

Why Dividing by Zero is Undefined.

1

Use rectangles to solve the equations:

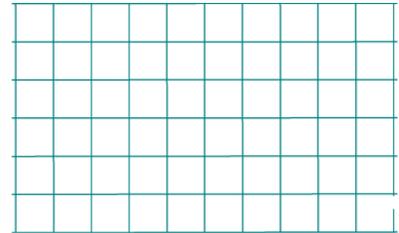
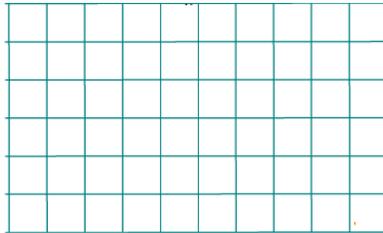
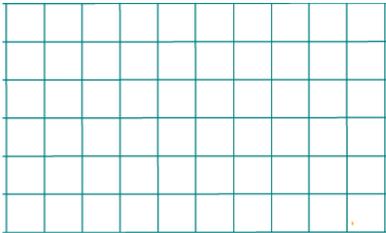
$X : 5 = 8$



$49 : Y = 7$



$W \times 8 = 56$



2

Solve the problems.

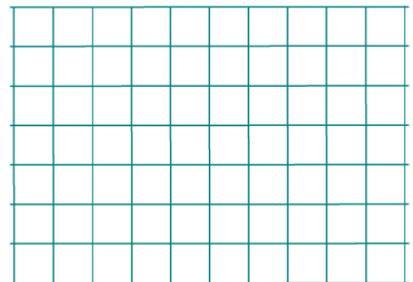
There are six minivan taxis at the airport, and each can hold seven passengers. How many passengers can the taxis take in total?

The airplane had 56 passengers. Each minivan taxi can hold seven passengers. How many minivan taxes are needed to take these passengers to a hotel?

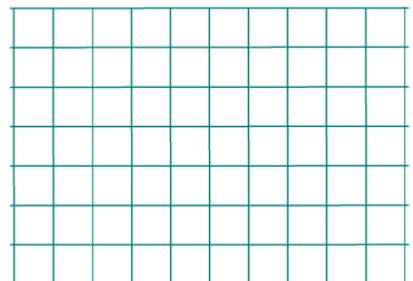
3

Compare the two problems. What is the difference?

A. School students were carving wood animals for 3 days. On the first day, they carved 5 owls. Next day, they carved 6 turtles. On the last day, they were in a hurry to go to a movie theater so they carved only 3 lizards. How many animals did they carve in total?



B. School students were carving wood animals for 3 days. Each day they carved 5 animals. How many animals did they carve in total?



Dividing by Zero is **undefined**.

To see why, let us look at what is meant by "division."

Division is an action of splitting objects or subjects into equal parts or groups. It is the result of "fair sharing."

There are 12 apples, and 2 mice want to share them, how can they divide the apples?

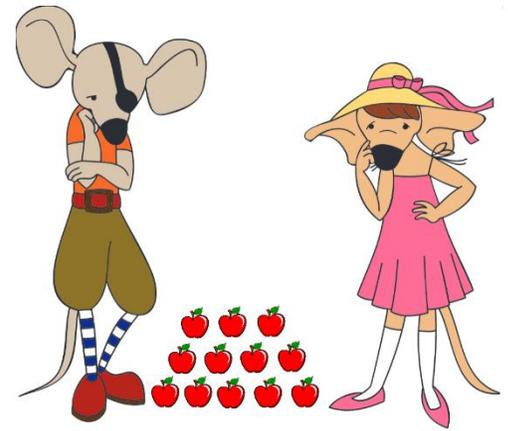
12 apples divided by 2

So they get 6 each: $12 \div 2 = 6$

Now, let us try dividing the 12 apples between **zero** mice, much does each one get?

Does that question even make sense?

We cannot share among zero mice, and we can't divide by 0.



After dividing, can we multiply to get back again?

12 divided by 2 is 6, then 6 times 2 is 12

12 divided by 0 is ? , then ? times 0 is 12

But multiplying by 0 always gives 0, so this does not work.

