

 Answer key available at [nctm.org/mtlt11411p2p](https://nctm.org/mtlt11411p2p).

## Problems to Ponder

Problems to Ponder provides 28 varying, classroom-ready mathematics problems that collectively span PK-12, arranged in the order of the grade level. Answers to the problems are available online. Individuals are encouraged to submit a problem or a collection of problems directly to [mtlt@nctm.org](mailto:mtlt@nctm.org). If published, the authors of problems will be acknowledged.

Megan Holmstrom

1

Show the number four in four ways.

2

What can we find in our classroom that is a square?  
A circle?

**For further thought:** What other shapes can you find?

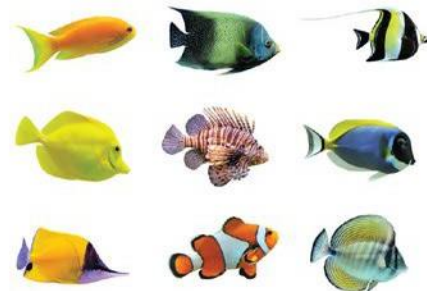
3

Here are some fish swimming in a circle. How many fish are there?



4

Andrew and Tyler see some fish. How many fish do they see?



5

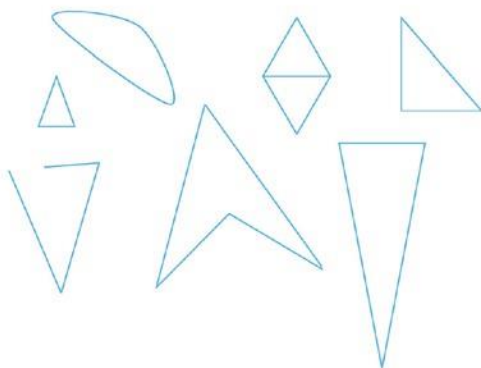
Look at the animals, which animals have more than two feet? How many feet does each one have?



**For further thought:** How many animal feet altogether are in the picture?

6

Which of the following are triangles? Why or why not? Let's name the attributes of all triangles.



7

Ryoji is setting up his schedule for the school week. Here are some times and activities. Match activities with times to create a schedule for Ryoji.

5:30 p.m.	Breakfast
12:00 p.m.	School day ends
7:00 a.m.	Recess
9:15 a.m.	Lunch
3:15 p.m.	Soccer practice begins
<b>For further thought:</b> Create two other times and activities that fit into Ryoji's day.	

8

Bryson and Eliza are using a hundred chart to add numbers. Bryson starts on 14 and adds 10. What number is he on now? Eliza starts on 38 and adds 20 more. What number is she on now? What are some ways Eliza might add 20 more?

9

Draw some examples of quadrilaterals. What are some nonexamples? What attributes are true for *all* quadrilaterals?

Megan Holmstrom, [megan.holmstrom@gmail.com](mailto:megan.holmstrom@gmail.com), is an independent consultant covering the scope of PK–8 mathematics. Her time is shared currently among several schools throughout Europe, the Middle East, and Africa.

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## 10

Ms. Nagle's third-grade class is going on a field trip to the aquarium.

- The cost of the trip is \$215.
- The school will pay \$100 toward the trip.
- The class earns money by selling school cookbooks. Each cookbook sells for \$15.

How much more money does the third-grade class still need to earn to pay for their trip? How many cookbooks will the class need to sell to pay for the trip?

**For further thought:** Write an equation to represent how you solved the problem.

## 11

Hulsing School is adding four more bookshelves to its library. The librarian would like to arrange them in order from shortest to tallest. Arrange the list of bookshelves in order from shortest to tallest.

Bookshelf 1	4 feet
Bookshelf 2	1 1/2 yards
Bookshelf 3	60 inches
Bookshelf 4	3 1/4 feet

**For further thought:** Show each bookshelf's measurement first in total feet and then in total inches.

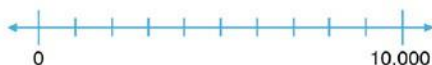
## 12

Show what you know about solving the following problem:  $5,396 + 2,814$

Concrete or pictorial:



Between what two numbers will the sum be on the number line?



