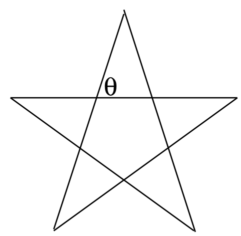
(1) What is the last digit in 2003^{2003}? [That's 2003 raised to the 2003^{rd} power.]

(2) Find the smallest positive integer with the property that the remainder is 1 if the integer is divided by any of the numbers 2, 3, 4, 5, 6, 7, 8, 9, 10.

(3) Depicted is a regular 5-pointed star. What is the measure of the angle θ in degrees?



(4) If the earth is assumed to be a sphere with radius 4000 miles, what is the circumference of a circle of latitude at 60 degrees north?

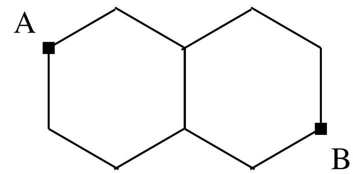
(5) Place these three numbers in order of increasing magnitutde: $\frac{9}{2}$, $\sqrt{20}$, $88^{\frac{1}{3}}$.

(6) In how many different ways can the integer 10 be written as the sum of four positive integers in which the order of terms is irrelevant? [That is, $4+2+2+2$ is to be regarded as the same as $2+4+2+2$.]

(7) A length of rope can be coiled into 10 circular loops each of diameter D inches. If the same rope is coiled into 12 circular loops, what would their common diameter be?

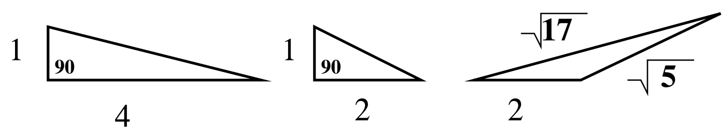
(8) Imagine a rope long enough to circle the Earth (assumed to be a perfect sphere) along the Equator at an altitude of 1 meter. How much of the rope would have to be cut off in order to ensure that the remaining length could circle the Equator while just touching the Earth's surface?

(9) These two regular hexagons share a side of length one. What is the distance from point A to point B?



(10) A vehicle with wheels of radius 15 inches rolls forward at the rate of 10 feet per second. How rapidly are the wheels revolving on their axes (in radians per seconds)?

(11) Find the sum of the areas of these three triangles.



(12) In a circle of radius 2, what is the length of a chord that is the perpendicular bisector of a radius?

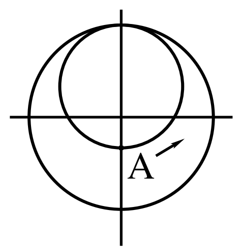
(13) If a, b, c are distinct positive integers for which $a = b^2 = c^3$, what is the smallest value for a?

(14) Suppose that the positive integer N has the property that $\log_{10}(\log_{10}(\log_{10} N)) = 0$. How many digits does N have?

(15) Three teams, the red team, the blue team, and the gold team, each consisting of two runners, compete in a two-mile relay race. Each runner runs one mile of the relay. The red team's two runners run the mile at 9 mph and 11 mph repsectively. The blue team's runners run the mile at 8 and 13 mph respectively. Both gold team runners run the mile at 10 mph. List the teams in order of finish − first, second, third, in that order.

(16) Of the nine digits $0, 1, 2, 3, 4, 5, 6, 7, 8$ which two cannot be the units digit of a base-9 representation of a prime number?

(17) A circle of radius 12 has center at the origin. A circle of radius 8 is inside the circle of radius 12 and is initially tangent to it at the point $(0, 12)$. If the small circle rolls inside the large circle in the direction indicated without slipping, what are the coordinates of point A on the small circle when the circles are tangent at the point $(0, -12)$?



(18) At the beginning of the year Maria invests \$12,345 in shares of Volatile stock. The stock's value increases by 25% the first month, decreases by 20% the second month, increases by 25% the third month, decreases by 20% the fourth month, etc. It continues monthly to alternate 25% increases with 20% decreases through 12 months. At the end of 12 months what is the value of Maria's investment?

(19) To raise money, the Liberty High School debate team washes cars. Nine students can wash 30 cars in 1.2 hours. The nine students are equally efficient. How many cars can one student wash in one hour?

