MATH BATH
ANT-SIRS
(ANSWERS)

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1. ROUND PEG IN A SQUARE HOLE.

A. PROVE THAT THE CIRCLE OF RADIUS r THAT FITS
EXACTLY INSIDE A SQUARE ACTUALLY TAKES
UP LESS AREA.

ANSWER:
AREA OF A CIRCLE OF IS PI * r^2
ONE SIDE OF A SQUARE THAT JUST FITS AROUND THE CIRCLE IS 2r
THE AREA OF THAT SQUARE IS 2r * 2r or $4r^2$

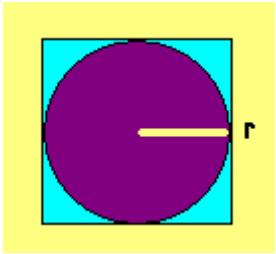
PI is about 3.14 so our proof is

Area of circle < Area of square around it ?
$(3.14)r^2 < 4r^2$? Divide both sides by r^2
3.14 < 4 ? TRUE PROOF POSITIVE.

B. OF THE DIFFERENCE IN AREA, BY HOW MUCH
IS THAT RELATIVE TO RADIUS r.

ANSWER:

$$\frac{4r^2 - 3.14r^2}{r} = .86r$$



C. OF THE DIFFERENCE IN AREA, BY HOW MUCH
IS THAT RELATIVE TO THE SQUARE?

$$\frac{4r^2 - 3.14r^2}{4r^2} = .86 / 4 = .21 = 21\% \text{ of the area of the square.}$$

2. YOU'RE IN HOT WATER.

A. IF THE COPPER PIPE IN YOUR HOUSE IS
1 INCH IN DIAMETER AND YOUR HOT WATER HEATER IS
32 FEET FROM THE BATHROOM TAP, WITH REGARDS AS TO HOW THE SNAKING PIPE GOES, IF NORMALLY THE WATER IS AT ROOM TEMPERATURE, SAY AT 70 DEGREES, AND YOU FLIP THE HOT SPICKET ON THE SINK TO PULL WATER FROM THE HEATER AT 120 DEGREES, HOW MUCH COLD WATER WILL YOU WASTE WHILE YOU LET IT RUN UNTIL YOU FEEL THE HOT WATER FROM THE SPICKET. DISTANCE FROM PIPE TO SPICKET IS NEGLIGIBLE.

B. IF THE WATER TRAVELS AT A FOOT A SECOND, HOW LONG WILL YOU HAVE TO WAIT TO FEEL THE HOT WATER.

C. IF THAT IS THE RATE, WHAT PRESSURE IS THE WATER UNDER IN POUNDS PER SQUARE INCH.

D. HOW MUCH ENERGY IN WATTS DID THE HOT WATER HEATER HAVE TO EXPEND TO HEAT THE FIRST 32 FEET OF HOT WATER IN THE PIPE FROM ROOM TEMPERATURE TO 120 DEGREES.

E. HOW LONG DID IT TAKE THE WATER HEATER TO HEAT THAT AMOUNT OF WATER.

F. HOW MUCH DID IT COST TO HEAT THAT MUCH WATER IF THE PRICE PER KILAWAT HOUR IS $0.00 (FILL IN THE PRICE FROM YOUR ELECTRIC BILL)

ANSWER ON ITS WAY.