Created by Mr. Lischwe

Warmup 8/(The sum of the first 7 positive whole numbers)

TODAY'S WARMUP WILL GO ON A NOTECARD, TO BE TURNED IN. ON YOUR WARMUP PAGE, FOR WEDNESDAY, YOU MAY JUST WRITE "NOTECARD."

While you're waiting, do some mental math to verify today's date problem!!!

Solve each equation. Find ALL possible solutions. Write your solutions as x = ___.

1. $x^2 = 36$
2. $x^2 = -49$
3. $x^3 = 64$
4. $x^3 = -27$

Today is Enrichment Wednesday!

- No PLT today!!!

- **WHAT IF I WANT TO CHANGE???**
- You may not switch before the first Enrichment.
- You may not switch if you got placed in your first choice.
- You may switch to ANYTHING that is not marked "full."
- If you want to switch, you need to have your assigned enrichment teacher email Dr. U. **You will only have one week to do this!**

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Rational vs. Irrational (1.1)

Objective:

-Review whole numbers & integers

-Know the difference between rational & irrational numbers

What do we remember?

- What is the difference between **whole numbers** and **integers?**
- Can you think of some numbers that are not whole numbers **OR** integers?
- The set of ALL numbers you know about is called **real numbers**.

Whole numbers: 0, 1, 2, 3…

Integers: Whole numbers plus all the negatives

Real Numbers: Integers plus all the fractions & decimals in between

- Try to come up with one real-world example of something that you would count with:
  - Whole numbers
  - Integers
  - Real Numbers

The two **most important** groups of numbers for this unit…

- Real numbers can be broken into two categories;

- **RATIONAL** and **IRRATIONAL.**
- **First 5 letters of "Rational"???**

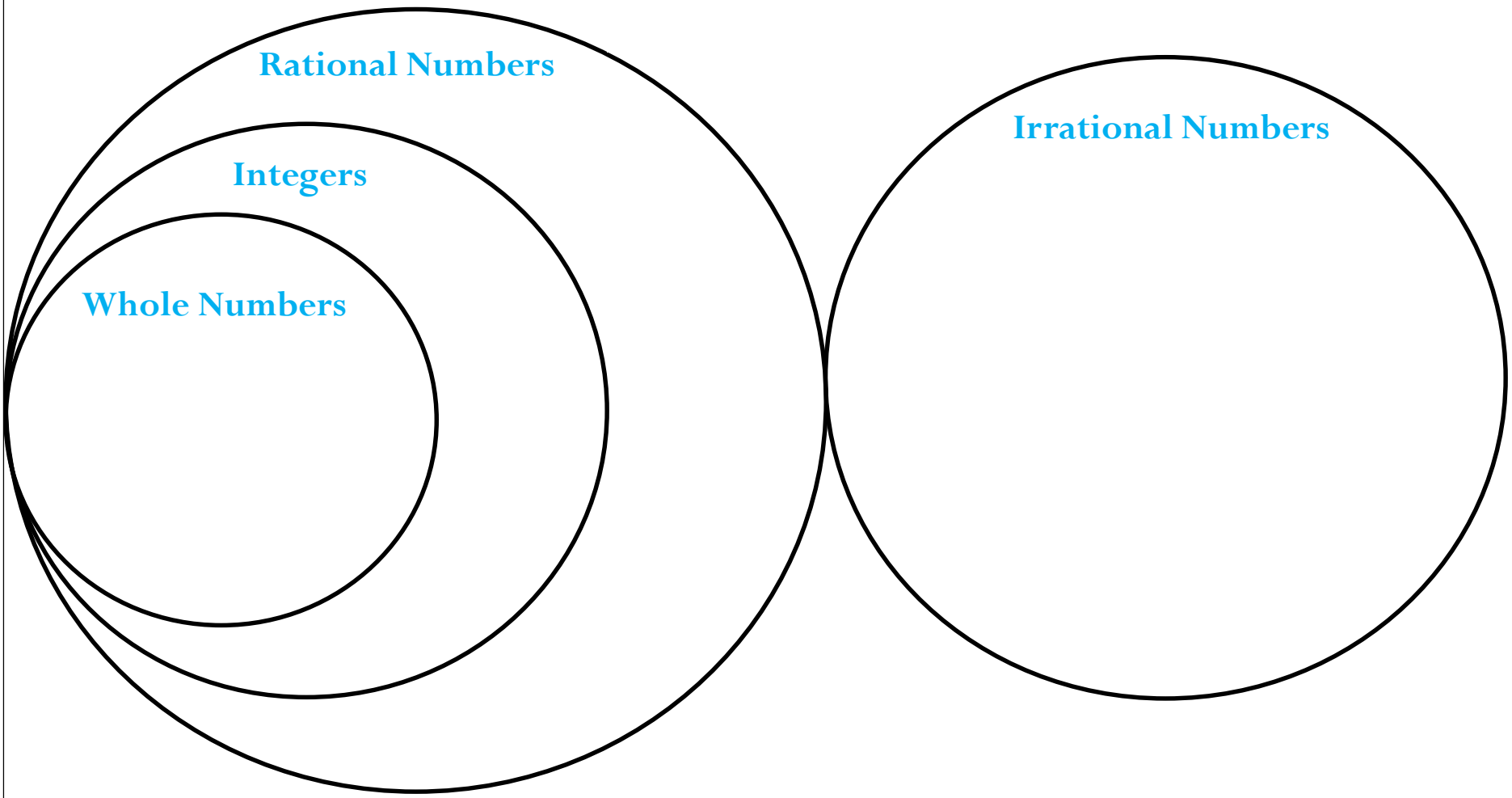
Rational Numbers:

