GRADE 7 · UNIT 3 · LESSON 7

Real-World Problems

Three or More Steps

MA.7.NSO.2.3

I can solve problems that take three or more operations, and find the error when someone else gets one wrong.

Today you grade other students' work.

Every one of them got part of it right.

Finding someone else's mistake is how you stop making it.

Warm-Up

On your own. Number your paper 1 to 3.

A shirt costs $24.00. Today it is one-quarter off.

1. How much do you pay for the shirt?

2. Rico worked it out as $24 - 1/4 = 23.75$. Is he right? Explain.

3. Write the multiplication that gives the right answer in one step.

Notes

I. A Fraction OF, Not a Fraction Subtracted

A. “A fraction off the price” means multiply, then subtract.

1. Or multiply once by what is left: one-fifth off means four-fifths of the price.

B. Never subtract the fraction **itself** from the price.

1. $40 minus one-fifth is not $39.80, and it is not $39.

A $19.95 pin with one-fifth off, in one step:

$$19.95 \times \frac{4}{5} = 15.96$$

Notes

II. Take the Discount Off the Right Number

A. The discount comes off the price of the ITEM.

   1. Not off the money you brought, and not off the change you get back.

B. Work out what the item costs first. Subtract from the gift card second.

C. Write down what each number means as you go.

Then, and only then, take it off the $40 gift card:

$$40.00 - 15.96 = 24.04$$

Notes

III. How to Read Someone Else's Work

A. Number the steps before you judge any of them.

B. Find what is **right** first. Most wrong work has a correct step in it.

C. Name the first step that goes wrong, and say why.

1. Work wrong from step 2 onward has ONE error, not four.

D. Then solve it correctly yourself.

Notes

IV. Money Has Exactly Two Decimal Places

A. Five cents is $0.05. Fifty cents is $0.50. Those are not the same number.

B. Round money to the nearest cent, and only at the end.

   1. $33.9533… is $33.95. $154.36 stays $154.36.

C. An answer like $4.5 is not finished. Write $4.50.

Error Analysis 1

Eugene has $40.00 and gets one-fifth off any item. A pin costs $19.95. How much is left?

Diana's work

Step 1: $19.95 \times 1/5 = 3.99$

Step 2: $40.00 - 3.99 = 36.01$

Step 3: $36.01 - 19.95 = 16.06$

Ninety seconds. Which step is the FIRST one that is wrong?

Find what is right before you look for what is not.

Error Analysis 1

Eugene has $40.00 and gets one-fifth off any item. A pin costs $19.95. How much is left?

Diana's work

Step 1: 19.95 × 1/5 = 3.99

Step 2: 40.00 − 3.99 = 36.01

Step 3: 36.01 − 19.95 = 16.06

What is right, and what is not

RIGHT: step 1. The discount really is $3.99.

WRONG: step 2 — but what did she take it off?

Step 1 is correct. The trouble starts at step 2.

$3.99 is a real number and the right one. What did she take it off?

Error Analysis 1

Eugene has $40.00 and gets one-fifth off any item. A pin costs $19.95. How much is left?

Diana's work

Step 1: $19.95 \times 1/5 = 3.99$

Step 2: $40.00 - 3.99 = 36.01$

Step 3: $36.01 - 19.95 = 16.06$

What is right, and what is not

RIGHT: step 1. The discount really is $3.99.

WRONG: step 2. She took the discount off the GIFT CARD, not off the pin.

She took the discount off the gift card, not off the pin.

Steps 2 and 3 are both wrong, but there is only ONE error — step 2 caused step 3.

Error Analysis 1

Eugene has $40.00 and gets one-fifth off any item. A pin costs $19.95. How much is left?

Diana's work

Step 1: 19.95 × 1/5 = 3.99

Step 2: 40.00 − 3.99 = 36.01

Step 3: 36.01 − 19.95 = 16.06

What is right, and what is not

RIGHT: step 1. The discount really is $3.99.

WRONG: step 2. She took the discount off the GIFT CARD, not off the pin.

19.95 − 3.99 = 15.96, then 40.00 − 15.96 = $24.04

Diana got $16.06. The gap is $7.98 — which is exactly twice the discount.

Error Analysis 2

A trail runs from −262 ft to 11,043 ft. Diego hikes three-fifths of the elevation change on day one. Where does he start day two?

Jeffrey's work

Step 1: 11,043 − 262 = 10,781

Step 2: 10,781 × 3/5 = 6,468.6

Step 3: he starts at 6,468.6 ft

Two things are wrong here, not one.

Jeffrey's middle step is the one that is right.

Error Analysis 2

A trail runs from −262 ft to 11,043 ft. Diego hikes three-fifths of the elevation change on day one. Where does he start day two?

Jeffrey's work

Step 1: 11,043 − 262 = 10,781

Step 2: 10,781 × 3/5 = 6,468.6

Step 3: he starts at 6,468.6 ft

What is right, and what is not

RIGHT: step 2. Multiplying the change by 3/5.

WRONG: step 1 subtracted 262, not −262.

WRONG: step 3 forgot to start from −262.

He lost a minus sign, and then forgot where he started.

