

1. Trapezoid ABCD has AB parallel to CD , with $\angle ADC = 90^\circ$. Given that $AD = 5$, $BC = 13$ and $DC = 18$, compute the area of the trapezoid.

Answer: 60

Solution: The trapezoid can be divided into a right triangle with legs of length 5 and 12, and a rectangle with side lengths 5 and 6. This gives an area of $\boxed{60}$.

2. The cubic $f(x) = x^3 - 7x - 6$ has three distinct roots, a , b , and c . Compute $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$.

Answer: $-\frac{7}{6}$

Solution: $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = \frac{ab+bc+ca}{abc} = -\frac{-7}{-6} = \boxed{-\frac{7}{6}}$.

3. Ben flips a fair coin repeatedly. Given that Ben's first coin flip is heads, compute the probability Ben flips two heads in a row before Ben flips two tails in a row.

Answer: $\frac{2}{3}$

Solution: If Ben successfully flips two heads in a row, then Ben must have flipped the coin an even number of times. If Ben successfully flips two tails in a row, then he must have flipped the coin an odd number of times. However, the coin must have been flipped at least twice. The

desired probability is therefore $\frac{\sum_{i=1}^{\infty} 4^{-i}}{\sum_{i=2}^{\infty} 2^{-i}} = \frac{\frac{1}{3}}{\frac{1}{2}} = \boxed{\frac{2}{3}}$.