Anything that can be written as a fraction $\frac{a}{b}$, where **a** and **b** are both integers. (but **b** can't be zero!)

Irrational Numbers:

Anything that CANNOT be written as a fraction (of integers)

Real Numbers



For example…

- $\frac{1}{2}$ is a rational number. It is 1 divided by 2.
- -7 is a rational number. It is -7 divided by 1.
- $2\frac{1}{4}$ is a rational number. It is equivalent to $\frac{9}{4}$.
- Is 43.21 a rational number?
- Is 2.777 … a rational number?
- Is 0.7423897… a rational number?

What KIND of decimals can rational numbers be???

- A rational number is **anything that can be written as a fraction of integers**

- Let's write some fractions and see what kind of decimals we get…

- https://www.mathsisfun.com/calculator-precision.html

Fractions and Decimals

- **Fractions of integers will <u>ALWAYS</u> give you either terminating decimals or repeating decimals.**
- **(Have you ever done a long division problem that never ends?)**

- <u>Terminating Decimals:</u>

When a long division problem results in a remainder of 0. (The decimal "ends")

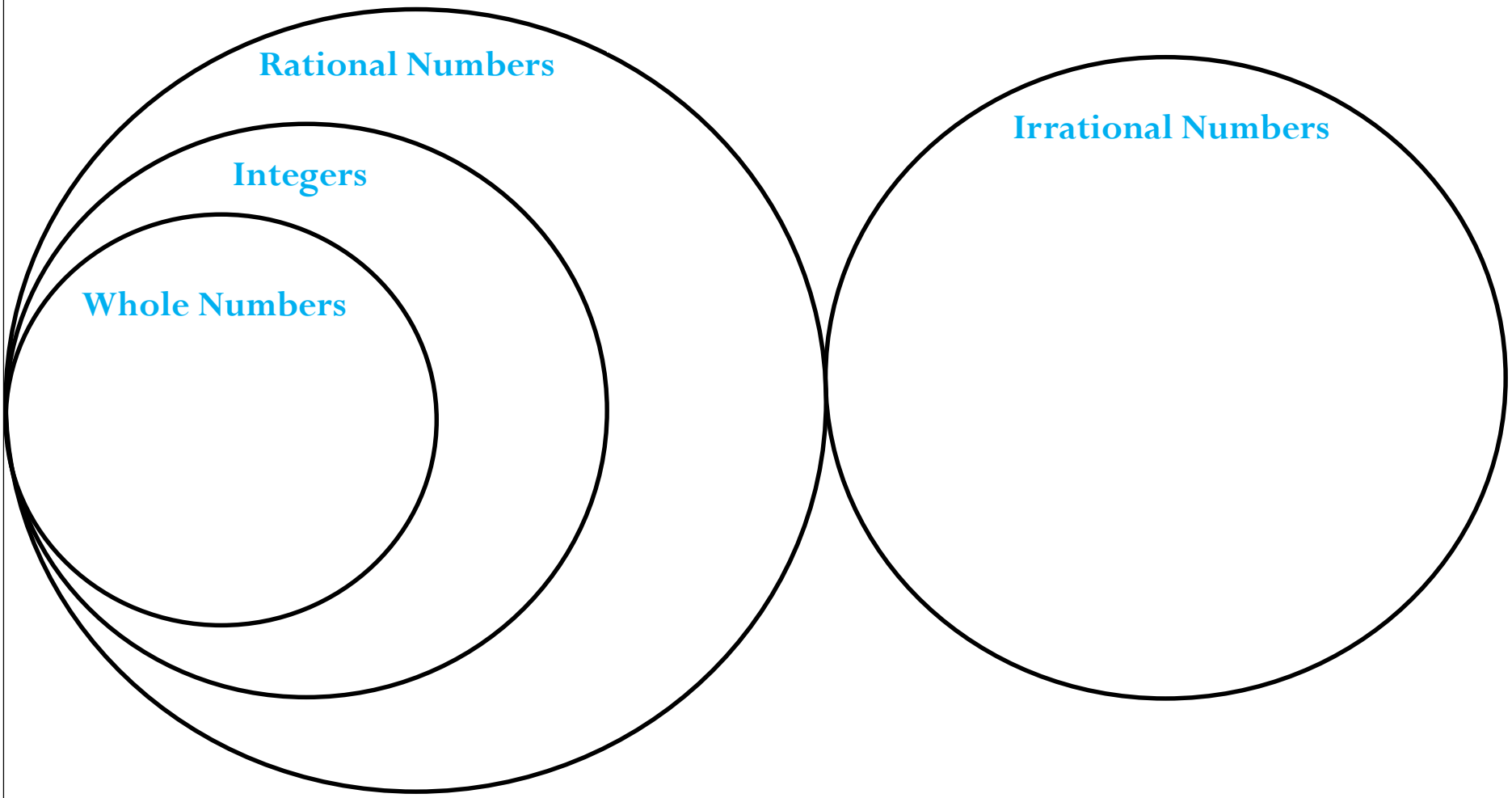
- <u>Repeating Decimals:</u>

Where one or more digits repeat without end.

Let's say you're dividing something by 7…

- **The only possible remainders are 0, 1, 2, 3, 4, 5, and 6.**
- **If your remainder is 0, you have a terminating decimal.**
- **The long division problem will never go on forever because there are only 6 other possible remainders!**
