Contents

Lesson 1 - *Adding and Subtracting Decimals*

Please read this section together with the student.

THE WHOLE number system is made up of series of integers; 1, 2, 3 ..... In whole numbers, there are no numbers less than one. To write numbers less than one, fractions are used. Fractions are a way of writing numbers that are smaller than one or fall in between the integers. By using fractions, we extend our number system like this; 0, $\frac{1}{6}, \frac{1}{3}, \frac{1}{2}, 1, \frac{7}{6}, \frac{3}{2}$ *etc.* Now fractions fill in the space between the whole numbers and we can express just about any number.

Decimals however, are a much better way of expressing fractions, as well as whole numbers. With decimals we can write whole numbers, and both rational and irrational numbers. It is a single system for writing all numbers, large or small. It is the most used and preferred system of writing numbers. Most importantly computers use decimal numbers for calculations. As you know, your calculator gives answers in decimals and not in fractions.

Here you see that what we can express in fractions, we can express in decimals.

The word decimal has the root "deci" which means 10. The position of the decimal tells us the value of the number as a multiple of 10.

Take 2.45 and 24.5. By moving the decimal to the right (from between 2 and 4 to between 4 and 5), the number 2.45 became 24.5 and the second number is 10 times bigger than the first.

In 12.8 and 1.28, moving the decimal to the left by one place, made the number 10 times smaller.

In 1245.6 and 12.456, moving the decimal to the left by two spaces, made the number 100 times smaller.

Each movement of the decimal to the right makes the number 10 times bigger.

Each movement of the decimal to the left makes the number 10 times smaller.

Note—Read these problems to the child, waiting for an answers after each sub-question.

1. Where would you put the decimal in these numbers to make these numbers 10 times bigger? 10.3; 15.7; 345.8; 85.7; 33.89; 9.22.
Ans: One place to the right of where it is now. 103.0; 157.0; 3458.0; 857.0; 338.9; 92.2.

2. Where would you put the decimal to make these numbers 100 times bigger? 10.311; 15.722; 345.83; 85.700; 33.890; 922.6.
Ans: Two places to the right of where it is right now. 1031.1; 1572.2; 34583.; 8570.0; 3389.0; 92260.

3. Where would you put the decimal to make these numbers 1000 times bigger? 10.3; 15.7; 345.8; 85.7; 33.89; 9.22
Ans: Three places to the right of where it is right now. 10300.; 15700.; 345800.; 85700.; 33890.; 92200.

4. Where would you put the decimal to make these numbers 10 times smaller? 10.3; 15.7; 345.8; 85.7; 33.89; 9.22.
Ans: One place to the left of where it is right now. 1.03; 1.57; 34.58; 8.57; 3.389; .922.

5. Where would you put the decimal to make these numbers 100 times smaller? 100.0; 115.0; 345.0; 805.7; 303.0; 92.
Ans: Two places to the left of where it is right now. 1.00; 1.15; 3.45; 8.057; 3.03; 0.92.

6. Where would you put the decimal to make these numbers 1000 times smaller? 1450.0; 1455.0; 32245.0; 8665.0; 3903.0; 9122.0.
Ans: Three places to the left of where it is right now. 1.450; 1.455; 32.245; 8.665; 3.903; 9.122.

Here are some properties of fractions. Please read with student.
Fractions can be written as decimal numbers by converting the fraction such that its denominator is 10.

Fraction $\frac{3}{5}$ can be converted to $\frac{6}{10}$ and this in turn can be written as 0.6 in the decimal form.

The goal is to multiply both the numerator and the denominator of the ratio with a number that will make the denominator 10.

To convert fraction $\frac{1}{5}$ to a decimal number, multiply both top and bottom of the fraction by 2, $\frac{1\times2}{5\times2}$ which is $\frac{2}{10}$ and hence is written in decimal form as 0.2.

Going the other way, we can also convert a decimal number to a fraction by writing the number without the decimal on top and then writing a 10 on the bottom. Decimal number 0.3 in fraction is $\frac{3}{10}$; and decimal number 0.5 is $\frac{5}{10}$, or $\frac{1}{2}$; 0.1 is written as $\frac{1}{10}$.

Decimals can be bigger than 1 or smaller. When a decimal is smaller than 1, it has a 0 or nothing in front of the decimal point. A decimal that has a number larger than 0 on the left side of the decimal is larger or equal to 1.0.

Here are some basic fractions and their decimal equivalent.

$\frac{1}{2} = 0.5$; $\frac{1}{4} = 0.25$; $\frac{1}{5} = 0.2$; $\frac{1}{8} = 0.125$; $\frac{1}{10} = 0.1$

7. Which of these decimal numbers are less than 1.0; 1.01; 1.00; 0.101; 0.001; .109; .456; 4.56?

8. Which is the tenths digit in these numbers? 0.11; 2.33; 4.55; 2.2; 0.002; 0.003; 9.2?

The first digit after the decimal point is called the tenths.

Hundredths is two digits after the decimal point.

Thousandths is three digits after the decimal point.

There can be any number of zeros after the decimal point.

We add and subtract decimal numbers the same way as we add and subtract regular (integers) numbers.

When the sum is greater than .9, then we just carry the number bigger than 1 to the left side of the decimal.

9. What is 0.8 plus 0.4?
8 plus 4 is 12, so we write the sum as 1.2

Add these decimal numbers.

10. 0.1 + 0.1 =? **Ans:** 0.2

11. 0.1 + 0.2 =? **Ans:** 0.3

12. 0.1 + 0.3 =? **Ans:** 0.4

13. 0.1 + 0.5 =? **Ans:** 0.6

14. 0.5 + 0.1 =? **Ans:** 0.6

15. 0.1 + 0.6 =? **Ans:** 0.7

16. 0.7 + 0.1 =? **Ans:** 0.8

17. 0.8 + 0.2 =? **Ans:** 1.0

18. 0.8 + 0.3 =? **Ans:** 1.1

19. 0.8 + 0.4 =? **Ans:** 1.2

20. 0.9 + 0.1 =? **Ans:** 1.0

21. 0.9 + 0.3 =? **Ans:** 1.2

Add these decimal numbers.

