Arithmetic of Decimals

Comprehensive Guide with Concepts, Examples, Pre-Test, Q&A, and Post-Test

Chapter 1: Key Concepts in Decimal Arithmetic

- **Decimal Place Value and Rounding:** Each digit to the right of the decimal point has a place value (tenths, hundredths, thousandths, ...). Rounding means approximating a decimal to a nearby value.
- **Changing Fractions to Decimals:** Divide the numerator by the denominator. Example: 3/4 = 0.75.
- **Changing Decimals to Fractions:** Write the decimal as a fraction with denominator 10, 100, 1000 etc., then simplify. Example: 0.25 = 25/100 = 1/4.
- **Comparing and Ordering Decimals:** Compare digits place by place, starting from the left.
- **Adding/Subtracting Decimals (& Money):** Line up the decimal points. Add or subtract as usual. Fill in missing zeros if needed.
- **Estimating Decimal Sums and Differences:** Round numbers to nearest whole number or tenth, then add/subtract.
- **Multiplying Decimals (& Money):** Multiply as if whole numbers, then count total decimal places in both numbers for the answer.
- **Estimating Decimal Products:** Round numbers before multiplying.
- **Dividing Decimals:** Move the decimal point (multiply by 10, 100, etc.) to make the divisor a whole number. Divide, then put decimal in answer.
- **Estimating Decimal Quotients:** Round numbers for easier division.
- **Understanding Percent:** Percent (%) means "out of 100". 45% = 45/100 = 0.45.
- **Percents and Fractions:** Convert percent to fraction by dividing by 100.
- **Percents and Decimals:** Move decimal point two places left to convert percent to decimal.
- **Multiplying Percents and Fractions:** Write percent as fraction or decimal, then multiply.

Chapter 2: Examples

- **Decimal Place Value:** In 5.472, 5 is ones, 4 is tenths, 7 is hundredths, 2 is thousandths. **Rounding:** Round 3.678 to nearest tenth: 3.7.

- **Fraction to Decimal:** 2/5 = 0.4 (2 ÷ 5 = 0.4).
- **Decimal to Fraction:** 0.75 = 75/100 = 3/4.
- **Comparing Decimals:** Which is larger: 0.65 or 0.6? 0.65 is larger.
- **Adding Decimals:** 2.35 + 4.1 = 6.45
- **Subtracting Decimals:** 8.6 – 3.25 = 5.35
- **Adding/Subtracting Money:** $5.25 + $3.10 = $8.35
- **Estimating Sums:** 2.78 + 5.13 ≈ 3 + 5 = 8
- **Multiplying Decimals:** 0.7 × 0.2 = 0.14 (multiply 7 × 2 = 14, move decimal two places)
- **Multiplying Money:** $2.50 × 3 = $7.50
- **Estimating Products:** 1.9 × 4.1 ≈ 2 × 4 = 8
- **Dividing Decimals by Whole Numbers:** 3.6 ÷ 3 = 1.2
- **Dividing Whole Numbers by Decimals:** 8 ÷ 0.4 = 20
- **Dividing Decimals by Decimals:** 0.9 ÷ 0.3 = 3
- **Dividing Money:** $6.00 ÷ 4 = $1.50
- **Estimating Quotients:** 7.8 ÷ 2.3 ≈ 8 ÷ 2 = 4
- **Percents:** 25% = 0.25 = 1/4. 40% of 50 = 0.4 × 50 = 20.

