

Math 123  
Fall 2017  
Dr. Lily Yen

# Assignment 1


Show all your work

Name: \_\_\_\_\_  
Number: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Score: \_\_\_\_/14

**Problem 1:** In a summer camp, a group of five children needed to shake hands with everyone else. How many handshakes would occur when they were all done?

Each of the 5 children shakes with 4 others; total  $5 \times 4 = 20$  handshakes. However, this way every handshake is counted twice, so the correct number is  $20 \div 2 = 10$ .

Alternatively, the first child shakes with 4 others. The second child shakes with 3 others (not counting the first child). The third child shakes with 2 others, and the fourth with just one other. Total  $4 + 3 + 2 + 1 = 10$  handshakes.

Alternatively, a picture:  each of the five vertices represents a child, and each of the ten edges represents a handshake.

Score: \_\_\_\_/2

**Problem 2:** Suppose the newly wed, Kendra and John, plan to have four children. If we list the genders of the children in birth order, how many different lists are possible? One possible order is *bbbg* for boy, boy, boy, girl.

There are two possibilities for the first child. For each of these two, there are two possibilities for the second child; total four possibilities. For each of these four, there are two possibilities for the third child; total eight possibilities. For each of these eight, there are two possibilities for the fourth child; total 16 possibilities.

Alternatively, list them systematically: *bbbb, bbbg, bbgb, bbgg, bgbb, bgbg, bggb, bggg, gbbb, gbbg, gbgb, gbgg, ggbb, ggbg, gggg*, total 16.

Score: \_\_\_\_/2

**Problem 3:** Decide whether the two sequences of operations will give the same results.

*Add two numbers, say  $x$  and  $y$ , then divide the result by 3.*

versus

*Divide  $x$  by 3 and divide  $y$  by 3, then add the results.*

Dividing by 3 is equivalent to multiplying by  $\frac{1}{3}$ . Therefore the first instruction amounts to

$$\frac{(x + y)}{3} = \frac{1}{3}(x + y)$$

while the second amounts to

$$\left(\frac{x}{3}\right) + \left(\frac{y}{3}\right) = \frac{1}{3}x + \frac{1}{3}y$$

These two are equal by the Distributive Law,  $a(b + c) = ab + ac$ .

Score: \_\_\_\_/2

**Problem 4:** In a recent home run derby competition, Joe Pederson, Todd Frazier, and Prince Fielder hit a total of 72 home runs. If Pederson hit one more than Frazier and 23 more than Fielder, how many did Pederson hit?

Say Pederson hit  $x$  home runs. Then Frazier hit  $x - 1$ , and Fielder hit  $x - 23$ . Therefore their total is  $x + x - 1 + x - 23 = 3x - 24 = 72$ , so  $3x = 72 + 24 = 96$ , so  $x = \frac{96}{3} = 32$

Score: /2

**Problem 5:** Conjecture the next two equations in this pattern:

a.  $2 + 4 = 2 \times 3$

b.  $2 + 4 + 6 = 3 \times 4$

c.  $2 + 4 + 6 + 8 = 4 \times 5$

d.  $2 + 4 + 6 + 8 + 10 = 5 \times 6$

e.  $2 + 4 + 6 + 8 + 10 + 12 = 6 \times 7$

Score: /2

**Problem 6:** Solve this KenKen puzzle:

$2 \div$ 2	4	$2 -$ 1	3
$3 \times$ 1	3	$2 \div$ 2	4
$1 -$ 4	1	$6 +$ 3	2
3	$2 -$ 2	4	1

Score: /3

**Problem 7:** Use inductive reasoning to fill in the fourth figure in the pattern.

X		X				X						X
			X		X				X			X

Score: /1