Solutions & reasoning

LESSON 1.1 / Real numbers and the number line

01 / Number sets

Give the most specific set for -12. Then name its larger sets.

Integer; it is also rational and real.

02 / Number sets

Classify 0 using the convention in this course.

Whole is the most specific set; 0 is also integer, rational and real, but not natural here.

03 / Number sets

Classify $\sqrt{36}$ in every applicable set.

$\sqrt{36}=6$: natural, whole, integer, rational and real.

04 / Number sets

Write 0.375 as a simplified fraction and classify it.

$0.375=375/1000=3/8$. It is rational and real, not an integer.

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05 / Rational or irrational

Is $0.\overline{3}$ rational even though it never ends?

Yes. 0.333…=1/3, so it is rational and real.

06 / Rational or irrational

Classify $\sqrt{2}$ and the exact decimal 1.414.

√2 is irrational and real; 1.414=707/500 is rational and real.

07 / Rational or irrational

Is $\pi = 3.14$ a correct statement? Repair it.

No. Write π≈3.14. π is irrational; 3.14 is a rational approximation.

08 / Rational or irrational

A decimal has a 1 followed by one zero, then a 1 followed by two zeros, then a 1 followed by three zeros, and so on forever: 0.101001000100001…. Is it rational?

It is irrational: the specified decimal never terminates and cannot eventually repeat a fixed block.

Solutions & reasoning

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09 / Order

Which is greater: -7 or -2? Explain using position.

-2 is greater because it lies to the right of -7.

10 / Order

Which is smaller: -0.8 or $-\frac{3}{4}$?

-3/4=-0.75, so -0.8=-0.80 is smaller.

11 / Order

Order $-\frac{5}{4},\ -1.2,\ -1.35$ from least to greatest.

-1.35<-5/4<-1.2.

12 / Order

Order $-\frac{2}{3},\ -0.7,\ -\frac{3}{5}$ from least to greatest.

-0.7=-21/30, -2/3=-20/30, -3/5=-18/30; hence -0.7<-2/3<-3/5.

Solutions & reasoning

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13 / Number-line reasoning

Place $-1.5, 0, \frac{1}{2}, 0.5$ on a scaled number line. How many distinct points are needed?

Three distinct points: -1.5, 0 and 0.5. The last point has both labels 1/2 and 0.5.

14 / Opposites

Give the opposite and the absolute value of -4.5.

The opposite is 4.5 and the absolute value is 4.5.

15 / Absolute value

Evaluate $|2 - 11|$.

|2-11|=|-9|=9.

16 / Absolute value

Evaluate $|-8| - |3 - 9|$.

8-|-6|=8-6=2.

Solutions & reasoning

LESSON 1.1 / Real numbers and the number line

17 / Absolute value

Evaluate $-|-8|$.

-|-8|=-(8)=-8. The outside minus sign is not inside the absolute value.

18 / Positions

Find every real coordinate x with $|x| = 4$.

x=-4 or x=4.

19 / Positions

Find every coordinate with $|x| = 0$. Can any coordinate have $|x| = -3$?

|x|=0 gives x=0 only. No real coordinate has absolute value -3.

20 / Distance

Find the distance between -6 and -2.

|-2-(-6)|=4 units.

Solutions & reasoning

LESSON 1.1 / Real numbers and the number line

21 / Change and distance

A lift moves directly from floor 5 to floor -3 with equally spaced floors. Find signed change and distance in floor intervals.

Signed change -3-5=-8 floors; distance 8 floor intervals.

22 / Change and distance

A temperature changes from -6°C to 2°C. Find its signed change. What changes if the readings occur in reverse order?

The change is +8°C. Reversing the readings gives -8°C; their separation remains 8°C.

23 / Challenge

Can two irrational numbers have a rational sum? Give a counterexample to “always irrational”.

Yes. $\sqrt{2}+(-\sqrt{2})=0$. Both addends are irrational, while 0 is rational.

24 / Challenge

A point is 4 units from coordinate -1. Find all possible coordinates and check both distances.

The coordinates are -5 and 3. $|-5-(-1)|=4$ and $|3-(-1)|=4$.