Show what you know using the standard algorithm:

$$\begin{array}{r} 5,396 \\ + 2,814 \\ \hline \end{array}$$

## 13

Write a story that matches  $\frac{3}{4} \times 3$  and ask a question that leads to the solution.

How can you model your story? What visual can you add to represent the fractions in your story?

## 14

Karina and Santiago go for walks each night. They kept track of the miles they walked for two weeks.

Daily miles: 6, 6.5, 3, 5, 4, 6, 5, 5, 3.5, 4, 5.5, 4, 7, 4  
Draw a line plot to represent the data.

**For further thought:** What other measures do you notice? What do you wonder about the data?

## 15

In a bag of red and blue marbles, the ratio of blue to red marbles is 5:7. What is the ratio of total marbles to blue ones? How many marbles might be in the bag?

## 16

Notice and Wonder are following a cookie recipe which uses  $\frac{2}{3}$  cup of nuts for 1 batch of cookies. How many batches of cookies can be made with 4 cups of nuts? Justify your answer using a diagram.



## 17

Two number cubes, each with faces labeled 1 through 6, are rolled at the same time. What is the probability that the sum of the number cubes will be a multiple of 3?

## 18

The scale drawing of a rectangular rug has dimensions 4 inches  $\times$  5 inches. The length of the longer side of the actual rug is 15 feet. What is the area of the rug?

19

Which expressions are equivalent to  $(5^4 \times 5^{-6})^{-2}$ ?

- a.  $5^{-8} \times 5^{12}$
- b.  $5^2 \times 5^{-8}$
- c. 625
- d.  $1/625$

**For further thought:** Write another equivalent expression.

20

The following table represents a linear function.

x	y
4	-2
7	0.25
12	4

Write an equation to represent the linear function.

21

Which of the numbers below when multiplied by  $7\sqrt{3}$  will result in a rational number?

- a.  $-1\sqrt{3}$
- b.  $7\sqrt{27}$
- c.  $6 + 2\sqrt{3}$
- d.  $\sqrt{\frac{16}{3}}$

22

In January, the Gonzales family starts saving for a trip to Mexico in September. The vacation is estimated to cost \$4,850. They start with \$675 in a savings account and will deposit 25 percent more each month than the previous month in the savings account. Will they have enough money for their vacation in September? Justify your reasoning.

**For further thought:** How much money would the family need to start with to have \$4,850 in August?

23

The Denver Metro area population was 582,000 in 1953 and 1,054,000 in 1970. What was the average yearly increase in the population during the years from 1953 to 1970?

24

Lava coming from the eruption of a volcano follows a parabolic path. The height  $h$  in feet of a piece of lava  $t$  seconds after it is ejected from the volcano is given by  $h(t) = -t^2 + 16t + 936$ . After how many seconds does the lava reach its maximum height? What is the maximum height of the lava?

25

Classify the polygon formed by connecting the points  $(-3, -2)$ ,  $(5, 3)$ ,  $(9, 9)$ , and  $(1, 4)$ .

26

In a game, you roll a single six-sided number cube numbered with one, two, three, four, five, and six. You earn three points if a six comes up; nine points if a two, four, or five come up; and nothing otherwise. What is the expected value?

27

An airplane leaves the runway and climbs at an 18 degree angle with a speed of 275 feet per second. Find the altitude of the plane after one minute.

28

A rocket is launched from a platform 150 feet above the ground. A function that models this situation is given by  $h = -16t^2 + 96t + 150$  with  $t$  measured in seconds and  $h$  as the height in feet above the ground.

- a. What is the domain of the function given this context?
- b. What is the maximum height reached by the rocket?
- c. After how many seconds is the rocket 100 above the ground?
- d. After how many seconds does the rocket hit the ground?