22. $0.1 + 0.01 =?$ **Ans:** 0.11
23. $0.01 + 0.2 =?$ **Ans:** 0.21
24. $0.01 + 0.3 =?$ **Ans:** 0.31
25. $0.1 + 0.05 =?$ **Ans:** 0.15
26. $0.05 + 0.1 =?$ **Ans:** 0.15
27. $0.01 + 0.06 =?$ **Ans:** 0.07
28. $0.07 + 0.1 =?$ **Ans:** 0.17
29. $0.8 + 0.02 =?$ **Ans:** 0.82
30. $0.8 + 0.03 =?$ **Ans:** 0.83
31. $0.8 + 0.04 =?$ **Ans:** 0.84
32. $0.9 + 0.09 =?$ **Ans:** 0.99
33. $0.9 + 0.03 =?$ **Ans:** 0.93
34. $1.1 + 0.1 =?$ **Ans:** 1.2
35. $1.1 + 0.2 =?$ **Ans:** 1.3
36. $2.2 + 0.03 =?$ **Ans:** 2.23
37. $10.3 + 0.4 =?$ **Ans:** 10.7
38. $9.4 + 0.5 =?$ **Ans:** 9.9
39. $1.5 + 0.5 =?$ **Ans:** 2.0
40. $2.5 + 1.6 =?$ **Ans:** 4.1
41. $1.6 + 1.6 =?$ **Ans:** 3.2
42. $2.7 + 2.7 =?$ **Ans:** 5.4
43. $3.8 + 3.8 =?$ **Ans:** 7.6
44. $1.9 + 1.9 =?$ **Ans:** 3.8
45. $10.01 + 0.1 =?$ **Ans:** 10.11
46. $10.02 + 0.1 =?$ **Ans:** 10.12
47. $1.03 + 10.01 =?$ **Ans:** 11.04

Subtract these decimal numbers.

48. $1.1 - 0.1 =?$ **Ans:** 1.0
49. $1.1 - 0.2 =?$ **Ans:** 0.9
50. $1.1 - 0.3 =?$ **Ans:** 0.8
51. $1.3 - 0.4 =?$ **Ans:** 0.9
52. $1.4 - 0.5 =?$ **Ans:** 0.9
53. $1.5 - 0.5 =?$ **Ans:** 1.0
54. $1.6 - 0.7 =?$ **Ans:** 0.9
55. $1.7 - 0.8 =?$ **Ans:** 0.9
56. $2.7 - 0.9 =?$ **Ans:** 0.8
57. $2.6 - 0.3 =?$ **Ans:** 0.3
58. $4.7 - 0.8 =?$ **Ans:** 3.9
59. $5.7 - 1.3 =?$ **Ans:** 4.4
60. $1.0 - 0.9 =?$ **Ans:** 0.1
61. $1.0 - 0.09 =?$ **Ans:** 0.91
62. $1.0 - 0.1 =?$ **Ans:** 0.9
63. $1.0 - 0.11 =?$ **Ans:** 0.89
64. $1.0 - 0.22 =?$ **Ans:** 0.78
65. $1.0 - 0.33 =?$ **Ans:** 0.67
66. $1.0 - 0.5 =?$ **Ans:** 0.5
67. $1.0 - 0.05 =?$ **Ans:** 0.95
68. $1.0 - 0.8 =?$ **Ans:** 0.2
69. $1.0 - 0.08 =?$ **Ans:** 0.92
70. $1.0 - 0.09 =?$ **Ans:** 0.91
71. $1.0 - 0.02 =?$ **Ans:** $0.98\breve{\cdot}$

Lesson 2 - *Multiplying Decimals*

WHAT is 0.5 times 0.2?

Ans: First convert these decimal numbers to fractions. 0.5 is same as $\frac{5}{10}$ and 0.2 is equal to $\frac{2}{10}$. Multiply the two fractions, $\frac{5}{10} \times \frac{2}{10}$ and we get $\frac{10}{100}$, which can be written in decimals as 0.1.

To multiply decimals directly without converting them to fractions, we just multiply the numbers as we would do with 5 and 2 except we have to know where to put the decimal.

First multiply just the integers ignoring the decimals. $5 \times 2 = 10$. Now count the decimal places for the two digits we multiplied, $0.\underleftarrow{5}$ and $0.\underleftarrow{2}$. Both integers are one place to the right of the decimal. So for the product, we would put decimal at two places from the right or the end of the number. For 10 which is product of 5 and 2, we put the decimals two place to the right of the end of the number, 10 and we get 0.10.

We can also write 0.10 as 0.1, because unlike the 0 at the end of an integer, the 0 at the right end of a decimal number can be dropped and is called *not significant.*

What is 2.5 times 2?

Ans: First forget about all the decimals that are there. Pretend you only have two whole numbers. The product of 25 and 2 is 50. Now to figure out where to put the decimal, count the numbers to the right of the decimals. There is only one number past the decimal for $2.\underleftarrow{5}$ and none for 2. So we put the decimal one place from the right of the end of the number or 5.0. Again we can drop the 0 to the right of the decimal and we can write 5.0 as 5. or just plain 5.

What is 0.1 times 3.463?

Ans: The product of 1 and 3463 is 3463. Let's count the numbers to the right of the decimals, there is only one for $0.\underleftarrow{1}$ and three for $3.\underleftarrow{463}$. So we put the decimal one plus three, four places to the right from the end of the number or .3463. We can also write this as 0.3463 which is exactly the same thing.

What is 0.001 times 4.55?

Ans: The product of 1 and 455 is 455. Let's count the numbers to the right of the decimals, there are three for $0.\underleftarrow{001}$ and two for $4.\underleftarrow{55}$. So we put the decimal three plus two, or five places to the right from the end of the number 455. But there are only three digits in the number, so we just add two zeros in front of 4 and get the answer of 0.00455.

