

Pre-Algebra Mastery

Integers · Rational Numbers · Distributive Property · Factoring

■ QUICK MEMORY POINTS

SIGN × SIGN

Same → + Different → -

$$(-3)(-4) = +12 \quad | \quad (-3)(+4) = -12$$

KCC (Subtract)

Keep · Change · Change

$$5 - (-3) = 5 + 3 = 8$$

DISTRIBUTE

$$a(b+c) = ab + ac$$

$$3(x-5) = 3x - 15$$

FACTOR OUT

Find GCF first, then factor

$$6x + 9 = 3(2x + 3)$$

DIVIDE FRAC

Flip & Multiply (reciprocal)

$$2/3 \div 4/5 = 2/3 \times 5/4 = 10/12$$

PEMDAS

Parentheses · Exp · Mult/Div · Add/Sub

Order of operations

■ PRACTICE PROBLEMS (Circle your answer — no peeking at the back!)

Q1 Integer Subtraction

■ WORKED EXAMPLE

Example: $5 - (-2) = 5 + 2 = 7$

What is $(-7) - (-3)$?

Hint: Subtracting a negative = adding a positive.

■ **Memory: KCC — Keep the first, Change minus to plus, Change sign of second.**

A. -10

B. -4

C. 4

D. 10

Q2 Integer Addition

■ WORKED EXAMPLE

Example: $(-4) + (-6) = -10$

$(-12) + (-5) = ?$

Hint: Adding two negatives — add the values, keep the negative sign.

■ Memory: Same signs → ADD the numbers, keep the sign.

A. -17

B. -7

C. 7

D. 17

Q3 Integer Addition

■ WORKED EXAMPLE

Example: $(-3) + 8 = 8 - 3 = +5$

$(-9) + 14 = ?$

Hint: Different signs — subtract smaller from larger, use sign of larger.

■ Memory: Different signs → SUBTRACT, keep sign of BIGGER magnitude.

A. -23

B. -5

C. 5

D. 23

Q4 Integer Multiplication

■ WORKED EXAMPLE

Example: $(-3) \times (-4) = +12$

$(-6) \times (-8) = ?$

Hint: Negative \times Negative = ?

■ Memory: Negative \times Negative = POSITIVE ✓

A. -48

B. -14

C. 14

D. 48

Q5 Integer Division

■ WORKED EXAMPLE

Example: $(-20) \div 5 = -4$

$(-36) \div (+4) = ?$

Hint: Different signs \rightarrow the answer is negative.

■ Memory: Negative \div Positive = NEGATIVE

A. -9

B. -8

C. 8

D. 9

Q6 Integer Mixed

■ WORKED EXAMPLE

Example: $(-1)(-2)(-3) = -6$ (3 negatives = odd \rightarrow negative)

$(-4) \times 3 \times (-2) = ?$

Hint: Count the negatives — even count = positive, odd count = negative.

■ Memory: Count negatives: EVEN \rightarrow + ODD \rightarrow -

A. -24

B. -12

C. 12

D. 24

Q7 Rational: Subtraction

■ WORKED EXAMPLE

Example: $1/2 - 1/3 = 3/6 - 2/6 = 1/6$

$3/4 - 5/6 = ?$

Hint: Find the LCD first! LCD of 4 and 6 = 12.

■ Memory: LCD (Least Common Denominator) before adding or subtracting fractions.

A. $-1/12$

B. $1/12$

C. $-2/12$

D. $14/24$

Q8 Rational: Multiplication

■ WORKED EXAMPLE

Example: $2/3 \times 9/4 = 18/12 = 3/2$

$(-2/5) \times (15/8) = ?$

Hint: Multiply numerators and denominators, then simplify.

■ Memory: Cross-cancel BEFORE multiplying to keep numbers small.

A. $-30/40$

B. $-3/4$

C. $3/4$

D. $-13/40$

Q9 Rational: Division

■ WORKED EXAMPLE

Example: $1/2 \div 3/4 = 1/2 \times 4/3 = 4/6 = 2/3$

$(-3/7) \div (6/14) = ?$

Hint: Flip the second fraction and multiply. Simplify 6/14 first!

