Bergen County Mathematics League

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Brief Contest Solutions #6

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6-1) $20000 < x^2 < 80000$

$100\sqrt{2} < x < 200\sqrt{2}$

$141.4\ldots < x < 282.8\ldots$

$142 \le x \le 282$

There are $282 - 142 + 1 = \boxed{141}$ lockers.

6-2) $x = \sqrt{12+\sqrt{12+12\sqrt{12+\ldots}}}$

So $x = \sqrt{12+x}$

$x^2 = 12+x$

$x^2 - x - 12 = (x-4)(x+3) = 0$

Since $x > 0$, $x = \boxed{4}$

A calculator has the capacity to show you the result approaches 4.

6-3) $(r+3)(10) = (3-r)(50)$, so $r = 2$.

$d = rt = (2+3)(10) = 50$

for a step, $d = rt$

$50 = 2t \Rightarrow t = \boxed{25}$ seconds.

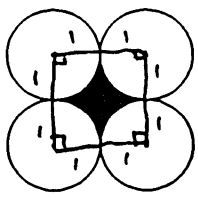
6-4

Area of each sect of the sort illustrated $= \frac{300}{12} = 25$.

Area of $\Delta = \frac{1}{2} \cdot r \cdot r \cdot \sin 30° = \frac{r^2}{4} = 25$, so $r = 10$

Area of circle $= \pi r^2 = \boxed{100\pi}$.

6-5



square − 4($\frac{1}{4}$ circles) = shaded region

$4 - 4\left(\frac{\pi}{4}\right) = \boxed{4-\pi}$.

6-6) 4 containers, 3 spaces inside each, so 12 slots of 4 types. Ignore the pennies. First can go into any slot. Second can go into either of the 2 of the same type. There are 11 from which to choose. The next time, there will be 10 slots from which to choose; I will be right. $P = 1 \times \frac{2}{11} \times \frac{1}{10} = \boxed{\frac{1}{55}}$.