

Understanding Addition and Subtraction

Researchers have separated addition and subtraction problems into three categories: join problems, separate problems, and part-part-whole problems. These categories are based on the different types of relationships involved. Each category can then be divided into sub-categories depending upon which of the three quantities in the problem is unknown.

In most mathematics curricula, the major emphasis is on the easier “join” and “separate” problems with the result as the unknown part. This leads to the definitions of addition as “put together” and subtract as “take away”. These definitions are limited and if these are the only exposure students have, they will have difficulty when the situation calls for something other than “put together” or “take away”. Take for example, the following problem: *Bob has 3 nickels and Bill has 7 nickels. How many more nickels does Bill have than Bob?*

Students need exposure to all the different types of addition and subtraction problems.

Examples of Join Problems

Join Problem: the result is unknown

Katie has 8 baseball cards. Mason gave her 4 more. How many baseball cards does Katie have altogether?

Join Problem: the amount of change is unknown

Katie has 8 baseball cards. Mason gave her some more. Now Katie has 12 baseball cards. How many baseball cards did Mason give her?

Join Problem: the initial amount is unknown

Katie has some baseball cards. Mason gave her 4 more. Now Katie has 12 baseball cards. How many baseball cards did Katie have to begin with?

Examples of Separate Problems

Separate Problem: the result is unknown

Katie had 12 baseball cards. She gave 4 baseball cards to Mason. How many baseball cards does Katie have now?

Separate Problem: the amount of change is unknown

Katie had 12 baseball cards. She gave some to Mason. Now she has 8 baseball cards. How many baseball cards did she give to Mason?

Separate Problem: the initial amount is unknown

Katie had some baseball cards. She gave 4 to Mason. Now she has 8 baseball cards left. How many baseball cards did Katie have to begin with?

Examples of Part-Part-Whole Problems

Part-Part-Whole Problem: the whole is unknown

Mason has 4 baseball cards and 8 basketball cards. How many cards does he have?

Mason has 4 baseball cards and Katie has 8 baseball cards. They put their baseball cards together in a notebook. How many baseball cards did they put into the notebook?

Part-Part-Whole Problem: one of the parts is unknown

Mason has 12 cards. Eight of his cards are baseball cards, and the rest are basketball cards. How many basketball cards does Mason have?

Mason and Katie put 12 baseball cards into a notebook. Mason put in 4 baseball cards. How many baseball cards did Katie put in?

Examples of Compare Problems

Compare Problem: the difference is unknown

Mason has 12 baseball cards and Katie has 8 baseball cards. How many more baseball cards does Mason have than Katie?

Mason has 12 baseball cards and Katie has 8 baseball cards. How many fewer baseball cards does Katie have than Mason?

Compare Problem: the larger amount is unknown

Mason has 4 more baseball cards than Katie. Katie has 8 baseball cards. How many baseball cards does Mason have?

Katie has 4 fewer baseball cards than Mason. Katie has 8 baseball cards. How many baseball cards does Mason have?

Compare Problem: the smaller amount is unknown

Mason has 4 more baseball cards than Katie. Mason has 12 baseball cards. How many baseball cards does Katie have?

Katie has 4 fewer baseball cards than Mason. Mason has 12 baseball cards. How many baseball cards does Katie have?