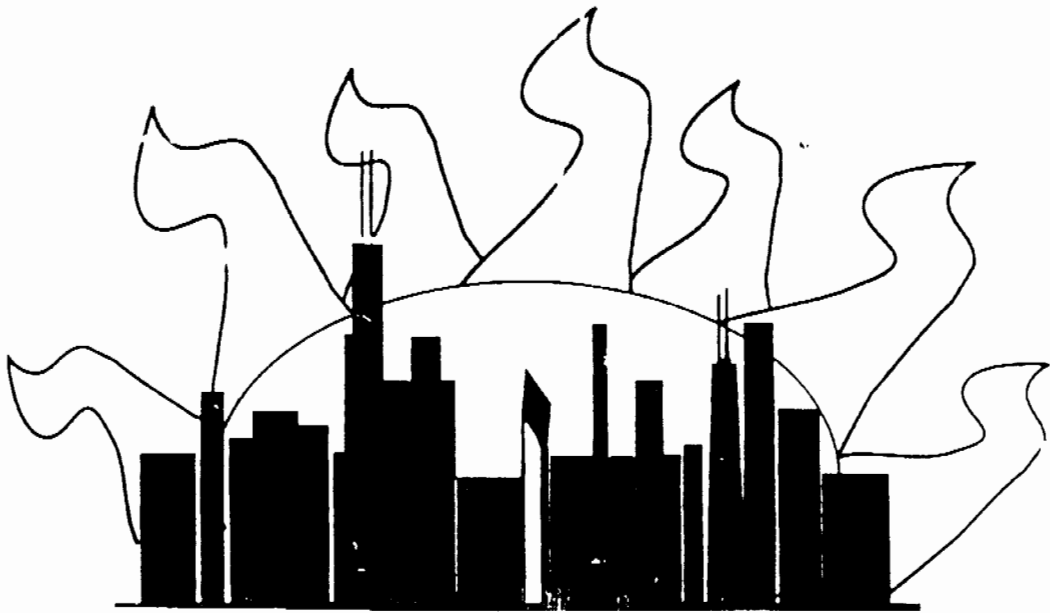


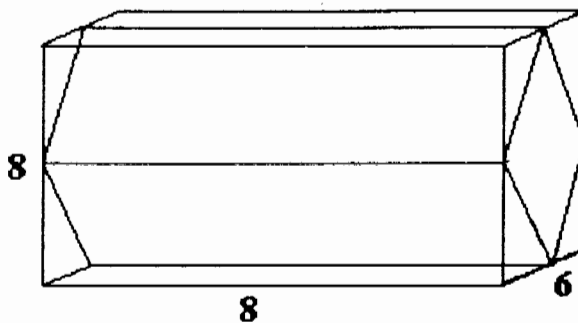
Theta Division

School  
Bowl



Mu Alpha Theta National Convention  
Chicago 1998

- Find the product  $xy$  where  $x$  is the greatest common divisor of 392 and 1274 and  $y$  is the volume of a cone whose slant height is  $3\sqrt{5}$  and whose radius is 3.
- A positive integer can be written uniquely in the form  $2^x 3^y 5^z k$ , where  $k$  is a positive integer not divisible by 2, 3, or 5; and  $x, y, z$  are non-negative integers. Express the number 756,000 in this manner. Find  $\frac{(k+x)}{yz}$  for this number.
- A rectangular prism is inscribed within another rectangular prism. The lengths of the edges of the larger prism are as shown in the diagram below. If the vertices of the smaller prism bisect the edges of the larger prism, what is the difference between the volumes of the prisms?



- Find the positive solution of  $x^2 - 12x - 427 = a$ , where  $a$  is the number of degrees in each interior angle of a regular 20-gon.
- In  $\triangle ABC$ , the measure of  $\angle A$  is  $(c + \frac{d}{3})^\circ$  and the measure of  $\angle B$  is  $(2b + \frac{c}{4})^\circ$ . Express the degree measure of the supplement of  $\angle C$  as a reduced fraction.
- Let  $A$  be the point  $(a-5, b)$  and  $B$  the point  $(2a - b, 2b + 3)$ . The slope of  $AB$  is  $\frac{7}{9}$  and the midpoint of the segment  $AB$  is a point on the line  $y = x$ . Find  $a + b$ .
- Let  $x$  be the overall average rate, in mph, for a two-way trip in which one way was traveled at 40 mph and the other way was traveled at 45 mph. (Assume the same route is traveled in both directions.) Let  $y$  be the perimeter of a rectangle whose sides are integers and whose diagonal is 15. Find the maximum of  $x$  and  $y$ .

- 8. Let  $\triangle ABC$  be a right triangle with area 16 and hypotenuse 7. Let  $\triangle A'B'C'$  be a similar triangle with area  $x$  and hypotenuse 5. Suppose  $y$  is the number of diagonals in a convex diagram. Find  $xy$  in simplified fraction form.
- 9. If  $n - m = 2$ ,  $n - p = 4$ ,  $p + r = - 2$ , and  $r - q = 3$ , what is the value of  $m + q$ ?
- 10. In trapezoid  $ABCD$ , shown below,  $AB \parallel DC$ ,  $AD \perp DC$ ,  $AB = 10$ ,  $BC = 20$ ,  $CD = 22$ , and  $DA = 16$ . If the trapezoid is revolved about the segment  $DC$ , what is the volume of the resulting solid?