■ Memory: FLIP & MULTIPLY — reciprocal rule for division.

A. -1

B. 1

C. $-9/14$

D. $1/2$

Q10 Distributive Property

■ WORKED EXAMPLE

Example: $-2(x + 4) = -2x - 8$

Expand: $-3(2x - 5)$

Hint: Multiply -3 by EACH term inside. Watch the sign!

■ Memory: Distribute the SIGN too — it's part of the number.

A. $-6x - 15$

B. $-6x + 15$

C. $6x - 15$

D. $-6x + 5$

Q11 Distributive Property

■ WORKED EXAMPLE

Example: $3(x+1) - 2x = 3x + 3 - 2x = x + 3$

Simplify: $4(3a + 2) - 5a$

Hint: Distribute first, then combine like terms.

■ Memory: Distribute FIRST, combine like terms SECOND.

A. $7a + 8$

B. $7a + 2$

C. $12a - 3$

D. $7a + 6$

Q12 Distributive Property

■ WORKED EXAMPLE

Example: $(1/3)(9x - 6) = 3x - 2$

Expand: $(1/2)(6x - 4)$

Hint: Distribute $1/2$ to both terms.

■ Memory: Fraction outside? Multiply top \times top, then simplify.

A. $3x - 4$

B. $3x - 2$

C. $6x - 2$

D. $12x - 8$

Q13 Distributive Property

■ WORKED EXAMPLE

Example: $-1(x - y + 2) = -x + y - 2$

Which expression equals $-2(a - b + 3)$?

Hint: Distribute -2 to ALL three terms.

■ Memory: Never skip a term — distribute to EVERY term inside.

A. $-2a - 2b + 6$

B. $-2a + 2b + 6$

C. $-2a + 2b - 6$

D. $2a - 2b - 6$

Q14 Factoring: GCF

■ WORKED EXAMPLE

Example: $8x + 12 = 4(2x + 3)$ ← GCF is 4

Factor completely: $12x + 18$

Hint: Find the GCF of 12 and 18, then factor it out.

■ Memory: GCF = Greatest Common Factor — biggest number that divides both.

A. $2(6x + 9)$

B. $6(2x + 3)$

C. $3(4x + 6)$

D. $12(x + 6)$

Q15 Factoring: GCF

■ WORKED EXAMPLE

Example: $-4x - 8 = -4(x + 2)$

Factor: $-5x - 20$

Hint: Factor out -5 (including the negative).

■ Memory: You CAN factor out a negative — it flips the signs inside.

A. $5(-x - 4)$

B. $-5(x - 4)$

C. $-5(x + 4)$

D. $5(x + 4)$

Q16 Factoring: GCF

■ WORKED EXAMPLE

Example: $6x^2 + 9x = 3x(2x + 3)$

Factor: $15a^2 - 10a$

Hint: GCF of 15 and 10? Also factor out the variable a .

■ Memory: Factor out GCF of BOTH numbers AND variables.

A. $5(3a - 2)$

B. $5a(3a - 2)$

C. $10a(a - 1)$

D. $5a(3a^2 - 2)$

Q17 Combined Operations

■ WORKED EXAMPLE

Example: $2(a+1) - (a-3) = 2a+2 - a+3 = a+5$

Simplify: $3(x + 4) - 2(x - 1)$

Hint: Distribute both groups, then combine like terms.

■ Memory: Watch the minus sign before second parenthesis — it distributes!

A. $x + 10$

B. $x + 14$

C. $5x + 10$

D. $x + 11$

Q18 Verify by Substitution

■ WORKED EXAMPLE

Example: If $x = -1$: $2x^2 - x = 2(1) - (-1) = 2 + 1 = 3$

If $x = -2$, what is $-3x^2 + 5x$?

Hint: Compute x^2 first, then multiply by -3 . Be careful with the exponent!

■ Memory: $(-2)^2 = +4$ (square first, then apply the negative outside).

A. -2

B. -22

C. 22

D. 2

Q19 Rational Equations

■ WORKED EXAMPLE

Example: $x/3 = 2 \rightarrow x = 6$

Which value makes $(x+3)/2 = -1/2$ true?

Hint: Multiply both sides by 2, then solve for x .