If we have a rectangle with sides of 4 cm and 3 cm, how can we find the area? $3 \text{ cm} \times 4 \text{ cm} = 12 \text{ cm}^2$

If now we know the area (12 cm^2) and one of the side (4cm), how can we find another side? $12 \text{ cm}^2 : 4 \text{ cm} = 3 \text{ cm}$.



Can our rectangle has an area of 12 cm^2 (or any area) if one of the sides is 0?

Let's assume that $12 \div 0 =$ some number, let's call it N .

Then we can write the equation as $12 = N \times 0$.

Can it be like this? Why or why not?

4

The hat game has become more complicated.

A hundred people have gathered to compete in a triathlon. They are 100 swimming caps: 99 white and 1 black. They sit in a circle so that everyone can see everyone else. They close their eyes, take a random hat from the pile in the middle, put it on, and open their eyes. How many of the triathletes know the color of the hat they are wearing?

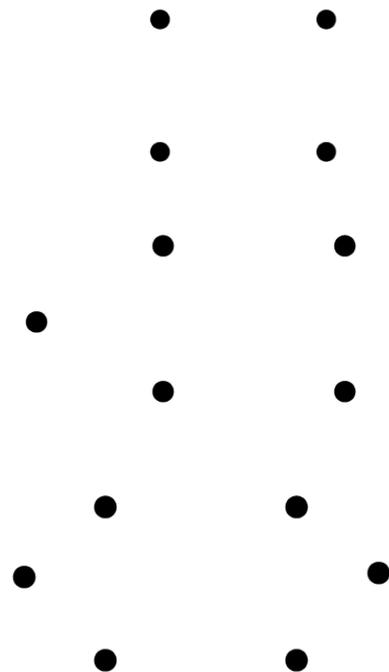
Next time they add 1 white hat to the existing pile. There are now 100 people and 101 hats: 100 white and one black. They repeat the process of putting on the hats and one remaining hat is hidden. After everyone opens their eyes and looks at each other, can each player say which color hat he/she is wearing? What is the color of the hat that was hidden?

5

A king plans to build four watchtowers in the corners of his kingdom and connect them all by paved roads. How many roads does he need to build and pave?

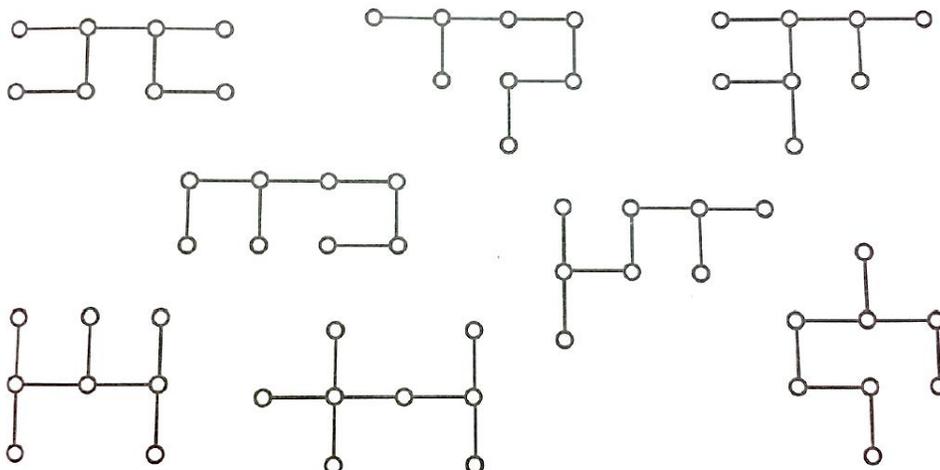
Later on the king decided to add one more watchtower and to have all five towers connected by paved roads. How many roads will be there in the kingdom after the project is completed?

How many roads will be there in the kingdom if king decided to have six watchtowers connected by paved roads?

