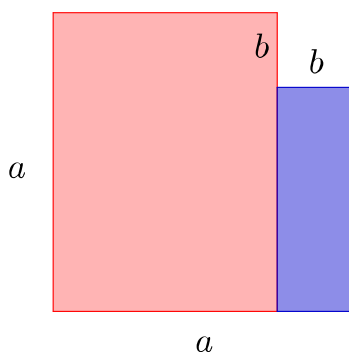# U.C. MATH BOWL 2019
LEVEL III — Session 1

Instructions: Write your answers in the blue book provided. Remember that even correct answers without explanation may not receive much credit and that partially correct answers that show careful thinking and are well explained may receive many points.

Have Fun!

1. Peter was 10 the day before yesterday. Next year, he'll be 13. Explain how this is possible.

2. A train that is 180 meters long passes a signal in 90 seconds. How long will this train take to pass over a bridge that is 360m long?

3. If Sean can eat a cake in 30 minutes by himself; Barbara, in 1 hour; and Michael, in 10 minutes, how long will it take for them to eat a cake together?

4. Jackie sold two cars for $25,000 each. The first car sold for a profit of 22%, and the second sold at a loss of 7%. What was the total percent profit on the sale of the two cars? Express your answer to the nearest hundredth.

5. Show how to rearrange the two shaded rectangles in the figure to prove that $a^2 - b^2 = (a+b)(a-b)$. Explain!

U.C. MATH BOWL 2019
LEVEL III — Session 2

Instructions: Write your answers in the blue book provided. Remember that even correct answers without explanation may not receive much credit and that partially correct answers that show careful thinking and are well explained may receive many points.

Have Fun!

1. Sally as a bunch of quarters and nickels in her pocket worth $3.35. If the quarters are switched into dimes and the nickels into pennies, she'll have $1.27. How many quarters and nickels does she have?

2. Some questions about fractions!

   (a) What number is greater, $\dfrac{2017}{2018}$ or $\dfrac{2018}{2019}$? Why?

   (b) If you have three years in a row, Year 1, Year 2, Year 3, which is bigger

   $$\frac{\text{Year 1}}{\text{Year 2}} \quad \text{or} \quad \frac{\text{Year 2}}{\text{Year 3}}?$$

   Please explain. (Hint let Year 1 be $k\ldots$)

3. If n is a positive integer write $s(n)$ for the sum of n's digits. So, for example, $s(543) = 5+4+3 = 12$.

   (a) $s(1) + s(2) + \cdots + s(9) = ?$

   (b) $s(1) + s(2) + s(3) + \cdots + s(100) = ?$ (hint: how does part (a) help here?)

4. Using the integers 1 through 9, each exactly once, fill a 3×3 grid so that the product of the numbers in the first row is 12, the product of the numbers in the second row is 112, the product of the numbers in the first column is 216, and the product of the numbers in the second column is 12.
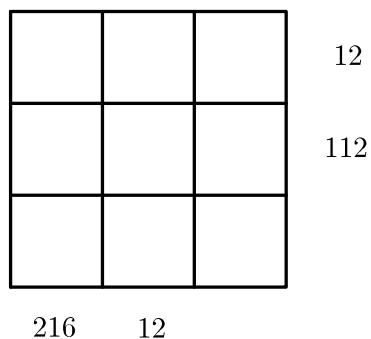
5. Three people stand in a line facing the same direction. Person C is at the end of line and can see A and B. Person B is in the middle and can only see A. And, A can see no one.

   A puzzle master shows the people that she has 3 blue hats and 2 red hats. With their eyes closed, she puts a one of these hats on each person's head and then invites them to open their eyes.

   Person C says, "I can't tell what color hat is on my head."

   Person B says, "I can't tell what color hat is on my head."

   Person A says, "I know what color hat is on my head."

   How does person A know, and what color is the hat?