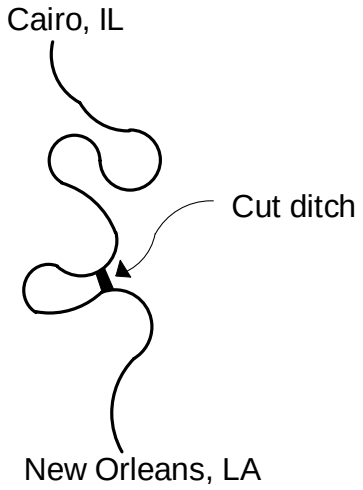
Activity 1

Read the quoted section of Life on the Mississippi by Twain and show this picture as an example.



Mark Twain in Life on the Mississippi (Adler, 1972, Book 2, pp. 56–58.) described a series of events involving the Mississippi River abandoning a course and acquiring a new, shorter one when considering the distance traveled between Cairo, Illinois, and New Orleans, Louisiana:

> The water cuts the alluvial banks of the "lower" river into deep horseshoe curves; so deep, indeed, that in some places if you were to get ashore at one extremity of the horseshoe and walk across the neck, half or three-quarters of a mile, you could sit down and rest a couple of hours while your steamer was coming around the long elbow at a speed of ten miles an hour to take you on board again. When the river is rising fast, some scoundrel whose plantation is back in the country, and therefore of inferior value, has only to watch his chance, cut a little gutter across the narrow neck of land some dark night, and turn the water into it, and in a wonderfully short time a miracle has happened: to wit, the whole Mississippi has taken possession of that little ditch, and placed the countryman's plantation on its bank (quadrupling its value), and that other party's formerly valuable plantation finds itself away out yonder on a big island; the old watercourse around it will soon shoal up, boats cannot approach within ten miles of it, and down goes its value to a fourth of its former worth. Watches are kept on those narrow necks at needful times, and if a man happens to be caught cutting a ditch across them, the chances are all against his ever having another opportunity to cut a ditch. . . . Since my own day on the Mississippi, cutoffs have been made at Hurricane Island, at Island 100, at Napoleon, Ark., at Walnut Bend, and at Council Bend. These shortened the river, in the aggregate, sixty-seven miles. In my own time a cut-off was made at American Bend, which shortened the river ten miles or more.

Therefore the Mississippi between Cairo and New Orleans was twelve hundred and fifteen miles long one hundred and seventy-six years ago. It was eleven hundred and eighty after the cut-off of 1722. It was one thousand and forty after the American Bend cut-off. It has lost sixty-seven miles since. Consequently, its length is only nine hundred and seventy-three miles at present.

Now, if I wanted to be one of those ponderous scientific people, and "let on" to prove what had occurred in the remote past, by what had occurred in a given time in the recent past, or what will occur in the far future by what has occurred in late years, what an opportunity is here! Geology never had such a chance, nor such exact data to argue from! Nor "development of species," either! Glacial epochs are great things, but they are vague—vague. Please observe: In the space of one hundred and seventy-six years the Lower Mississippi has shortened itself two hundred and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi River was upward of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-rod. And, by the same token any person can see that seven hundred and forty-two years from now the lower Mississippi will be only a mile and three-quarters long, and Cairo and New Orleans will have joined their streets together, and be plodding comfortably along under a single mayor and a mutual board of aldermen. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact. (Adler, I. (1972). Life on the Mississippi. In Readings in mathematics (Book 2, pp. 50–58). Lexington, MA: Ginn.)

Activity 2

Demonstrate the “L” method for finding GCF and LCD and then have participants break into subgroups and do a few. Each subgroup should summarize their findings and reactions and report back to the entire group.
L method to find the LCM and GCF of 16 and 24

```
2 | 16  24
    8  12

4 | 8  12
    2   3
```

Combined

```
    2 | 16  24
    4 |  8  12      Whole L shows LCM (48 = 2 x 4 x 2 x 3)
        2   3

                    Vertical of L shows GCF (8 = 2 x 4)
```

Activity 3

DO the Big 20, permitting no technology and limiting them to 2 minutes, announcing that limit before they start.

