

## Subgroups of Real Numbers

*Identify the subgroup of Real numbers a number belongs to.*

Link to section in online textbook

First, watch the video below to review the different sets of Real numbers. You can print out [these notes](#) to follow along and keep notes to organize your thoughts.

YouTube link: <https://www.youtube.com/watch?v=RXXZOZBvYQs>

After watching the video, write down your own definitions for the following subgroups of the Real numbers. You should include examples for each (you may even want to take a sneak peak at the problems and use some of these as examples!) and descriptions of how to tell what the smallest set the number belongs to.

- Natural:
- Whole:
- Integers:
- Rational:
- Irrational:
- Real:

We will test these definitions by categorizing the same set of numbers.

**Exercise 1** Choose all of the following numbers that are **NATURAL** numbers.

**Select All Correct Answers:**

(a)  $-\frac{21}{7}$

(b)  $-\frac{7}{21}$

(c)  $\frac{21}{7}$  ✓

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Learning outcomes: Understand the different sets of numbers along with the properties of these sets.

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- (d)  $\frac{\pi}{4}$
- (e)  $\frac{4}{\pi}$
- (f)  $\frac{0}{\pi}$
- (g)  $\frac{\pi}{0}$
- (h)  $\sqrt{4}$  ✓
- (i)  $\sqrt{-4}$
- (j)  $\sqrt{21}$
- (k)  $\sqrt{-21}$

**Hint:** Remember to reduce *\*first\**, then think about what groups the number belongs to.

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**Exercise 2** Choose all of the following numbers that are **Whole** numbers.

**Select All Correct Answers:**

- (a)  $-\frac{21}{7}$
- (b)  $-\frac{7}{21}$
- (c)  $\frac{21}{7}$  ✓
- (d)  $\frac{\pi}{4}$
- (e)  $\frac{4}{\pi}$
- (f)  $\frac{0}{\pi}$  ✓
- (g)  $\frac{\pi}{0}$
- (h)  $\sqrt{4}$  ✓
- (i)  $\sqrt{-4}$

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(j)  $\sqrt{21}$

(k)  $\sqrt{-21}$

**Hint:** What is the only number included in the Whole numbers that is **not** included in the Natural numbers?

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**Exercise 3** Choose all of the following numbers that are **Integer** numbers.

Select All Correct Answers:

(a)  $-\frac{21}{7}$  ✓

(b)  $-\frac{7}{21}$

(c)  $\frac{21}{7}$  ✓

(d)  $\frac{\pi}{4}$

(e)  $\frac{4}{\pi}$

(f)  $\frac{0}{\pi}$  ✓

(g)  $\frac{\pi}{0}$

(h)  $\sqrt{4}$  ✓

(i)  $\sqrt{-4}$

(j)  $\sqrt{21}$

(k)  $\sqrt{-21}$

**Hint:** What is the biggest difference between Whole numbers and Integers?

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**Exercise 4** Choose all of the following numbers that are **Rational** numbers.

Select All Correct Answers:

(a)  $-\frac{21}{7}$  ✓

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(b)  $-\frac{7}{21}$  ✓

(c)  $\frac{21}{7}$  ✓

(d)  $\frac{\pi}{4}$

(e)  $\frac{4}{\pi}$

(f)  $\frac{0}{\pi}$  ✓

(g)  $\frac{\pi}{0}$

(h)  $\sqrt{4}$  ✓

(i)  $\sqrt{-4}$

(j)  $\sqrt{21}$

(k)  $\sqrt{-21}$

**Hint:** What is the biggest difference between *Integers* and *Rational* numbers?

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**Exercise 5** Choose all of the following numbers that are ***Irrational*** numbers.

**Select All Correct Answers:**

(a)  $-\frac{21}{7}$

(b)  $-\frac{7}{21}$

(c)  $\frac{21}{7}$

(d)  $\frac{\pi}{4}$  ✓

(e)  $\frac{4}{\pi}$  ✓

(f)  $\frac{0}{\pi}$

(g)  $\frac{\pi}{0}$

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(h)  $\sqrt{4}$

(i)  $\sqrt{-4}$

(j)  $\sqrt{21}$  ✓

(k)  $\sqrt{-21}$

**Hint:** What is the biggest difference between Rational and Irrational numbers?

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**Exercise 6** Choose all of the following numbers that are **Real** numbers.

**Select All Correct Answers:**

(a)  $-\frac{21}{7}$  ✓

(b)  $-\frac{7}{21}$  ✓

(c)  $\frac{21}{7}$  ✓

(d)  $\frac{\pi}{4}$  ✓

(e)  $\frac{4}{\pi}$  ✓

(f)  $\frac{0}{\pi}$  ✓

(g)  $\frac{\pi}{0}$

(h)  $\sqrt{4}$  ✓

(i)  $\sqrt{-4}$

(j)  $\sqrt{21}$  ✓

(k)  $\sqrt{-21}$

**Hint:** There are two ways to not be a Real number (that we know so far)...

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As you can see, there is a lot of overlap between these groups. You should also try to draw a picture like the video to represent how these subgroups interact. *Since numbers belong to more than one group, the best way to describe these numbers is to identify the **smallest** subgroup they belong to.* The pictorial representation will help with this! **Remember to reduce first, then decide the smallest subgroup the number belongs to!**

**Note:** This part of the homework will change each time you click “Another”. You can keep clicking “Another” to practice seeing these more difficult numbers to classify.

**Exercise 7** Which of the following is the **smallest** set of Real numbers that

$??\sqrt{\frac{??}{??}}$  belongs to?

*To work around current Xronos issues, input the corresponding number for the correct set.*

Natural - 0

Whole - 1

Integer - 2

Rational - 3

Irrational - 4

Not a Real Number - 5

**Hint:** While many students have learned Irrational numbers are “Never ending, non-repeating decimals”, this can be tricky with a calculator. A number like 3/17 may look Irrational if put in a calculator, but it does end after 16 places. Your definition should include the words “fraction” and “integers”. The best way to complete these problems are to reduce as much as possible **without making the number a decimal**.

**Exercise 8** Which of the following is the **smallest** set of Real numbers that

$??\sqrt{\frac{??}{??}}$  belongs to?

*To work around current Xronos issues, input the corresponding number for the correct set.*

Natural - 0

Whole - 1

Integer - 2

Rational - 3

Irrational - 4

Not a Real Number - 5

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**Hint:** While many students have learned Irrational numbers are "Never ending, non-repeating decimals", this can be tricky with a calculator. A number like  $3/17$  may look Irrational if put in a calculator, but it does end after 16 places. Your definition should include the words "fraction" and "integers". The best way to complete these problems are to reduce as much as possible **without making the number a decimal**.

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**Exercise 9** Which of the following is the **smallest** set of Real numbers that  $\sqrt{\frac{??}{??}}$  belongs to?

To work around current Xronos issues, input the corresponding number for the correct set.

Natural - 0

Whole - 1

Integer - 2

Rational - 3

Irrational - 4

Not a Real Number - 5

**Hint:** While many students have learned Irrational numbers are "Never ending, non-repeating decimals", this can be tricky with a calculator. A number like  $3/17$  may look Irrational if put in a calculator, but it does end after 16 places. Your definition should include the words "fraction" and "integers". The best way to complete these problems are to reduce as much as possible **without making the number a decimal**.

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