**Problem**

You are driving into St. Louis and in the distance you see the famous Gateway-to-the-West arch. From your guide book you know that this monument rises to a height of 192m. You estimate your line of sight with the top of the arch to be 3 degrees above the horizontal. Approximately how far in kilometers are you from the base of the arch?

**Solution (DIANA)**

**DEFINITIONS** – define symbols for unknowns sought and data given

**DIAGRAM** – label with your symbols, include a directed coordinate system

**IDEA** – what fundamental idea/equation will you use?

**ALGEBRA** – symbolically derive the unknown you want

**NUMBERS** – substitute data for the knowns.

**ANSWER** – round to appropriate precision, put units

---

**D**

Knowns: \( y = \) height of arch = 192 m, \( \theta = \) angle of sight = 3°

Unknown: \( x = \) horizontal distance from base of arch

\[
tan \theta = \text{Opp/Adj} = \frac{y}{x}
\]

---

**I**

\[ x \tan \theta = y \]

\[ x = \frac{y}{\tan \theta} \]

---

**A**

*Hint: put one line above the other, do not snake algebra across the page*

\[ x = 192 / \tan 3^\circ \]

\[ = 192 / 0.05 = 3840 \]

---

**A**

*Hint: use precision from the least precise data used*

\[ x = 4 \text{ km (1 s.f.)} \]