

The Mobius Strip! (And bonus problems)

Early Elementary meeting 2, Oct. 19, 2014

1. A snail crawls up a tree which is 10 meters high:

- Every day, the snail crawls 5 meters up;
- Every night, the snail crawls 4 meters down.

If the snail starts on Monday morning, when will it reach the top of the tree?

To solve the problem, let's see where the snail ends up at various moments. Record the data in the table below:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Morning							
Evening							

2. Find the next two numbers in the sequence:

(a) 3, 7, 11, 15,...

(b) 9, 1, 7, 1, 5, 1,...

(c) 4, 5, 8, 9, 12, 13,...

(d) 1, 2, 4, 8, 16, 32,...

Please use the paper cylinder and Mobius strips that you have made for the following experiments.

1. How many edges does a cylinder have?
2. How many edges does a Mobius strip have? To find out, imagine that you put an ant on the edge and mark the starting point. Then, have the ant crawl along the edge.

(a) Will the ant come back to the same starting point?

(b) How many edges does a Mobius strip have?

3. Mark a point on a cylinder such that it has the same distance to both edges. After that, draw a line on the cylinder so that all the points on the line are the same distance to both edges.

(a) What shape is this line?

(b) Can you draw another line on the cylinder such that all the points on this line are at the same distance from both edges?

What is the shape of this line?

(c) Do the two lines above intersect?

(d) How many sides (surfaces) does the cylinder have?

4. Mark a point on a Mobius strip such that it has the same distance to both edges. After that, draw a line on the Mobius strip so that all the points on the line are the same distance to both edges.
 - (a) Are there any other points on the Mobius strip that are the same distance to the edges?
 - (b) How many sides (surfaces) does the Mobius strip have?
5. (Carefully!) Cut a cylinder along the middle line. (You can use the cylinder you have already drawn the middle line on). What do you get as a result?
6. (Carefully!) Cut a Mobius strip along the middle line. What do you get?
7. Take another Mobius strip and draw a line which is twice as close to one of the edges compared to the other.
 - (a) What do you think will happen if you cut the Mobius strip along this line?
 - (b) Cut the Mobius strip along this line and see what you get.
8. A watermelon weighs 6 kg plus half of its weight. How much does the watermelon weigh?
9. A brick weighs 2 kg plus a third of its weight. How much does the brick weigh?

10. On a table are some pennies (1¢), nickels (5¢), and quarters (25¢). There are many coins of each type. Jane took 3 coins and added the values together. She says she has 36¢ (cents). Kate says this is not true! Can you explain why Kate says this?

11. Now, we also put some dimes (10¢) on the table. Kate takes 3 coins and says they add up to 36¢ . Do you know which coins she took?

12. Snow White and the 7 dwarves are playing a game:

- Snow White wrote the number 20 on a piece of paper and gave it to the dwarves;
- Each of the 7 dwarves looks at the number on the paper and adds or subtracts 1 to it;

Then he gives the number he gets to the next dwarf.

- Can they get 21 in the end? (If yes, show how? If not, explain why not.)

- Can they get 23?

- Can they get 19?

- Can they get 17?

- Can they get 22?

- Can they get 18?

- Can you list all the numbers they can get?