Directions: Answer the following question(s).

1 Which of the following is equivalent to $0.\overline{2}$?

A. $\dfrac{1}{5}$

B. $\dfrac{2}{9}$

C. $\dfrac{2}{7}$

D. $\dfrac{1}{2}$

Master ID: 3246737 Revision: 1

Correct: **B**

Rationale:

A. Student(s) may have ignored the bar above the 2.
B. Correct answer
C. Student(s) may have correctly reasoned that $\overline{2}$ is greater than 2/10, so if the numerator is 2, then the denominator is less than 10, but they may have mistakenly chosen a number that is greater than 2/10.
D. Student(s) may have mistakenly chosen the fraction with 2 in the denominator, since the decimal has a repeating 2.

Rubric: 1 Point(s)

Standards:

      8.NS.A.1

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2 Suppose that a number written as a decimal has an infinite number of non-repeating digits after the decimal point. What is this number called?

A. irrational

B. natural

C. rational

D. unnatural

Master ID: 3246708 Revision: 1

Correct: **A**

Rationale:

A. Correct answer
B. Student(s) may have confused a positive number that has no digits after the decimal point with a positive number that has an infinite number of non-repeating digits after the decimal point.
C. Student(s) may have confused a number that can be written with a finite number of digits after the decimal point with a number that has an infinite number of non-repeating digits after the decimal point.
D. Student(s) may have mistakenly concluded that since a number with an infinite number of non-repeating digits after the decimal point is not natural, it must be the opposite of natural.

Rubric: 1 Point(s)

Standards:

      8.NS.A.1

Directions: Answer the following question(s).

3   Which of the following is a correct statement?

A. $0.\overline{13}$ is equivalent to $\dfrac{13}{99}$

B. $0.\overline{17}$ is equivalent to $\dfrac{17}{100}$

C. $0.\overline{19}$ is equivalent to $\dfrac{99}{19}$

D. $0.\overline{23}$ is equivalent to $\dfrac{100}{23}$

Master ID: 3245288 Revision: 1

Correct: A

Rationale:
- A.   Correct answer
- B.   Student(s) may have not noticed the bar above the 17 in $0.\overline{17}$.
- C.   Student(s) may have mixed up the numerator and the denominator of the fraction.
- D.   Student(s) may not have noticed the bar above the 23 in $0.\overline{23}$, and they may have then mixed up the numerator and the denominator of the fraction.

Rubric: 1 Point(s)

Standards:
    8.NS.A.1

4   Silas wrote a number as a fraction with an integer in both the numerator and the denominator. Which of the following statements correctly describes the number?

A.   It could be either rational or irrational.

B.   It must be rational and not irrational.

C.   It must be irrational and not rational.

D.   It could be neither rational nor irrational.

Master ID: 3245278 Revision: 1

Correct: B

Rationale:
- A.   Student(s) may not have realized that a fraction with an integer in the numerator and the denominator cannot be irrational.
- B.   Correct answer
- C.   Student(s) may have confused irrational numbers with rational numbers.
- D.   Student(s) may not have realized that a fraction with an integer in the numerator and the denominator must be rational.

Rubric: 1 Point(s)

Standards:
    8.NS.A.1

Directions: Answer the following question(s).

5 | Is it possible to convert $0.12\overline{5}$ into a fraction?

A.   No, because the digits 1, 2, and 5 do not repeat.

B.   No, because even though the digit 5 repeats, the digits 1 and 2 do not repeat.

C.   Yes, because even though the digits 1 and 2 do not repeat, the digit 5 repeats.

D.   Yes, because the digits 1, 2, and 5 repeat.

Master ID: 3245230 Revision: 1

Correct: C

Rationale:
A.   Student(s) may not have noticed the bar above the digit 5, and they may not have realized that even if there wasn't a bar above the 5, the decimal would have repeating 0s after the 5.
B.   Student(s) may have mistakenly thought that all the digits after the decimal point have to repeat in order to be able to convert a decimal into a fraction.
C.   Correct answer
D.   Student(s) may not have noticed that the bar is only above the digit 5 and not above the digits 1 and 2.

Rubric: 1 Point(s)

Standards:
     8.NS.A.1

6 | Several numbers are shown below. Determine which numbers are rational and which are irrational.

Drag and drop each number to the correct box.