Multiply these decimal numbers.

1. $0.1 \times 1 =?$ **Ans:** 0.1

2. $0.1 \times 0.1 =?$ **Ans:** 0.01

3. $0.1 \times 1.9 =?$ **Ans:** 0.19

4. $0.1 \times 2 =?$ **Ans:** 0.2

5. $0.1 \times 0.02 =?$ **Ans:** 0.002

6. $0.1 \times 30 =?$ **Ans:** 3.0

7. $0.1 \times 20 =?$ **Ans:** 2.0

8. $0.1 \times 0.002 =?$ **Ans:** 0.0002

9. $0.1 \times 40 =?$ **Ans:** 4.0

10. $0.1 \times 400 =?$ **Ans:** 40.0

11. $0.1 \times 0.003 =?$ **Ans:** 0.0003

12. $0.1 \times 400 =?$ **Ans:** 0.22

13. $0.1 \times 120 =?$ **Ans:** 12.0

14. $0.1 \times 5.5 =?$ **Ans:** 0.55

15. $0.2 \times 0.1 =?$ **Ans:** 0.02

16. $0.1 \times 0.1 =?$ **Ans:** 0.01

17. $2.5 \times 2.0 =?$ **Ans:** 5.0

18. $3 \times 0.2 =?$ **Ans:** 0.6

19. $0.1 \times 0.2 =?$ **Ans:** 0.02

20. $2.5 \times 30 =?$ **Ans:** 75.0

21. $0.1 \times 4 =?$ **Ans:** 0.4

22. $0.1 \times 0.02 =?$ **Ans:** 0.002

23. $2.5 \times 40 =?$ **Ans:** 100.0

24. $0.1 \times 40 =?$ **Ans:** 4.0

25. $0.1 \times 0.032 =?$ **Ans:** 0.0032

26. $5.0 \times 400 =?$ **Ans:** 2000.

27. $0.1 \times 1200.0 =?$ **Ans:** 120.0

28. $0.1 \times 2.2 =?$ **Ans:** 0.22

29. $0.01 \times 1 =?$ **Ans:** 0.01

30. $0.01 \times 4 =?$ **Ans:** 0.04

31. $0.01 \times 0.7 =?$ **Ans:** 0.007

32. $0.01 \times 2 =?$ **Ans:** 0.02

33. $0.01 \times 40 =?$ **Ans:** 0.40

34. $0.01 \times 7 =?$ **Ans:** 0.07

35. $0.01 \times 20 =?$ **Ans:** 0.2

36. $0.001 \times 0.2 =?$ **Ans:** 0.0002

37. $0.01 \times 0.02 =?$ **Ans:** 0.002

38. $0.4 \times 30 =?$ **Ans:** 12.

39. $0.001 \times 20 =?$ **Ans:** 0.020

40. $0.1 \times 0.002 =?$ **Ans:** 0.0002

41. $0.03 \times 40 =?$ **Ans:** 1.2

42. $0.001 \times 400 =?$ **Ans:** 0.4

43. $0.01 \times 0.032 =?$ **Ans:** 0.0032

44. $0.004 \times 400 =?$ **Ans:** 1.6

45. What is 0.25 multiplied by 100? **Ans:** 25.0

46. What is 0.125 multiplied by 10? **Ans:** 1.25

47. What is 0.125 multiplied by 100? **Ans:** 12.5

48. What is 0.1 multiplied by 10? **Ans:** 1.0

49. What is 0.1 multiplied by 100? **Ans:** 10.0

50. What is 0.01 multiplied by 10? **Ans:** 0.1

51. What is 0.01 multiplied by 100? **Ans:** 1.0

52. What is 0.125 divided by 10? **Ans:** 0.0125

53. What is .0125 multiplied by 100? **Ans:** 1.25

54. Multiply 0.1×1.05? **Ans:** 0.105

55. What is 10×0.1? **Ans:** 1.0

56. What is 100×0.1? **Ans:** 10.0

57. What is 1000×0.1? **Ans:** 100

58. What is 0.2×20? **Ans:** 4.0

59. What is 0.02×20? **Ans:** 0.4

60. What is $0.035 \times 2.0 =$? **Ans:** 0.070.

61. What is $234 \times 0.01 =$? **Ans:** 2.34

62. What is 45×0.001? **Ans:** 0.045

63. What is 68.7×0.01? **Ans:** $0.687\breve{\breve{}}$

Lesson 3 - *Dividing Decimals*

DIVIDE 10 by 0.1.

Ans: First let's see what this means by using fractions. 0.1 is same as $\frac{1}{10}$. Dividing 10 by $\frac{1}{10}$ is same as $10 \div \frac{1}{10} = 10 \times 10 = 100$.

You should remember that when we divide a number by a decimal number that is smaller than one, the answer will be larger than the numerator. Just as the answer 100 in this problem is bigger than 10.

If you divide $10 \div 0.2$, is the answer bigger than 10 or smaller? What is the answer?

Ans: We are dividing by a decimal number less than 1, so the answer will be bigger than 10.

Decimal number 0.2 is same as $\frac{2}{10}$. Dividing 10 by $\frac{2}{10}$ is same as $10 \times \frac{10}{2} = 50$.

Fractions that have a 5 or 10 in the denominator are easy to convert to decimals. But what about a fraction like $\frac{3}{4}$?

The first thing we know about this fraction is that it is less than one. The decimal form of this fraction will have 0 in front of the decimal.

To convert this to a decimal number, we need to do division: 3 is less than 4, which means, 4 does not go into 3 or goes into 3 zero times. We write down 0. with a decimal at the end of it as our starting point. The remainder now is 3. Now we borrow a 10 which is multiplied by 3, and the remainder becomes 30. Now divide 30 by 4. 4 goes into 30, 7 times. So now we have 0.7. The remainder with 30 minus 28 is 2. Again we borrow a 10 and multiply it by the remainder 2. Now we have 20. 4 goes into 20, 5 times with no remainder and the division is complete with the answer 0.75 as the decimal number which is same as the fraction $\frac{3}{4}$.

