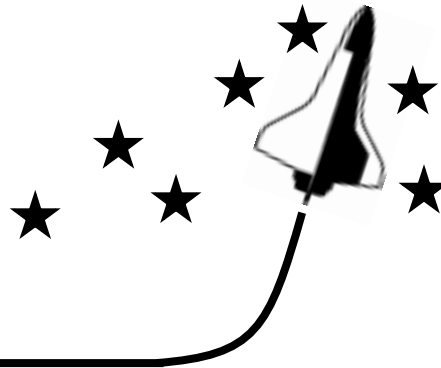


FACULTY NOTES

The LTAs and Spinoffs are designed so that each professor can implement them in a way that is consistent with his/her teaching style and course objectives. This may range from using the materials as out-of-class projects with minimal in-class guidance to doing most of the work in class. The LTAs and Spinoffs are amenable to small group cooperative work and typically benefit from the use of some learning technology. Since the objective of the LTAs and Spinoffs is to support the specific academic goals you have set for your students, the Faculty Notes are not intended to be prescriptive. The purpose of the Faculty Notes is to provide information that assists you to take full advantage of the LTAs and Spinoffs. This includes suggestions for instruction as well as answers for the exercises.



FACULTY NOTES

SPINOFF 13A

Don't Tread On Me

Background Information

Math Subject Areas: Proportions, Area, Volume

Math Prerequisites: Basic understanding of proportions

Learning Technology Suggested: Scientific Calculator and Internet Access

Approximate Class Time required for LTA: One class period

How Should We Make the Flowable Fill?

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

$$1x + 5x + 21.5x + 4.5x = 690.4 \text{ yd}^3$$

$$x = 21.575$$

So you should mix together:	1(21.575)	=	21.575 yd ³ of Portland cement
	5(21.575)	=	107.875 yd ³ of fly ash
	21.5(21.575)	=	463.8625 yd ³ of fine sand
	4.5(21.575)	=	97.0875 yd ³ of water.

Of course this might be a good time to talk to your class about significant digits or at least what a “reasonable” number of digits would be for a problem.

How Much Paint Do We Need?

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

$$\frac{\text{Width}}{\text{Length}} = \frac{1}{1.9} = \frac{110\text{ft}}{209\text{ft}}$$

Since $(1.9)(110) = 1(209)$, the ratio of width to length is correct and the flag is in correct proportions.

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

$$\frac{\text{Diameter}}{\text{Flag Width}} = \frac{0.0616}{1} = \frac{D}{110\text{ft}}$$

$$D = 6.776 \text{ ft}$$

- 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?

$$\frac{\text{Stripe Width}}{\text{Flag Width}} = \frac{1}{13} = \frac{S}{110 \text{ ft}}$$

$S = 110 \text{ ft}/13$ or approximately 8.5 ft, which is wide enough for the bus.

- 5) Assume that the flag requires approximately 5/6 of the 6000 gallons of the paint mentioned in the VAB website information. Approximately how many square feet does a gallon of this paint cover?

$$\frac{5}{6} (6000 \text{ gallons}) = 5000 \text{ gallons} \quad \text{Area} = (110 \text{ ft})(209 \text{ ft}) = 22,990 \text{ sq ft}$$

So the paint covers 22,990 sq ft/5,000 gallons or approximately 4.6 sq ft/gal.

- 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?

$$\text{New area} = (220 \text{ ft})(418 \text{ ft}) = 91,960 \text{ sq ft}$$

$$91,960 \text{ sq ft}/22,990 \text{ sq ft} = 4 \text{ times larger}$$

- 7) If you triple each dimension, how would the new area relate to the area of the original flag?

Since both the length and width are tripled the area will be 9 times larger.

- 8) You decide to build a model of the VAB to 1/100 scale. This means each dimension will be 1/100th its actual size. What will the dimensions of the model be?

$$\text{Length} = 7.16 \text{ ft} \quad \text{Width} = 5.18 \text{ ft} \quad \text{Height} = 5.25 \text{ ft}$$

- 9) How does the volume of your model compare with the actual volume of the VAB?

Since each dimension is 1/100 of the previous dimension the new volume will be 1/1,000,000 or one-millionth of the actual volume.

- 10) If you made a model with 1/10 scale how would the volume compare?

The new volume will be 1/1000 of the actual volume.