Name: _____ Period: _____ Date: _____

Unit 1-TEST

Number System - Real Numbers and Exponents

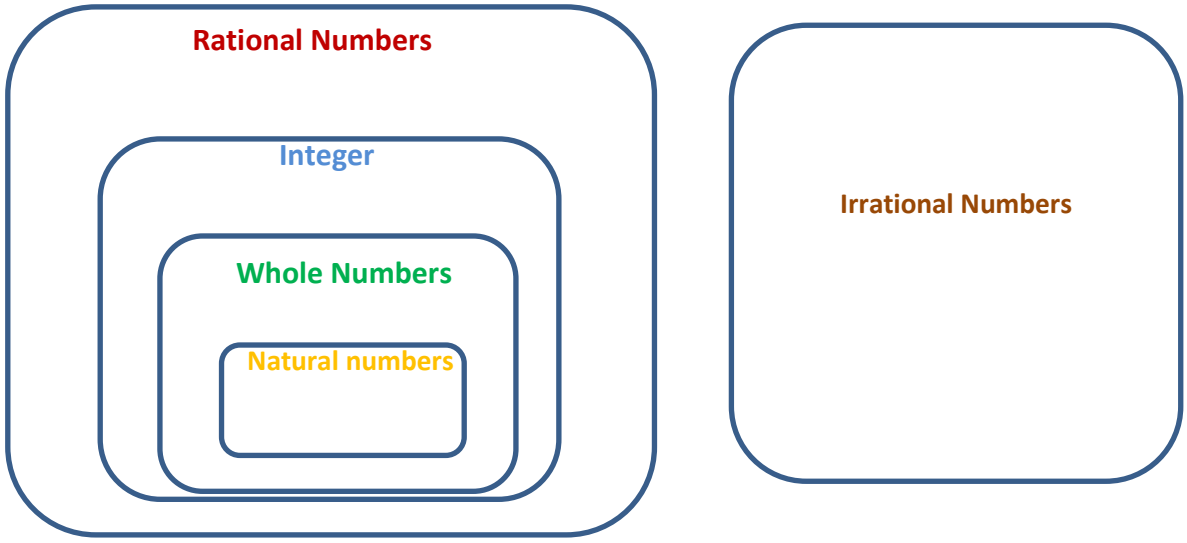
Math 8

1. Classify these numbers as rational or irrational and give your reason.

Number	Rational/Irrational	Explanation
89		
$23.569034\ldots\ldots$		
$-45.321321321\ldots\ldots$		

2. Classify the numbers by writing them in the appropriate section of the Venn Diagram.

$\frac{1}{2},\ \sqrt{211},\ 12,\ \sqrt{10}, -15, 0, \sqrt{81}, -116, -3.\overline{6}, 78,\ \frac{0}{3},\ \frac{36}{12}$



Name: _____ Period: _____ Date: _____

Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

Evaluate the expression for the given replacement values.

3. $2x + y(x - y)$
$x = -0.11 \qquad y = 2.22$

4. $x^2 + y^2 \div (x - y)$
$x = \frac{1}{3}, \qquad y = \frac{2}{5}$

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Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

5. **Write $0.0\overline{23}$ as a fraction.**

6. **Write 0.045 as a fraction.**

7. **Classify each number below as either rational or irrational.**
   If you believe your number is rational, prove your answer by writing it as a fraction.

Number	Rational/Irrational	Fraction
$0.\overline{3}$		
0.12		
-4		
$-\sqrt{66}$		
$45.3567120\ldots$		

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Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

8. Find the value of each square root and then classify them accordingly.

Number	Value	Perfect square	Irrational Number
$-\sqrt{100}$			
$\sqrt{78}$			
$\sqrt{36}$			
$-\sqrt{7}$			
$\sqrt{14,884}$			

Approximate the following square roots to the nearest hundredths.

9. $\sqrt{14}$

10. $\sqrt{110}$

Approximate the following cube roots to the nearest integer.

11. $\sqrt[3]{199}$

12. $\sqrt[3]{(-1,220)}$

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Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

Solve each expression. Identify if the answer will be rational or irrational.

13. If $x = \sqrt{2}$ and $y = 4$, what is the value of $x^2 + 2y - 3\sqrt{y}$?

14. If $x = 11$ and $y = \sqrt{5}$, what is the value of $x^2\, y^2 - (5y + 2\sqrt{x})$?

Evaluate each expression.

