

WA8MNAUN1

Understanding number

Core + Challenge

Rational and Irrational Numbers

I can define and identify rational and irrational numbers and use correct notation for terminating, recurring and rounded decimals.

Name: _____ Date: _____ Score: _____ / 58

Key idea

Rational numbers can be written as a fraction $\frac{a}{b}$ of two integers ($b \neq 0$): $5 = \frac{5}{1}$, $-0.75 = -\frac{3}{4}$, $0.333... = \frac{1}{3}$. Every integer is rational.

Irrational numbers **cannot** be written as a fraction: their decimals go on forever **without repeating**. e.g. $\pi = 3.14159...$, $\sqrt{2} = 1.41421...$

Decimals: terminating 0.625 (stops) · recurring 0.272727... (the block 27 repeats forever; ... means the pattern continues) · rounded 0.27 (an approximation, not exact).

Perfect squares 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 have whole-number roots ($\sqrt{49} = 7$, rational). $\sqrt{50}$ is irrational: $49 < 50 < 64$, so $7 < \sqrt{50} < 8$.

A Fluency *practise the skill*

/ 16 marks

Q1–6: write rational or irrational. Q7–16: work out each answer. 1 mark each.

1. $\frac{3}{7}$ _____

9. $\sqrt{81}$ _____

2. $\sqrt{9}$ _____

10. $\sqrt{\frac{4}{9}}$ _____

3. $\sqrt{10}$ _____

11. $\frac{3}{8}$ as a decimal _____

4. π _____

12. $\frac{2}{3}$ as a decimal _____

5. -2.5 _____

13. $0.272727...$ to 2 d.p. _____

6. $0.444...$ _____

14. π to 3 d.p. _____

7. 0.35 as a fraction _____

15. Largest perfect square < 90 _____

8. -1.2 as a fraction _____

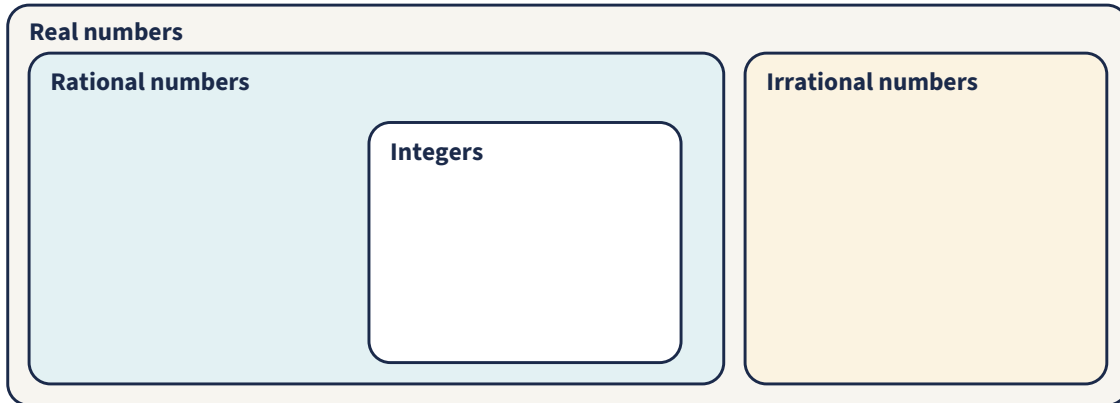
16. $\sqrt{50}$ lies between ____ and ____ _____

B

Core *apply the skill to problems*

/ 22 marks

- 1 Write each number in the correct region of the diagram: -6 , $\frac{5}{8}$, $\sqrt{36}$, $\sqrt{7}$, $0.1212\dots$, π , 4.25 , $-\sqrt{16}$. [3 marks]



- 2 Show that each number is rational by writing it as a fraction $\frac{a}{b}$: 0.8 , -3 , $2\frac{1}{4}$, -0.125 . [2 marks]

Answer: _____

- 3 A square veggie patch in a Piara Waters backyard has an area of 50 m^2 , so its side length is $\sqrt{50} \text{ m}$. Between which two whole numbers is $\sqrt{50}$? Is the side length rational or irrational? [2 marks]

Answer: _____

- 4 A bike wheel with a diameter of 1 m has a circumference of exactly π metres. (a) Write π rounded to 2 decimal places and to 4 decimal places. (b) Explain why neither answer is the exact circumference. [3 marks]

Answer: _____

- 5 Coles sells 3 avocados for \$4. The price of one avocado is $4 \div 3$ dollars. Write this as a recurring decimal, then round to the nearest cent. [2 marks]

Answer: _____

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- 6 (a) Which of these are perfect squares? 121, 150, 169, 200, 225. (b) Which of $\sqrt{121}$, $\sqrt{150}$, $\sqrt{169}$, $\sqrt{200}$ and $\sqrt{225}$ are irrational? [2 marks]

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Answer: _____

- 7 A netball team won 7 of its 11 games. The fraction won is $\frac{7}{11}$. The scoreboard app shows 0.64. Write $\frac{7}{11}$ as a decimal using correct notation, and state whether 0.64 is exact or rounded. [2 marks]

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Answer: _____

- 8 Amira writes $\frac{5}{6} = 0.83$. Mo writes $\frac{5}{6} = 0.838383...$ Who is correct? Write $\frac{5}{6}$ as a decimal using correct notation. [2 marks]

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Answer: _____

- 9 Write two different irrational numbers of the form $\sqrt{n}$ that lie between 3 and 4. [2 marks]

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Answer: _____

- 10 The number 0.101001000100001... continues the pattern (one more 0 before each 1). Is it rational or irrational? Explain. [2 marks]

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C

Reasoning *explain, justify and check*

/ 9 marks

- 1 Jake says " $\frac{22}{7} = \pi$, because both are 3.14 to 2 decimal places." Is Jake correct? Explain. [3 marks]

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- 2 True or false: every integer is a rational number. Give a reason. [2 marks]

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- 3 Spot the error: Ruby says "all square roots are irrational numbers." Explain why she is wrong and correct her statement. [2 marks]

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- 4 A calculator shows $\sqrt{2} = 1.414213562$. Joel says this proves $\sqrt{2}$ is a terminating decimal. Explain the mistake. [2 marks]

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D

Challenge *multi-step and problem-solving*

/ 11 marks

- 1 For how many whole numbers n from 1 to 50 is $\sqrt{n}$ irrational? [2 marks]

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Answer: _____

- 2 (a) Use $\sqrt{8} = \sqrt{4 \times 2} = 2 \times \sqrt{2}$ to show that $\sqrt{2} \times \sqrt{8}$ is rational. (b) Give two different irrational numbers whose sum is rational. [3 marks]

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Answer: _____

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- 3 $\frac{1}{7} = 0.142857142857\dots$ (a) What is the 100th digit after the decimal point? (b) What is the sum of the first 100 digits after the decimal point? [3 marks]

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Answer: _____

- 4 A square tile has an area of 20 cm^2 . Without using the $\sqrt{\quad}$ key, find its side length correct to 1 decimal place. Show your squaring. [3 marks]

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Answer: _____

How did I go?

Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 11 **Total ____ / 58**

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