Web Only Interaction

Master ID: 2113649 Revision: 4

Rubric: 1 Point(s)

A rational number is a number that can be expressed as a fraction p/q, where p and q are integers and q is not equal to 0. An irrational number is not rational, so it cannot be expressed as the ratio of two integers. Rational numbers have decimal expansions that terminate or repeat. Irrational numbers have decimal expansions that neither terminate nor repeat. The irrational numbers are 3π, square root of 5, 7 times the square root of 7, and 8.06225774... . Pi, or π, is a famous irrational number, as it also cannot be expressed as the ratio of two integers. So 3π is not rational. Square roots of numbers that are not perfect squares, like 5 and 7, cannot be expressed as the ratio of two integers. The number 8.06225774... is irrational because it is a non-terminating, non-repeating decimal. The other numbers are rational. The number –2.125 is rational because it is a terminating decimal. The square root of 4 is rational because 4 is a perfect square. Its value is actually 2, which can be expressed as 2/1. The final two numbers are rational because they are repeating decimals.

Standards:
     8.NS.A.1

7 | The table contains a list of numerical expressions. Drag and drop the appropriate category to identify the value of each expression as either a rational number or an irrational number.

Web Only Interaction

Master ID: 2113651 Revision: 3

Rubric: 1 Point(s)

A rational number is a number that can be expressed as a fraction p/q, where p and q are integers and q is not equal to 0. An irrational number is not rational, so it cannot be expressed as the ratio of two integers. Rational numbers have decimal expansions that terminate or repeat. Irrational numbers have decimal expansions that neither terminate nor repeat. The irrational numbers are radical 2, π, and 1.7320508075688.... Roots of numbers that are not perfect squares, like 2, cannot be expressed as the ratio of two integers. Pi, or π, is a famous irrational number, as it also cannot be expressed as the ratio of two integers. 1.7320508075688... is irrational because it is a non-terminating, non-repeating decimal. The other numbers are rational. The number 0.18181818... is rational because it is a repeating decimal. The fraction 1/2 is rational because it is the ratio of two integers, 1 and 2. The number 1.25 is rational because it is a terminating decimal. Radical 9 is rational, because 9 is a perfect square. Its value is actually 3, which can be expressed as 3/1.

Standards:
     8.NS.A.1

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Page 3

Directions: Answer the following question(s).

8 Which of the following statements is correct based on the number line below?
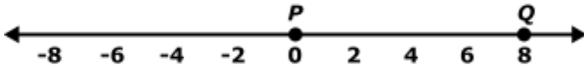
A. $\sqrt{68}$ is to the right of Point Q because it is less than 8.

B. $\sqrt{68}$ is between points P and Q because it is less than 0 and greater than 8.

C. $\sqrt{68}$ is between points P and Q because it is greater than 0 and less than 8.

D. $\sqrt{68}$ is to the right of Point Q because it is greater than 8.

Master ID:　　　　3212383 Revision:　　　　1

Correct:　　　　**D**

Rationale:

A. Student(s) may have correctly determined that $\sqrt{68}$ is to the right of point Q, but they may have misidentified the reason why.

B. Student(s) may have mixed up the positions of "greater than" and "less than" in the statement when mistakenly determining that $\sqrt{68}$ is less than 8, but they may have correctly determined what this would have meant.

C. Student(s) may have mistakenly determined that $\sqrt{68}$ is less than 8, but they may have correctly determined what this would have meant.

D. Correct answer

Rubric:　　　　1 Point(s)

Standards:
　　8.NS.A.2

9 Which of the following numbers is between 5 and 10 on a number line? Select two that apply.

A. $\sqrt{6}$

B. $-\sqrt{8}$

C. $\sqrt{21}$

D. $\sqrt{38}$

E. $\sqrt{44}$

F. $-\sqrt{59}$

Master ID:　　　　3212350 Revision:　　　　1

Correct:　　　　**DE**

Rationale:

A. Student(s) may have mistakenly compared 5 and 10 to 6 instead of 5 and 10 to $\sqrt{6}$.

B. Student(s) may not have noticed the negative sign, and they may have mistakenly compared 5 and 10 to 8 instead of 5 and 10 to $\sqrt{8}$.

C. Student(s) may have mistakenly assumed that numbers between 5 and 10 on a number line are less than 5 or greater than 10.

