Thanks for looking at our Recreational problem examples

To the Right

Table of the types of recreation problems solved in Chapter 6.

Below

There are three sample problems presented.
They have three levels of difficulty
- Easier
- Moderate
- Harder

The easier one is presented here.
Scroll or page down for the others.

List of Recreation Problem Types

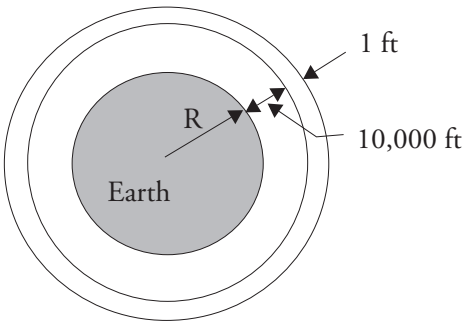
Type of Problem	Example Number(s)
Magic Squares	6.1 - 6.5
Summing Numbers in Sequences	6.6 - 5.7
Sudoku	6.8
Crossing Over	6.9 - 6-11
Geometry	6.11 - 6.13
Miscellaneous Fun: Mayan Steps Special Nickel Remainder of One Interesting Inheritance Army of Ants Inheriting Silver Dollars Flying Higher Loaded Dice Happy Birthday Game of 514 Stick or Switch	6.14 - 6.25

Easy Recreational Example

Problem: An airplane flies around the earth above the equator at an altitude of 10,000 feet. A second plane flies the same course except one foot higher. How much farther did the second plane fly? (You don't need to know any dimensions of the earth.)

Solution:

Make the drawing! (*Always* make the drawing.)



Distance flown by first plane = $2\pi(R + 10{,}000)$

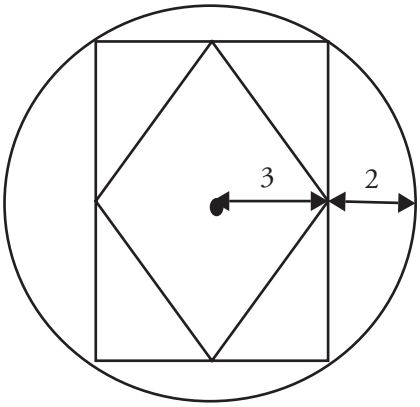
Distance flown by second plane = $2\pi(R + 10{,}001)$

Difference = 2π feet

Scroll or Page Down for Moderate Example

Moderate Recreational Example

Problem: A rectangle is drawn concentrically inside a circle as shown below. A diamond is drawn with apexes at the midpoint of the rectangle's sides. The distances shown are in inches. We would like to know the length of each side of the diamond.



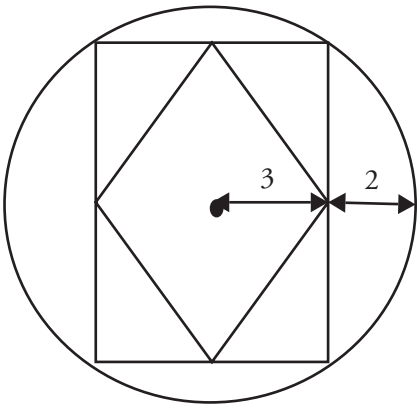
Solution:

We start the process with the usual *Preparation*:

Preparation: Re-read it — and redraw the diagram to fix it in our mind:

A rectangle is drawn concentrically inside a circle as shown below. A diamond is drawn with apexes at the midpoint of the rectangle's sides. The distances shown are in inches. We would like to know the length of each side of the diamond.

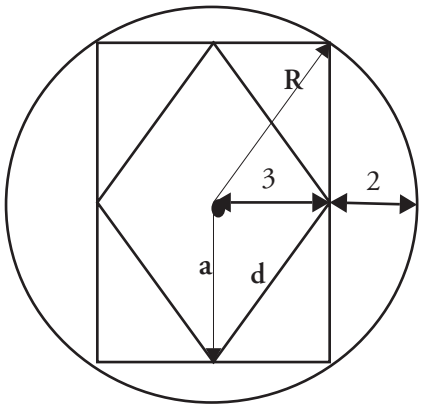
+ Write the Given Info: Redrawing the diagram serves this purpose:



Write what is to be found: Length of the side of the diamond

Translation: What we can do here in the way of *translation* is define some symbols and add some helpful (hopefully) lines to the diagram.

Let d = length of side of diamond (to be found)
R = radius of the circle
a = see diagram above right



The problem solvers initiative to draw these lines and label these dimensions is important to success.

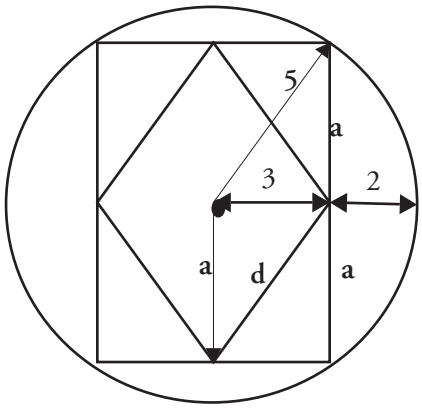
Application: Well, this isn't a problem that allows for straight forward application. But what to do?

Study the diagram as an answer to that question. Maybe there is more there that we can use for a handle.

Now one has just to see that R = 5. It's not so obvious until you see it. Some will see it immediately; some will take a little longer.

It might help guide us to remember (always!) to look for 3-4-5, 5-12-13, and 30-60-90 right triangles, etc.

Now if we remember about 3-4-5 right triangles, we are almost done.



The height of the rectangle is 2a and there is a neat 3-a-5 right triangle, so a = 4.

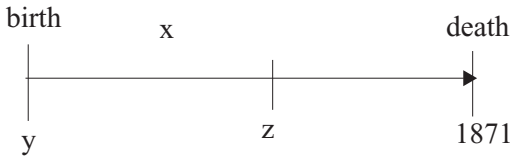
There's also another 3-4-5 right triangle that gives us d = 5.

Check: The area of the rectangle is 6 x 8 = 48 in^2. The area of the diamond should be half the area of the rectangle. If our numbers are right, the area if the diamond is 4 x (3/2) x 4 = 24. *Checks.*

Harder Recreational Example

Problem: The logician Augustus De Morgan died in 1871. He once made the statement that he was x years old in the year x^2. In what year was he born?[1]

Solution: We might be able to do this by analysis so we do the Preparation. Then . . draw the diagram:, define the symbols, and write the equations:



y = year of birth
x = his age
z = year he made the statement

He said he was x years old in the year x^2.

So: $x^2 = z$

And from the diagram: $x = z - y$

We can manipulate these around to get

$$y = x^2 - x \qquad (1)$$

but we can't solve for either y or x unless we know z. There are three unknowns and two equations.

Let's Try Test and Revise. Set up a table to help us. We can try different ages (x) when he made the statement, and find the year of his birth from equation (1). Maybe something will show up.....

Something does show up. (See table below.)

Since he died in 1871, his year of birth couldn't be 380, 870, or 1540 corresponding to ages 20, 30, 40. And it couldn't be 2450 either, corresponding to age 50. It has to be more then 40 but less than 50. It turns as the table shows that age 43 is the only one possible: he was born in 1806.

x (Age When He Made Statement)	x^2	$y = x^2 - x$ Year of Birth
20	400	380
30	900	870
40	1600	1540
50	2500	2450
45	2025	1980
42	1764	1722
43	1849	1806
44	1936	1892

1. For more about this problem, Google 'Augustus DeMorgan.'