Grade 8 Math, Explained

Unit 3 · Rational and Irrational Numbers

HARDER PRACTICE QUESTIONS

Full marks 28

Write your answers on separate paper. Show your working. Don't use a calculator unless a question says so.

1 Rational or irrational? [4]

Give a reason for each.

Sort these into rational and irrational numbers:

$\sqrt{0.16}$, $\sqrt{0.4}$, $\sqrt[3]{27}$, 0.1010010001… (one more 0 each time), $0.\overline{10}$, $\frac{22}{7}$, π, $\sqrt{\frac{4}{9}}$

2 A decimal that starts late [3]

Only the 18 repeats in $0.3\overline{18} = 0.3181818\ldots$. Change it to a fraction in its lowest terms.

3 On the number line [3]

On squared paper, show $\sqrt{13}$ on a number line with a ruler and compass.

i. Which right-angled triangle do you draw, and why?

ii. Between which two whole numbers does the point fall?

iii. Mark $-\sqrt{13}$ too. How did you find it?

4 Spot the error [3]

Find the mistake and correct it.

i. Karma's calculator shows $\sqrt{2} = 1.414213562$. He says: "It stops, so it is a terminating decimal, and $\sqrt{2}$ is rational."

ii. Yangchen worked out $3.2 \times 10^5 + 4.1 \times 10^4 = 7.3 \times 10^9$.

5 Put them in order [3]

Arrange these from smallest to largest, and write the largest in proper scientific notation:

4.5×10^{-3}, 0.046, 470×10^{-5}, 0.44×10^{-2}

6 Simplify [3]

Simplify, and give the answer in scientific notation:

$$\frac{(4.8 \times 10^5) \times (2.5 \times 10^{-3})}{1.6 \times 10^4 - 4 \times 10^3}$$

7 In a real setting [4]

A sack holds 30 kg of rice, and one grain has a mass of about 2×10^{-5} kg and a length of about 6×10^{-3} m. (These numbers are rounded and made up for the problem.)

i. About how many grains are in the sack? Give your answer in scientific notation.

ii. If all the grains were laid end to end, how many kilometers would the line reach?

8 Think [3]

Jeevan says $0.\overline{9} = 0.999\ldots$ is a little less than 1. Use the method for changing a recurring decimal to a fraction to test this. Then explain the answer another way, using $\frac{1}{3} = 0.\overline{3}$.

9 Make your own [2]

i. Find two different irrational numbers whose sum is rational.

ii. Find two different irrational numbers whose product is rational.