Rational numbers: operations, powers and large numbers — Teacher answers

Year 7, upper volume • text pp. 15–40 • foundation lessons 8–20

Use the prerequisite checks to choose support, project the worked and guided items, then let learners work on paper. Select supplements or extensions as needed. No learner answers are saved by this presentation.

Worked example 1

Evaluate the expression and explain why subtracting a negative becomes addition.

$$(-4) + 7 - (-2)$$

Reference answer

The value is 5.

$$5$$

1. −4 + 7 = 3.
2. Subtracting −2 means adding 2, giving 3 + 2 = 5.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Guided attempt 2

Evaluate, completing the power and product before the subtraction.

$$(-3)^2 - 2 \times 4$$

1. $(-3)^2$ = _____.
2. 2×4 = _____.
3. _____ − _____ = _____.

Reference answer

The value is 1.

$$1$$

1. The base is −3, so $(-3)^2 = 9$.
2. $2 \times 4 = 8$; then 9 − 8 = 1.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Prerequisite 3

Add the two negative numbers.

$$-6 + (-3)$$

Reference answer

The value is −9.

$$-9$$

1. Add the absolute values: 6 + 3 = 9.
2. Keep the common negative sign: −9.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Prerequisite 4

Calculate the quotient and explain its sign.

$$18 \div (-3)$$

Reference answer

The value is −6.

$$-6$$

1. The operands have different signs, so the quotient is negative.
2. 18 ÷ 3 = 6, hence the quotient is −6.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Independent practice 5

Evaluate and retain the sign of each term.

$$-12 - (-5)$$

Reference answer

The value is −7.

$$-7$$

1. Change subtraction to addition: −12 + 5.
2. The negative magnitude is larger, giving −7.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Independent practice 6

Find the product. Explain how many negative factors determine its sign.

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

Reference answer

The value is −24.

$$-24$$

1. Three negative factors give a negative product.
2. 2 × 3 × 4 = 24, so the product is −24.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Independent practice 7

Give the exact fraction value.

$$\frac{3}{4} - \frac{5}{6}$$

Reference answer

The value is −1/12.

$$\frac{-1}{12}$$

1. Use denominator 12: 3/4 = 9/12 and 5/6 = 10/12.
2. 9/12 − 10/12 = −1/12.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Independent practice 8

Write 450000 in scientific notation. State the allowed range of the coefficient.

$$450000$$

Reference answer

4.5×10^{5}; the coefficient is at least 1 and less than 10.

1. Move the decimal point 5 places left to obtain 4.5.
2. Compensate by multiplying by 10^{5}; check the original value.

- Use a coefficient from 1 inclusive to 10 exclusive.
- Give an exponent that restores the original number exactly.

Exit question 9

Evaluate. Explain why the two squared terms have different signs before addition.

$$-3^2 + (-3)^2$$

Reference answer

The value is 0.

$$0$$

1. $-3^2 = -(3^2) = -9$, whereas $(-3)^2 = 9$.
2. The sum is $-9 + 9 = 0$.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Exit question 10

Evaluate in the correct order.

$$(8 - 14) \div 3 + 2^3$$

Reference answer

The value is 6.

$$6$$

1. First $8 - 14 = -6$ and $2^3 = 8$.
2. Then $-6 \div 3 = -2$; finally $-2 + 8 = 6$.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Further practice 11

Evaluate without treating the whole expression as zero.

$$(-5) \times 0 + 4$$

Reference answer

The value is 4.

$$4$$

1. The product $(-5) \times 0$ is 0.
2. The remaining addition is $0 + 4 = 4$.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Further practice 12

Evaluate the quotient before the subtraction.

$$(-24) \div (-6) - 5$$

Reference answer

The value is −1.

$$-1$$

1. The quotient of two negatives is positive: 24 ÷ 6 = 4.
2. 4 − 5 = −1.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Further practice 13

Write 7200000 in scientific notation. State the allowed range of the coefficient.

$$7200000$$

Reference answer

7.2 × 10⁶; the coefficient is at least 1 and less than 10.

1. Move the decimal point 6 places left to obtain 7.2.
2. Compensate by multiplying by 10⁶; check the original value.

- Use a coefficient from 1 inclusive to 10 exclusive.
- Give an exponent that restores the original number exactly.

Further practice 14

Round 3.146 to two decimal places. Identify the digit that decides the rounding.

Reference answer

3.15; the third decimal digit is 6, so the hundredths digit increases by 1.

1. Keep the hundredths place and inspect the next digit, 6.
2. Since 6 is at least 5, 3.14 rounds up to 3.15.

- State the applicable definition or condition accurately.
- Support the conclusion with the given numbers, a check or a concrete counterexample.

Extension 15

Evaluate exactly and explain the sign of the product being subtracted.

$$\frac{1}{2} - \frac{3}{4} \times (-2)$$

Reference answer

The value is 2.

$$2$$

1. The product is (3/4) × (−2) = −3/2.
2. 1/2 − (−3/2) = 1/2 + 3/2 = 2.

- Apply the relevant sign and order rules to every operation.
- Show an intermediate calculation and obtain the exact stated value.

Extension 16

A learner writes $8 \div 0 = 0$. Is this defined? Explain using the multiplication that division would require.

Reference answer

It is undefined. A quotient q would require $0 \times q = 8$, but $0 \times q = 0$ for every number q.

1. $A \div B = q$ requires $B \times q = A$.
2. No number multiplied by 0 gives 8.

- State the applicable definition or condition accurately.
- Support the conclusion with the given numbers, a check or a concrete counterexample.