With certain fractions such as 1 divided by 3, we are never be able to end the division. In this case we end after some number of times after the decimal. $\frac{1}{3}$ is equal to 0.3333333... but often as in this book, we will stop at 2 or 3 places after the decimal.

What is fraction $\frac{2}{3}$ in decimal?; $\frac{1}{4}$; $\frac{2}{5}$ *Ask child to do these by dividing it out on paper.* **Ans:** 0.666667...; 0.25; 0.4.

The reason we put a 7 at the end or 0.666667 is that we know that $\frac{1}{3} + \frac{2}{3} = 1.0$, and if we say that $\frac{1}{3}$ is 0.333333 then $\frac{2}{3}$ must be 0.666667 so that the sum adds to 1.0.

Note—For all division problems, before asking for the answer, ask if the answer will be bigger or smaller than the numerator; if I divide 1 by 0.2, will the answer be bigger than 1 or smaller?

Divide $1 \div 0.2$. **Ans:** 5.

Divide $1 \div 0.01$. **Ans:** 100.

Divide $1 \div 0.1$. **Ans:** 10.

Divide these decimal numbers.

1. $0.1 \div 0.1 =?$ **Ans:** 1.00

2. $0.1 \div 0.01 =?$ **Ans:** 10.

3. $0.1 \div .01 =?$ **Ans:** 10.

4. $0.1 \div 0.2 =?$ **Ans:** 0.5

5. $0.1 \div .001 =?$ **Ans:** 100.

6. $0.1 \div 0.4 =?$ **Ans:** 0.25

7. $0.1 \div 0.02 =?$ **Ans:** 5.0

8. $0.1 \div 0.1 =?$ **Ans:** 1.0

9. $0.1 \div 0.5 =?$ **Ans:** 0.2

10. $0.1 \div 0.333 =?$ **Ans:** 0.3

11. $0.1 \div 10 =?$ **Ans:** 0.01

12. $0.1 \div .05 =?$ **Ans:** 20.

13. $0.1 \div .033 =?$ **Ans:** 3.0

14. $0.1 \div 100 =?$ **Ans:** 0.001

15. $1.0 \div 0.1 =?$ **Ans:** 10.0

16. $2.0 \div 0.01 =?$ **Ans:** 200

17. $5.0 \div 0.5 =?$ **Ans:** 10.

18. $1.0 \div 0.2 =?$ **Ans:** 5.0

19. $2.0 \div 0.02 =?$ **Ans:** 100

20. $5.0 \div .05 =?$ **Ans:** 100.

21. $1.0 \div 0.4 =?$ **Ans:** 2.5

22. $2.0 \div 0.002 =?$ **Ans:** 1000

23. $10.0 \div 0.4 =?$ **Ans:** 25.

24. $1.0 \div 0.02 =?$ **Ans:** 50.

25. $2.0 \div 0.001 =?$ **Ans:** 2000

26. $100 \div 0.04 =?$ **Ans:** 2500.

27. $1.1 \div 0.01 =?$ **Ans:** 110.

28. $10 \div 0.04 =?$ **Ans:** 250.

29. What is 0.5 divided by 0.5? **Ans:** 1.0

30. What is 1 divided by 2? **Ans:** 0.5

31. What is 2 divided by 1? **Ans:** 2.

32. What is 2 divided by 8? **Ans:** 0.25

33. What is 8 divided by 2? **Ans:** 4.

34. What is 1 divided by 100? **Ans:** 0.01

35. What is 10 divided by 40? **Ans:** 0.25

36. What is 10 divided by 50? **Ans:** 0.20

37. What is 10 divided by 60? **Ans:** 0.166

38. What is 20 divided by 40? **Ans:** 0.50

39. What is 40 divided by 20? **Ans:** 2.

40. What is 100 divided by 700? **Ans:** 0.143

41. What is 10 divided by 80? **Ans:** 0.125

42. What is 50 divided by 200? **Ans:** 0.25

43. What is 500 divided by 20? **Ans:** 25

44. What is 100 divided by 800? **Ans:** 0.125

45. What is 10 divided by 90? **Ans:** 0.111

46. What is 20 divided by 60? **Ans:** 0.333

47. What is 60 divided by 20? **Ans:** 3.

48. What is 10 divided by 20? **Ans:** 0.5

49. Divide $1.15 \div 0.01$. **Ans:** 115.

50. Divide $2.13 \div 0.03$. **Ans:** 71

51. Divide $560 \div 100$. **Ans:** 5.6

52. Divide $1000 \div 100$. **Ans:** 10.0

53. Divide $10 \div 100$. **Ans:** 0.1

54. Divide $1 \div 100$. **Ans:** 0.01

55. Divide $0.1 \div 100$. . **Ans:** 0.001

56. To multiply 220 by 0.1, what can we do instead? **Ans:** We can divide it by 10.

57. To multiply 300 by 0.01, what can we do instead? **Ans:** We can divide it by 100.

58. To multiply 400 by 0.001, what can we do instead? **Ans:** We can divide it by 1000.

59. To divide 140 by 0.1, what can we do instead? **Ans:** We can multiply it by 10.

60. To divide 50 by 0.01, what can we do instead? **Ans:** We can multiply it by 100.

61. To divide 10 by 0.001, what can we do instead? **Ans:** We can multiply it by 100.

62. If you divide a number by a decimal number smaller than one, the result is bigger than the original number, True or False? **Ans:** True.

63. If you multiply a number by a decimal number smaller than one, the result is smaller than the original number, True or False? **Ans:** True.

Give answers to the following decimal operations.

64. $10 \div 0.1 =?$ **Ans:** 100.

65. $10 \div 0.01 =?$ **Ans:** 1000.