D. Correct answer

E. Correct answer

F. Student(s) may not have noticed the negative sign.

Rubric:　　　　1 Point(s)

Standards:
　　8.NS.A.2

Directions: Answer the following question(s).

| 10 | Which inequalities are true? Choose ALL that are correct. |

A. $\sqrt{10} > \pi$

B. $\sqrt{8} > 4 \times \sqrt{2}$

C. $\pi = 3.14$

D. $\pi < \sqrt{3}$

E. $\sqrt{11} < \sqrt{5} + \sqrt{6}$

Master ID: 2113659 Revision: 1

Correct: **AE**

Rationale:
  A.   To compare irrational numbers, find rational approximations. $\sqrt{10} \approx 3.16$ and $\pi \approx 3.14$. Therefore, $\sqrt{10} > \pi$.
  B.   This is the result of not recognizing that $\sqrt{8} \approx 2.83$ and $\sqrt{2} \approx 1.41$. Therefore, the given inequality cannot be true.
  C.   This is the result of misinterpreting π as a rational number, equal to a terminating decimal number, when in fact it is irrational.
  D.   This is the result of not recognizing that . $\pi \approx 3.14$ and $\sqrt{3} \approx 1.73$. Therefore, the given inequality cannot be true.
  E.   To compare irrational numbers, find rational approximations. $\sqrt{11} \approx 3.32$, $\sqrt{5} \approx 2.24$, and $\sqrt{6} \approx 2.45$. Therefore, $\sqrt{11} < \sqrt{5} + \sqrt{6}$.

Rubric: 1 Point(s)

Standards:
  8.NS.A.2

| 11 | Between which two numbers does $\sqrt{11}$ lie on a number line? |

A.   3 and 4

B.   10 and 11

C.   4 and 5

D.   5 and 6

Master ID: 307132 Revision: 3

Correct: **A**

Rationale:
  A.   This shows the square root of 11.
  B.   This answer shows 11 without the square root.
  C.   This is the result of making a miscalculation in the square root of 11.
  D.   These two numbers add to 11.

Rubric: 1 Point(s)

Standards:
  8.NS.A.2

Directions: Answer the following question(s).

12 Which of these is true?

A. $\sqrt{5} = \pi$

B. $\sqrt{5} > \pi$

C. $\sqrt{5} = 2\pi$

D. $\sqrt{5} < \pi$

Master ID: 307130 Revision: 4

Correct: **D**

Rationale:

A. Since radical 4 < radical 5 < radical 9, then 2 < radical 5 < 3. The rational approximation of π is 3.14. Since radical 5 is less than 3, the two quantities are not equal.

B. Since radical 4 < radical 5 < radical 9, then 2 < radical 5 < 3. The rational approximation of π is 3.14. Since radical 5 is less than 3, it is not greater than 3.14.

C. Since radical 4 < radical 5 < radical 9, then 2 < radical 5 < 3. The rational approximation of π is 3.14. Since radical 5 is less than 3, it is certainly less than 2(3.14), and this statement is not true.

D. Since radical 4 < radical 5 < radical 9, then 2 < radical 5 < 3. The rational approximation of π is 3.14. Since radical 5 is less than 3, it is also less than 3.14, and this statement is true.

Rubric: 1 Point(s)

Standards:
     8.NS.A.2

13 Each number in the table represents a value for *x*. Drag each number to the correct box in the table that classifies it by its approximate value.

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Master ID: 2113660 Revision: 3

Rubric: 1 Point(s)

The rational number $\frac{2}{7}$ has the approximate value of 0.2857, and the numerator is less than the denominator so it should be placed in the column for $x \leq 1$.

The rational number $\frac{23}{13}$ has the approximate value of 1.7692, and 23 is greater than 13 but less than two times 13 so it should be placed in the column for $1 < x < 2$.

The irrational number $\sqrt{2}$ has the approximate value of 1.4142, so it should also be placed in the column for $1 < x < 2$.

The irrational number $\sqrt{6}$ has the approximate value of 2.4495, and 2 x 2=4 and 3 x 3=9 so the square root of 6 should be placed in the column for $2 < x < 3$.

The rational number $\frac{7}{2}$ has the value of 3.5, so it should be placed in the column for $x \geq 3$.

The rational number $1\frac{14}{5}$ has the value of 3.8 and 15/5 is 3 so 14/5 is a little less than 3 so 1 and 14/5 is a little less than 4 but greater than 3 so it should be placed in the column for $x \geq 3$.

Standards:
     8.NS.A.2

14 Drag each expression to the correct box to indicate whether it is equivalent or not equivalent to $\dfrac{5^{49}}{5^{-13}}$.

Web Only Interaction

Master ID: 3461940 Revision: 1

Rubric: 1 Point(s)

$$\frac{5^{49}}{5^{-13}} = 5^{49} \cdot 5^{13} = 5^{62}$$

Standards:
     8.EE.A.1

Directions: Answer the following question(s).

