

Integer Model Lab

Build models, write equations and explain signs

GRADE 6 • 6.CE.2.a

6.CE.2.a "Demonstrate/model addition, subtraction, multiplication, and division of integers using pictorial representations or concrete manipulatives.*"

NAME _____

DATE _____

BUILD UNDERSTANDING

Use two-color counters, or draw circles labeled + and -. Each counter represents +1 or -1; one of each forms a zero pair. Adding or removing a zero pair preserves the total. Addition combines counters; subtraction removes the stated counters, adding zero pairs first if needed. Positive groups repeat a signed amount; division can share a signed total equally. Label every group.

WORKED EXAMPLE

Build one positive and one negative counter. Explain why adding this pair to a model leaves its value unchanged.

1. The two signed values cancel: $+1 + (-1) = 0$.
2. Adding zero changes no total.

Answer: A zero pair has value 0; it can be added when a take-away model needs more counters of a sign.



One zero pair: $+1 + (-1) = 0$

PRACTICE 4 problems

- 1** Model $9 + (-15)$. Show signed counters before cancellation, cross out zero pairs and write the resulting sum.

Combine signed counters

- 2** Model $(-5) - 8$ as removing eight positive counters. Show how zero pairs let you remove them without changing the starting value first. Find the difference.

Show before and after removal



- 3** Model $4 \times (-6)$ with four equal groups. Label the signed value of each group and the total.

Draw four equal groups



- 4** Model $(-24) \div 6$ by sharing twenty-four negative counters equally among six groups. Find the quotient and verify it with multiplication.

Share among six groups



APPLY IT Show your work

- 1** Model $(-2) \times (-3)$ as removing two groups of three negative counters from zero. Show the zero pairs needed, the removal and the remaining value.

Removal of negative groups



- 2** For $(-12) \div (-3)$, ask how many groups with value -3 make -12 . Draw twelve negative counters, circle equal groups of three, and write the quotient with a multiplication check.

Count the negative groups

**CHALLENGE** One step up

Kai claims $5 - (-3) = 2$. Build or draw a take-away counter model to test this. Include any zero pairs, cross out what is subtracted and use the remaining counters to correct the equation.

Test the claimed equation



Require student-created signed models in every model task, including intermediate zero pairs and grouping boundaries. Counter signs must remain explicit in monochrome printing. For negative multipliers the stated removal-of-groups interpretation starts at zero; for negative divisors the quotient counts groups with the stated negative value. A sign-rule answer without the required model is incomplete.

PRACTICE 1

Nine positive and fifteen negative counters form nine zero pairs. Six negative counters remain: $9 + (-15) = -6$.

PRACTICE 2

Start with 5 negative counters. Add 8 zero pairs; remove the 8 positives. Thirteen negatives remain: $(-5) - 8 = -13$.

PRACTICE 3

Four groups of six negative counters give -24. $4 \times (-6) = -24$.

PRACTICE 4

Each group has 4 negatives, value -4. $(-24) / 6 = -4$; $6 \times (-4) = -24$.

APPLY IT 1

Add 6 zero pairs to zero. Remove 2 groups of 3 negatives; 6 positives remain. $(-2) \times (-3) = 6$.
Accept an equivalent justified solution with the required model or recorded evidence.

APPLY IT 2

Four groups of -3 make -12. Thus $(-12) / (-3) = 4$; $4 \times (-3) = -12$. The positive quotient counts four groups.
Accept an equivalent justified solution with the required model or recorded evidence.

CHALLENGE

Start with 5 positives; add 3 zero pairs. Remove 3 negatives, leaving 8 positives. $5 - (-3) = 8$. Kai subtracted positive 3 instead of negative 3.