Chapter 3: Pre-Test (40 Multiple Choice Questions)

Q1. Which digit is in the hundredths place in 4.329?
- ○ 2
- ○ 3
- ○ 9
- ○ 4

Q2. Round 5.678 to the nearest tenth.
- ○ 5.6
- ○ 5.7
- ○ 5.67
- ○ 5.68

Q3. What is 3/4 as a decimal?
- ○ 0.34
- ○ 0.25
- ○ 0.75
- ○ 0.8

Q4. Which fraction is equivalent to 0.4?
- ○ 1/2
- ○ 4/10
- ○ 2/5
- ○ 3/5

Q5. Write 0.56 as a fraction in simplest form.
- ○ 56/100
- ○ 28/50
- ○ 14/25
- ○ 7/25

Q6. Which is the largest decimal?
- ○ 0.67
- ○ 0.76
- ○ 0.607
- ○ 0.706

Q7. Arrange 0.5, 0.25, 0.75 in ascending order.
- ○ 0.25, 0.5, 0.75
- ○ 0.5, 0.25, 0.75
- ○ 0.75, 0.5, 0.25
- ○ 0.25, 0.75, 0.5

Q8. What is 1.4 + 2.36?
- ○ 3.7
- ○ 3.76
- ○ 3.64
- ○ 3.8

Q9. What is 5.82 − 3.7?
- ○ 2.12
- ○ 2.02
- ○ 1.12
- ○ 1.92

Q10. Estimate 3.62 + 5.47 by rounding to the nearest whole number.
- ○ 8
- ○ 9
- ○ 10
- ○ 7

Q11. What is $4.25 + $3.90?
- ○ $8.15
- ○ $7.15
- ○ $8.05
- ○ $7.95

Q12. What is $10.50 − $6.25?

○ $4.25

○ $4.15

○ $3.25

○ $5.25

Q13. Estimate $7.98 + $2.05 to the nearest dollar.

○ $11

○ $10

○ $9

○ $8

Q14. What is 2.4 × 1.5?

○ 3.6

○ 3.4

○ 4.0

○ 3.9

Q15. What is 0.6 × 0.7?

○ 0.13

○ 0.42

○ 0.12

○ 0.48

Q16. Estimate 2.8 × 3.2 by rounding to the nearest whole number.

○ 12

○ 8

○ 9

○ 10

Q17. What is $3.20 × 4?

○ $12.80

○ $13.80

○ $12.20

○ $13.20

Q18. What is 4.2 ÷ 2?

○ 2.1

○ 2.2

○ 2.0

○ 2.5

Q19. What is 15 ÷ 0.5?

