

Ice Cream

The objective of this activity is to optimize the distance between ice cream shops to determine the best location for the ice cream production center using geometry, the Pythagorean theorem, and trigonometry.

Planning

A new ice cream company, *I Scream, You Scream Ice Cream*, plans to purchase three buildings in a city to house their first three ice cream shops. The buildings are located at points $A(0, 2)$, $B(0, -2)$ and $C(5, 0)$. A production center will also be constructed to provide the ice cream to the shops. The owner, Heath, wants to build the production center in a location that would allow his three delivery trucks to travel as little as possible to help minimize costs.



Let the site of the production center be located at a point S . Assume that it is possible to drive directly from the production center to each ice cream shop. Also assume that each ice cream shop sells the same amount of ice cream. Determine the best location for Heath to place the production center.

Relocation

While planning the construction of his new ice cream shops, Heath found out that the locations of shops A and B would not work due to zoning issues. Fortunately, he was able to find new locations for his shops. He now plans to place shop A at $(0, 3)$ and shop B at $(0, -3)$. Shop C is still planned for $(0, 5)$. Where should Heath build his production center considering these new locations?

Expansion

After great success in ice cream sales, Heath decides it is time to expand his business by relocating shops A and B into larger buildings. The new locations of shops A and B are $(0, 4)$ and $(0, -4)$, respectively. Shop C will stay at $(0, 5)$. Because gas is one of his highest expenses, Heath is also willing to relocate his production center to minimize the distance traveled by his delivery trucks. Where should the production center be located?

Noticing Patterns

Based on your findings from the previous problems, if Heath wanted to move shop A and B even further away, what do you think would happen to the location of his ice cream production center?

A Fixed Production Center

Assume that shop C is at $(5,0)$ and the production center has already been built at $S(3,0)$. If Heath still wants to build shops A and B equal distance from the origin and on the y-axis, where would each shop need to be located to minimize the distance traveled by his delivery trucks?