

Algebra Sample Problems

1. The cost of 3 hamburgers, 5 milk shakes, and 1 order of fries at a certain fast food restaurant is \$23.50. At the same restaurant, the cost of 5 hamburgers, 9 milk shakes, and 1 order of fries is \$39.50. What is the cost of 2 hamburgers, 2 milk shakes and 2 orders of fries at this restaurant? (1998 Exam)
2. Bobbo starts swimming at 2 feet/s across a 100 foot wide river with a current of 5 feet/s. Bobbo doesn't know that there is a waterfall 175 feet from where he entered the river. He realizes his predicament midway across the river. What is the minimum speed that Bobbo must increase to make it to the other side of the river safely? (1998 Exam)
3. Find the sum of every even positive integer less than 233 not divisible by 10. (1998 Exam)
4. A man named Juan has three rectangular solids, each having volume 128. Two of the faces of one solid have areas 4 and 32. Two faces of another solid have areas 64 and 16. Finally, two faces of the last solid have areas 8 and 32. What is the minimum possible exposed surface area of the tallest tower Juan can construct by stacking his solids one on top of the other, face to face? (Assume that the base of the tower is not exposed.) (1998 Exam)

Advanced Topics Sample Problems

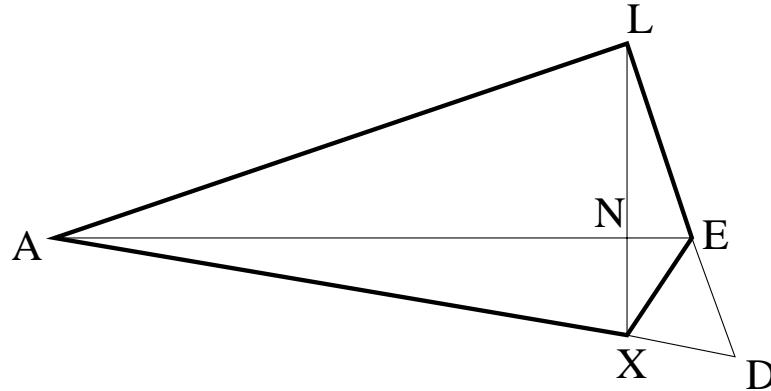
1. Evaluate $\sin(1998 + 237) \sin(1998 - 1653)$. (degrees) (1998 Exam)
2. How many values of x , $-19 < x < 98$ satisfy $\cos^2 x + 2 \sin^2 x = 1$? (1998 Exam)
3. Find the sum of the infinite series $1 + 2\left(\frac{1}{1998}\right) + 3\left(\frac{1}{1998}\right)^2 + 4\left(\frac{1}{1998}\right)^3 + \dots$ (1998 Exam)
4. Given any two positive real numbers x and y , let $x@y$ be a positive real number defined in terms of x and y by some fixed rule. Suppose the operation $x@y$ satisfies the equations $(xy)@y = x(y@y)$ and $(x@1)@x = x@1$ for all $x, y > 0$. Given that $1@1 = 1$, find $19@98$. (1998 Exam)

Calculus Sample Problems

1. Find the area of the region bounded by the graphs of $y = x^2$, $y = x$, and $x = 2$. (1998 Exam)
2. Find the slopes of all lines passing through the origin and tangent to the curve $y^2 = x^3 + 39x - 35$. (1998 Exam)

Geometry Sample Problems

1. Quadrilateral $ALEX$, pictured below (but not necessarily to scale!) can be inscribed in a circle. Furthermore, angle $LAX = 20^\circ$ and angle $AXE = 100^\circ$.



Calculate angle EDX . (1998 Exam)

2. MD is a chord of length $\sqrt{2}$ in a circle of radius 1 and L is chosen on the circle so that the area of triangle MLD is maximized.

Find angle MLD . (1998 Exam)

3. A cube with side length 100 cm is filled with water and has a hole through which the water drains into a cylinder of radius 100 cm. If the water level in the cube is falling at a rate of 1 cm/s, how fast is the water level in the cylinder rising? (1998 Exam)
4. A circle is inscribed in an equilateral triangle of side 1. Tangents to the circle are drawn that cut off equilateral triangles at each corner. Circles are inscribed in each of these equilateral triangles. If this process is repeated infinitely many times, what is the sum of the areas of all the circles? (1998 Exam)

