GRADE 7 · UNIT 3

Reference Sheet

Operations with Rational Numbers — keep this in your binder

Name_____

Period_____

Use this at home to study. It is complete, so reading it is not studying — filling in the Study Guide from it is. Fractions are written 13/12 for thirteen twelfths; a mixed number is written 2 1/4.

1. Adding *MA.7.NSO.2.2*

Same signs — add the two amounts and keep that sign. Different signs — subtract the smaller amount from the larger and keep the sign of the number that was further from zero.

Worked examples

Same signs. $-3.482 + (-6.15) = -9.632$ Add 3.482 + 6.150 = 9.632, then keep the negative.
Different signs. $-7/4 + 2/3 = -21/12 + 8/12 = -13/12$ A common bottom number first.
Mixed forms. $2\ 1/4 + 3.6$. $2\ 1/4 = 2.25$, and $2.25 + 3.6 = 5.85$.

Watch out. Write in the missing zeros before you line up decimals: 3.482 + 6.150, not 3.482 + 6.15 pushed to the left.

2. Subtracting *MA.7.NSO.2.2*

There is no subtraction rule. Subtracting is adding the opposite: **a − b = a + (−b)**. Rewrite it that way, then use the two rules above.

Worked examples

$5 - (-9) = 5 + 9 = 14$ Subtracting a negative adds.
$-2.5 - 8\ 1/6 = -2.5 + (-8\ 1/6) = -5/2 + (-49/6) = -32/3$
Change. A change is always final − beginning, in that order.

Watch out. Order matters here and it did not for adding. 5 − 9 = −4 and 9 − 5 = 4 are different answers to different questions.

3. Multiplying *MA.7.NSO.2.2*

Multiply the amounts. Then count the negative factors: an **even** number of them gives a positive product, an **odd** number gives a negative one.

Worked examples

One negative. $(-2.07)(6.4) = -13.248$ 207 × 64 = 13,248, and three decimal places.
Two negatives. $(-21/8)(-4/9) = 84/72 = 7/6$ Tops times tops, bottoms times bottoms.
Reduce after. $(-3/8)(4/7) = -12/56 = -3/14$

Watch out. Count the decimal places in the two factors you were given, not in the answer you were expecting.

4. Dividing *MA.7.NSO.2.2*

Dividing by a number is multiplying by its reciprocal — turn the second fraction over. That is why the sign rule is the same one.

Worked examples

$-27/10 \div 9/5 = -27/10 \times 5/9 = -135/90 = -3/2$
$8 \div 4/5 = 8 \times 5/4 = 10$ Dividing by four fifths gives more than 8, not less.
Decimals. $-1{,}846.8 \div (-45) = 41.04$ Two negatives, so the quotient is positive.

Watch out. Turn over the number you are dividing *by*, and only that one. The reciprocal of 4/5 is 5/4; the reciprocal of 6 is 1/6.

5. Getting Into One Form First *MA.7.NSO.1.2*

You cannot add a fraction to a decimal as they stand. Pick one form and convert. fraction → decimal: divide the top by the bottom. mixed → improper: whole × bottom + top, over the bottom.

Worked examples

$3\ 1/4 = 3.25$ $27\ 2/5 = 137/5$ 27 × 5 + 2 = 137.
$7/12 = 0.58333\ldots$, which does not stop. Keep it as 7/12 and let the calculator hold it.

Watch out. Rounding before the last step moves the answer. 7/12 × 1,200 = 700 exactly, and 0.58 × 1,200 = 696.

6. Choosing the Operation *MA.7.NSO.2.3*

The words tell you which operation, and the four cues below cover most of what a question can ask.

Operation	What the words look like
Add	amounts combined · a rise and a fall together · a total made of parts
Subtract	how much more · how far apart · change, as final − beginning · how far to go
Multiply	so many of the same amount · a rate written with “per” · a fraction OF an amount
Divide	shared equally · how many groups of that size fit · how many times it goes in

Worked examples

Example. A weather balloon at 1,240 3/4 feet is falling at 62 1/2 feet per minute. How long until it reaches 615 3/4 feet?

How far to fall. 1,240 3/4 − 615 3/4 = 625 feet — a distance, so subtract

How long it takes. 625 ÷ 62 1/2 = 10 minutes — “per minute”, so divide

Watch out. A rate with the word “per” in it is the number you divide BY when the question asks how long or how many.

7. Problems That Take Several Steps *MA.7.NSO.2.3*

Write every operation down with what it stands for. Do the multiplying and dividing that answers each part, then combine the parts at the end.

Worked examples

Example. Screws are $0.32 each, brackets are $2.75 each and paint is $18.40 a can. Dev buys 24 screws, 6 brackets and 1 1/2 cans of paint.

screws 24 × 0.32 = 7.68 — brackets 6 × 2.75 = 16.50

paint 1.5 × 18.40 = 27.60

total 7.68 + 16.50 + 27.60 = 51.78

Watch out. Checking someone else's work means redoing each line, not reading it. A wrong line usually looks reasonable — that is why it survived to be printed.

How to study this

Two nights before. Read this through once, then do the Unit Review closed-book and mark it.
The night before. Redo on paper only the sections the review cost you.
On the day. Bring the Study Guide you filled in, and anything else you have written.