15. $\left(\sqrt[3]{(1,000)} + \sqrt{256}\right) \times \left(\left(\sqrt{289}\right)^2 - \sqrt[3]{216}\right)$

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Unit 1-TEST

Number System - Real Numbers and Exponents

Math 8

16. $\left(\sqrt{36}\right)^2 \div \left(\sqrt[3]{64} - \sqrt{9}\right) \times \left(\sqrt[3]{343} - \sqrt[3]{216}\right)$

17. $\left(\frac{12^2}{3} - \frac{3^{-2}}{9^{-2}}\right) \div \left(\frac{36 - 4^2}{5} - \frac{3^{-2}}{12^{-2}}\right)$

18. $\left(\frac{x^2}{5} + \frac{3x^2}{15}\right)^2 \times \left(\frac{12}{8x^2 + 7x^2}\right)^{-1}$

19. $\left(\frac{3ab}{b^{-2}} - \frac{2b^3}{a^{-1}}\right) \times \left(\frac{ab}{b^{-2}} + 3 \times \frac{ab}{b^{-2}}\right)$

Name: _____ Period: _____ Date: _____

Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

Evaluate the expression. Write your answer in scientific notation.

20. $$\frac{\left((4 \times 10^3) - (1 \times 10^2)\right) \times (6 \times 10^4)}{200,000}$$

Name: _____ Period: _____ Date: _____

Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

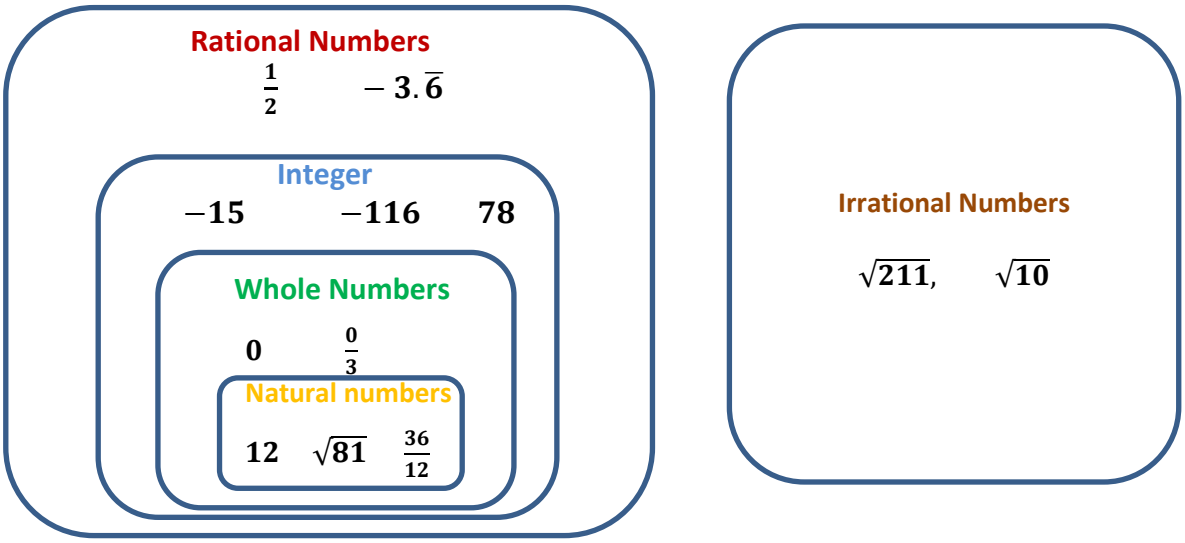
ANSWERS

1. Classify these numbers as rational or irrational and give your reason.

Number	Rational/Irrational	Explanation
89	Rational	because this number is a natural, whole, integer
23.569034 … ….	Irrational	because the decimal does not repeat or terminate
-45.321321321 … ….	Rational	because the decimal eventually repeats

2. Classify the numbers by writing them in the appropriate section of the Venn Diagram.

$\frac{1}{2}$, $\sqrt{211}$, 12, $\sqrt{10}$, -15, 0, $\sqrt{81}$, -116, $-3.\overline{6}$, 78, $\frac{0}{3}$, $\frac{36}{12}$



Name: _____ Period: _____ Date: _____

Unit 1-TEST

Number System - Real Numbers and Exponents

Math 8

Evaluate the expression for the given replacement values.

3. $2x + y(x - y)$

$x = -0.11 \qquad y = 2.22$

$$2x + y(x - y) =$$
$$= 2 * (-0.11) + 2.22 * (-0.11 - 2.22) =$$
$$= -0.22 + 2.22 * (-2.33) =$$
$$= -0.22 + \left(\frac{-222}{100}\right) * \left(\frac{-233}{100}\right) =$$
$$= -0.22 + \left(\frac{51,726}{10,000}\right) =$$
$$= -0.22 + 5.1726 =$$
$$= 4.9526$$

