



LEARNING ACTIVITY:

Sifting Stones

GRADES 3-8

MATERIALS

- 2 lb (1 L) crushed stone of random sizes smaller than 1.5 inch (38 mm) (can be purchased from local landscape/hardware store)
- Screen with 0.5 inch (12.7 mm) holes (Screen A) and screen with 1/8 inch (3 mm) holes (Screen B) (screens may be made using hardware cloth or purchased or borrowed from a local ready-mix concrete or aggregate supplier)

Every day the aggregate industry sifts millions of tons of rock pieces to make important and valuable construction materials from raw resources of crushed stone or gravel. Engineers specify size ranges of rock pieces to be used to make concrete, asphalt, and so on. We depend on concrete or asphalt for sidewalks, highways, and basement floors and walls, among many other things — in fact, more than 20,000 pounds (10 tons) of size-specific aggregates are needed for every person per year in the United States!

In this exercise you will sift (screen, as it is known in the industry) randomly sized rocks into groups of specified size ranges. This process not only allows the screened product to meet an engineer's requirements for use, but also increases the value of the material over the value of the original, random-sized material.

PROCEDURE

- 1 Take the crushed stone and sift it using Screen A. This produces (on top) the clean, crushed stone that is used along with sand and Portland cement to make concrete pavement. Use Screen B to sift what fell through. What stays on Screen B is the "chips" used with sand and asphalt to make asphalt pavement.



A pile of randomly sized natural gravel and piles of the screened separate sized products, each of which meets specifications for particular use in construction projects.

Images courtesy of the Ohio Aggregate and Industrial Minerals Association.

- 2 Estimate the amount (weight or volume) of material retained on Screen A, then estimate the amount retained by Screen B and estimate the amount passing through Screen B. Added together these should add up to 100 percent.
- 3 Assume the material coarser than Screen A is worth \$15/ton, the next smaller material is worth \$10/ton, and the dust worth \$3/ton. What is the value of 10 tons of material sized to each these specifications? Using the estimated percentages, which resulting pile is most valuable?
- 4 Discuss:
 - What size would you try to maximize for production? Minimize?
 - What factors affect the size of the materials (such as geologic, equipment, production)?
 - Where could the type of rock you used be obtained in nature? Where have you seen a mine or quarry?
 - How would you design a machine to sort rock pieces by size?



A technician using a screen to sort rock particles.

Image courtesy of the Gilson Company.

Go to www.MineralsEducationCoalition.org/esw for an accompanying video and lesson plan and more detailed standards correlations.

NGSS CONNECTIONS

- Science and Engineering Practices — Planning and Carrying Out Investigations
- Disciplinary Core Ideas — Earth and Human Activity
- Crosscutting Concepts — Scale, Proportion and Quantity



Source: Minerals Education Coalition. Adapted with permission.