



12. The number 3 can be expressed as the sum of one or more positive integers in four different ways:

$$3; \quad 1 + 2; \quad 2 + 1; \quad 1 + 1 + 1.$$

In how many ways can the number 5 be so expressed?

- A 8 B 10 C 12 D 14 E 16

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12. **E** Two different ways of expressing 5 are $1 + 4$ and $4 + 1$. In the following list these are denoted as {1, 4: two ways}. The list of all possible ways is {5: one way}, {2, 3: two ways}, {1, 4: two ways}, {1, 2, 2: three ways}, {1, 1, 3: three ways}, {1, 1, 1, 2: four ways}, {1, 1, 1, 1, 1: one way}. So in total there are 16 ways.

{Different expressions of a positive integer in the above form are known as 'partitions'. It may be shown that the number of distinct compositions of a positive integer n is 2^{n-1} .}