Pascal's Triangle (homework)

Date:

1. Shown below are portions of Pascal's triangle. Fill in the missing numbers

a)

	15	
35	35	
	56	

b)

91	14	1

c)

120	210	
		462
495		

d)

715	286	
3003	1365	

e)

105		
120	560	1820

f)

	153	
	171	
190	1140	

g)

1716		
3003		3003

2. Determine the sum of the terms in each of these rows in Pascal's triangle

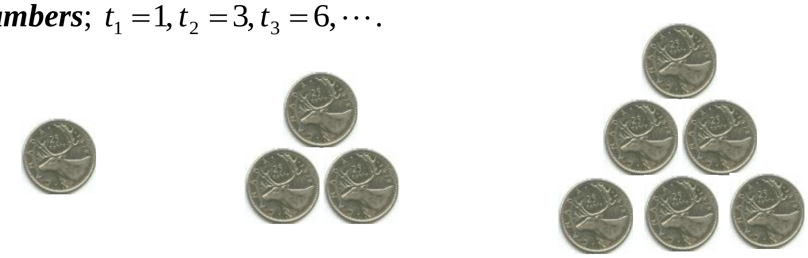
   a) row 12 b) row 25 c) row 20

3. Determine the row number for each of the following row sums from Pascal's triangle.

   a) 256 b) 4096 c) 16384 d) 65536

4. Refer to Example 4, let's assume the checker may jump over the X into the diagonally opposite square. How many paths are there to the top of the board now?

5. Coins can be arranged in the shape of an equilateral triangle as shown. This sequence of numbers are called ***triangular numbers***; $t_1 = 1, t_2 = 3, t_3 = 6, \cdots$.

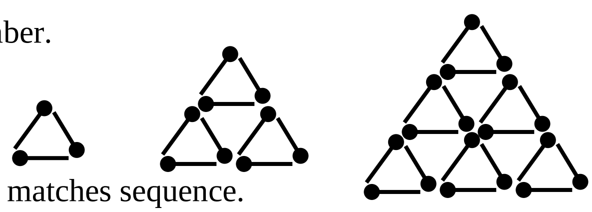


   a) Continue the pattern to determine the fourth, fifth and sixth triangular numbers.

   b) Relate the sequence of triangular numbers to Pascal's Triangle. State the n^{th} triangular number in terms of a Pascal's Triangle term, $t_{n,r}$.

   c) Determine a general rule for the n^{th} triangular number.

   d) Determine the twelfth triangular number.

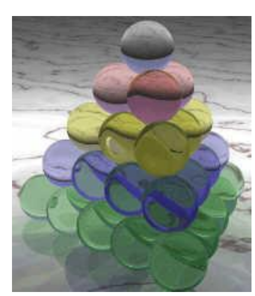


6. Matches are laid out to form triangles as shown.

   a) Determine a general rule for the n^{th} number in this matches sequence.

   b) How many matches would the 10^{th} triangle contain?

7. Spheres can be piled in a tetrahedral shape as shown on the right. Consequently, this sequence is called ***tetrahedral numbers***.



   a) State the next 4 tetrahedral numbers, continuing the pattern:
   $t_1 = 1, t_2 = 4, t_3 =$ ________, $t_4 =$ ________, $t_5 =$ ________, $t_6 =$ ________, $\cdots$

   b) Relate the sequence of tetrahedral numbers to Pascal's Triangle.

   c) Determine a general rule for the n^{th} tetrahedral number.

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Answers

2a) 4096 b) 33554432 c) 1048576 3a) 8 b) 12 c) 14 d) 16

4. 5 + 12 + 14 + 11 = 42 5b) $r = 2;\ t_{n+1,\,2}$ c) $\frac{n(n+1)}{2}$ d) 78

6a) $\frac{3n(n+1)}{2}$ b) 165 7a) 10, 20, 35, 56 b) $r = 3;\ t_{n+1,\,3}$ c) $\frac{n(n+1)(n+2)}{6}$