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1. Prince Ash, Lord Nixon the 2nd's sole remaining heir, is planning to have a series of monuments erected throughout the kingdom to commemorate his upcoming ascension to the throne. It will cost \$10,000 to commission an architect to design the layout that all the monuments will use, plus an additional \$5,000 for the construction of each individual monument. The local populations will be expected to visit the monuments and pay tribute, the royal accountants expect an income of $I(m) = 11000 - 500m$ from each of the m monuments built. What's the highest return the Prince can expect from this great endeavor?
- (a) What will be the total Cost, C , of erecting m monuments?
- (b) What will be the total Revenue (all the money coming in), R , from m monuments?
- (c) What will be the total Profit, P , from m monuments?
- (d) How many monuments should be built to maximize the profits?
- (e) What are the maximum profits?
- (f) How many monuments can be made before the operation becomes insolvent?

2. Our great and glorious leader, Lord Nixon the 3rd, is constructing a new "Relaxation" camp for political dissidents. To house all the "guests" it will need to be $120,000 \text{ m}^2$. The south wall will be Shark River. The east and west walls will cost \$200 per meter to build. The north wall will need "motivational" spikes and will cost \$300 per meter to build. Lord Nixon would like you to find the minimum price this camp can be built for. Note: The camp will be a rectangle.
- (a) Draw a picture of the problem set up, labeling all variables you intend to use. Draw a little political dissident inside.
- (b) Write equations for the Price (P) and the Area (A) in terms of the length and width of the camp.
- (c) Use the fact that area is fixed to find the minimum price to build the camp.

3. After the people overthrew the tyrant, Ash the Bloody, the "Relaxation" camp was torn down. In its place a rectangular arena is being erected to throw the execution party. The south wall will be Shark River. The east and west walls will cost \$150 per meter to build. The north wall will house the concession stands and cost \$200 per meter to build. If only \$90,000 has been allocated for this project what's the largest arena (area wise) that can be built? What are its dimensions?
- (a) Draw a picture of the problem set up, labeling all variables you intend to use.
- (b) Write equations for the Price (P) and the Area (A) in terms of the length and width of the camp.
- (c) Use the fact that the price is fixed to find the maximum area that can be covered by the arena.

4. The newly formed Republic of Nixondia has decided to spread its message of self governance to the neighboring kingdom of Prosperity, whose capitol is located 100 km to the east on the other side of the 40 km wide Shark River. An initial force of 500,000 men and women will set off by boat from Freedom Arena, make landfall in the outer provinces of Prosperity, and then march on the capitol. The force depletion reports for the liberation army suggest they will lose about 300 soldiers per km while marching along the shore and 500 soldiers per km while crossing Shark River. How many soldiers are expected to be available for the siege?
- (a) Draw a picture of the problem set up, labeling all variables you intend to use.
- (b) Write equations for the number of soldier lost on land (L) and the number of soldiers lost to Shark River (R) in terms of the distance east from Freedom Arena where landfall will be made.
- (c) Find the point of landfall that minimizes losses.
- (d) What percentage of the initial force will survive the journey?