

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) $\frac{21}{7}$ ✓

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.

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?

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?

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?

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?

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)...

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

$-\sqrt{\frac{5}{10}}$ 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

$\sqrt{\frac{-2}{0}}$ 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**.

Exercise 9 Which of the following is the **smallest** set of Real numbers that

$\sqrt{\frac{0}{49}}$ 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**.
