

1. In how many ways can Beth place 28 different books on four shelves so that there is at least one book on each shelf? (For any of these arrangements consider the books on each shelf to be placed one next to the other, with the first book at the left of the shelf.

(Beth 将 28 本不同的书放在 4 排书架上使得每排书架上至少有 1 本书, 那么一共有多少种方式 (这些书是一本接一本地竖着横排在一起, 并且在每一排上的书都从最左边开始摆放。)

2. Find the coefficient of $w^2 xy^2 z^3$ in the expansion of $(w+x+y+z+1)^{10}$

(在下列的展开式中确定 $w^2 xy^2 z^3$ 的系数: $(w+x+y+z+1)^{10}$)

3. For primitive statements $p, q, r,$ and $s,$ simplify the compound statement.

$$[[[(q \wedge p) \wedge r] \vee [(q \wedge p) \wedge \neg r]] \vee \neg p] \rightarrow s$$

(对于简单命题 p, q, r, s 简化复合命题)

4. Give the reason(s) for each step needed to show that the following argument is valid.

(给出每一步的理由以说明下面的推理有效。)

$$[q \wedge (q \rightarrow p) \wedge (s \vee r) \wedge (r \rightarrow \neg p)] \rightarrow (s \vee t)$$

Steps:

- (1) q
- (2) $q \rightarrow p$
- (3) p
- (4) $r \rightarrow \neg p$
- (5) $p \rightarrow \neg r$
- (6) $\neg r$
- (7) $s \vee r$
- (8) s
- (9) $\therefore s \vee t$

5. Let Ω be a given universe with $A, B \subseteq \Omega$, $|A \cap B| = 3$, $|A \cup B| = 8$, and $|\Omega| = 12$

(令 Ω 是一个给定的全集)

a) How many subsets $C \subseteq \Omega$ satisfy $A \cap B \subseteq C \subseteq A \cup B$?

b) How many subsets $D \subseteq \Omega$ satisfy $\overline{A \cup B} \subseteq D \subseteq \overline{A} \cup \overline{B}$?