66. $0.001 \times 0.1 =?$ **Ans:** 0.0001

67. $0.1 \div 1. =?$ **Ans:** 0.1

68. $0.22 \div 10 =?$ **Ans:** 0.022

69. $1000 \times 3.1416 =?$ **Ans:** 3141.6

70. $0.1 \div 0.1 =?$ **Ans:** 1.

71. $230 \div 1000 =?$ **Ans:** 0.23

72. $100 \times 678.2 =?$ **Ans:** 67820

73. $0.1 \div 0.01 =?$ **Ans:** 10.

74. $0.22 \div 0.001 =?$ **Ans:** 220.

75. $100 \times 0.0144 =?$ **Ans:** 1.44

76. $0.1 \div 0.001 =?$ **Ans:** 100.

77. $100 \times 445.7 =?$ **Ans:** 44570.

78. $1 \div 10 =?$ **Ans:** 0.1

79. $220 \div 0.1 =?$ **Ans:** 2200.

80. $0.01 \times 6.786 =?$ **Ans:** 0.06786

81. $1 \div 100 =?$ **Ans:** 0.01

82. $0.001 \div 100 =?$ **Ans:** 0.00001

83. $0.01 \times 0.8923 =?$ **Ans:** 0.008923

84. $1 \div 1000 =?$ **Ans:** 0.001

85. $100 \div 0.01 =?$ **Ans:** 10000.

86. $100.5 \div 10 =?$ **Ans:** 10.05

87. $10 \div 10000 = ?$ **Ans:** 0.001

88. $35.89 \div 10 =?$ **Ans:** $3.589\breve{}$

Lesson 4 - *Rounding and Comparing Decimal Numbers*

WHICH number is the smallest in this group?
0.09; 0.10; 0.12. **Ans:** 0.09

1. Which number is the largest in this group? 0.012; 0.009; 0.098. **Ans:** 0.098

2. Which number is the smallest in this group? 0.03; 0.039; 0.033. **Ans:** 0.03

3. Which number is the largest in this group? 3.3; 3.03; 3.033. **Ans:** 3.3

4. One half is equal to what decimal number? **Ans:** 0.5

5. One quarter is equal to what decimal number? **Ans:** 0.25

6. One eighth is equal to what decimal number? **Ans:** 0.125

7. Is this number less than 1.0? 0.5; 1.2; 0.002; 0.23, 1.001; .99; 1.99.
Ans: yes, no, yes, yes, no, yes, no.

8. Is this number less than 2.09? 2.1; 2.29; 2.902; 2.039, 2.008; 2.19; 2.99.
Ans: no, no, no, yes, yes, no, no.

9. Is this number less than 0.016? 1.056; 0.09; 0.902; 0.012, 0.002; 0.014; 0.0099.
Ans: no, no, no, yes, yes, yes, yes.

10. Is this number greater than 0.020? 0.256; 0.09; 0.902; 0.012, 0.002; 0.214; 0.0099.
Ans: yes, no, yes, no, no, yes, no.

11. Is this number greater than 1.020? 1.256; 1.09; 1.902; 1.012, 1.002; 2.214; 2.0099.
Ans: yes, yes, yes, no, no, yes, yes.

12. Which number is closer to zero? 0.001 or 0.01? **Ans:** 0.001

13. Which number is closer to zero? 0.001 or 0.0009? **Ans:** 0.0009

14. Round these fractions to the nearest tens place.
0.01; 0.08; 0.09; 0.04; 0.05; 0.5.
Ans: 0.0; 0.1; 0.1; 0.0; 0.1; 0.5

15. Round these fractions to the nearest ones place.
0.01; 0.08; 0.09; 0.04; 0.05; 0.5.
Ans: 0.0; 0.1; 0.1; 0.0; 0.1; 0.5

16. Round these fractions to the nearest tens place.
0.01; 0.08; 0.09; 0.04; 0.05; 0.5.
Ans: 0.0; 0.1; 0.1; 0.0; 0.1; 0.5

17. Round these fractions to the nearest tens place.
0.01; 0.08; 0.09; 0.04; 0.05; 0.5.
Ans: 0.0; 0.1; 0.1; 0.0; 0.1; 0.5

18. Round these fractions to the nearest tens place.
0.01; 0.08; 0.09; 0.04; 0.05; 0.5.
Ans: 0.0; 0.1; 0.1; 0.0; 0.1; 0.5

19. Round these fractions to the nearest tens place.
0.1; 0.8; 0.9; 0.4; 0.5; 0.5.
Ans: 0; 1; 1; 0; 1; 1

20. Round these fractions to the nearest tens place.
0.01; 0.08; 0.09; 0.04; 0.05; 0.5.
Ans: 0.0; 0.1; 0.1; 0.0; 0.1; 0.5̈

Lesson 5 - *Decimals to Fractions*

HOW do we convert decimal number 0.02 into a fraction?

We know that 0.2 is same as $\frac{2}{10}$. Moving the decimal one space to the left means the number gets smaller by 10, so 0.02 is equal to $\frac{2}{100}$.

How do we convert the number $3\frac{1}{4}$ into a decimal number? We know that $\frac{1}{4}$ is same as 0.25. The value of 3 plus 0.25 gives the number 3.25.

These conversions come up very often and should be memorized.

$\frac{1}{2} = 0.5$ $\frac{1}{5} = 0.2$ $\frac{1}{6} = 0.1667$ $\frac{5}{8} = 0.675$

$\frac{1}{3} = 0.33$ $\frac{2}{5} = 0.4$ $\frac{1}{7} = 0.14286$ $\frac{1}{9} = 0.11111$

$\frac{2}{3} = 0.67$ $\frac{3}{5} = 0.6$ $\frac{1}{8} = 0.125$ $\frac{1}{10} = 0.1$

$\frac{1}{4} = 0.25$ $\frac{4}{5} = 0.8$ $\frac{3}{8} = 0.375$ $\frac{1}{20} = 0.05$

Express this decimal number as a fraction.

1. 1.1; 1.2; 1.5; 2.1; 4.5; 8.8.

