

## 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  ${}_xP_{x-2}$

## Answers

List all possible permutations.

1) 1, 2, 3

123 213 312  
132 231 321

3) ☺, ☀, ♥, ▲, taken two at a time

☺☀ ☀☺ ♥☺ ▲☺  
☺♥ ☀♥ ♥☀ ▲☀  
☺▲ ☀▲ ♥▲ ▲♥

Evaluate each expression.

5)  ${}_4P_2$

12

7)  ${}_6P_2$

30

9)  $-4 + {}_7P_4$

836

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

TV VT WT  
TW VW WV

4) A, B, C, D

ABCD BACD CABD DABC  
ABDC BADC CADB DACB  
ACBD BCAD CBAD DBAC  
ACDB BCDA CBDA DBCA  
ADBC BDAC CDAB DCAB  
ADCB BDCA CDBA DCBA

6)  ${}_5P_1$

5

8)  ${}_6P_6$

720

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  ${}_xP_{x-2}$

$\frac{x!}{2}$