○ 7.5

○ 30
○ 10
○ 25

Q20. What is 2.4 ÷ 0.6?
○ 4.0
○ 3.0
○ 2.0
○ 3.5

Q21. Estimate 9.6 ÷ 3 to the nearest whole number.
○ 2
○ 3
○ 4
○ 5

Q22. What is $12.60 ÷ 3?
○ $3.20
○ $4.20
○ $4.80
○ $4.20

Q23. What is 0.06 ÷ 0.3?
○ 0.2
○ 0.5
○ 0.6
○ 0.3

Q24. What is 8 ÷ 0.2?
○ 40
○ 16
○ 4
○ 20

Q25. Estimate $7.50 ÷ 2 to the nearest dollar.
○ $3
○ $4
○ $5
○ $2

Q26. What percent is 0.6?
○ 60%
○ 6%

○ 0.6%

○ 16%

Q27. What is 3/4 as a percent?
○ 25%
○ 50%
○ 75%
○ 80%

Q28. Write 20% as a decimal.
○ 2
○ 0.2
○ 0.02
○ 20

Q29. What is 0.35 as a percent?
○ 35%
○ 3.5%
○ 0.35%
○ 350%

Q30. What is 40% of 50?
○ 20
○ 40
○ 25
○ 15

Q31. What is 1/5 of 60?
○ 15
○ 12
○ 10
○ 20

Q32. What is 30% of 120?
○ 36
○ 40
○ 30
○ 32

Q33. Which is greater: 0.6 or 0.65?
○ 0.6
○ 0.65
○ Equal

○ Can't tell

Q34. Which fraction is equal to 0.8?
○ 4/5
○ 3/4
○ 2/3
○ 5/8

Q35. Round 3.456 to the nearest hundredth.
○ 3.5
○ 3.46
○ 3.45
○ 3.4

Q36. Add: 0.07 + 0.8 = ?
○ 0.87
○ 0.15
○ 0.8
○ 0.85

Q37. What is 5.5 − 2.75?
○ 2.75
○ 2.25
○ 3.25
○ 3.75

Q38. Multiply: 0.5 × 0.6 = ?
○ 0.3
○ 0.06
○ 1.1
○ 0.11

Q39. Divide: 0.8 ÷ 0.2 = ?
○ 0.4
○ 4
○ 2
○ 0.2

Q40. Which is the smallest: 0.33, 0.3, 0.31, 0.32?
○ 0.33
○ 0.3
○ 0.31
○ 0.32

Q41. Write 7/10 as a decimal.
- ○ 0.07
- ○ 0.7
- ○ 0.77
- ○ 0.17

Q42. Convert 0.125 to a fraction in simplest form.
- ○ 1/8
- ○ 1/6
- ○ 1/4
- ○ 1/2

Submit

Chapter 4: Questions & Answers from Your Pre-Test

Take the pre-test above. Each mistake will generate a Q&A here!

Chapter 5: Post-Test (40 Multiple Choice Questions)

Q1. What digit is in the tenths place in 5.34?
- ○ 5
- ○ 3
- ○ 4
- ○ None

Q2. Round 2.67 to the nearest whole number.
- ○ 2
- ○ 3
- ○ 2.6
- ○ 2.7

Q3. Write 1/2 as a decimal.
- ○ 0.5
- ○ 0.2
- ○ 2
- ○ 5

Q4. Convert 0.2 to a fraction in simplest form.

○ 2/10
○ 1/5
○ 1/2
○ 2/5

Q5. Which is greater: 0.4 or 0.39?
○ 0.4
○ 0.39
○ They are equal
○ Cannot tell

Q6. Arrange 0.8, 0.5, 0.7 in ascending order.
○ 0.5, 0.7, 0.8
○ 0.8, 0.7, 0.5
○ 0.7, 0.8, 0.5
○ 0.5, 0.8, 0.7

Q7. What is 2.5 + 1.75?
○ 4.25
○ 3.25
○ 4.15
○ 3.75

Q8. What is 6.3 − 2.8?
○ 3.5
○ 4.1
○ 2.5
○ 4.5

Q9. Estimate 4.89 + 2.12 by rounding to the nearest whole number.
○ 7
○ 8
○ 6
○ 9

Q10. What is $7.30 + $2.45?
○ $9.75
○ $9.85
○ $9.65
○ $10.75

Q11. What is $12.00 − $5.25?
○ $6.75

○ $7.75

○ $6.85

○ $7.25

Q12. Estimate $8.90 + $1.20 to the nearest dollar.

○ $9

○ $10

○ $11

○ $8

Q13. What is 1.8 × 2.5?

○ 4.5

○ 4.0

○ 5.0

○ 3.5

Q14. What is 0.5 × 0.4?

○ 0.2

○ 0.20

○ 2.0

○ 0.04

Q15. Estimate 3.4 × 2.9 by rounding to the nearest whole number.

○ 9

○ 8

○ 7

○ 10

Q16. What is $2.75 × 6?

○ $16.50

○ $15.50

○ $17.50

○ $12.50

Q17. What is 5.4 ÷ 3?

○ 1.8

○ 1.7

○ 1.9

○ 2.8

Q18. What is 10 ÷ 0.2?

