

Rational and Irrational Numbers: math practice, Grade 8 – download the PDF

21 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Sort the numbers

★ ★ ★

Sort these numbers into **rational** and **irrational**: 5 , $-\frac{2}{3}$, $\sqrt{49}$, $\sqrt{11}$, $0.\overline{3}$, 2.75 , π .

2 Perfect squares and cubes

★ ★ ★

Evaluate: a) $\sqrt{81}$ b) $\sqrt{144}$ c) $\sqrt{\frac{1}{4}}$ d) $\sqrt{0.36}$ e) $\sqrt[3]{27}$ f) $\sqrt[3]{-64}$ g) $\sqrt[3]{\frac{8}{27}}$

3 Fractions to decimals

★ ★ ★

Write each fraction as a decimal and say whether it terminates or repeats: a) $\frac{3}{8}$ b) $\frac{5}{9}$ c) $\frac{7}{11}$
d) $\frac{1}{6}$

4 Between two integers



Between which two consecutive integers does each number lie? a) $\sqrt{20}$ b) $\sqrt{50}$ c) $\sqrt{90}$ d) $\sqrt{5}$ e) $\sqrt[3]{30}$ f) $\sqrt[3]{100}$

5 True or false?



True or false? Justify each answer. a) Every integer is a rational number. b) $\sqrt{25}$ is irrational. c) $\pi = \frac{22}{7}$. d) A terminating decimal is rational. e) A number can be both rational and irrational.

6 Solve the equations



Solve: a) $x^2 = 49$ b) $x^2 = 2.25$ c) $x^3 = -8$ d) $x^3 = \frac{1}{125}$ e) $x^2 = 17$ f) $x^3 = 20$. Leave irrational answers in radical form.

7 Garden, box and tile



a) A square garden has an area of **169** square feet. How long is each side? Give the answer in feet and in meters (1 ft = 0.3048 m). b) A cube-shaped box has a volume of **216** cubic inches. Find its edge. c) A square tile has an area of **50 cm²**. Find its side to the nearest hundredth.

8 Repeating decimals to fractions



Write each repeating decimal as a fraction in lowest terms: a) $0.\overline{27}$ b) $0.\overline{504}$ c) $1.\overline{4}$ d) $0.\overline{12}$

9 A digit in front of the block



Convert to fractions: a) $0.\overline{27}$ b) $0.\overline{83}$ c) $0.\overline{145}$

10 Squeeze the root



Use squares to find the two tenths that surround each number. Then give the best estimate. a) $\sqrt{13}$ b) $\sqrt{41}$ c) $\sqrt{75}$ (to the nearest hundredth)

11 Which is bigger?



Compare using $<$ or $>$, and justify with squares or cubes when possible. a) $\sqrt{30}$ and 5.5 b) $\sqrt{12}$ and $\frac{7}{2}$ c) $\sqrt[3]{9}$ and 2.1 d) π and $\frac{22}{7}$

12 Rational or irrational results



Decide whether each result is rational or irrational. a) $\sqrt{9} + \sqrt{16}$ b) $\sqrt{2} \times \sqrt{8}$ c) 2π d) $\sqrt{0.09}$ e) $4 + \sqrt{5}$

13 Name that point



The points A to E are plotted below. Match each one with one of these numbers: $\sqrt{2}$, $\sqrt{5}$, $\sqrt[3]{20}$, $-\sqrt{3}$, $\sqrt{12}$.



14 The aquarium



A cube-shaped aquarium holds **64** liters of water. (1 liter = 1000 cm^3). Find the length of one edge in centimeters, and then in inches (1 in = 2.54 cm), to the nearest tenth.

15 Pattern or no pattern?

Decide if each number is rational or irrational, and explain. a) $0.101001000100001\dots$ (one more zero each time) b) $0.\overline{142857}$ c) $0.12122122212222\dots$ (one more 2 each time) d) 3.14

16 A tricky repeating decimal

Write $2.\overline{036}$ as a fraction in lowest terms and check your answer with a division.

17 Is $0.999\dots$ equal to 1?

Some students believe that $0.\overline{9}$ is a little smaller than 1. Use the conversion method to settle the question. Then explain what this says about $0.\overline{9}$ being rational.

18 Order the negatives

Order from least to greatest: $-\sqrt{7}$, -2.6 , $-\frac{5}{2}$, $-\sqrt[3]{15}$, -2.4 .

19 How many integers?

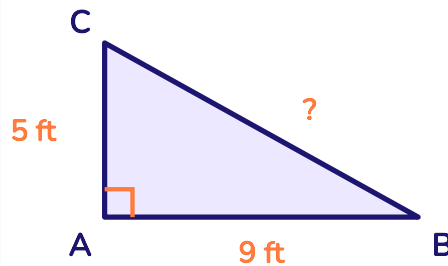
a) How many integers n satisfy $7 < \sqrt{n} < 8$? List the smallest and the largest. b) How many integers n satisfy $6.2 < \sqrt{n} < 6.3$?

20

The hypotenuse

★★★

A ramp makes a right triangle with legs of **9** feet and **5** feet. a) Write the exact length of the hypotenuse. b) Between which two tenths does it lie? c) Is the length rational or irrational? Explain.



21

Find the mistakes

★★★

A student wrote four statements. Find the error in each and correct it. a) $\sqrt{50} = 25$ b) $0.\overline{45} = \frac{45}{100}$ c) $\sqrt{20}$ is between **5** and **6** d) $\sqrt[3]{-8}$ does not exist.



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