

Illustrative Mathematics

7.RP and 7.G Sand Under the Swing Set

Alignment 1: 7.RP.A.3, 7.G.B.6

Not yet tagged

The 7th graders at Sunview Middle School were helping to renovate a playground for the kindergartners at a nearby elementary school. City regulations require that the sand underneath the swings be at least 15 inches deep. The sand under both swing sets was only 12 inches deep when they started.

The rectangular area under the small swing set measures 9 feet by 12 feet and required 40 bags of sand to increase the depth by 3 inches. How many bags of sand will the students need to cover the rectangular area under the large swing set if it is 1.5 times as long and 1.5 times as wide as the area under the small swing set?

Solution: Finding the scale factor the hard way

3 inches is $\frac{1}{4} = 0.25$ foot, so the volume of sand that was used is

$$0.25 \times 9 \times 12 = 27$$

cubic feet. The amount of sand needed for an area that is 1.5 times as long and 1.5 times as wide would be

$$0.25 \times (1.5 \cdot 9) \times (1.5 \cdot 12) = 60.75$$

cubic feet.

We know that 40 bags covers 27 cubic feet. Since the amount of sand for the large swing set is

$$60.75 \div 27 = 2.25$$

times as large, they will need 2.25 times as many bags. Since $2.25 \times 40 = 90$ they will need 90 bags of sand for the large swing set.

Solution: Finding the scale factor the easy way

Since we have to multiply both the length and the width by 1.5, the area that needs to be covered is

$$1.5^2 = 2.25$$

times as large. Since the depth of sand is the same, the amount of sand needed for the large swing set is 2.25 times as much as is needed for the small swing set, and they will need 2.25 times as many bags. Since $2.25 \times 40 = 90$ they will need 90 bags of sand for the large swing set.

Solution: Using a unit rate

The area they cover under the small swing set is $9 \times 12 = 108$ square feet. Since the depth is the same everywhere, and we know that 40 bags covers 108 square feet, they can cover $108 \div 40 = 2.7$ square feet per bag.

The area they need to cover under the large swing set is

$$1.5^2 = 2.25$$

times as big as the area under the small swing set, which is

$$2.25 \times 108 = 243$$

square feet. If we divide the number of square feet we need to cover by the area covered per bag, we will get the total number of bags we need:

$$243 \div 2.7 = 90$$

So they will need 90 bags of sand for the large swing set.

Solution: The other unit rate

The area they cover under the small swing set is $9 \times 12 = 108$ square feet. Since the depth is the same everywhere, and we know that 40 bags covers 108 square feet, they can cover $40 \div 108 = \frac{10}{27}$ bags per square foot.

The area they need to cover under the large swing set is

$$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

times as big as the area under the small swing set, which is

$$\frac{9}{4} \times 108 = 243$$

square feet. If we multiply the number of square feet they need to cover by the number of bags needed per square foot, we will get the total number of bags we need:

we will get the total number of bags we need.

$$243 \times \frac{10}{27} = 90$$

So they will need 90 bags of sand for the large swing set.



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