

# INTRODUCTION TO CALCULUS

MATH 1A

## UNIT 1: WORKSHEET

**1):** How does the following sequence

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0 6 24 60 120 210 336 504

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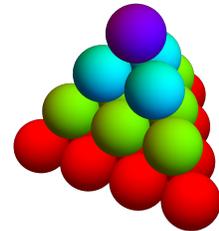
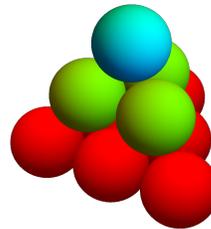
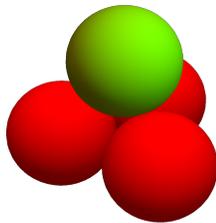
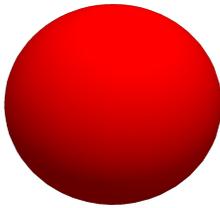
continue? We look at this as a function  $f(1) = 0, f(2) = 6, \dots, f(8) = 504$ . What is the next term  $f(9)$ ?

**2):** If we stack oranges onto each other we are led to **tetra-**  
**hedral numbers**. Can you find the next number?

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1 4 10 20 35 56 84 120 ...

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n=1

n=2

n=3

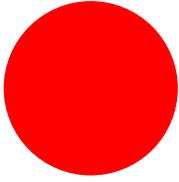
n=4

**3):** When adding the first integers we get the so called **tri-**  
**angular numbers**. This sequence defines a **function** on the  
natural numbers. For example,  $f(4) = 10$ . Do you recall a  
formula which gives  $f(x)$ ?

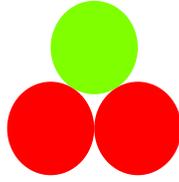
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1 3 6 10 15 21 36 45 ...

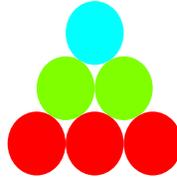
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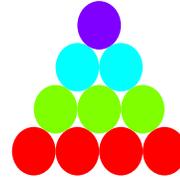
n=1



n=2



n=3



n=4

4): Verify that

$$f(x) = \frac{x(x+1)}{2}$$

gives the above numbers. Check this by algebraically evaluating

$$f(x) - f(x-1) = x + 1.$$



Carl-Friedrich Gauss,  
1777-1855

5): (More challenging) You do that in the homework. Verify that

$$g(x) = \frac{x(x+1)(x+2)}{6}$$

satisfies

$$g(x) - g(x-1) = (x+1)(x+2)/2.$$