- **You will eventually get a remainder you've already had, which means the decimal will repeat.**

Real Numbers



What about roots?

- Estimating $\sqrt{2}$:
- $1.4 \cdot 1.4 = 1.96$ (too low)
- $1.5 \cdot 1.5 = 2.25$ (too high)
- $1.41 \cdot 1.41 = 1.9881$ (too low)
- $1.42 \cdot 1.42 = 2.0164$ (too high)
- $1.415 \cdot 1.415 = 2.002225$ (too high)
- $1.414 \cdot 1.414 = 1.999396$ (too low)
- $1.4145 \cdot 1.4145 = 2.00081025$ (too high)
- $1.4144 \cdot 1.4144 = 2.00052736$ (still too high)
- $1.4143 \cdot 1.4143 = 2.00024449$ (still too high)
- $1.4142 \cdot 1.4142 = 1.99996164$ (too low)
- Etc.
- You could keep going, but…
- **You'll NEVER get exactly 2.**

What about roots?

$\sqrt{1} = 1$

$\sqrt{2} \approx 1.41421356 \ldots$

$\sqrt{3} \approx 1.73205080 \ldots$

$\sqrt{4} = 2$

$\sqrt{5} \approx 2.23606797 \ldots$

$\sqrt{6} \approx 2.44948974 \ldots$

$\sqrt{7} \approx 2.64575131 \ldots$

$\sqrt{8} \approx 2.82842712 \ldots$

$\sqrt{9} = 3$

$\sqrt{10} \approx 3.1622776 \ldots$

Roots: Rational or Irrational?

- If a root doesn't come out as "exact", it is **automatically irrational**.

- $\sqrt{64} = 8$, rational
- $\sqrt{37} \approx 6.1, irrational$
- $\sqrt{\frac{9}{16}} = \frac{3}{4}$, rational
- $\sqrt{\frac{8}{17}} \approx \frac{2.8ish}{4.1ish}$, irrational

About pi…

- **A lot of people think pi is a "cool" or "special" number because the digits go on forever without repeating.**

- **But actually, EVERY IRRATIONAL NUMBER IS LIKE THIS!!!**

COPY THE CHART!!!

