Appendix A: Situations Involving Operations with Numbers

Situations Involving Addition and Subtraction

These situations represent the fundamental meanings and uses of addition and subtraction. The four unshaded situation types are expectations for Kindergarten students. Grade 1 and 2 students should work with all situation types. Darker shading indicates the four most difficult types that students should work with in Grade 1 but not need master until Grade 2.

	Result Unknown	Change Unknown	Start Unknown
Add To	Three birds sat on a wire. Two more birds landed next to them. How many birds are on the wire now? $3 + 2 = ?$	Three birds sat on a wire. Some more birds landed next to them. Then there were five birds on the wire. How many birds landed on the wire next to the first three? $3 + ? = 5$	Some birds were sitting on a wire. Two more birds landed there. Then there were five birds. How many birds were on the wire to start? $? + 2 = 5$
Take From	Five snacks were on the table. Three snacks were eaten. How many snacks are on the table now? $5 - 3 = ?$	Five snacks were on the table. Some snacks were eaten. Then there were two snacks on the table. How many snacks were eaten? $5 - ? = 2$	Some snacks were on the table. Then three snacks were eaten. Now there are two snacks left on the table. How many snacks were on the table at the start? $? - 3 = 2$

	Total Unknown	Addend Unknown	Both Addends Unknown
Put Together	Three purple pens and two red pens were in the box. How many pens are in the box? $3 + 2 = ?$	Five pens are in the box. Three of them are purple, the rest are red. How many pens are red? $3 + ? = 5 \quad 5 - 3 = ?$	Jennifer has five pens. How many of them could be purple and how many of them could be red? $5 = 0 + 5 \quad 5 = 5 + 0$ $5 = 1 + 4 \quad 5 = 4 + 1$ $5 = 2 + 3 \quad 5 = 3 + 2$

	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare	More: Jim has two pens. Keisha has five pens. How many more pens does Keisha have than Jim? Fewer: Jim has two pens. Keisha has five pens. How many fewer pens does Jim have than Keisha? $2 + ? = 5 \quad 5 - 2 = ?$	More: Keisha has three more pens than Jim. Jim has two pens. How many pens does Keisha have? Fewer: Jim has three fewer pens than Keisha. Jim has two pens. How many pens does Keisha have? $2 + 3 = ? \quad 3 + 2 = ?$	More: Keisha has three more pens than Jim. Keisha has five pens. How many pens does Jim have? Fewer: Jim has three fewer pens than Keisha. Keisha has five pens. How many pens does Jim have? $5 - 3 = ? \quad ? + 3 = 5$

Adapted from Box 2-4 of *Mathematics Learning in Early Childhood*, National Research Council (2009, pp. 32-33).

Situations Involving Multiplication and Division

These situations represent the fundamental meanings and uses of multiplication and division. The situations increase in difficulty when moving from the top of the page to the bottom and from left to right across the page. Students in Grade 3 should work with all situation types but need not master the multiplicative comparisons until Grade 4.

	Unknown Product	Group Size Unknown (Partitive or Fair Shares Division)	Number of Groups Unknown (Quotative or Measurement Division)
	$3 \times 6 = ?$	$3 \times ? = 18 \qquad 18 \div 3 = ?$	$? \times 6 = 18 \qquad 18 \div 6 = ?$
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag?	If 18 plums are to be packed 6 to a bag, then how many bags are needed?
Arrays	There are 3 rows of apples with 6 apples in each row. How many apples are there?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be?
Multiplicative Comparisons	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does the blue hat cost?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat?

Adapted from Box 2-4 of *Mathematics Learning in Early Childhood*, National Research Council (2009, pp. 32-33).