Problems of the Week (POWs) Assignments

***Instructions*:** Your solution will be graded according to the official Oregon Scoring Guide, and thus your write up should include all your reasoning, and not just a final answer.
*The **emphasis** of these assignments is on **clear, complete and precise explanations.** Please write your solutions in a way that a "typical" student in the 5-8th grade range will be able to follow it.*

If you do not like the score you receive on your POWS, you could choose another one from each of the 5 assignments and turn in your second attempt by 11/25. Be sure to attach the POW you wish to replace. The scores of the 1st two attempts will then be averaged.

Some of these problems were taken from the following sources:
www.eduplace.com, http://www.cmc.uwaterloo.ca/english/contests/pascal.shtml

A. POW 1 Due 10/5: Choose one of the following two problems:
Half of the students who eat lunch during second period brought their lunch and didn't buy anything at the cafeteria. Of the remaining half who bought something, $\frac{3}{4}$ bought ice cream. Half of the ice cream bought was chocolate and one-fourth was vanilla. The remaining 15 choices were strawberry. How many students were at second period lunch?

P, Q, R, S, and T are five different integers between 2 and 19 inclusive.
• P is a two-digit prime number whose digits add up to a prime number.
• Q is a multiple of 5.
• R is an odd number, but not a prime number.
• S is the square of a prime number.
• T is a prime number that is also the mean (average) of P and Q.
Find P, Q, R, S, and T.

B. POW 2 Due 10/12: Choose one of the following two problems:
A bag contains 20 candies: 4 chocolate, 6 mint and 10 butterscotch. Candies are removed randomly from the bag and eaten. What is the minimum number of candies that must be removed to be certain that at least two candies of each flavor have been eaten?

Matt has a vinyl place mat that is consists of a 10 by 10 grid. He thinks it has 100 squares, but then his older brother comes along and remarks, “Take another look. That mat has at least three times as many squares as you think!” How many squares does Matt’s mat have?

C. POW 3 Due 10/19: Choose one of the following two problems:
Carmen, Jordy, Mariah, and Ronnie each have less than $1.00 to spend at the snack bar. Altogether they have $3.26, all in coins, including 7 quarters, 1 penny, and the same number of dimes as nickels.

- Each person has 7 coins.
- They each have a different number of dimes.
- Jordy has more dimes but fewer quarters than anyone else.
- Ronnie has the most money, and Jordy has the least.
- Mariah is the only one who has a penny.
- Ronnie has the same number of nickels as Jordy and Carmen has the same number as Mariah.
- Ronnie has the same number of nickels as quarters, but more dimes than nickels.

What combination of coins, and how much money, does each person have?

Find the sum of all positive integers less than 1,000 that are divisible by 3 but not by 2.

D. POW 4 Due 10/26: Choose one of the following two problems:
Shilpa gets "digits" from Raj at the local watering hole. She remembers that his 10-digit phone number is something like 1472583690, where it consists of one each of the digits 0-9. She also remembers that if the 1st digit (1 in this case) is a multiple of 1. The 1st two digits (14 in this case) is a multiple of 2. The 1st three digits (147 in this case) is a multiple of 3 and so on (….the 1st 10 digits are a multiple of 10). What is Raj's phone number? There is a unique phone number which satisfies the above criteria.

How many leap years will there be from the years 2006 to 3100 inclusive?

(i) Year *Y* is not a leap year if *Y* is not divisible by 4.
(ii) Year *Y* is not a leap year if *Y* is divisible by 100 but not by 400.
(iii) Otherwise year Y is a leap year.

E. POW 5 Due 11/2: Choose one of the following two problems:
Cindy leaves school at the same time every day. If she cycles at 20 km/h, she arrives home at 4:30 in the afternoon. If she cycles at 10 km/h, she arrives home at 5:15 in the afternoon. At what speed must she cycle to arrive home at 5 in the afternoon?

A palindrome is a positive integer whose digits are the same when read forwards or backwards. There are pairs of four-digit palindromes whose sum is a five-digit palindrome. One such pair is 2882 and 9339, How many such pairs are there?