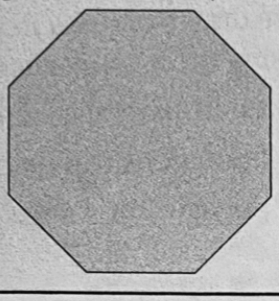
16. a) How many diagonals are there in any convex octagon?

Literacy Link

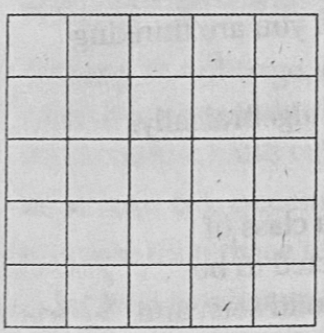
Convex means curved out. *Concave* means curved in. A convex octagon has all vertices pointing outward.



b) How many diagonals are there in a convex polygon with n sides? Explain your reasoning.

✓ Achievement Check

17. Ten identical playing pieces are placed on a 5 by 5 game board.



a) In how many ways could 10 playing pieces be placed on the board if there are no restrictions?

b) In how many ways could 10 playing pieces be placed on the board if there must be two pieces in each row?

c) Describe how the results would change if the playing pieces were all different.

18. In how many ways can 15 people be divided into three identical groups of five?

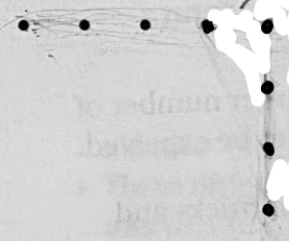
19. In how many ways can a team of 20 hockey players be accommodated in 10 two-person hotel rooms? Assume that the order of assigning the rooms does not matter.

20. Compare your technique in #18 and #19 to the one you used in #12 in section 3.1 on page 109.

21. Show that the number of ways of dividing a class of 30 students into six teams of five members is the same as the number of ways of arranging five red, five green, five purple, five blue, five white, and five black balls.

22. **Communication** For $r > 0$, will there always be more r-permutations of n items or r-combinations of n items? Why?

23. **Thinking** Five points are drawn horizontally, and four points are drawn vertically, with the top one overlapping the point on the right side. How many triangles can be formed using the points as vertices?



Processes

Problem Solving
How would you solve a simpler version of this problem?

Extend

24. a) Show that the product of three consecutive numbers is divisible by 3!.

b) Show that the product of r consecutive numbers is divisible by $r!$.

25. Solve for n in $n! = 12 \times {}_nC_2$.

26. How many ways are there to choose three numbers from 1 to 20 so that no two are consecutive?