1. An open rectangular box with a square base is to be made from 48 ft$^3$ of material. Find the dimensions that will give the largest possible volume.

2. A company wants to make a box with a square base and a volume of 10 ft$^3$. If the material for the top and bottom costs $5/ft^2$ and the material for the other four sides costs $4/ft^2$, find the dimensions of the least expensive such box.

3. Find the minimum distance from the point (2, 8) to the points on the graph of $y = 2\sqrt{x}$.

4. A cylindrical container is to be made from 24π ft$^3$ of material. Find the radius and height of the container which will have the largest volume.

5. A cylindrical can is to be made to hold 40π ft$^3$. The material for the top and bottom costs 10¢/in$^2$ and the material for the side costs 8¢/in$^2$. Find the radius and height of the least expensive can.

6. A power station is on one side of a river which is 400 m wide, and a factory is 600 m downstream on the other side of the river. If it costs $50/m to run a powerline downstream from the factory, across the river, and $30/m to run a powerline along the bank of the river, find the value of x which will minimize the cost of running a powerline from the power station to the factory.

7. A hiker in the desert is 4 miles from the nearest point on a straight road. If the hiker can walk 4 mph off the road and 5 mph along the road, find the shortest time it will take her to walk to a town which is 14 miles down the road (from the point on the road closest to her).

8. A farmer wants to add 100 ft of fencing to a 40-ft wall to enclose a rectangular corral. Find the dimensions of the corral with the largest area.

9. Find the area of the largest isosceles triangle that can be inscribed in a circle of radius 6 in.

10. A wall 8 ft high stands 27 ft away from a tall building. Find the length of the shortest ladder that will reach over the wall to the building.

11. Find the length of the longest pipe that can be carried horizontally around a corner from a hall 27 ft wide into a hall 8 ft wide, by writing the length $L$ as a function of $\theta$. 

![Diagram of a ladder reaching over a wall and a triangle inscribed in a circle.]

![Diagram of a pipe around a corner.]

![Diagram of a power line between a power station and a factory.]