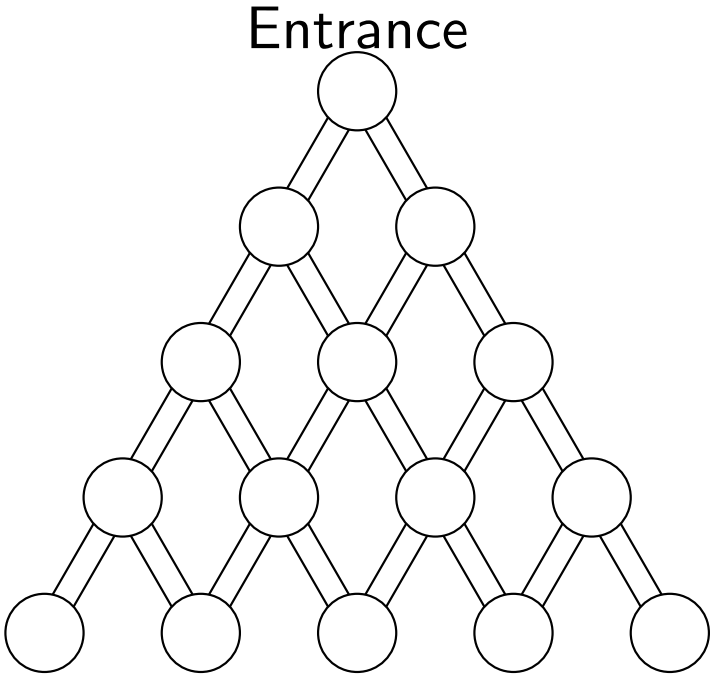
The houses of 6 students who came to VITM today are marked in pentagons.



Which of these students have the highest number of routes to return home?
Keep in mind these students try to take the shortest possible routes.

Number of routes

Write in every circle the number of ways that lead to it from the entrance.



Pascal's Triangle