1. Bob has 15 km of fencing that he plans to use to fence off a rectangular region next to a river. In addition, he plans to use some of the fencing to subdivide the region into three smaller regions as shown below:

(a) Determine the total amount of fence used in terms of \(a\) and \(b\) (no fencing is required next to the river).

(b) Determine the area of the total region enclosed by the fence in terms of \(a\) and \(b\).
(c) If $a = 1$ km, determine the area of the region enclosed by the fence (recall that he has 15 km of fence).

(d) If $a = 3$ km, determine the area of the region enclosed by the fence.

(e) Express the area of the region as a function of $a$.

(f) Sketch a graph of the function for the area of the region (from part (e)).
2. A freight company wants to manufacture large metal shipping containers. The containers will have the shape of a box with no top, and must be twice as long as they are wide:

Each container is required to hold 10 cubic meters of goods. Material for the bottoms of the containers costs $20 per square meter, and material for the sides costs $9 per square meter.

(a) Find a formula for the total cost of one container in terms of the width $x$ and the height $h$. 
(b) Determine the volume of the box in terms of $x$ and $h$.

(c) Express the total cost of the container as a function of $x$.

(d) Sketch a graph of the function of the cost of the container (from part (c)).
3. Carol plans to create a large open box (a box without a top) from a piece of cardboard. She has a cardboard rectangle with side lengths 6 feet and 12 feet. She will cut off a square with side length $a$ from each corner, and then fold the resulting flaps up to create a box.

(a) Express the volume of the resulting box as a function of $a$.

(b) Sketch a graph of the formula for the volume of the box (from part (a)).
4. Boat $A$ starts at a dock and travels due North at a speed of 20 km/hour. At the same time, Boat $B$ starts 90 km East of the dock, and is sailing West at a speed of 15 km/hour.

(a) How far will Boat $A$ be from the dock after 1 hour?

(b) How far will Boat $B$ be from the dock after 1 hour?

(c) Determine the distance between Boats $A$ and $B$ after 1 hour.

(d) Determine the distances between the boats after 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, and 6 hours, and then fill in the following table with the values:

<table>
<thead>
<tr>
<th></th>
<th>1 hour</th>
<th>2 hours</th>
<th>3 hours</th>
<th>4 hours</th>
<th>5 hours</th>
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</table>
(e) How far is Boat $A$ from the dock after $t$ hours?

(f) How far is Boat $B$ from the dock after $t$ hours?

(g) How far apart are the two boats after $t$ hours?

(h) Sketch a graph of the formula for the distance between the two boats (from part (g)).