

# ***SPINOFFS***

Spinoffs are relatively short learning modules inspired by the LTAs. They can be easily implemented to support student learning in courses ranging from prealgebra through calculus. The Spinoffs typically give students an opportunity to use mathematics in a real world context.

LTA - SPINOFF 13A

Don't Tread On Me

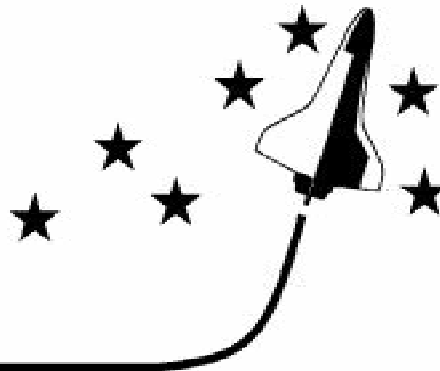
LTA - SPINOFF 13B

Wait a Moment for the Shear fun of it all

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## **SPINOFF 13A**

### **Don't Tread On Me**

Spinoff 13A involves the application of mathematics to two problems encountered at the Kennedy Space Center. The first application deals with filling a tunnel with concrete; the second application deals with painting a very large flag on the side of the Vehicle Assembly Building.

#### **How Should We Make the Flowable Fill?**

Flowable Fill is a cement-like mixture that was used to fill in a tunnel under the Crawlerway at Kennedy Space Center. It is important that the components of the concrete are mixed in the correct proportions. If the proportions are not correct, the Flowable Fill might not provide the needed support. The fill consists of 1 part Portland cement, 5 parts fly ash, 21.5 parts fine sand, and 4.5 parts water. That is, the parts are in the ratio 1 : 5 : 21.5 : 4.5. It was determined in LTA 13 that 690.4 yd<sup>3</sup> of Flowable Fill was needed to fill in the tunnel.

- 1) Determine how many cubic yards of each substance you should mix together to create the fill.

#### **How Much Paint Do We Need?**

Suppose you are put in charge of the Building Maintenance Crew at the Vehicle Assembly Building (VAB). It is the huge facility where the fuel tanks are attached to the Orbiter just before launch. A large American flag is painted on the side of the VAB. You are the supervisor put in charge of repainting the flag. You first decide to check the dimensions of the flag to be sure that it meets the standard dimensions for a United States flag. Go to the Internet site <http://www.ksc.nasa.gov/facilities/vab.html> to find the dimensions of the flag on the VAB and go to <http://www.icss.com/usflag/flag.specs.html> to find the dimensions of a standard flag.

- 2) Does the current flag meet the specified dimensions? Show work to support your answer.

- 3) Use proportions to determine the width of the diameter of a star on the VAB.

- 4) On the Kennedy Space Center tour the guides say that one stripe on the VAB flag would be wide enough for a bus to drive on. Is this true or are they exaggerating?  
(To find the width of a bus, you can estimate the width, measure a school bus, or look for the information on the internet at a site such as <http://www.midbus.com/bodspecs.html>)
  
- 5) Assume that the flag requires approximately  $\frac{5}{6}$  of the 6000 gallons of paint mentioned in the VAB website information. Approximately how many square feet does a gallon of this paint cover?
  
- 6) If you double the length and width of the current flag, what is the area of the “doubled” flag and how does it compare with the area of the original flag?
  
- 7) If you triple each dimension, how would the new area relate to the area of the original flag?
  
- 8) You decide to build a model of the VAB to  $\frac{1}{100}$  scale. This means each dimension will be  $\frac{1}{100}$ th of its actual size. What will the dimensions of the model be?
  
- 9) How does the volume of your model compare with the VAB’s actual volume?
  
- 10) If you made a model with  $\frac{1}{10}$  scale how would the volume of your model compare to the VAB's actual volume?