Sort the Spill

Design, test, and improve a separation system

P.5.5B.4 "Design an effective system (e.g., sifting, filtration, evaporation, magnetic attraction, or floatation) for separating various mixtures. Use an engineering design process to define the problem, design, construct, evaluate..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Number Mina's separation steps in order, then circle the evidence that shows why her system needs improvement.

Mina's Garden Club Challenge

1. The garden club spills a mix of dry sand, small stones, and steel paper clips. Mina's challenge is to put each material in its own cup without losing much. She chooses a strainer with holes larger than the sand grains but smaller than the stones and clips. She also gets a magnet inside a thin plastic bag and three empty cups.

2. Mina pours the mix into the strainer over the first cup. Sand falls through; stones and clips stay above. She moves the bagged magnet across the items in the strainer. The steel clips stick to it, but the stones do not. Over the second cup, she pulls the magnet out of the bag, dropping the clips. Then she tips the stones into the third cup.

3. Mina checks the cups and spots several sand grains trapped among the stones. She also sees one clip left in the strainer because it was hidden under a stone. Her system worked for most of the mix, but not all of it. For her next trial, she will shake the strainer gently before using the magnet and spread the remaining pieces in a thin layer.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why did Mina choose strainer holes larger than sand grains but smaller than stones and clips?

2. How does the bag help Mina move the clips into their own cup?

3. What evidence shows that Mina's first system did not fully separate the mix?

4. How could Mina's two changes help in her next trial?

3 YOUR TURN

Your own words

A new mix contains cork pieces, glass marbles, and steel washers; cork floats in water, marbles sink, and steel sticks to magnets. In five sentences, design a separation system using a bag-covered magnet, water, and a spoon, then explain how you would check the cups and improve a step if needed.

ANSWER KEY

Sort the Spill

GRADE 5 · P.5.5B.4

PART 1 · READ AND MARK

Number Mina's separation steps in order, then circle the evidence that shows why her system needs improvement. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why did Mina choose strainer holes larger than sand grains but smaller than stones and clips?	**The sand can fall through, while the stones and clips stay in the strainer.**
2	How does the bag help Mina move the clips into their own cup?	**The clips stick to the magnet through the bag. When Mina pulls the magnet out, the clips drop into the cup.**
3	What evidence shows that Mina's first system did not fully separate the mix?	**Sand grains remained among the stones, and one clip was left in the strainer.**
4	How could Mina's two changes help in her next trial?	**Gently shaking the strainer could free sand trapped among the stones. Spreading the pieces in a thin layer could expose the hidden clip to the magnet.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

First, I would use the bag-covered magnet to remove the steel washers and put them in one cup. Next, I would put the cork pieces and glass marbles in water. I would lift the floating cork into a second cup with the spoon, then take the sunken marbles out and put them in a third cup. I would check each cup for pieces that do not belong. If marbles were caught among the cork, I would stir the water gently and scoop the cork again.

Accept other workable step orders if the student uses magnetism and floating or sinking to separate all three materials. The check should look for materials in the wrong cups, and the improvement should address a possible separation problem.