H1 (2/2 points)

1)How many of the integers from 1 to 500 are divisible by 3 or 5 but not divisible by 7?

200

200

Answer: 200

2)How many of the integers from 1 to 500 are divisible by both 3 and 5, but not divisible by 7?

29

29

Answer: 29

EXPLANATION

1)Let $S = \{1, 2, 3, \ldots, 500\}$, A_1 be the subset of numbers within S divisible by 3, A2 the numbers divisible by 5, and A3 those divisible by 7. Then we have:

$$|A_1 \cup A_2| = \lfloor \tfrac{500}{3} \rfloor + \lfloor \tfrac{500}{5} \rfloor - \lfloor \tfrac{500}{3\times 5} \rfloor = 166 + 100 - 33 = 233$$

$$\begin{aligned} & |(A_1 \cup A_2) \cap \overline{A_3}| \\ &= |A_1 \cup A_2| - |(A_1 \cup A_2) \cap A_3| \\ &= |A_1 \cup A_2| - (|A_1 \cap A_3| + |A_2 \cap A_3| - |A_1 \cap A_2 \cap a_3|) \\ &= 233 - (\lfloor \frac{500}{3 \times 7} \rfloor + \lfloor \frac{500}{5 \times 7} \rfloor - \lfloor \frac{500}{15 \times 7} \rfloor) \\ &= 233 - (23 + 14 - 4) \\ &= 200 \end{aligned}$$

2)if a number is divisible by 3 and 5，it's also divisible by 15

$$\lfloor \tfrac{500}{15} \rfloor - \lfloor \tfrac{500}{15\times 7} \rfloor = 33 - 4 = 29$$

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H2 (1/1 point)

92 people travel together; 47 have brought bread，38 instant noodles，42 biscuits， 28 both bread and instant noodles， 31 both bread and biscuits， 26 both instant noodles and biscuits，and 25 have brought bread, instant noodles and biscuits. The rest all brought sandwiches – so how many brought sandwiches?

25

25

Answer: 25

EXPLANATION

Let A_1, A_2, A_3 represent the (sets of) travellers bringing bread, instant noodles and biscuits respectively，so

$$\begin{aligned} &|A_1 \cup A_2 \cup A_3| \\ &= |A_1| + |A_2| + |A_3| - |A_1 \cap A_2| - |A_1 \cap A_3| - |A_2 \cap A_3| + |A_1 \cap A_2 \; cap A_3| \\ &= 47 + 38 + 42 - 28 - 31 - 26 + 25 \\ &= 67 \end{aligned}$$

There are 92-67=25 left.

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