4. $x^2 + y^2 \div (x - y)$

$x = \frac{1}{3}, \qquad y = \frac{2}{5}$

$$x^2 + y^2 \div (x - y) =$$
$$= \left(\frac{1}{3}\right)^2 + \left(\frac{2}{5}\right)^2 \div \left(\frac{1}{3} - \frac{2}{5}\right) =$$
$$= \frac{1}{9} + \frac{4}{25} \div \left(\frac{5}{15} - \frac{6}{15}\right) =$$
$$= \frac{1}{9} + \frac{4}{25} \div \left(-\frac{1}{15}\right) =$$
$$= \frac{1}{9} + \frac{4}{25} * \frac{(-15)}{1} =$$
$$= \frac{1}{9} + \frac{4 * 5 * (-3)}{5 * 5 * 1} =$$
$$= \frac{1}{9} + \frac{4 * (-3)}{5} =$$
$$= \frac{1}{9} + \frac{(-12)}{5}$$
$$= \frac{5}{45} - \frac{108}{45}$$
$$= \frac{-103}{45}$$

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Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

5. Write $0.0\overline{23}$ as a fraction.

$0.0\overline{23} = 0.023232323\ldots\ldots$

$1{,}000x = 23.232323\ldots\ldots$
$-10\,x = \quad 0.232323\ldots\ldots$

$990x = 23$

$x = \frac{23}{990}$

$0.0\overline{23} = \frac{23}{990}$

6. Write 0.045 as a fraction.

$0.045 = \frac{45}{1{,}000}$

$0.045 = \frac{5 * 9}{5 * 200}$

$0.045 = \frac{9}{200}$

7. Classify each number below as either rational or irrational.
If you believe your number is rational, prove your answer by writing it as a fraction.

Number	Rational/Irrational	Fraction
$0.\overline{3}$	Rational	$\frac{1}{3}$
0.12	Rational	$\frac{3}{25}$
-4	Rational	$-\frac{4}{1}$
$-\sqrt{66}$	Irrational	/
$45.3567120\ldots$	Irrational	/

Name: _____ Period: _____ Date: _____

Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

8. Find the value of each square root and then classify them accordingly.

Number	Value	Perfect square	Irrational Number
$-\sqrt{100}$	10	✓	
$\sqrt{78}$	$8.8317\ldots..$		✓
$\sqrt{36}$	6	✓	
$-\sqrt{7}$	$2.6457\ldots\ldots..$		✓
$\sqrt{14,884}$	122	✓	

Approximate the following square roots to the nearest hundredths .

9. $\sqrt{14}$

$3^2 < \left(\sqrt{14}\right)^2 < 4^2$
$9 < 14 < 16$
$14 - 9 = 5$
$16 - 9 = 7$
$\frac{5}{7} = 0.74$
$\sqrt{14} \approx 4.74$

10. $\sqrt{110}$

$10^2 < \left(\sqrt{110}\right)^2 < 11^2$
$100 < 110 < 121$
$110 - 100 = 10$
$121 - 100 = 21$
$\frac{10}{21} = 0.48$
$\sqrt{110} \approx 10.48$

Approximate the following cube roots to the nearest integer.

11. $\sqrt[3]{199}$

$5^3 < \left(\sqrt[3]{199}\right)^3 < 6^3$
$125 < 199 < 216$

$\sqrt[3]{199} \approx 6$

12. $\sqrt[3]{(-1,220)}$

$(-10)^3 > \left(\sqrt[3]{(-1,220)}\right)^3 > (-11)^3$
$(-1,000) > (-1,220) > (-1,331)$

$\sqrt[3]{(-1,220)} \approx -11$

Name: _____ Period: _____ Date: _____

Unit 1-TEST
Number System - Real Numbers and Exponents

Math 8

Solve each expression. Identify if the answer will be rational or irrational.

13. If $x = \sqrt{2}$ and $y = 4$, what is the value of $x^2 + 2y - 3\sqrt{y}$?

$x = \sqrt{2} \qquad y = 4$

$$x^2 + 2y - 3\sqrt{y} =$$
$$= \left(\sqrt{2}\right)^2 + 2 * 4 - 3\sqrt{4} =$$
$$= 2 + 8 - 3 * 2 =$$
$$= 2 + 8 - 6 =$$
$$= 10 - 6 =$$
$$= 4$$

Rational

14. If $x = 11$ and $y = \sqrt{5}$, what is the value of $x^2\, y^2 - \left(5y + 2\sqrt{x}\right)$?

$x = 11 \qquad y = \sqrt{5}$

$$x^2\, y^2 - \left(5y + 2\sqrt{x}\right) =$$
$$= (11)^2 \left(\sqrt{5}\right)^2 - \left(5\sqrt{5} + 2\sqrt{11}\right) =$$
$$= 121 * 5 - \left(5\sqrt{5} - 2\sqrt{11}\right) =$$
$$= 605 - (5 * 2.2360 \ldots . - 2 * 3.3166 \ldots .) =$$
$$= 605 - (11.1803 \ldots . - 6.6632 \ldots) =$$
$$= 605 - 4.5171 \ldots .$$
$$= 600.4868 \ldots ..$$

Irrational

Evaluate each expression.

