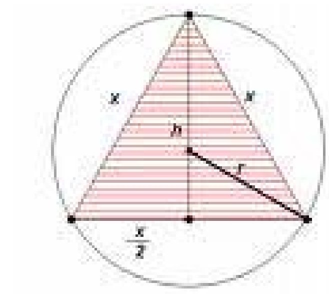
Solutions:

1. We can write an equation, and solve. So, $\frac{x}{x+10} = \frac{x}{x+15} + \frac{1}{10}$. We can simplify the right side as $\frac{x}{x+10} = \frac{x}{x+15} + \frac{1}{10} = \frac{10x}{10x+150} + \frac{1}{10} = \frac{10x+(x+15)}{10x+150} = \frac{11x+15}{10x+150}$.
Cross multiplying gives
$10x^2 + 150x = 11x^2 + 125x + 150; x^2 - 25x + 150 = 0, (x-15)(x-10) = 0.$
Since x>10, our answer is 15.



2. If we draw a diagram, like the one to the side. So we know that $\frac{x}{2}$=3√3, and h=9.
Multiplying these two together, we get the area of the triangle is 27√3.

3. The best way is to count up and make a list of numbers.
Able to be attained: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 20, 21, 24, 25, 28, 32
Not able to be attained: 15, 19, 22, 23, 26, 27, 29, 30, 31
Thus only 9 numbers cannot be attained.

4. Looking at a few of the patterns, we see that $\frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} + \cdots \ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$. Thus, n=100, and $\frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{20} \ldots + \frac{1}{100(100+1)}$=$\frac{100}{101}$.

5. If we look at the patterns, we see that a◁b=a(a+b). So 6◁4=6(6+4)=6(10)=60.

6. We can do this two different ways, because I'm lazy, we'll use the easier method (not Vieta). We have
(x+5)(x-1)=x^2+4x-5. So the real polynomial is x^2-5x+4, which factors as (x-4)(x-1). Thus the answer is (4,1).

7. For this problem, we do a little casework. There are 840 four letter "words", 2520 five letter "words", 5040 six letter "words", and 5040 seven letter "words". Adding these up gives 13440 different "words".

8. We can easily see that 6+3-3*3=0, though Peter can't. Since he can only see, 6 3 3 3, we have to see if there are any other format of the numbers that will achieve 0. From the Communicative Property of Addition, we see that 6-3(3)+3 also works. There are 4^3 ways to place one of the four symbols in each of the three spaces. Thus Peter has a $\frac{2}{64} = \frac{1}{32}$ probability of getting the problem right.

9. We don't have to find out everything. We just need, $\frac{5}{50} * 100 + \frac{15}{50} * 250 + \frac{30}{50} * 600 = 10 + 75 + 360 = 445$ feet/minute.

10. We know that $\left(\frac{n(n+1)}{2}\right)^2 = 784$. Square rooting both sides gives $\frac{n(n+1)}{2} = 28$, so n=7.

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