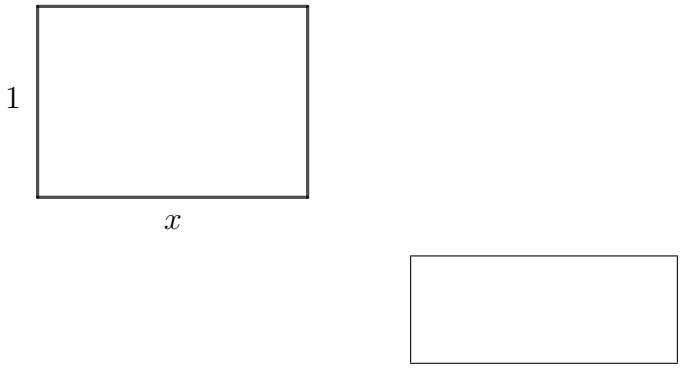
Problem 1. If a and b are real numbers whose average is 10, what is the average of a, b, and 16?

Problem 1. If a and b are real numbers whose average is 10, what is the average of a, b, and 16?

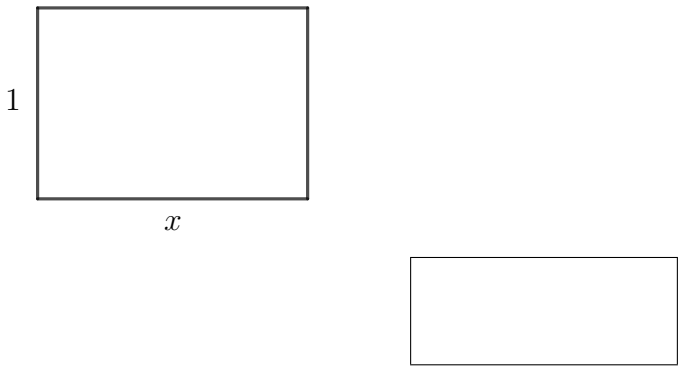
Problem 2. How many solutions to $x + y = z$ are there if x, y, z are (not necessarily distinct) elements of $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$? Note that $1 + 2 = 3$ and $2 + 1 = 3$ are different solutions.

Problem 2. How many solutions to $x + y = z$ are there if x, y, z are (not necessarily distinct) elements of $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$? Note that $1 + 2 = 3$ and $2 + 1 = 3$ are different solutions.

Problem 3. Find a value $x > 1$ so that a 1 by x rectangle can be cut into two congruent rectangles each similar to the original 1 by x rectangle.

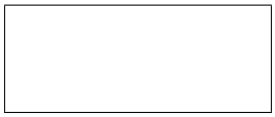


Problem 3. Find a value $x > 1$ so that a 1 by x rectangle can be cut into two congruent rectangles each similar to the original 1 by x rectangle.



Problem 4. How many subsets of $\{U, G, A, H, S, M, T\}$ have nonempty intersection with $\{U, G, A\}$?

Problem 4. How many subsets of $\{U, G, A, H, S, M, T\}$ have nonempty intersection with $\{U, G, A\}$?



Problem 5. I got the following message on my phone: "Your screen time was down 37% from last week for an average of 9 minutes/day." What was my screen time, in minutes, last week?

Problem 5. I got the following message on my phone: "Your screen time was down 37% from last week for an average of 9 minutes/day." What was my screen time, in minutes, last week?

Problem 6. Let L be the line segment in $\mathbb{R}^2$ from $(0,0)$ to $(2,0)$. At each point $(x,0)$ of L draw a disk of radius 1 centered at $(x,0)$. What is the area of the union of these disks? (A *disk* consists of a circle together with the points inside the circle.)

Problem 6. Let L be the line segment in $\mathbb{R}^2$ from $(0,0)$ to $(2,0)$. At each point $(x,0)$ of L draw a disk of radius 1 centered at $(x,0)$. What is the area of the union of these disks? (A *disk* consists of a circle together with the points inside the circle.)

Problem 7. What is $\arcsin\left(\frac{\pi}{4}\right) + \arccos\left(\frac{\pi}{4}\right)$?

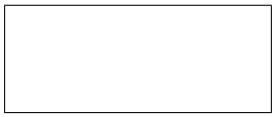
Problem 7. What is $\arcsin\left(\frac{\pi}{4}\right) + \arccos\left(\frac{\pi}{4}\right)$?

Problem 8. What is the largest positive integer k for which 3^k divides $\underbrace{999\ldots9}_{\text{2019 nines}}$?

Problem 8. What is the largest positive integer k for which 3^k divides $\underbrace{999\ldots9}_{\text{2019 nines}}$?

Problem 9. Detective Uga comes across a combination lock requiring a 5-digit keycode, with each digit in $\{0, 1, 2, \ldots, 9\}$. Dusting for prints reveals that the combination only uses the digits $2, 0, 1, 9$ and only those four digits. How many possible keycodes use those four digits?

Problem 9. Detective Uga comes across a combination lock requiring a 5-digit keycode, with each digit in $\{0, 1, 2, \ldots, 9\}$. Dusting for prints reveals that the combination only uses the digits $2, 0, 1, 9$ and only those four digits. How many possible keycodes use those four digits?



Problem 10. If $p(x)$ is a degree 2 polynomial with positive integer coefficents, with $p(1) = 11$ and $p(10) = 236$, what is $p(-1)$?

Problem 10. If $p(x)$ is a degree 2 polynomial with positive integer coefficents, with $p(1) = 11$ and $p(10) = 236$, what is $p(-1)$?