Ans: $\frac{11}{10}$; $\frac{12}{10}$; $\frac{15}{10}$; $\frac{21}{10}$; $\frac{45}{10}$; $\frac{88}{10}$.

2. 1.01; 1.12; 1.25; 2.01; 4.05; 2.08.

Ans: $\frac{101}{100}$; $\frac{112}{100}$; $\frac{125}{100}$; $\frac{201}{100}$; $\frac{405}{100}$; $\frac{208}{100}$.

3. 22.1; 15.2; 42.5; 40.1; 60.5; 50.8.

Ans: $\frac{221}{10}$; $\frac{152}{10}$; $\frac{425}{10}$; $\frac{401}{10}$; $\frac{605}{10}$; $\frac{508}{10}$.

4. 10.1; 1.12; 11.5; 2.01; 41.5; 2.8.

Ans: $\frac{101}{10}$; $\frac{112}{100}$; $\frac{115}{10}$; $\frac{201}{100}$; $\frac{415}{10}$; $\frac{28}{10}$.

5. 10.11; 6.7; 43.22; 14.01; 1.5; 9.5.

Ans: $\frac{1011}{100}$; $\frac{67}{10}$; $\frac{4322}{100}$; $\frac{1401}{100}$; $\frac{15}{10}$; $\frac{95}{10}$.

6. 0.1; 0.3; 0.5; 0.6; 0.5; 0.9.

Ans: $\frac{1}{10}$; $\frac{3}{10}$; $\frac{5}{10}$; $\frac{6}{10}$; $\frac{5}{10}$; $\frac{9}{10}$.

7. 0.15; 0.32; 0.55; 0.92; 0.67; 0.99.

Ans: $\frac{15}{100}$; $\frac{32}{100}$; $\frac{55}{100}$; $\frac{92}{100}$; $\frac{67}{100}$; $\frac{99}{100}$.

8. 1.15; 2.32; 3.55; 1.92; 2.67; 9.99.

Ans: $\frac{115}{100}$; $\frac{232}{100}$; $\frac{355}{100}$; $\frac{192}{100}$; $\frac{267}{100}$; $\frac{999}{100}$.

9. 0.1; 0.11; 0.22; 0.4; 0.45; 0.80.

Ans: $\frac{1}{10}$; $\frac{11}{100}$; $\frac{22}{100}$; $\frac{4}{10}$; $\frac{45}{100}$; $\frac{80}{100}$.

10. 0.11; 0.115; 0.223; 0.41; 0.450; 0.805.

Ans: $\frac{11}{100}$; $\frac{115}{1000}$; $\frac{223}{1000}$; $\frac{41}{100}$; $\frac{450}{1000}$; $\frac{805}{1000}$.

11. 0.01; 0.05; 0.03; 0.06; 0.07; 0.08.

Ans: $\frac{1}{100}$; $\frac{5}{100}$; $\frac{3}{100}$; $\frac{6}{100}$; $\frac{7}{100}$; $\frac{8}{100}$.

12. 0.003; 0.002; 0.005; 0.007; 0.008; 0.009.

Ans: $\frac{3}{1000}$; $\frac{2}{1000}$; $\frac{5}{1000}$; $\frac{7}{1000}$; $\frac{8}{1000}$; $\frac{9}{1000}$.

13. 0.013; 0.052; 0.035; 0.067; 0.078; 0.089.

Ans: $\frac{13}{1000}$; $\frac{52}{1000}$; $\frac{35}{1000}$; $\frac{67}{1000}$; $\frac{78}{1000}$; $\frac{89}{1000}$.

14. 1.003; 1.002; 1.005; 1.007; 1.008; 1.009.

Ans: $\frac{1003}{1000}$; $\frac{1002}{1000}$; $\frac{1005}{1000}$; $\frac{1007}{1000}$; $\frac{1008}{1000}$; $\frac{1009}{1000}$.

15. 22.00; 11.00; 55.00; 77.00; 45.0; 35.0.

Ans: $\frac{2200}{100}$; $\frac{1100}{100}$; $\frac{5500}{100}$; $\frac{7700}{100}$; $\frac{450}{10}$; $\frac{350}{10}$.

16. 22.1; 35.01; 55.01; 22.45; 3.4; 5.0.

Ans: $\frac{221}{10}$; $\frac{3501}{100}$; $\frac{5501}{100}$; $\frac{2245}{100}$; $\frac{34}{10}$; $\frac{50}{10}$.

17. 0.1; 0.01; 0.001; 0.2; 0.03; 0.006.

Ans: $\frac{1}{10}$; $\frac{1}{100}$; $\frac{1}{1000}$; $\frac{2}{10}$; $\frac{3}{100}$; $\frac{6}{1000}$.

18. 0.012; 0.051; 0.011; 0.02; 0.013; 0.046.

Ans: $\frac{12}{1000}$; $\frac{51}{1000}$; $\frac{11}{1000}$; $\frac{2}{100}$; $\frac{13}{1000}$; $\frac{46}{1000}$.

19. 0.012; 0.051; 0.011; 0.02; 0.013; 0.046.

Ans: $\frac{12}{1000}$; $\frac{51}{1000}$; $\frac{11}{1000}$; $\frac{2}{100}$; $\frac{13}{1000}$; $\frac{46}{1000}$.

20. 0.12; 0.51; 0.11; 0.02; 0.01; 0.06.

Ans: $\frac{12}{100}$; $\frac{51}{100}$; $\frac{11}{100}$; $\frac{2}{100}$; $\frac{1}{100}$; $\frac{6}{100}$.

How do you express this mixed number as a decimal number?

21. $1\frac{1}{2}$; $1\frac{1}{3}$; $1\frac{1}{5}$; $2\frac{1}{2}$; $3\frac{1}{3}$; $10\frac{1}{5}$.

Ans: 1.5; 1.33; 1.2; 2.5; 3.33; 10.2.

22. $11\frac{1}{2}$; $10\frac{1}{3}$; $2\frac{1}{4}$; $2\frac{1}{2}$; $200\frac{1}{3}$; $100\frac{1}{5}$.