■ Memory: Multiply both sides by the denominator to clear fractions fast.

A. $x = -4$

B. $x = -2$

C. $x = 2$

D. $x = 4$

Q20 **Distributive + Factoring**

■ **WORKED EXAMPLE**

Example: $4a - 6b + 2 = 2(2a - 3b + 1)$

Which is equivalent to $6x - 9y + 3$?

Hint: Factor out the GCF from ALL three terms.

■ **Memory: Check ALL terms — the GCF must divide every term.**

A. $3(2x - 3y)$

B. $3(2x - 9y + 1)$

C. $3(2x - 3y + 1)$

D. $6(x - 9y + 3)$

ANSWER KEY + EXPLANATIONS**Q1 → B. B. -4**

$$(-7) - (-3) \rightarrow \text{KCC} \rightarrow (-7) + (+3) = -4$$

Q2 → A. A. -17

$$\text{Both negative} \rightarrow 12 + 5 = 17, \text{ keep minus} \rightarrow -17$$

Q3 → C. C. 5

$$14 - 9 = 5 ; \text{ larger magnitude is } 14 \text{ (positive)} \rightarrow \text{answer is } +5$$

Q4 → D. D. 48

$$\text{Same signs} \rightarrow \text{positive. } 6 \times 8 = 48 \rightarrow +48$$

Q5 → A. A. -9

$$\text{Different signs} \rightarrow \text{negative. } 36 \div 4 = 9 \rightarrow -9$$

Q6 → D. D. 24

$$\text{Two negatives (even)} \rightarrow \text{positive. } 4 \times 3 \times 2 = 24 \rightarrow +24$$

Q7 → A. A. -1/12

$$\text{LCD} = 12. \quad 3/4 = 9/12, \quad 5/6 = 10/12. \quad 9/12 - 10/12 = -1/12$$

Q8 → B. B. -3/4

$$(-2 \times 15) / (5 \times 8) = -30/40 = -3/4$$

Q9 → A. A. -1

$$6/14 = 3/7. \text{ So: } (-3/7) \div (3/7) = (-3/7) \times (7/3) = -21/21 = -1$$

Q10 → B. B. -6x + 15

$$-3 \times 2x = -6x \text{ and } -3 \times (-5) = +15 \rightarrow -6x + 15$$

Q11 → A. A. 7a + 8

$$4(3a+2) = 12a + 8. \text{ Then } 12a + 8 - 5a = 7a + 8$$

Q12 → B. B. 3x - 2

$$(1/2)(6x) = 3x \text{ and } (1/2)(-4) = -2 \rightarrow 3x - 2$$

Q13 → C. C. $-2a + 2b - 6$

$$(-2)(a) = -2a, (-2)(-b) = +2b, (-2)(3) = -6 \rightarrow -2a + 2b - 6$$

Q14 → B. B. $6(2x + 3)$

GCF of 12 and 18 is 6. $12x + 18 = 6(2x + 3)$. Check: $6 \times 2x = 12x$, $6 \times 3 = 18$ ✓

Q15 → C. C. $-5(x + 4)$

$$-5 \times x = -5x, -5 \times 4 = -20. \text{ Answer: } -5(x + 4). \text{ Check: } -5(x+4) = -5x - 20 \checkmark$$

Q16 → B. B. $5a(3a - 2)$

$$\text{GCF} = 5a. 15a^2 \div 5a = 3a, 10a \div 5a = 2. \text{ Answer: } 5a(3a - 2)$$

Q17 → B. B. $x + 14$

$$3(x+4) = 3x+12. -2(x-1) = -2x+2. \text{ Combine: } x + 14$$

Q18 → B. B. -22

$$x = -2: x^2 = (-2)^2 = 4. -3(4) = -12. 5(-2) = -10. -12 + (-10) = -22$$

Q19 → A. A. $x = -4$

Multiply both sides by 2: $x + 3 = -1$. Subtract 3: $x = -4$

Q20 → C. C. $3(2x - 3y + 1)$

$$\text{GCF of } 6, 9, 3 \text{ is } 3. 6x/3 = 2x, -9y/3 = -3y, 3/3 = 1 \rightarrow 3(2x - 3y + 1)$$