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## 10 Knights and liars

### Warm-up

**Problem 10.1** *One week, Mrs. Jones sold eggs at the market every day from Monday through Friday. She sold 73 eggs on Thursday and 118 on Friday. Doing her Saturday bookkeeping, Mrs. Jones noticed that the number of the eggs sold every day of that week starting with Wednesday was equal to the sum of the numbers of the eggs sold in the previous two days. How many eggs did Mrs. Jones sell on Monday? Filling out the table below helps to answer the question.*

<i>Day</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>
<i># of eggs</i>				73	118

**Answer:** Mrs. Jones sold \_\_\_\_\_ eggs on Monday.

## 10.1 Lesson

There are two kinds of people living on the Island of Knights and Liars. A *knight* always tells the truth. A *liar* always lies.



**Problem 10.2** *An islander tells you that the top and bottom projections of a solid are mirror images of each other. Is this a knight or a liar? Circle the correct answer. Explain your choice.*

Knight

Liar

**Problem 10.3** *You ask a knight the same question twice and get two different answers. What could be the question?*

**Answer:** \_\_\_\_\_

**Problem 10.4** *You ask a knight and a liar the same question and get the same answer. What could be the question?*

**Answer:** \_\_\_\_\_

**Problem 10.5** *Can you ask an islander exactly one question to find out if this is a knight or a liar? What could be the question?*

**Answer:** \_\_\_\_\_

**Problem 10.6** *An islander claims that  $1 + 1 = 10$ . Is this a knight or a liar? Circle the correct answer. Explain your choice.*

Knight                  Liar                  Could be either

There are *tourists* visiting the Island of Knights and Liars. A tourist sometimes tells the truth and some other times lies.

**Problem 10.7** *Alice says, "I am a liar." What kind is she? Circle the correct answer. Explain your choice.*

Knight                  Liar                  Tourist

**Problem 10.8** *Bob says, "I am a knight." Is it possible to figure out what kind he is? Circle the correct answer. Explain your choice.*

Yes                          No

**Problem 10.9** *Charlie, Donna, and Emily are islanders, not tourists. A tourist asked Charlie if he was a knight. Charlie mumbled something chewing his gum, so the tourist did not understand his answer. The tourist asked Donna what Charlie said. Donna answered that Charlie claimed to be a liar. To that Emily responded, “Don’t believe Donna, she is a liar herself!” What kinds are Charlie, Donna, and Emily?*

**Answer:** Charlie \_\_\_\_\_ ,

Donna is a \_\_\_\_\_ ,

Emily is a \_\_\_\_\_ .



**Problem 10.10** *Fleur and George live on the Island of Knights and Liars. George says, “We are both liars.” Who is Fleur and who is George? Note: since they live on the island, they are not tourists.*

**Answer:** Fleur is a \_\_\_\_\_ ,

George is a \_\_\_\_\_ .

**Problem 10.11** *Henry and Irene live on the Island of Knights and Liars. Henry says, “We are the same kind.” Irene says, “We are different kinds.” Who is Henry and who is Irene?*

**Answer:** Henry is a \_\_\_\_\_ ,

Irene is a \_\_\_\_\_ .

**Problem 10.12** *) The following way of punishing criminals was used for a while on the Island of Knights and Liars. A convicted lawbreaker would be brought to two neighboring identically looking doors leading to two jail cells. One of the cells was empty. There was a hungry tiger in the other cell. There were two guards standing next to the doors.*

*One of the guards was a knight, the other was a liar, but there was no way to tell what kind they were based on their looks only. The criminal was allowed to ask one guard one question and then to choose the door based on the answer. What question would you ask? How would you choose the door?*

**Question:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Choosing:** \_\_\_\_\_

## 10.2 Homework

Finish solving all the problems from class. Teach your parents about the Island of Knights and Liars.

**Problem 10.13** *A tourist meets two islanders, Jake and Kate, and asks them if they are knights or liars. Jake says, “If you ask Kate whether she is a knight, she would say no.” Kate says, “If you ask Jake whether he is a knight, he would say yes.” Who are they?*

**Answer:** Jake is a \_\_\_\_\_ ,

Kate is a \_\_\_\_\_ .

**Problem 10.14** *A tourist meets two islanders, Luke and Mary, and asks them if they are knights or liars. Luke says, “If you ask Mary whether I am a knight, she would say no.” Mary says, “If you ask Luke whether I am a knight, he would say yes.” Who are they?*

**Answer:** Luke is a \_\_\_\_\_ ,

Mary is a \_\_\_\_\_ .

**Problem 10.15** *The age of Nick's great grandfather is the smallest three-digit number written with three different digits. How old is Nick's great grandpa?*

**Answer:** \_\_\_\_\_

**Problem 10.16** *Olivia noticed that the sum of her age and the ages of her mom and dad equals to 70. The girl is wondering when the sum of the ages will be equal to 100. Can you help her?*

**Answer:** \_\_\_\_\_

**Problem 10.17** *One apple costs more than two bananas. What is more expensive, two apples or three bananas?*

**Answer:** \_\_\_\_\_