Ans: 11.5; 10.33; 2.25; 2.5; 200.33; 100.2.

23. $1\frac{1}{20}$; $2\frac{1}{30}$; $1\frac{1}{40}$; $10\frac{1}{10}$; $5\frac{1}{30}$; $2\frac{1}{50}$.

Ans: 1.05; 2.033; 1.025; 10.1; 5.033; 2.02.

24. $2\frac{1}{200}$; $3\frac{1}{300}$; $4\frac{1}{400}$; $5\frac{1}{10}$; $6\frac{1}{300}$; $2\frac{1}{50}$.

Ans: 2.005; 3.0033; 4.0025; 5.1; 6.0033; 2.02.

25. $3\frac{1}{200}$; $4\frac{1}{300}$; $7\frac{1}{40}$; $2\frac{1}{10}$; $10\frac{1}{3}$; $50\frac{1}{50}$.

Ans: 3.005; 4.0033; 7.025; 2.1; 10.33; 50.02.$\ddot{\smile}$

Lesson 6 - *Proportions and Fractions*

WHAT number is same proportion of 100 as 3 is to 6?
Ans: 3 is one half of 6. One half of 100 is 50. 50 is same proportion of 100 as 3 is to 6.

1. What number is same proportion of 100 as 1 is to 10?
Ans: 1 is $\frac{1}{10}$ of 10. $\frac{1}{10}$ of 100 is 10.

2. What number is same proportion of 100 as 1 is to 5? **Ans:** 20.

3. What number is same proportion of 100 as 4 is to 5? **Ans:** 80.
Ans: 4 is $\frac{4}{5}$ of 5. $\frac{4}{5}$ of 100 is 80.

4. What number is same proportion of 100 as 3 is to 5?
Ans: 3 is $\frac{3}{5}$ of 5. $\frac{3}{5}$ of 100 is 60.

5. What number is the same proportion of 100 as $2\frac{1}{2}$ is to 5?
Ans: $2\frac{1}{2}$ is to 5 as 50 is to 100.

6. What number is same proportion of 100 as $3\frac{1}{2}$ is to 7?
Ans: 50.

7. What number is same proportion of 100 as 1 is to $2\frac{1}{2}$?
Ans: 1 is $\frac{2}{5}$ of $2\frac{1}{2}$. $\frac{2}{5}$ of 100 is 40.

8. What number is same proportion of 100 as $\frac{1}{2}$ is to $2\frac{1}{2}$?
Ans: $\frac{1}{2}$ is $\frac{2}{10}$ of $2\frac{1}{2}$. $\frac{2}{10}$ of 100 is 20.

9. What number is same proportion of 100 as $4\frac{1}{2}$ is to 10?
Ans: $4\frac{1}{2}$ is $\frac{9}{20}$ of 10. $\frac{9}{20}$ of 100 is 45.

10. What number is same proportion of 100 as 3 is to 2? **Ans:** 150.

11. What number is same proportion of 100 as $\frac{1}{2}$ is to 5?
Ans: $\frac{1}{2}$ is $\frac{1}{10}$ of 5. $\frac{1}{10}$ of 100 is 10.

12. What number is same proportion of 100 as $2\frac{1}{2}$ is to $\frac{1}{4}$?
Ans: $2\frac{1}{2}$ is 10 times $\frac{1}{4}$.. 10 times of 100 is 1000.

13. What number is same proportion of 90 as $2\frac{1}{3}$ is to 21?
Ans: $2\frac{1}{3}$ is $\frac{1}{9}$ of 21. $\frac{1}{9}$ 90 is 10.

14. What number is same proportion of 100 as $2\frac{1}{5}$ is to 22?
Ans: $2\frac{1}{5}$ is $\frac{1}{10}$ of 22. $\frac{1}{10}$ 100 is 10.

15. What number is same proportion of 100 as $\frac{3}{8}$ is to 15?
Ans: $\frac{3}{8}$ is $\frac{1}{40}$ of 15. $\frac{1}{40}$ of 100 is $2\frac{1}{2}$.

16. What number is same proportion of 100 as $\frac{5}{8}$ is to 5?
Ans: $\frac{5}{8}$ is $\frac{1}{8}$ of 5. $\frac{1}{8}$ of 100 is $12\frac{1}{2}$.

17. What number is same proportion of 100 as $\frac{7}{2}$ is to 35?
Ans: $\frac{7}{2}$ is $\frac{1}{10}$ of 35. $\frac{1}{10}$ of 100 is 10.

18. What number is same proportion of 100 as $3\frac{1}{3}$ is to 8?
Ans: $3\frac{1}{3}$ is $\frac{10}{3}$. $\frac{10}{3}$ is to 8 as $\frac{5}{12}$.$\frac{5}{12}$ of 100 is 43.

19. What number is same proportion of 100 as $2\frac{1}{2}$ is to 1?
Ans: $2\frac{1}{2}$ is $\frac{5}{2}$ times 1. So the number will be $\frac{5}{2}$ times 100 or, 250.