6,468.6 is a distance climbed. The question asked for an elevation.

Error Analysis 2

A trail runs from −262 ft to 11,043 ft. Diego hikes three-fifths of the elevation change on day one. Where does he start day two?

Jeffrey's work

Step 1: 11,043 − 262 = 10,781

Step 2: 10,781 × 3/5 = 6,468.6

Step 3: he starts at 6,468.6 ft

What is right, and what is not

RIGHT: step 2. Multiplying the change by 3/5.

WRONG: step 1 subtracted 262, not −262.

WRONG: step 3 forgot to start from −262.

11,043 − (−262) = 11,305 × 3/5 = 6,783 −262 + 6,783 = 6,521 ft

Three steps, and the third one is the one nobody writes down.

Whiteboards · Question 1 of 9

Boards up on three.

A $60 jacket is one-third off.

How much do you pay?

One step. Multiply by what is left.

Whiteboards · Question 1 of 9

Answer.

One-third off leaves two-thirds.

$$60 \times 2/3$$

$40.00

Whiteboards · Question 2 of 9

Boards up on three.

A $45 pair of shoes is two-fifths off.
How much do you pay?

Two-fifths off leaves how many fifths?

Whiteboards · Question 2 of 9

Answer.

Two-fifths off leaves three-fifths.

$45 \times 3/5$

$27.00

Whiteboards · Question 3 of 9

Boards up on three.

Rhonda mixes hair dye from 1⅛ oz red,
0.75 oz gray and ⅝ oz brown.
How many ounces is one batch?

Fractions and a decimal in the same sum. Pick one form.

Answer.

Put them all in one form: 1.125 + 0.75 + 0.625

$$1\frac{1}{8} + 0.75 + \frac{5}{8} = 2.5$$

Whiteboards · Question 4 of 9

Boards up on three.

Rhonda needs 20 ounces of dye.
How many batches is that?

One batch is 2.5 oz. What is missing — the total, or the number of batches?

Whiteboards · Question 4 of 9

Answer.

The total is given and the number of batches is missing.

$$20 \div 2.5$$

8 batches

Whiteboards · Question 5 of 9

Boards up on three.

Eight batches. How much of each tone?

Red 1⅛ oz, gray 0.75 oz, brown ⅝ oz per batch.

Three answers. Then check them against the 20 ounces.

Whiteboards · Question 5 of 9

Answer.

$$1.125 \times 8 = 9, \quad 0.75 \times 8 = 6, \quad 0.625 \times 8 = 5$$

Check: $9 + 6 + 5 = 20$.

9 oz, 6 oz, 5 oz

Whiteboards · Question 6 of 9

Boards up on three.

Fernando ran 4.34, 6.56 and 1.375 miles.

Marcus ran four-tenths as far. Ashlyn wrote:

4.34 + 6.56 = 10.90 10.90 + 1.375 = 11.275

11.275 ÷ 4/10 = 28.19

Find BOTH of her errors.

One is arithmetic. The other should have stopped her before she finished.

Whiteboards · Question 6 of 9

Answer.

Error 1: 10.90 + 1.375 = 12.275, not 11.275.

Error 2: four-tenths AS FAR means multiply, not divide.

28 miles is more than Fernando ran. That alone is the flag.

$$12.275 \times \frac{4}{10} = 4.91$$

Whiteboards · Question 7 of 9

Boards up on three.

Kelly is running a 26.2-mile race. Her sister stands at the 3/4 point of the course and her father at the 7/8 point. How many miles apart are they?

A 3.275 mi B 13.10 mi C 19.65 mi D 22.925 mi

Find the fraction of the course between them before you multiply.

Whiteboards · Question 7 of 9

Answer.

Gap: $7/8 - 3/4 = 7/8 - 6/8 = 1/8$

Distance: $26.2 \times 1/8$
Same as $26.2 \div 8$.

A. 3.275 miles

Whiteboards · Question 8 of 9

Boards up on three.

Floyd buys a $7.50 baseball. His coupon means he pays only 2/5 of the price. A month later a late fee of 0.22 times what he owed is added. What does he owe?

A $2.34 B $3.66 C $4.65 D $9.15

Three steps. The fee is charged on what he owed, not on the $7.50.

Whiteboards · Question 8 of 9

Answer.

Paid price: $7.50 \times 2/5 = 3.00$

Late fee: $0.22 \times 3.00 = 0.66$

Owed now: $3.00 + 0.66$

B. $3.66

Whiteboards · Question 9 of 9

Boards up on three.

Priscilla camps at elevation −184.56 ft. The trail ends at 759.20 ft. On Saturday she hikes 5/8 of the trail's total change in elevation. Where is she on Sunday?

Find the total change first. Show every step; three lines at least.

Answer.

Change: $759.20 - (-184.56) = 943.76$

Saturday: $943.76 \times 5/8 = 589.85$

Sunday start: $-184.56 + 589.85$

405.29 ft

IXL

Last five minutes.

Open IXL and start today's skills.

Work on paper where the question needs work. The answer box does not show it.

Whatever you do not finish is tonight's practice.

The skills for today are posted in Google Classroom.