

Individual Round — Arithmetic

- (1) A stack of 100 nickels is 6.25 inches high. To the nearest \$.01, how much would a stack of nickels 8 feet high be worth?

- (2) Continue the pattern:

$$1^3 = 1^2 - 0^2$$

$$2^3 = 3^2 - 1^2$$

$$3^3 = 6^2 - 3^2$$

$$4^3 = \underline{\hspace{2cm}}$$

$$5^3 = \underline{\hspace{2cm}}$$

- (3) Determine the largest prime divisor of $87! + 88!$ (The exclamation point indicates the *factorial* of a number – the product of all the integers from 1 to that number. For example, $5! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 = 120$.)

Individual Round — Algebra

- (1) The sum of three numbers is 98. The first number is $\frac{2}{3}$ of the second and the second is $\frac{5}{8}$ of the third. What is the second number?

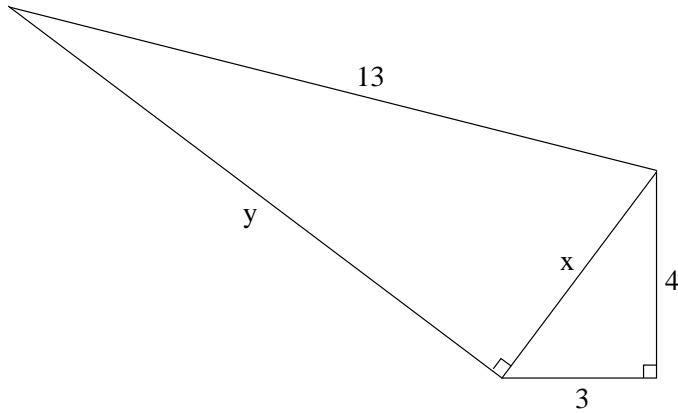
- (2) Find a value of x that satisfies the following:

$$8^{10x} = 32^{7x-5}$$

- (3) A number x satisfies the equation $x + \frac{1}{x} = 4$. Find the value of $x^2 + \frac{1}{x^2}$.

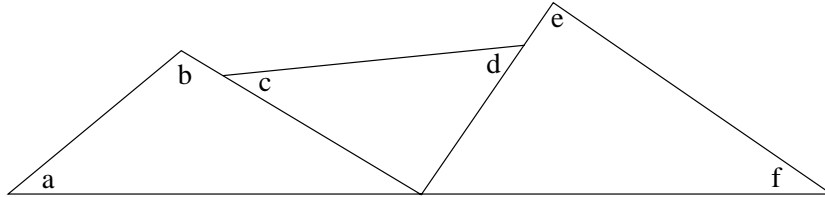
Individual Round — Geometry

- (1) What is the length of the segment marked y in the following diagram?

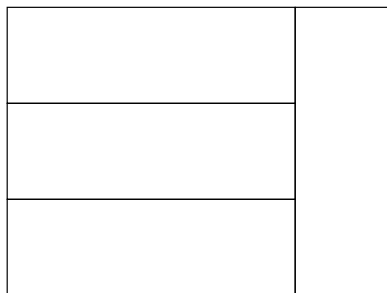


- (2) Find the value in degrees of the sum of the six angles indicated in the diagram.

$$a + b + c + d + e + f = \underline{\hspace{2cm}}$$



- (3) Four congruent rectangles are arranged as shown below to form a large rectangle. The area of the large rectangle formed is 768. What is the area of a square having the same perimeter as the large rectangle?



Team Round — CAPT

A consultant is hired to analyze the pricing of one of the product lines at HSM Corporation. The work of a previous consultant is made available which shows that the relationship between p (the price, which is determined by HSM) and q (the quantity sold in a month, which is determined by market forces) is

$$q = 20 \cdot (500 - p)$$

According to this model, how many units should HSM expect to “sell” if they are giving them away for free? _____

If HSM sets the price too high demand for this product will drop. At what price would the quantity sold (q) be zero? _____

The revenue generated by this item is the product of the price set (p) and the quantity sold (q). Find the ideal price – the price at which the most revenue is generated. _____

Some additional data is brought to the consultant: During January of 2005 the price of the product was set at \$260.00 and the quantity sold in January was 5800 units. During February of 2005 the price of the product was reduced to \$220.00 which stimulated sales, the quantity sold in February was 6600 units. Using this new data to determine an updated model for the relationship between price (p) and quantity sold (q). What is the ideal price according to your new model? _____