○ 50

○ 5

○ 20
○ 2

Q19. What is 3.6 ÷ 0.9?
○ 4
○ 3
○ 2
○ 1

Q20. Estimate 8.2 ÷ 2.1 to the nearest whole number.
○ 4
○ 3
○ 2
○ 5

Q21. What is $9.00 ÷ 3?
○ $3.00
○ $2.00
○ $2.50
○ $4.00

Q22. What is 0.09 ÷ 0.3?
○ 0.3
○ 0.27
○ 0.4
○ 0.25

Q23. What is 6 ÷ 0.3?
○ 20
○ 2
○ 18
○ 12

Q24. Estimate $7.80 ÷ 2 to the nearest dollar.
○ $3
○ $4
○ $5
○ $2

Q25. What percent is 0.45?
○ 45%
○ 4.5%
○ 0.45%

○ 0.045%

Q26. What is 1/2 as a percent?
○ 15%
○ 50%
○ 25%
○ 5%

Q27. Write 15% as a decimal.
○ 1.5
○ 0.15
○ 0.015
○ 15

Q28. What is 0.28 as a percent?
○ 2.8%
○ 0.028%
○ 28%
○ 0.28%

Q29. What is 30% of 70?
○ 21
○ 27
○ 30
○ 25

Q30. What is 1/4 of 80?
○ 20
○ 25
○ 16
○ 32

Q31. What is 25% of 160?
○ 40
○ 25
○ 32
○ 45

Q32. Which is greater: 0.55 or 0.505?
○ 0.55
○ 0.505
○ They are equal
○ Cannot tell

Q33. Which fraction is equal to 0.6?

- ○ 3/5
- ○ 2/3
- ○ 1/2
- ○ 3/4

Q34. Round 7.654 to the nearest hundredth.

- ○ 7.65
- ○ 7.66
- ○ 7.60
- ○ 7.64

Q35. Add: 0.09 + 0.8 = ?

- ○ 0.89
- ○ 0.98
- ○ 0.8
- ○ 0.88

Q36. What is 6.2 − 3.1?

- ○ 3.1
- ○ 2.1
- ○ 2.2
- ○ 3.0

Q37. Multiply: 0.2 × 0.5 = ?

- ○ 0.1
- ○ 0.01
- ○ 0.25
- ○ 1.0

Q38. Divide: 0.9 ÷ 0.3 = ?

- ○ 3
- ○ 2
- ○ 1
- ○ 0.3

Q39. Which is the smallest: 0.22, 0.2, 0.21, 0.23?

- ○ 0.22
- ○ 0.2
- ○ 0.21
- ○ 0.23

Q40. Write 3/5 as a decimal.

○ 0.5
○ 0.6
○ 0.75
○ 0.8

Q41. Convert 0.375 to a fraction in simplest form.
○ 3/8
○ 1/2
○ 3/4
○ 2/5

Submit

Algebra Foundations: Concepts, Examples, and Practice

Chapter 1: Concepts Explained

Exponents

- **Exponent** means raising a number (the base) to a certain power. For example, $2^3 = 2 \times 2 \times 2 = 8$.
- **Zero exponent:** Any nonzero number to the power of zero is 1, e.g., $5^0 = 1$.

Scientific Notation

- Used to write very large or small numbers. Format: $a \times 10^n$, where $1 \leq a < 10$.
- Example: 4500 = 4.5×10^3

Order of Operations

- The rules for which operations to perform first in an expression. Remember: **PEMDAS** (Parentheses, Exponents, Multiplication/Division, Addition/Subtraction).

Commutative and Associative Properties

- **Commutative Property:** Order doesn't matter for addition or multiplication. $a + b = b + a$, $ab = ba$.
- **Associative Property:** Grouping doesn't matter for addition or multiplication. $(a + b) + c = a + (b + c)$.

Distributive Property and Identity

- **Distributive:** $a(b + c) = ab + ac$.
- **Identity:** For addition, 0 is the identity: $a + 0 = a$. For multiplication, 1 is the identity: $a \times 1 = a$.

Zero Property, Equality Properties

- **Zero property of multiplication:** $a \times 0 = 0$.
- **Equality properties:** If $a = b$, then $a + c = b + c$ and $a - c = b - c$, etc.

Factors and Multiples

- **Factor:** A number that divides another exactly. (e.g., 3 is a factor of 12)
- **Multiple:** The product of a number and an integer. (e.g., 12 is a multiple of 3)

Understanding Variable Expressions

- Expressions that include numbers, variables (like x), and operations.
- Example: $2x + 5$

Solving Equations by Addition and Subtraction

- To isolate a variable, add or subtract the same value from both sides.
- Example: $x + 4 = 10 \Rightarrow x = 6$

Solving Equations by Multiplication and Division

- To isolate a variable, multiply or divide both sides by the same number (except zero).
- Example: $3x = 12 \Rightarrow x = 4$

Inequalities

- Mathematical sentences using <, >, ≤, ≥, ≠ instead of =.
- Example: $x > 5$
- Remember: When multiplying/dividing both sides by a negative, reverse the inequality sign!