1. \$57 divided by 10 = _____

2. \$627 divided by 100 = _____

3. \$48 divided by 1000 = _____

4. \$8.45 x 10 = _____

5. \$0.28 x 100 = _____

6. \$12.24 x 1000 = _____

7. \$0.05 x \$0.12 = _____

8. \$18 - \$0.22 = _____

9. \$15 - \$0.15 = _____

10. 0.82 as a fraction = _____

11. $(5/8)^2$ = _____

12. \$52.6249 = _____

13. $3\ ^1/_2 - 2\ ^1/_4$ = _____

14. $5\ ^1/_4 - 3\ ^1/_2$ = _____

15. 7 divided by $1\ ^1/_4$ = _____

16. $^1/_4 \times 2\ ^1/_2$ = _____

17. $5\ ^1/_2\%$ of \$60 = _____

18. 8.65 divided by 0.05 = _____

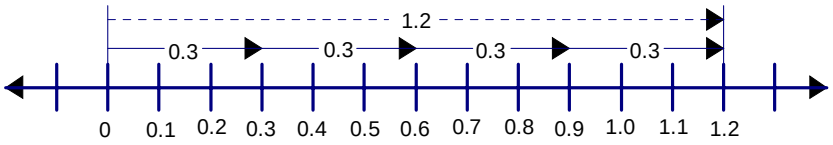
19. $^1/_4$ as a decimal = _____

20. $(0.2)^2$ = _____

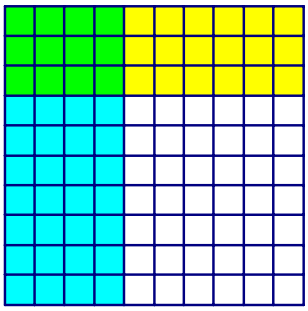
Activity 4

Show the following three decimal multiplication examples and ask participants, who are in subgroups to develop a similar example, explain it to their subgroup, and summarize their reactions to the activity. The activity reaction should be reported back to the entire group.

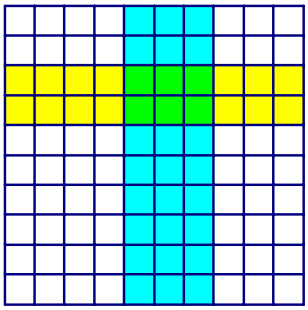
4 × 0.3



0.4 × 0.3 = 0.12



0.2 × 0.3 = 0.06



Big 20 Handout

The BIG 20

1. $57 divided by 10 = _____

2. $627 divided by 100 = _____

3. $48 divided by 1000 = _____

4. $8.45 x 10 = _____

5. $0.28 x 100 = _____

6. $12.24 x 1000 = _____

7. $0.05 x $0.12 = _____

8. $18 - $0.22 = _____

9. $15 - $0.15 = _____

10. 0.82 as a fraction = _____

11. $(5/8)^2$ = _____

12. $52.6249 = _____

13. $3\ ^1/_2 - 2\ ^1/_4$ = _____

14. $5\ ^1/_4 - 3\ ^1/_2$ = _____

15. 7 divided by $1\ ^1/_4$ = _____

16. $^1/_4 \times 2\ ^1/_2$ = _____

17. $5\ ^1/_2$% of $60 = _____

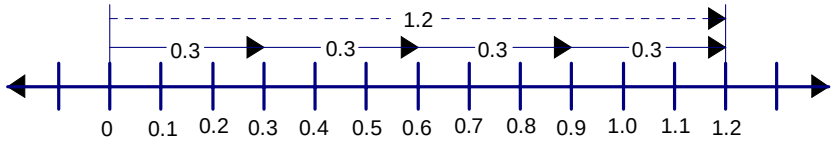
18. 8.65 divided by 0.05 = _____

19. $^1/_4$ as a decimal = _____

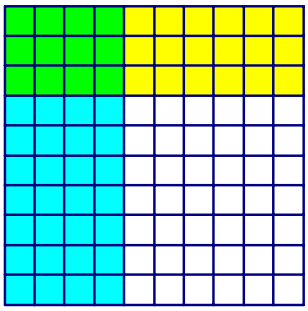
20. $(0.2)^2$ = _____

>>>>>> Decimal multiplication handout >>>>>>>>..

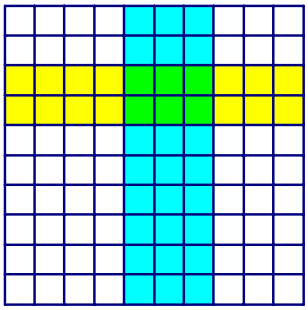
4 × 0.3



0.4 × 0.3 = 0.12



0.2 × 0.3 = 0.06



>>>>>>>>>>>> Proof that $0.\overline{999} = 1$ >>>>>>>>>>

Show this proof and then have the participants, in subgroups, prove that $0.232\overline{323} = \frac{23}{99}$.

Let x =	$0.\overline{999}$	(1) Given
10x =	$9.\overline{999}$	(2) Multiply (1) by 10
Subtract (1) from (2)		
10x =	$9.\overline{999}$	
− x =	$0.\overline{999}$	(3) Subtracting (1) from (2)
9x =	9.000	(4) Collect like terms
x =	1	(5) Divide (4) by 9
But, x =	$0.\overline{999}$	Given
So, 1 =	$0.\overline{999}$	Transitive property of =

After the subgroups have finished proving that $0.232\overline{323} = \frac{23}{99}$, have them explain any difficulties they encountered and their reaction to the process to the entire group.

>>>>>>>>>> 1089

Do the following number trick with the entire group. When they complete the work, ask if there are any questions. Generally there are two:

Does this always work (to which you respond that you do not know and that they should try it again)?

How does this work? The proof lies in number theory and is not overly complex. It might be interesting to ask them to do the proof as a homework assignment and report back via email.

Write any 3-digit number. DO NOT repeat the digits.	357
Reverse number	753
Subtract smaller from larger	753 – 357 = 396
If get 99, write as 099	
Reverse missing addend	693
Add to missing addend	693 + 396 = 1089

>>>>>>>>> Etc.

Any of the problem solving problems in the Mathematics in General Exercise Solutions could be used as activity events for the Workshop.