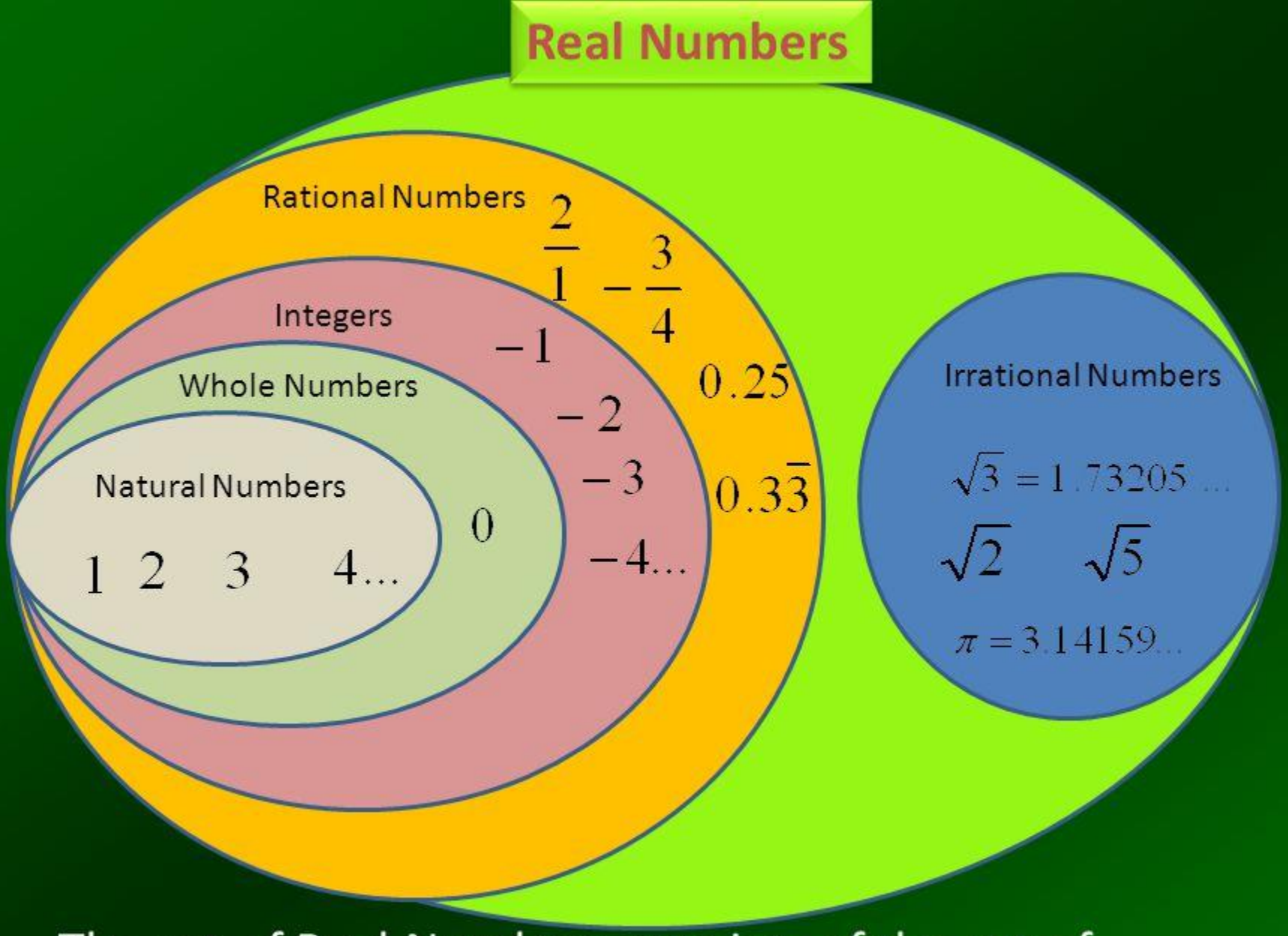
Rational	Irrational
• Integers	• π or any expression that contains π
• Any fraction made up of integers	
• Terminating decimals (the decimal "ends")	
• Repeating decimals	• Decimals that go on forever and don't repeat
• Any root that comes out "exact"	• Any root that doesn't come out "exact"

WARNING:

*****ALWAYS SIMPLIFY THE PROBLEM FIRST!!!*****

(It may be a rational number "in disguise")

$$\frac{18\sqrt{7}}{6\sqrt{7}}$$



The set of Real Numbers consists of the set of rational numbers and the set of irrational numbers.

Examples: State whether the quantity is rational or irrational. If it is rational, write it as a fraction.

1. -8 — Rational $\left(\frac{-8}{1}\right)$
2. $\frac{65}{76}$ — Rational
3. $\sqrt{100}$ — Rational $\left(\frac{10}{1}\right)$
4. $\sqrt{12}$ — Irrational
5. 4π — Irrational
6. 3.6782364 — Rational $\left(3\frac{6782364}{10000000}\right)$
7. $7.1487254557\ldots$ — Irrational
8. $4.33333\ldots.$ — Rational $\left(4\frac{1}{3}\right)$
9. $2.\overline{08}$ — Rational $\left(4\frac{8}{99}\right)$
10. $\frac{3\sqrt{2}}{4\sqrt{2}}$ — Rational $\left(\frac{3}{4}\right)$
11. $\sqrt[3]{30}$ — Irrational