Permutations

List all possible permutations.

1) 1, 2, 3  
2) T, V, W, taken two at a time

3) ☺, ♡, ♥, ▲, taken two at a time  
4) A, B, C, D

Evaluate each expression.

5) \(4P_2\)  
6) \(5P_1\)

7) \(6P_2\)  
8) \(6P_6\)

9) \(-4 + 7P_4\)  
10) \(5 \cdot 6P_5\)

Find the number of unique permutations of the letters in each word.

11) DESIGN  
12) MATH

13) CHEESE  
14) FURTHER

15) BALLISTICS  
16) BILLIONAIRE

Critical thinking questions:

17) Write a word for which there are 30 unique permutations of the letters.  
18) Simplify \(xP_2\)
Permutations

List all possible permutations.

1)  1, 2, 3
    123  213  312
    132  231  321

2)  T, V, W, taken two at a time
    TV, VT, WT
    TW, VW, WV

3)  ☺, ☼, ♥, ▲, taken two at a time
    ☺☼, ☺♥, ☺▲, ☼☺, ☼♥, ☼▲, ♥☺, ♥☼, ♥▲, ▲☺, ▲☼, ▲♥

4)  A, B, C, D
    ADBC, BACD, CABD, DABC
    ABDC, BADC, CADB, DBCA
    ACBD, BCAD, CBAD, DBAC
    ACDB, BCDA, CBDA, DBCA
    ADBC, BDAC, CDAB, DCAB
    ADCB, BDCA, CDBA, DCBA

Evaluate each expression.

5)  \(4P_2\)
    12

6)  \(5P_1\)
    5

7)  \(6P_2\)
    30

8)  \(6P_6\)
    720

9)  \(-4 + 7P_4\)
    836

10)  \(5 \cdot 6P_5\)
    3,600

Find the number of unique permutations of the letters in each word.

11)  DESIGN
    720

12)  MATH
    24

13)  CHEESE
    120

14)  FURTHER
    2,520

15)  BALLISTICS
    453,600

16)  BILLIONAIRE
    3,326,400

Critical thinking questions:

17)  Write a word for which there are 30 unique permutations of the letters.
    LEVEL

18)  Simplify \(xP_2\)
    \(x(x - 1)\)