

Scale Changes Systems

Use ratios to predict how changing one part changes a system.

GRADE 6 • TEKS 6.5.C

6.5.C "analyze how differences in scale, proportion, or quantity affect a system's structure or performance;"

NAME _____

DATE _____

SCALE AND SYSTEM PERFORMANCE

When one part of a system increases, compare it to another part with a ratio or rate. If conditions stay the same and the relationship is proportional, multiply or divide both quantities by the same factor. A change in quantity can change how much a system moves, cleans, supports, or uses.

WORKED EXAMPLE

A pond has 4 water plants for 20 tadpoles. If the pond keeps the same plant-to-tadpole ratio, how many plants are needed for 35 tadpoles?

1. Find the number of tadpoles per plant:
 $20 / 4 = 5$.

2. Divide the new number of tadpoles by the rate: $35 / 5 = 7$.

Answer: 7 water plants

PRACTICE 6 problems

- 1** Eight bees pollinate 24 flowers each minute. At the same rate, how many flowers can 15 bees pollinate each minute?

ANSWER _____

- 2** A fish moves 6 liters of water across its gills each minute while resting. During activity, it moves water at 3 times the resting rate. How much water does it move each minute during activity?

ANSWER _____

- 3** In a plant model, a 27-centimeter stem supports 9 leaves. At the same stem-length-to-leaf ratio, how many leaves can a 33-centimeter stem support?

ANSWER _____

- 4** In a grassland model, 26 grass plants provide enough food for 13 rabbits. At the same proportion, how many grass plants are needed for 21 rabbits?

ANSWER _____

- 5** One water filter cleans 14 liters in 2 hours. How much water can 3 identical filters clean in the same amount of time?

ANSWER _____

- 6** Thirty-six decomposers break down a leaf pile in 9 days. If 54 decomposers work at the same rate on an equal leaf pile, how many days will the job take?

ANSWER _____

APPLY IT Show your work

- 1** The table shows food eaten by mealworms in identical compost bins under the same conditions. How many grams of food will 45 mealworms eat each day?

COMPOST BIN DATA

Mealworms	Food eaten each day (g)
9	6
18	12
27	18

ANSWER _____

- 2** A student is helping set up a new aquarium display. One pump moves 16 liters of water each minute. The display holds 96 liters and needs all its water moved in 1 minute. How many identical pumps are needed?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two model lungs are designed to transfer oxygen. Model A has 12 air sacs with a surface area of 3 square centimeters each. Model B has 18 air sacs with a surface area of 2 square centimeters each. Which model has more total surface area, or are they equal? Explain how the number and size of air sacs affect the models' potential oxygen transfer.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Eight bees pollinate 24 flowers each minute. At the same rate, how many flowers can 15 bees pollinate each minute?	45 flowers per minute
2	A fish moves 6 liters of water across its gills each minute while resting. During activity, it moves water at 3 times the resting rate. How much water does it move each minute during activity?	18 liters per minute
3	In a plant model, a 27-centimeter stem supports 9 leaves. At the same stem-length-to-leaf ratio, how many leaves can a 33-centimeter stem support?	11 leaves
4	In a grassland model, 26 grass plants provide enough food for 13 rabbits. At the same proportion, how many grass plants are needed for 21 rabbits?	42 grass plants
5	One water filter cleans 14 liters in 2 hours. How much water can 3 identical filters clean in the same amount of time?	42 liters
6	Thirty-six decomposers break down a leaf pile in 9 days. If 54 decomposers work at the same rate on an equal leaf pile, how many days will the job take?	6 days

PART 2 • APPLY IT

- 30 grams each day** The table shows 6 grams for 9 mealworms, which is $\frac{2}{3}$ gram per mealworm. Multiply 45 by $\frac{2}{3}$ to get 30 grams.
- 6 pumps** Divide the total water volume by the amount one pump moves each minute: $96 / 16 = 6$.

CHALLENGE

They are equal. Model A has $12 \times 3 = 36$ square centimeters, and Model B has $18 \times 2 = 36$ square centimeters. Model B has more air sacs, but each sac is smaller, so both models have the same total surface area and the same potential oxygen transfer.

Accept correct unit-labeled answers and valid equivalent ratio work. For the challenge, accept explanations that show both models have 36 square centimeters of total surface area and therefore equal potential oxygen transfer.