(20) While returning an exam, a teacher announces, "The class average for this exam is 82%. However, after removing an unusual test score, the average increases to 84%." If there are 20 students in the class, what is the "unusual" test score?

(21) Three red dots and three blue dots are placed randomly in the plane, the only restriction being that no three of the six dots can be collinear. Nine line segments are then drawn, one from each red dot to each blue dot. What is the fewest possible number of intersections formed by these line segments, not counting intersections at the six dots?

(22) When the polynomial $p(x)$ is divided by $x^2 - 4$, the remainder is of the form $ax + b$. Find a and b if we know that $p(2) = 7$ and $p(-2) = 15$.

(23) A party consisting of 5 men and 4 women arrive at a tennis club, but only one court is available for play. They decide to arrange a mixed doubles match, i.e., a team consisting of one man and one woman playing another team consisting of one man and one woman. They use only players from their party. What is the total number of mixed doubles matches that can be arranged?

(24) Two buckets, each containing 4 liters of water are on opposite sides of a see-saw. Bucket A is 3 units from the fulcrum; Bucket B is 2 units from the fulcrum. Additional water is poured into Bucket A at the rate of 1 liter/minute and into Bucket B at the rate of 4 liters/minute. After how many seconds will the see-saw be balanced?

(25) Twelve points are equally spaced on the circumference of a circle of radius 1. What is the distance between a pair of adjacent points?

(26) Compute $\sqrt{999^4 + 4 \cdot 999^3 + 6 \cdot 999^2 + 4 \cdot 999 + 1}$.

(27) We are given that $p(x)$ is a 2^{nd} degree polynomial with the following properties:

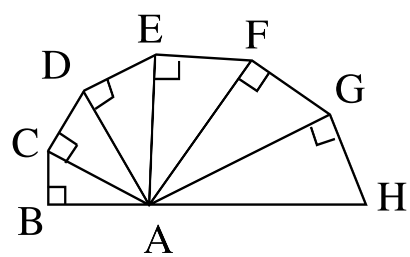
$p(x) > 0$, if $x < 3$ or $x > 4$

$p(x) < 0$, if $3 < x < 4$,

$p(2) = 6$.

Find $p(0)$.

(28) The six depicted triangles are all 30-60-90 right triangles sharing a common vertex A and sharing common sides with their neighbors. If the length of side AB is 1 unit, how long is side AH?

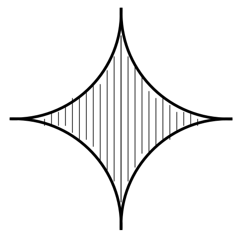


(29) In the illustration for problem 28, how much is
$BC^2 + CD^2 + DE^2 + EF^2 + FG^2 + GH^2$?

(30) How many digits are there in the number 2003^5?

(31) A patient, but slightly crazed, spider spins a web that begins at point $(1, 0)$ and then proceeds counterclockwise to $(0, \frac{1}{2})$, $(-\frac{1}{4}, 0)$, $(0, -\frac{1}{8})$, and so forth forever, always ending a strand at the boundary between quadrants and each time cutting the distance to the origin by half. Assuming that the spider can finish this infinite process, what would be the sum of the lengths of all these strands?

(32) Pittsburgh Steeler fans will recognize this shape. The four arcs are each a fourth of a circle of radius R. What is the enclosed area in terms of R?



(33) Given a circle of radius 1 with an inscribed regular hexagon and a circumscribed regular hexagon, find the area between the two hexagons.

(34) If $\tan^2\theta - \sin^2\theta = 25$, find $(\tan^2\theta)(\sin^2\theta)$.

(35) The contenders for the top positions in a basketball league are the Atlantics, the Buffaloes, and the Canards. It is certain that the Atlantics will end up in either first or second place, and the probability that the Atlantics will finish in a higher place than the Canards is 0.5. The probability that the Buffaloes will take second place is 0.1, and the probability that the Atlantics will take first place is 0.4. What is the probability that the Buffaloes will finish in third place?

(36) A cone is inscribed in a sphere of radius 2 in such a way that its base is one unit from the bottom of the sphere. What is the volume of the cone?