Solving Equations and Inequalities by Substitution

- Replace a variable with a given value or another expression.
- Example: If $y = 2x$, substitute y in $x + y = 10$ to get $x + 2x = 10 \Rightarrow x = \frac{10}{3}$.

Chapter 2: Examples

Exponents:
$2^4 = 2 \times 2 \times 2 \times 2 = 16$
$5^0 = 1$

Scientific Notation:
$0.00032 = 3.2 \times 10^{-4}$

Order of Operations:
$3 + 6 \times (5 + 4) \div 3 - 7$
Step 1: Parentheses: $3 + 6 \times 9 \div 3 - 7$

Step 2: Multiply/Divide: $3 + 54 \div 3 - 7$
Step 3: $3 + 18 - 7 = 14$

Commutative Property:
$7 + 4 = 4 + 7 = 11$

Associative Property:
$(2 + 3) + 4 = 2 + (3 + 4) = 9$

Distributive Property:
$3(a + 5) = 3a + 15$

Zero Property:
$7 \times 0 = 0$

Factors and Multiples:
3 is a factor of 12; 24 is a multiple of 6.

Variable Expressions:
If $x = 7$, then $2x + 3 = 2 \times 7 + 3 = 17$

Solving by Addition:
$x + 5 = 11$ → $x = 6$

Solving by Multiplication:
$5x = 35$ → $x = 7$

Inequality Example:
$2x - 3 < 9$ → $2x < 12$ → $x < 6$

Substitution:
If $y = 4x$, and $x = 2$, then $y = 4 \times 2 = 8$

Chapter 3: Pre-Test

1. What is 3^2?

○ 6
○ 9
○ 12
○ 27

2. $5^0 = $?

○ 0
○ 5
○ 1
○ Undefined

3. Write 34,000 in scientific notation.

○ 3.4×10^4
○ 34×10^3
○ 3.4×10^3
○ 0.34×10^5

4. Order of operations: $8 + 2 \times 5$?

○ 50
○ 18
○ 60
○ 30

5. Which is an example of the commutative property?

○ $a \times (b + c) = ab + ac$
○ $a + b = b + a$
○ $(a + b) + c = a + (b + c)$

○ $(a \times 0 = 0)$

6. Which is the distributive property?

○ $(a + (b + c) = (a + b) + c)$
○ $(a \times (b + c) = ab + ac)$
○ $(a + 0 = a)$
○ $(a \times 0 = 0)$

7. The identity element for multiplication is:

○ 0
○ 1
○ -1
○ 10

8. Zero property of multiplication: $(17 \times 0 =)$?

○ 17
○ 0
○ 1
○ -17

9. Which is a factor of 20?

○ 3
○ 4
○ 7
○ 9

10. Which is a multiple of 6?

○ 8
○ 12
○ 10
○ 5

11. Evaluate: $(4x + 2)$ when $(x = 3)$

○ 12
○ 14
○ 10
○ 20

12. Solve: $x + 7 = 15$

○ 8
○ 22
○ 7
○ 15

13. Solve: $5x = 25$

○ 5
○ 20
○ 0
○ 25

14. Which is an inequality?

○ $x = 7$
○ $x > 7$
○ $x + 7$
○ $x + 7 = 0$

15. If $y = 2x$, and $x = 5$, what is y?

○ 2
○ 7
○ 10
○ 25

16. $a + 0 = a$ is the _____ property.

○ Identity
○ Commutative
○ Associative

○ Distributive

17. $((2 + 3) + 4 = 2 + (3 + 4))$ is _____ property.

○ Commutative
○ Associative
○ Distributive
○ Identity

18. $(6 \times (2 + 3) = 6 \times 2 + 6 \times 3)$ is _____ property.

