

Ruesdale

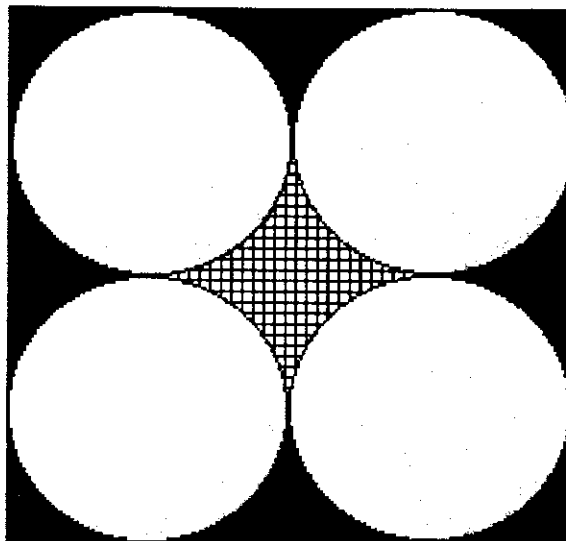
Pic Calc

TEAM QUESTIONS JANUARY 12, 1991 REGIONAL

1 Find the sum of the real solutions of the polynomial: $x^5 + 3x^4 - 3x^3 - 9x^2 - 4x - 12$.

2 If $\sqrt{3} \cos \theta - \sin \theta = -\sqrt{2}$ find all values of θ so that $0^\circ < \theta < 360^\circ$.

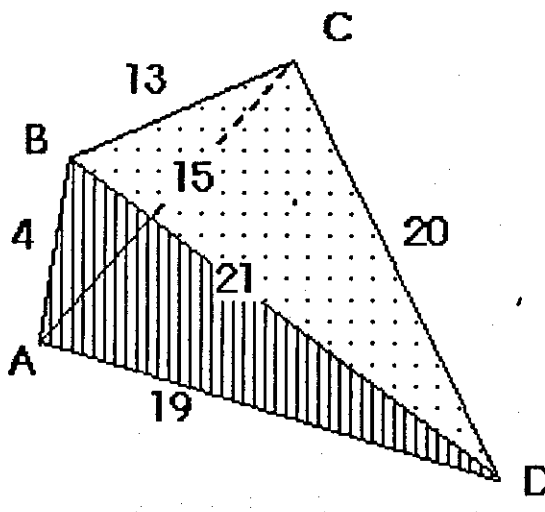
3 The figure consists of four congruent circles which are tangent to each other and to the sides of the square. Find the ratio of the area of the checkered part to the area of the black part.



4 The locus of points, in a plane, 4 cm from a given circle with radius 4 cm and also equidistant from two lines that intersect at the center of the given circle at an angle of 30° , all of which are coplanar, consists of how many points?

5 Find $\tan(3x)$ if $\sin x = -3/5$ and $\pi < x < 3\pi/2$.

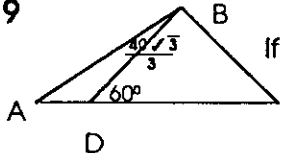
6 ABCD is a tetrahedron with triangular faces. The lengths of the edges are as marked: $AB = 4$, $BC = 13$, $CD = 20$, $AD = 19$, $AC = 15$ and $BD = 21$. Find the total area of ABCD in simplest radical form.



7 Find x if

$$x = \sqrt{x} + \sqrt{x} + \sqrt{x} + \sqrt{x} + \dots$$

8 Evaluate $(2 + 2i)^7$
Give your answer in $a + bi$ form.

9  If $m \angle BDC = 60^\circ$
 $BD = \frac{40}{3}$
 $\sin A = 5/13$ and $\cos C = 3/5$ find the perimeter of triangle ABC.

10 Evaluate: $64 \cdot \sqrt[3]{64} \cdot \sqrt[9]{64} \cdot \sqrt[27]{64} \dots$

11 Find the sum of the solutions:

$$\frac{1}{x} + \frac{1}{y} + \frac{2}{z} = 2$$

$$\frac{2}{x} - \frac{3}{y} + \frac{4}{z} = -11$$

$$\frac{3}{x} - \frac{5}{y} - \frac{6}{z} = 0$$

12 Evaluate: $(\log_2 2 - \log_2 4) \log_2 3$.