0.3d Class Activity: Solving Problems with Multi-Digit Decimals

Students often compartmentalize a procedure or algorithm when doing it repetitively within one lesson. This lesson gives students the opportunity to practice using a variety of fluency skills for many different operations. In order for students to be fluent in operations with multi-digit decimals they not only must chose the right operation to be performed but also the best method in which to perform that operation. Some of these methods might include; estimation, mental math, changing fractions to decimals or decimals to fractions, or executing an algorithm.

Directions: Perform each indicated operation.

1. $0.5 + 1.674$ 2.174	2. $4.192 - 1.255$ 5.447	3. $14.9(0.56)$ 8.344	4. $2.92 \div 0.002$ 1460
5. Add 26.59, 1.80, and 13. 41.39	6. Find the difference of 42.05 and 11.621 30.429	7. Find the product of 13.6 and 901.15. 124.44	8. What is the quotient of 72.05 and 0.11? 655

Use mental math to perform each indicated operation. Be ready to discuss your mental math strategies.

Discuss student's mental math strategies together as a class, sample strategies are given. Encourage students to get in the habit of considering a mental math strategy before jumping to an algorithm because often times they are much easier and less time consuming.

9. $99 + 36$

   135, give 1 from the 36 to the 99 and you get $100 + 35 = 135$

10. $42 - 29$

   Add 1 to each number and you get $43 - 30 = 13$. It is okay to change the value of each number by the same number or scale factor because we are looking for a difference. This stratgey would not work for addition or multiplication.

11. 50×8

   Double the 50 and cut the 8 in half and you get $100 \times 4 = 400$. Since we doubled one number and cut the other number in half we are not changing the overall value of the product.

12. $120 \div 5$

   Doube both numbers and you get $240 \div 10 = 24$. Once again this works because you are changing both numbers by the same scale factor and you are dividing, this is similar to changing each number by the same power of 10.

Perform each indicated operation using two different methods. Be ready to discuss your prefered method. Round each answer to the nearest thousandth.

13. $0.5 \div 0.1$

Method 1:	Method 2:
Multiply each number by the same power of ten to get a whole number divisor (move both decimal points one place to the right). $$0.5 \div 0.1 = 5 \div 1 = 5$$	Change each decimal to a fraction first and then divide. $$0.5 \div 0.1 = \frac{5}{10} \div \frac{1}{10} = \frac{5}{10} \times \frac{10}{1} = 50 = 10$$ $$= 5$$

14. 7.05×24.25

Method 1:	Method 2:
Multiply using the standard algorithm $$7.05 \times 24.25 = 7050 \div 24205$$ $$\begin{array}{r} 2\ 1\ 3 \\ \not{2}\not{1}\not{2} \\ 24.25 \\ \times 7.05 \\ \hline 12125 \\ 00000 \\ +1697500 \\ \hline 170.9625 \end{array}$$	Change each decimal to a fraction first and then divide. $$7.05 \times 24.25 = 7\frac{5}{100} \times 24\frac{25}{100} = \frac{705}{100} \times \frac{2425}{100} =$$ $$\frac{1709625}{10000} = 170.9625.$$

Solve each problem

Tell students to be mindful about the method in which they choose to perform each operation. It is expected that you pick and choose tasks below based off of the needs of your students.

15. A group of 10 scientists won a $1,000,000 prize for a discovery they made. They will share the prize equally. How much money will each person get?

Each scientist will get $100,000

Students can definitely find the answer to this problem with long division. However it is much easier and demonstrates a greater level of fluency if a student uses mental math to solve this problem.

16. Two cousins shared 0.006 kilograms of gold equally. How many kilograms of gold did each cousin get?

Each cousin gets 0.003 kilograms of gold.

Once again students can use long division to obtain their answer. However it is much easier to use mental math to solve this problem.

17. A barrel contained 160 liters of oil that costs $51.20. What is the cost for one liter? How many liters can you buy for $1.00?

One liter costs of oil costs $0.32. You can buy 3.125 liters of oil for $1.00.

For this problem students will most likely use a standard algorithm or change the decimals to fractions.

18. A preschool is putting new fence up in their triangular play yard and they are planting grass. Use the picture below to answer the questions that follow.

a. If the fence is to go around the perimeter of the triangular yard how much fencing will they need?
They will need 145.48 feet of fence.

b. The grass will be planted everywhere in the yard except in the square sandbox. How many square feet of grass will they need to plant.
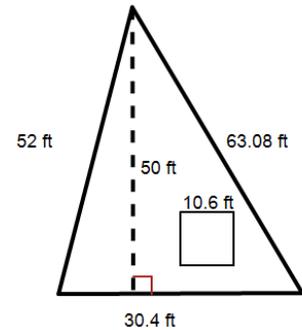They will need 647.64 square feet of grass.

c. Grass costs $0.35 per square foot. How much money will they spend on the grass?
The grass will cost $226.68 for the grass.

d. The fencing comes in panels of 9.25 ft. How many panels of fencing do they need to order?
They will need to order 16 panels of fencing.

19. Hallie is in 6th grade and she can buy movie tickets for $8.25. Hallie's father was in 6th grade in 1987 when movie tickets cost $3.75.
This is an Illustrative Mathematics Task
a. When he turned 12, Hallie's father was given $20.00 so he could take some friends to the movies. How many movie tickets could he buy with this money? How much money would he have leftover?
Hallie's father could buy $5.\overline{3}$ movie tickets in 1987. However, given this context it does not make sense for him to purchase a partial movie ticket so it is sufficient to say that he could buy 5 movie tickets. He would have $1.25 leftover.

b. How many movie tickets can Hallie buy for $20.00? How much money will she have leftover.
Hallie can buy $2.\overline{42}$ movie tickets. Once again, given this context she we would say that she can buy 2 movie tickets. She will have $3.50 leftover.

c. On Hallie's 12th birthday, her father said,
   When I turned 12, my dad gave me $20 so I could go with three of my friends to the movies and buy a large popcorn. I'm going to give you some money so you can take three of your friends to the movies and buy a large popcorn.
How much money do you think her father should give her?
Since $4 \times 3.75 = 15$, a large popcorn had to cost $5.00 or less if her father bought it with the change from buying the tickets. Hallie's movie tickets cost $8.25 \div 3.75 = 2.2$ times as much as movie tickets cost in 1987. Assuming the price of popcorn increased at the same rate, and since $2.2 \times 5 = 11$, she should be able to buy a large popcorn for $11.00. Four tickets cost $4 \times 8.25 = 33$ dollars. With these assumptions, Hallie's father should give her at least $44.00.