SAMPLE SOLUTIONS, Contest #1

1. Answer: 15

If D and d are positive integers and D $\geq$ d, the maximum possible remainder for D $\div$ d is d – 1.
By trial and error: 99 $\div$ 18 = 5R9; 98 $\div$ 17 = 5R4;
97 $\div$ 16 = 6R1; 79 $\div$ 16 = 4R15; 15 is 1 less than the divisor 16.

2. Answer: 20

Let *l* and w represent the lengths of a pair of adjacent sides of the rectangle. Then,
1.15*l*(xw) = 0.92*l*w; 1.15x = 0.92; x = 0.8. Thus, the adjacent side must be reduced by (1 – 0.8)%
or 20%

3. Answer: 12:08 pm

The minute hand of a standard 12-hour clock rotates at 6° per minute and the hour hand
rotates at 0.5^o per minute. Let x represent the number of minutes transpiring past noon. Then,
6x – 0.5x = 44 or 60x – 5x = 440 and x = 8.

4. Answer: $12\sqrt{3}$

Minor $\overset{\frown}{AB}$ measures 120°. Draw a radius to point A and a segment from the center of the circle
perpendicular to chord $\overline{AB}$, creating a 30-60-90 triangle. The radius (hypotenuse of the right
triangle created) is 12 cm and ½ · AB is $6\sqrt{3}$.

5. Answer: 16

Let x = # of blue marbles and x + 11 = # of red marbles.
Then, $\dfrac{x+11}{2x+11} \cdot \dfrac{x+10}{2x+10} = 12\left(\dfrac{x}{2x+11}\right)\left(\dfrac{x-1}{2x+10}\right)$;
x^2 + 21x + 110 = $12x^2$ – 12x; $11x^2$ – 33x – 110 = 0; x^2 – 3x – 10 = 0; (x – 5)(x + 2) = 0; x = 5.

6. Answer: (3, 13, 1)   [Accept a = 3, b = 13, c = 1.]

Let x = number. Then x^2 = 29 + x. Putting this equation in standard quadratic form and
applying the quadratic formula, x = $\dfrac{1 \pm 3\sqrt{13}}{2}$. Reject the negative root.