○ Distributive
○ Commutative
○ Associative
○ Identity

19. Solve: $(x - 5 = 9)$

○ 14
○ 4
○ 5
○ 9

20. Solve: $(7x = 28)$

○ 4
○ 21
○ 35
○ 3

21. $(10^2 =)$?

○ 20
○ 100
○ 1000
○ 10

22. $(8^1 =)$?

- O 0
- O 8
- O 1
- O 16

23. Which is the correct scientific notation for 0.0025?

- O 2.5×10^{-3}
- O 2.5×10^{-2}
- O 25×10^{-4}
- O 0.25×10^{-1}

24. What is 7 + 2 × 5?

- O 45
- O 17
- O 27
- O 57

25. Which is an example of the associative property?

- O $2 \times 3 = 3 \times 2$
- O $(2 \times 3) \times 4 = 2 \times (3 \times 4)$
- O $2 \times 0 = 0$
- O $2 \times 1 = 2$

26. Which is the identity property of addition?

- O $a + 0 = a$
- O $a \times 1 = a$
- O $a + b = b + a$
- O $a \times (b + c) = ab + ac$

27. What is 0 × 123456?

- O 0
- O 123456
- O 1

○ -123456

28. Which is a multiple of 4?

○ 5

○ 8

○ 9

○ 7

29. What is a factor of 18?

○ 4

○ 9

○ 7

○ 8

30. Evaluate $2x - 5$ when $x = 4$

○ 3

○ 8

○ 13

○ 2

31. Solve: $x - 8 = 10$

○ 2

○ 18

○ -2

○ 8

32. Solve: $4x = 32$

○ 8

○ 12

○ 28

○ 36

33. Which is an inequality?

○ $(x = 2)$
○ $(x \neq 2)$
○ $(2x = 4)$
○ $(x + 2)$

34. If $(z = 3y)$, and $(y = 4)$, what is (z)?

○ 3
○ 7
○ 12
○ 24

35. $(a \times 1 = a)$ is the _____ property.

○ Identity
○ Commutative
○ Associative
○ Distributive

36. $((a \times b) \times c = a \times (b \times c))$ is _____ property.

○ Identity
○ Distributive
○ Commutative
○ Associative

37. $(5 \times (2 + 4) = 5 \times 2 + 5 \times 4)$ is _____ property.

○ Distributive
○ Identity
○ Associative
○ Commutative

38. Solve: $(x + 12 = 20)$

○ 12
○ 8
○ 32

○ 7

39. Solve: $9x = 63$

○ 6
○ 7
○ 8
○ 9

40. If $m = 2n$, and $n = 9$, what is m?

○ 11
○ 18
○ 20
○ 9

Chapter 4: Common Questions & Answers

Q: What does the exponent mean?

A: The exponent tells you how many times to multiply the base by itself. For example, 3^4 means $3 \times 3 \times 3 \times 3$.

Q: How do I change a number to scientific notation?

A: Move the decimal so you have a number 1–10, then multiply by 10 to the number of places you moved. For example, 0.0056 = 5.6×10^{-3}.

Q: Why is multiplication before addition in order of operations?

A: This rule keeps math consistent worldwide and prevents ambiguity.

Q: What is the difference between a factor and a multiple?

A: A factor divides a number exactly. A multiple is a product of a number and an integer. For example, 4 is a factor of 20, and 20 is a multiple of 4.

Q: When do I reverse the sign in an inequality?

A: When you multiply or divide both sides of an inequality by a negative number.

Q: How does substitution help solve equations?

A: Substitution allows you to replace a variable with a value or another expression, helping to simplify or solve equations.

Q: What is the distributive property?

A: It states $a(b + c) = ab + ac$. It helps simplify expressions and solve equations.

Chapter 5: Post-Test

Score: 0 / 40

1. What is 3^2?
- ○ 6
- ○ 9
- ○ 12
- ○ 27

2. $5^0 = $?
- ○ 0
- ○ 5
- ○ 1
- ○ Undefined