Math 123
Fall 2018
Dr. Lily Yen

Test 1

Show all your work

Name: _____

Number: _____

Signature: _____

Score: ___/40

Problem 1: Sierpinski triangle is a fractal: first take an equilateral triangle (stage 0), then draw a middle triangle (stage 1). Below shows the first three stages.

Tabulate the number of *black* triangles at each stage, and conclude with a formula giving the number of black triangles at the n-th stage.

Score: ___/2

Problem 2: Suppose you need a new phone number where the area code (first three digits) is fixed, and the last four digits of the ten-digit phone number is the same as your landline number. How many choices do you have for the remaining digits?

Score: ___/2

Problem 3: Capilano University (initially, Capilano College) was established fifty years ago. Write the year of its birth in Roman numerals.

Score: ___/2

Problem 4: You are buying treats consisting of M&M's, Skittles, and Coffee Crisps to give out for Halloween. Suppose you have twice as many M&M's as Skittles, and 30 more Coffee Crisps than M&M's, how many of each would you have knowing that you have 200 treats all together?

Score: ___/3
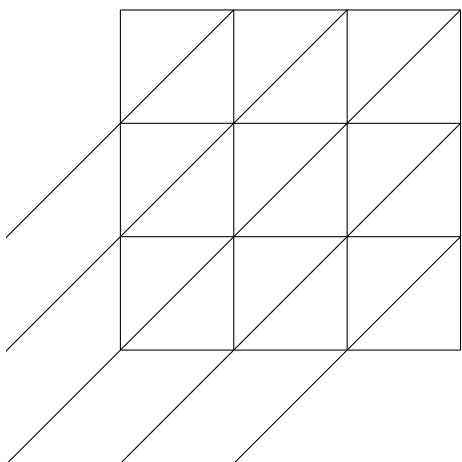
Problem 5: Express 321456 in Babylonian numeral.

Problem 6: Express the subtraction $397 - 126$ in Mayan numeral, then find its answer in Mayan numeral.

Problem 7: Convert 73 in base 10 to a binary numeral.

Problem 8: Multiply 258×476 using the galley method.
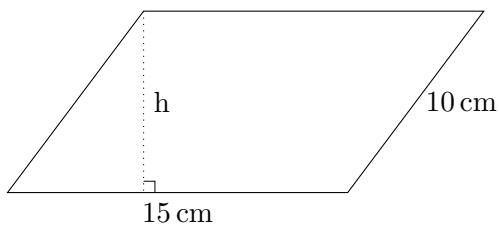
Problem 9: You have a chime clock and a cuckoo clock in the living room. The chime clock chimes every quarter of an hour while the cuckoo clock cuckoos every half hour. Starting at twenty past eleven one morning when our lecture ends, how many times would both clocks announce the time together by three in the afternoon that day? Assume, of course, that the clocks are synchronized.

<div align="right">Score: /2</div>

Problem 10: Set up a table for convex polygons' angle sums beginning with a triangle, followed by a quadrilateral, a pentagon, and so on. From your table, derive a formula for the measure of an interior angle in a regular n-sided polygon.
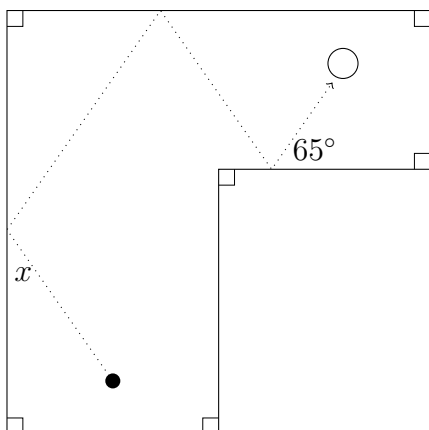
<div align="right">Score: /3</div>

Problem 11: Given that the area of the parallelogram shown is $120\,\text{cm}^2$, find the area of the largest square you can draw sharing the height, h of the parallelogram such that all four vertices of the square are on the perimeter of the parallelogram. Include units.

<div align="right">Score: /3</div>

Problem 12: Find the measure of angle x to make a hole-in-one at the miniature golf course hole. Use the following two facts to find x:

   a. The angle the ball makes as it hits a flat surface has the same measure as the angle the ball makes as it leaves the same surface.
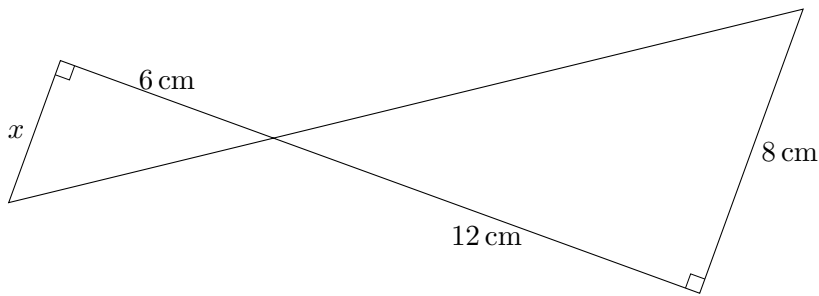
   b. The interior angle sum of a triangle is 180°.

<div align="right">Score: /3</div>

Problem 13: Which of the two shapes cover more area? An equilateral triangle of side length 4 or a circle of diameter 4. Show your work to support your claim.

Problem 14: Find $x =$ [   ]. Name the triangles and provide reasons for your claim.

Problem 15: Take two rectangular prisms with the same volume of $24\,\text{cm}^3$. Suppose that the dimensions of both prisms are integer centimetre lengths.

   a. Give two examples of such rectangular prisms with different surface areas.

   b. Find two such rectangular prisms whose surface areas differ as much as possible.