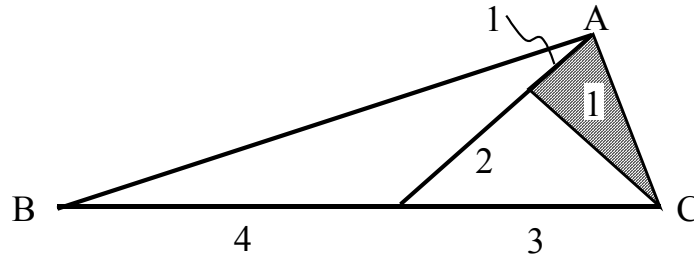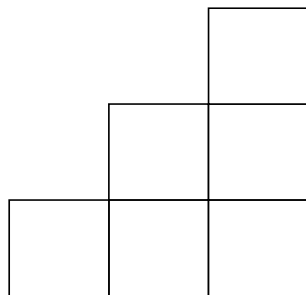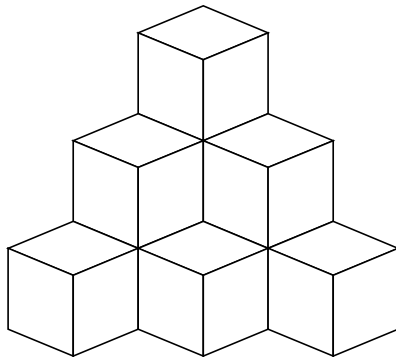Student Name: _____

1. If the shaded region in the diagram has area 1, what is the area of triangle ABC?

Answer: _____

2.The figure below is stacked with cm^3 cubes. Note that there are some cubes below the back cubes to hold them up; they're not seen in the top diagram. What is the surface area of the entire figure, including the back sides, and bottom?
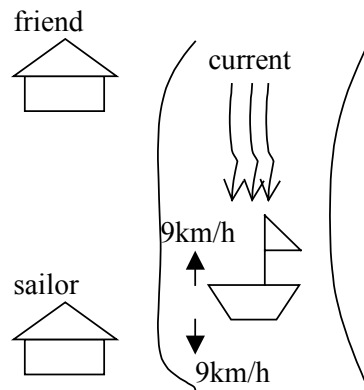

This view from one of the back sides lets you see the missing cubes.

Answer: _____

Student Name: _____

3.A sailor wants to sail on the river from his house, which is downstream, to his friend's house, which is upstream, and back. The boat's motor propels it at 9km/h, but the actual speed of the boat is affected by the current of the river. If the sailor spends twice as much time to get to his friend's house than to get back home, then what is the speed of the current?

friend

current

9km/h

sailor

9km/h

Answer: _____

4.You sell lemonade for $1.00 a cup, and usually sell 30 cups a day. You noticed that for every 10 cents you raise the price, you sell 2 fewer cups per day. It costs you 50 cents to make each cup. How much should you raise the price to maximize your profit? (For example, if you put the price at $1.10, then you will sell 28 cups per day, and thus collect 28 x $1.10 = $30.80 but spend 28 x $0.50 = $14.00, netting a profit of $16.80.)

Answer: _____

5.If a painter paints at a constant speed for 2 hours, he could finish painting his wall. His brother would need to paint at a constant speed for 3 hours to finish the same wall. If they paint the wall together, each at their own speed, how long will it take?

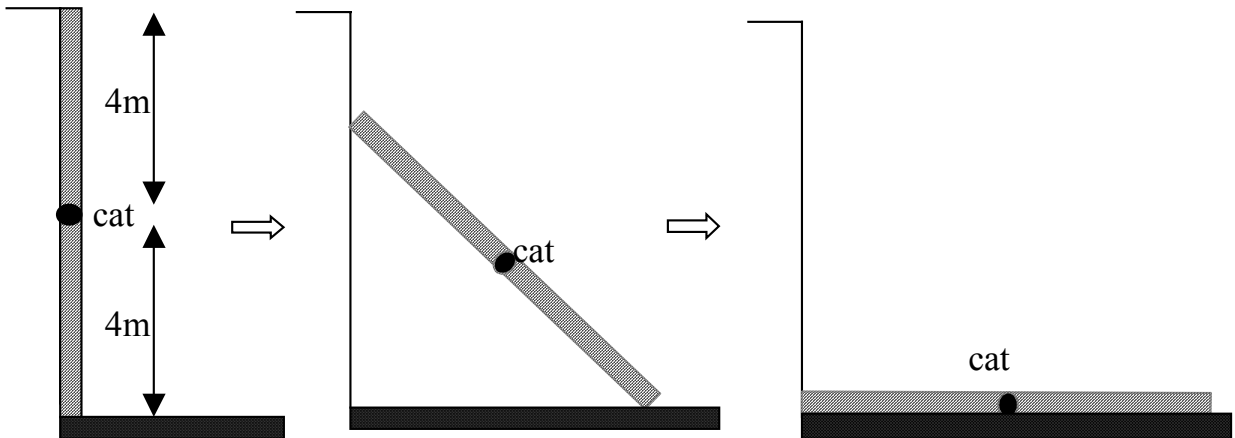Answer: _____

6.What is the last digit of 77^{79}?

Answer: _____

Student Name: _____

7.Chapters 1, 2 and 3 of "The Nine Chapters on the Mathematical Art" were written collectively by 60 people. For each chapter, exactly 26 people worked on it (although some of them could have also worked on other chapters). Exactly 7 people worked on both chapters 1 and 2 (once again, some of them could have also worked on Chapter 3). Similarly, 7 people worked on both Chapters 3 and 1, and 7 people worked on both chapters 2 and 3. How many people worked on all 3 chapters?

Answer: _____

8.An 8m tall ladder stands vertically next to a wall. A cat falls asleep half way up the ladder. While the cat is sleeping, the ladder slips to the ground in such a way that the top of the ladder is always against the wall and the bottom of the ladder is always touching the ground. To the nearest cm, how far did the cat travel?

4m

cat

4m

⟹

cat

⟹

cat

Answer: _____