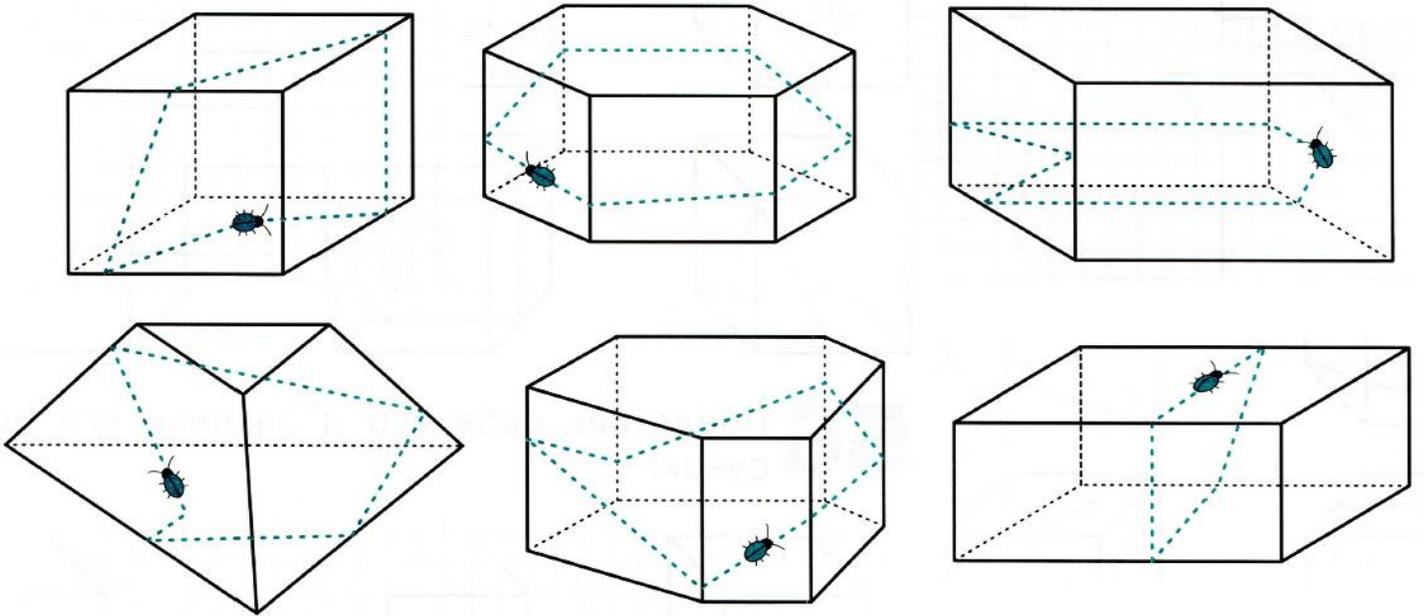


6

Find similar chains and color them with the same color.

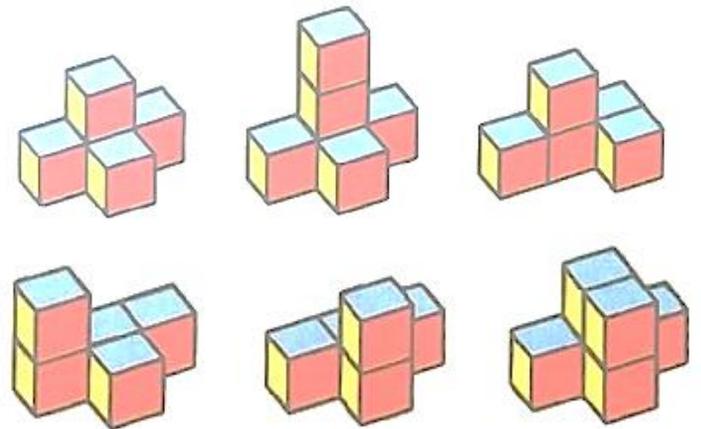


6 Imagine that there is a bug crawling over the surface of a solid polyhedron. Trace with a solid red line the parts of the path you would be able to see. Trace with a green dashed line the parts of the path that you would not be able to see.



7 Find the figures whose views are on the left.

Front View	Top View



Front View	Top View