20. What number is same proportion of 100 as $2\frac{1}{2}$ is to $\frac{1}{2}$? **Ans:** 500.

21. What number is same proportion of 100 as $4\frac{1}{2}$ is to 10? **Ans:** 45.

22. What number is same proportion of 100 as $6\frac{1}{2}$ is to 10? **Ans:** 62.5.

23. What number is same proportion of 100 as $\frac{1}{2}$ is to 5? **Ans:** 10.

24. $\frac{1}{3}$ = what decimal number? **Ans:** 0.333

25. $\frac{1}{4}$ = what decimal number? **Ans:** 0.25

26. $\frac{1}{5}$ = what decimal number? **Ans:** 0.20

27. $\frac{1}{6}$ = what decimal number? **Ans:** 0.166

28. $\frac{1}{7}$ = what decimal number? **Ans:** 0.143

29. $\frac{1}{8}$ = what decimal number? **Ans:** 0.125

30. $\frac{1}{9}$ = what decimal number? **Ans:** 0.111

31. $\frac{1}{10}$ = what decimal number? **Ans:** 0.1

32. $\frac{2}{3}$ = what decimal number? **Ans:** 0.667

33. $\frac{2}{5}$ = what decimal number? **Ans:** 0.4

34. $\frac{5}{8}$ = what decimal number? **Ans:** 0.625

35. If $\frac{1}{8}$ is equal 0.125, then what is $\frac{2}{8}$ =? **Ans:** 0.25

36. If $\frac{1}{8}$ is equal 0.125, then what is $\frac{3}{8}$ =? **Ans:** 0.375

37. If $\frac{1}{8}$ is equal 0.125, then what is $\frac{5}{8}$ =? **Ans:** 0.625

38. If $\frac{1}{8}$ is equal 0.125, then what is $\frac{7}{8}$ =? **Ans:** 0.875

39. A business found that its rent was 0.25 times its income. The salaries it paid were 0.375 times its total income. What part of the income are these expenses? **Ans:** 0.625

40. A filing cabinet has three drawers and they are 1.25, 1.5 and 1.75 ft. high. The base of the cabinet is 0.2 ft. high. How tall is the cabinet? **Ans:** 5.7 ft.

41. A business paid out of each dollar it earned, 0.05 dollars for state tax, 0.09 for inventory taxes, 0.04 for county taxes. What part does it have left for its own use after paying the taxes? **Ans:** 0.86

42. The tax in one county is 0.028 per dollar and in the neighboring county it is 0.018. How much lower is the tax in the first county? **Ans:** 0.01 per dollar.

43. A building has three floors and they are 12.5, 10.5 and 11.75 ft. high. How tall is the building? **Ans:** 34.75 ft.

44. A driveway has three sections and they are 22.45, 35.55 and 15.45 ft. long. How long is the driveway? **Ans:** 73.45 ft.

45. What part of the dial of a clock does the hour-hand move while the minute hand has gone once around the dial? **Ans:** 5 minutes-spaces, which is one-twelfths of 60 minutes.

46. What part of the dial of a clock does the hour-hand move while the minute hand has gone 0.667 of the distance around the dial?
Ans: .667 is same as $\frac{2}{3}$. $\frac{2}{3}$ of 60 minutes is 40 minutes. If in 60 minutes, the hour hand moves 5 minutes, then in 40 minutes, it will move $\frac{10}{3} = 3.33$ minutes.

47. What part of the dial of a clock does the hour-hand move while the minute hand has gone 0.50 of the distance around the dial?
Ans: 0.5 is same as $\frac{1}{2}$. One-half of 60 minutes is 30 minutes. If in 60 minutes, the hour hand moves 5 minutes, then in 30 minutes, it will move 2.5 minutes.

48. Divide 100 points between Thomas and Jack so that their shares are as 3 is to 2. **Ans:** 60 and 40.

49. In a school there are 5 boys to 4 girls. If the school has 450 students, how many boys are in the school? **Ans:** 250 boys.☺

Lesson 7 - *Decimal Operations*

HOW much bigger is the answer when 4.5 is multiplied by 23, then when it is multiplied by 2.3?

Ans: 23 can be written as 2.3×10, the product will be $4.5 \times 2.3 \times 10$, so the answer is 10 times bigger.

1. The result of multiplying 2.13 with 38 is how many times bigger than when multiplying 2.13 with 0.038?
Ans: 1000 times.

How many times bigger or smaller is the result for the first pair than the second pair?

Let student write down the pairs is she is confused.

2. 4.96×2.5 0.25×4.96 **Ans:** 10 times bigger.

3. 53.9×1.39 0.139×53.9 **Ans:** 10 times bigger.

4. 1065×4.96 10.65×4.96 **Ans:** 100 times bigger.

5. 23.78×1.3 23.78×0.13 **Ans:** 10 times bigger.

6. 56.67×0.35 5.667×0.35 **Ans:** 10 times smaller.

7. 1.234×133.2 12.34×0.1332 **Ans:** 100 times smaller.

8. 11.1×5.6 0.11×0.56 **Ans:** 1000 times bigger.

9. 0.35×0.22 2.2×3.5 **Ans:** 100 times smaller.

10. 1111×3.3 1.111×3.33 **Ans:** 1000 times bigger.

11. 0.101×4.5 45×101 **Ans:** 10000 times bigger.

12. 6.7×0.66 0.67×6.6 **Ans:** Same.

13. 4.03×0.03 3.0×0.403 **Ans:** 10 times smaller.

14. 1.01×0.025 0.25×0.101 **Ans:** Same.

15. 0.55×155 15.5×5.5 **Ans:** Same.

16. 56.7×3.3 5.67×0.33 **Ans:** Same.

17. A train travels at the rate of 38.95 miles per hour. How far will it go in 10 hours? **Ans:** 389.5 miles.

18. Can you estimate the area of a rectangle that is 4.5 in. on one side and 2.5 in. on the other? **Ans:** The answer will be between 10 and 12.5 sq. inches.

19. What is the cost of a wood post that is 8 ft. tall and costs \$1.05 per ft.? **Ans:** \$8.40.

20. What is the cost of 48 ft. of material at the cost of \$5.5 per ft.? **Ans:** \$264.

21. What is the cost of $5\frac{1}{2}$ yards of material at the cost of \$1.5 per yard? **Ans:** \$7.75.

22. What is the cost of $26\frac{3}{4}$ lb. of cement at the cost of \$0.25 per pound? **Ans:** $\$6\frac{11}{16}$.

23. What is the fraction equivalent of 0.1? **Ans:** $\frac{1}{10}$

24. What is the fraction equivalent of 0.2? **Ans:** $\frac{1}{5}$

25. What is the fraction equivalent of 0.15? **Ans:** $\frac{3}{20}$

26. What is the fraction equivalent of 0.3? **Ans:** $\frac{3}{100}$

27. What is the fraction equivalent of 0.333? **Ans:** $\frac{1}{3}$