15. $\left(\sqrt[3]{(1,000)} + \sqrt{256}\right) \times \left(\left(\sqrt{289}\right)^2 - \sqrt[3]{216}\right)$

$$\left(\sqrt[3]{(1,000)} + \sqrt{256}\right) \times \left(\left(\sqrt{289}\right)^2 - \sqrt[3]{216}\right) =$$
$$= (10 + 16) \times (17 - 6) =$$
$$= 26 \times 11 =$$
$$= 286$$

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Unit 1-TEST

Number System - Real Numbers and Exponents

Math 8

16. $\left(\sqrt{36}\right)^2 \div \left(\sqrt[3]{64} - \sqrt{9}\right) \times \left(\sqrt[3]{343} - \sqrt[3]{216}\right)$

$\left(\sqrt{36}\right)^2 \div \left(\sqrt[3]{64} - \sqrt{9}\right) \times \left(\sqrt[3]{343} - \sqrt[3]{216}\right) =$

$= 36 \div (4 - 3) \times (7 - 6) =$

$= 36 \div 1 \times 1 =$

$= 36 \times 1 =$

$= \mathbf{36}$

17. $\left(\frac{12^2}{3} - \frac{3^{-2}}{9^{-2}}\right) \div \left(\frac{36 - 4^2}{5} - \frac{3^{-2}}{12^{-2}}\right)$

$= \left(\frac{144}{3} - \frac{9^2}{3^2}\right) \div \left(\frac{36 - 16}{5} - \frac{12^2}{3^2}\right) =$

$= \left(48 - \frac{81}{9}\right) \div \left(\frac{20}{5} - \frac{144}{9}\right) =$

$= (48 - 9) \div (4 - 16) =$

$= 39 \div (-12) =$

$= \mathbf{-3.25}$

18. $\left(\frac{x^2}{5} + \frac{3x^2}{15}\right)^2 \times \left(\frac{12}{8x^2 + 7x^2}\right)^{-1}$

$= \left(\frac{3x^2}{15} + \frac{3x^2}{15}\right)^2 \cdot \left(\frac{12}{15x^2}\right)^{-1} =$

$= \left(\frac{6x^2}{15}\right)^2 \cdot \frac{15x^2}{12} =$

$= \frac{6^2 x^{2*2}}{15^2} \cdot \frac{15x^2}{12} =$

$= \frac{36x^4}{225} \cdot \frac{15x^2}{12} = \frac{12 * 3 * x^{4+2} 15}{15 * 5 * 3 * 12} =$

$= \mathbf{\frac{x^6}{5}}$

19. $\left(\frac{3ab}{b^{-2}} - \frac{2b^3}{a^{-1}}\right) \times \left(\frac{ab}{b^{-2}} + 3 \times \frac{ab}{b^{-2}}\right)$

$\left(\frac{3ab}{b^{-2}} - \frac{2b^3}{a^{-1}}\right) \times \left(\frac{ab}{b^{-2}} + 3 \times \frac{ab}{b^{-2}}\right) =$

$= \left(3ab^{1-(-2)} - 2ab^3\right) \times \left(ab^{1-(-2)} + 3ab^{1-(-2)}\right) =$

$= (3ab^{1+2} - 2ab^3) \times (ab^{1+2} + 3ab^{1+2}) =$

$= (3ab^3 - 2ab^3) \times (ab^3 + 3ab^3) =$

$= ab^3 \times 4ab^3 = 4a^{1+1}b^{3+3}$

$= \mathbf{4a^2b^6}$

Name: _____ Period: _____ Date: _____

Unit 1-TEST

Number System - Real Numbers and Exponents

Math 8

Evaluate the expression. Write your answer in scientific notation.

20. $\dfrac{\left((4\times10^{3})-(1\times10^{2})\right)\times(6\times10^{4})}{200,000}$

$=\dfrac{\left((4\times10^{3})-(0.1\times10^{3})\right)\times(6\times10^{4})}{2\times10^{5}}=$

$=\dfrac{\left((4-0.1)\times10^{3}\right)\times(60\times10^{3})}{2\times10^{5}}=$

$=\dfrac{(3.9\times10^{3})\times(60\times10^{3})}{2\times10^{5}}=$

$=\dfrac{(3.9\times60)\times10^{3+3}}{2\times10^{5}}$

$=\dfrac{23.4\times10^{6}}{2\times10^{5}}$

$=\dfrac{23.4}{2}\times10^{6-5}$

$=11.7\times10^{1}$

$=1.17\times10^{2}$