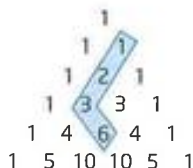


A Practise

For help with questions 1 and 2, refer to Example 1.

- The hockey stick pattern is one of many found in Pascal's triangle. Start on any of the 1s along the side. Select any number of entries along a diagonal to this 1, ending inside the triangle. Determine the sum of these numbers. Turn at the bottom, as shown in the example. How is the number not on the diagonal related to the sum? On a copy of Pascal's triangle, outline five hockey stick patterns of your own.



- Determine the sum of the terms in each row of Pascal's triangle.

- a) row 8 b) row 12
c) row 20 d) row n

For help with questions 3 and 4, refer to Example 2.

- Express as a single term from Pascal's triangle in the form $t_{n,r}$.
- a) $t_{4,3} + t_{4,4}$ b) $t_{8,5} + t_{8,6}$
c) $t_{25,17} + t_{25,18}$ d) $t_{a,b} + t_{a,b+1}$
- Write each as the sum of two terms, each in the form $t_{n,r}$.
- a) $t_{4,2}$ b) $t_{12,9}$ c) $t_{28,14}$ d) $t_{17,x}$

For help with questions 5 to 7, refer to Example 3.

- Use Pascal's triangle to expand each power of a binomial.
- a) $(x + 2)^5$ b) $(y - 3)^4$ c) $(4 + t)^6$
d) $(1 - m)^5$ e) $(2x - 3y)^4$ f) $(a^2 + 4)^5$
 - How many terms are in each expansion?

a) $(3a + 5)^0$ b) $(x + 2)^{25}$
c) $(t - 6)^{15}$ d) $(5b + 6a)^n$

- Use patterns in the terms of the expansion to determine the value of k in each term of $(x + y)^{12}$.

- a) ky^{12} b) $792x^k y^5$
c) $495x^8 y^k$ d) $kx^4 y^8$



B Connect and Apply

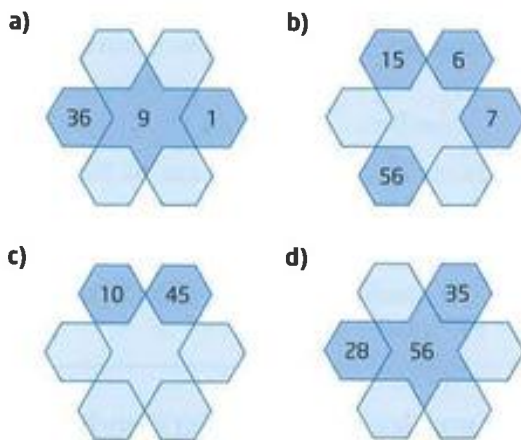
- What row number of Pascal's triangle has each row sum?

- a) 256 b) 2048
c) 16 384 d) 65 536

- Write each as the difference of two terms in the form $t_{n,r}$.

- a) $t_{4,2}$ b) $t_{6,3}$ c) $t_{12,9}$ d) $t_{28,14}$

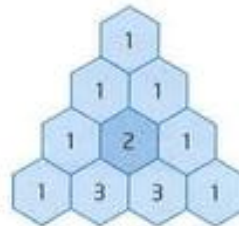
- Look for patterns in Pascal's triangle. What are the missing numbers in each diagram?



11. Chapter Problem

You can find fractal qualities in Pascal's triangle.

Use a copy of Pascal's triangle and colour all even numbers one colour and all odd numbers another colour. Describe the pattern that emerges.



12. Find the Fibonacci sequence in Pascal's triangle. Describe the position of these numbers.

Hint: Write Pascal's triangle as a right triangle and look diagonally.

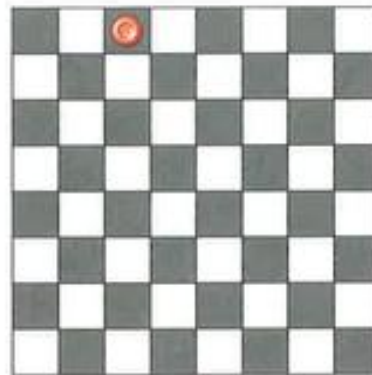
C Extend

13. Determine the sum of the squares of the terms in the horizontal rows of Pascal's triangle. Write these numbers as a sequence and then locate the sequence in the triangle. Write a formula for the sequence.
14. In the expansion of $(1 + x)^n$, the first three terms are 1, -18 , and 144 . Determine the values of x and n .
15. Describe the process used to generate the terms in the triangular array shown. Write this in a recursive form. Write the next three rows of this triangular array.

$$\begin{array}{ccccccc}
 & & & & \frac{1}{1} & & & & \\
 & & & & & & \frac{1}{2} & & \frac{1}{2} & & \\
 & & & \frac{1}{3} & & \frac{1}{6} & & \frac{1}{3} & & & \\
 & & \frac{1}{4} & & \frac{1}{12} & & \frac{1}{12} & & \frac{1}{4} & & \\
 \frac{1}{5} & & \frac{1}{20} & & \frac{1}{30} & & \frac{1}{20} & & \frac{1}{5} & &
 \end{array}$$

16. Locate a row in Pascal's triangle where the first term after the 1 is a prime number. Look for a relationship between that number and the other terms in the row. Describe this relationship. Locate another row where the first term after the 1 is prime. Do you see the same relationship? Ask a classmate which row they tried and see if they came to the same conclusion.

17. Determine the number of pathways for the checker from the top to the bottom of the checkerboard if the checker can be moved diagonally down only.



18. **Math Contest** A school hallway contains 50 lockers numbered 1 to 50. One student ensures they are closed. A second student opens every even-numbered locker. A third student changes the state of the lockers that are a multiple of 3. (To change the state of a locker means an open locker will be closed and a closed locker will be opened.) A fourth student changes the state of all lockers that are a multiple of 4. This pattern continues for 50 students. After the last student, what is the sum of the numbers on the lockers that are closed?

A 100 **B** 765 **C** 140 **D** 50

19. **Math Contest** The value of the constant in the expansion of $\left(2x^3 - \frac{3}{x^2}\right)^5$ is

A 0 **B** -1080 **C** 1080 **D** -243

20. **Math Contest** Every day at midnight, a ship leaves New York for London at the same time a ship leaves London for New York. It takes exactly 5 days to complete this journey. How many New York-bound ships will a London-bound ship pass on its journey?

A 11 **B** 9 **C** 10 **D** 5