Proportional Reasoning with Scale Models

Spot mistakes, reason, and work backward

Name _____ **Date** _____ **Score** _____ / 6

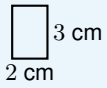
QUICK REVIEW

A $1 : k$ scale model preserves every length ratio: actual length $= k$ times model length. At $1 : 20$, a 3 cm model wing represents 60 cm, and a 100 cm wing needs 5 cm. Compare lengths in the same units.

Worked example

A model has scale $1 : 10$. Its rectangular base is 2 cm by 3 cm. Find the actual dimensions in cm.

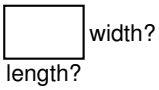
1. The scale means actual/model $= 10$.
2. $2 \times 10 = 20$ cm and $3 \times 10 = 30$ cm are the actual sides.
3. Working backward: $20 \div 10 = 2$ cm and $30 \div 10 = 3$ cm.
Answer: 20 cm by 30 cm.



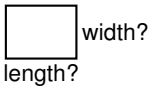
Practice Problems

Show your thinking.

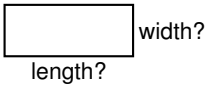
1. An actual rectangle is 36 cm by 24 cm. Its model must be $1 : 12$. A student multiplies by 12. Correct the model dimensions.



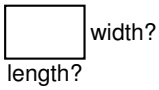
2. An actual rectangle is 80 cm by 60 cm. Its model must be $1 : 20$. A student multiplies by 20. Correct the model dimensions. Complete the actual/model ratio for the long side and explain its direction.



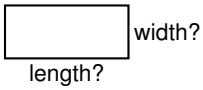
3. An actual rectangle is 75 cm by 30 cm. Its model must be $1 : 15$. A student multiplies by 15. Correct the model dimensions. Find the actual area of the base and the model area, checking the area scale.



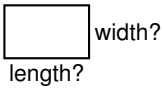
4. An actual rectangle is 60 cm by 40 cm. Its model must be $1 : 10$. A student multiplies by 10. Correct the model dimensions. A second model uses $1 : 20$. Find its dimensions for the same actual object.



5. An actual rectangle is 56 cm by 24 cm. Its model must be $1 : 8$. A student multiplies by 8. Correct the model dimensions. A proposed second model has sides 14 cm and 5 cm. Are both sides at one common scale?



6. An actual rectangle is 40 cm by 25 cm. Its model must be $1 : 5$. A student multiplies by 5. Correct the model dimensions. Find total base area for three such models.



Answer Key

1. 3 cm by 2 cm.
2. 4 cm by 3 cm. Actual/model $= 80/4 = 20$.
3. 5 cm by 2 cm. Model 10 cm^2, actual 2250 cm^2; factor 225.
4. 6 cm by 4 cm. Second model 3 cm by 2 cm.
5. 7 cm by 3 cm. No: $56/14 = 4$ but $24/5 = 4.8$.
6. 8 cm by 5 cm. $3(8)(5) = 120$ cm^2.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The scale means actual/model $= 12$.
2. Divide actual sides by 12: $36 \div 12 = 3$ cm and $24 \div 12 = 2$ cm.
3. Check $3(12) = 36$ and $2(12) = 24$ cm. Multiplying takes model lengths to actual lengths, not the reverse.

Problem 2

1. The scale means actual/model $= 20$.
2. Divide actual sides by 20: $80 \div 20 = 4$ cm and $60 \div 20 = 3$ cm.
3. Check $4(20) = 80$ and $3(20) = 60$ cm. Multiplying takes model lengths to actual lengths, not the reverse.
4. $80/4 = 20$, so actual lengths are 20 times model lengths.

Problem 3

1. The scale means actual/model $= 15$.
2. Divide actual sides by 15: $75 \div 15 = 5$ cm and $30 \div 15 = 2$ cm.
3. Check $5(15) = 75$ and $2(15) = 30$ cm. Multiplying takes model lengths to actual lengths, not the reverse.
4. Model $5(2) = 10$ cm^2; actual $75(30) = 2250$ cm^2, ratio $225 = 15^2$.

Problem 4

1. The scale means actual/model $= 10$.
2. Divide actual sides by 10: $60 \div 10 = 6$ cm and $40 \div 10 = 4$ cm.
3. Check $6(10) = 60$ and $4(10) = 40$ cm. Multiplying takes model lengths to actual lengths, not the reverse.
4. Same actual object is 60 by 40 cm; divide by 20 to get 3 by 2 cm.

Problem 5

1. The scale means actual/model $= 8$.
2. Divide actual sides by 8: $56 \div 8 = 7$ cm and $24 \div 8 = 3$ cm.
3. Check $7(8) = 56$ and $3(8) = 24$ cm. Multiplying takes model lengths to actual lengths, not the reverse.
4. Compare actual/model ratios $56/14 = 4$ and $24/5 = 4.8$; these differ.

Problem 6

1. The scale means actual/model $= 5$.
2. Divide actual sides by 5: $40 \div 5 = 8$ cm and $25 \div 5 = 5$ cm.
3. Check $8(5) = 40$ and $5(5) = 25$ cm. Multiplying takes model lengths to actual lengths, not the reverse.
4. One base area is $8(5) = 40$ cm^2; three need $3(40) = 120$ cm^2.

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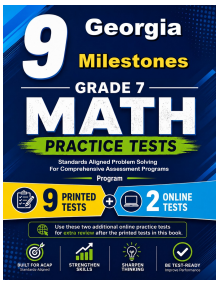

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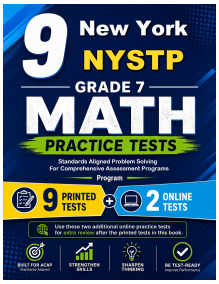

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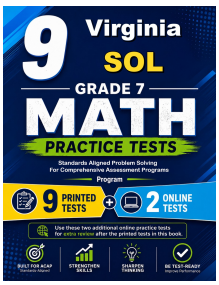

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