

## 6.RP Mixing Concrete

### Task

A mixture of concrete is made up of sand and cement in a ratio of 5 : 3. How many cubic feet of each are needed to make 160 cubic feet of concrete mix?

### IM Commentary

In order to solve this problem, students must assume that if you mix a cubic foot of sand with a cubic foot of cement, you will have 2 cubic feet of mix. In reality, the volume of the mixture may actually be less than that as cement particles settle into the spaces between the grains of sand. It is important for students to understand that they must explicitly make this assumption, and that for some contexts this is a reasonable assumption (e.g. mixing water with juice concentrate) and others it is completely inappropriate (e.g. mixing water and salt).

### Solutions

#### **Solution: Ratio table**

Constructing a ratio table that shows the amount of sand, cement, and concrete mix (assuming the volumes add):

Sand	5	10	20	30	40	50	60	70	80	90	100
Cement	3	6	12	18	24	30	36	42	48	54	60

Concrete mix	8	16	32	48	64	80	96	112	128	144	160
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We can see in the last column that one needs 100 cubic feet of sand and 60 cubic feet of cement to make 160 cubic feet of concrete mixture.

### **Solution: Using the scale factor**

We know that to make  
 $k \times 8$  cubic feet of concrete mix, we need  
 $k \times 5$  cubic feet of sand and  
 $k \times 3$  cubic feet of cement.

We need 160 cubic feet of concrete mix and  
 $20 \times 8 = 160$ , so we need to use  
 $20 \times 5 = 100$  cubic feet of sand and  
 $20 \times 3 = 60$  cubic feet of cement.

In other words, 100 ft<sup>3</sup> of sand and 60 ft<sup>3</sup> of cement will make 160 ft<sup>3</sup> of concrete mix.