15   Simplify the expression using the correct order of operations:

$$14\left(2 + 3 - 2 \cdot 2\right) \div \left(4^2 - 3^2\right)$$

A.   2

B.   4.29

C.   5.29

D.   18

Master ID: 3291589 Revision: 1

Correct: A

Rationale:

A.   Correct answer

B.   Student(s) may have miscalculated as follows:
$$14\left(2 + 3 - 2 \times 2\right) \div \left(4^2 - 3^2\right) = 14\left(2\right) + \left(3 - 2\right)$$
$$\times 2 \div \left(16 - 9\right) = 28 + 2 \div 7 = 30 \div 7 = 4.29$$

C.   Student(s) may have miscalculated, or may not have used the correct order of operations.

D.   Student(s) may have miscalculated as follows: 1
$$4\left(2 + 3 - 2 \times 2\right) \div \left(4^2 - 3^2\right) = 14\left(2\right) + 3 - \left(4\right.$$
$$\left. \div 16\right) - 9 = 28 + 3 - 4 - 9 = 31 - 4 - 9 = 18$$

Rubric: 1 Point(s)

Standards:

    8.EE.A.1

16   Simplify the expression using the correct order of operations:

$$23 - (17 - 3 \cdot 4)^2 + 6.25$$

A. -3106.75

B. -131.75

C.   4.25

D.   24.25

Master ID: 3291574 Revision: 1

Correct: C

Rationale:

A.   Student(s) may have miscalculated as follows:
$$17 - 3 = 14; 14 \times 4 = 56; 56^2 = 3136; 23$$
$$- 3136 + 6.25 = -3106.75$$

B.   Student(s) may have miscalculated as follows: $23 - 17 - 12^2 + 6.25 = -131.75$

C.   Correct answer

D.   Student(s) may have miscalculated as follows: $23 - 17 + 12 + 6.25 = 24.25$

Rubric: 1 Point(s)

Directions: Answer the following question(s).

17   Simplify the expression:

$$\frac{2^{-3}}{2^2}$$

A. 2^{-1}

B. $\frac{1}{2}$

C. $\frac{1}{32}$

D. $\frac{1}{2^{-1}}$

Master ID: 3284670 Revision: 1

Correct: C

Rationale:

  A.   Student(s) may not have understood how to use negative exponents and miscomputed $2^{-3} \bullet 2^2 = 2^{-1}$.

  B.   Student(s) may have understood how to convert the answer from A into a fraction, rather than exponential form, but may have miscomputed to get A.

  C.   Correct answer

  D.   Student(s) may have miscomputed $1/2^{-3} \bullet 2^2 = 1/2^{-1}$, or may not have understood how to proceed with the question and guessed.

Rubric: 1 Point(s)

Standards:

     8.EE.A.1

18   Which of the following has the same value as

$$\frac{5^{-3}}{5^{-2}}?$$

A. $\frac{-15}{-10}$

B. $\frac{-125}{-25}$

C. $\frac{5}{1}$

D. $\frac{25}{125}$

Master ID: 3284673 Revision: 1

Correct: D

Rationale:

  A.   Student(s) may not have understood how to correctly use negative exponents and found $-(5 \times 3)/-(5 \times 2)$ instead.

  B.   Student(s) may not have understood how to correctly use negative exponents and found $-(5^3)/-(5^2)$ instead.

  C.   Student(s) may have interpreted negative exponents as in B, but thought that since this is a simplified equivalent, it is more correct than B.

  D.   Correct answer

Rubric: 1 Point(s)

Standards:

     8.EE.A.1

Directions: Answer the following question(s).

19 Which of the following expressions is equivalent to $\dfrac{4^{-6} \cdot 5^4}{4^3 \cdot 5^{-2}}$?

A. $\dfrac{5^2}{4^3}$

B. $\dfrac{5^6}{4^9}$

C. $\dfrac{5^2}{4^9}$

D. $\dfrac{1}{4^2 \cdot 5^2}$

Master ID: 3272300 Revision: 1

Correct: **B**

Rationale:

  A. Student(s) may have added the exponents instead of subtracting the exponents.

  B. Correct answer

  C. Student(s) may have accidentally added the base 5 exponents instead of subtracting the exponents.

  D. Student(s) may have divided the exponents instead of subtracting the exponents.

Rubric: 1 Point(s)

Standards:

    8.EE.A.1

20 Simplify.

$$\frac{5^4 \cdot 8^{-6} \cdot 9^{-12}}{5^{-2} \cdot 8^3 \cdot 9^{-4}}$$

A. $\dfrac{5^2}{8^3 \cdot 9^{16}}$

B. $\dfrac{9^3}{5^2 \cdot 8^2}$

C. $\dfrac{5^6}{8^9 \cdot 9^8}$

D. $\dfrac{5^8}{8^{18} \cdot 9^3}$

Master ID: 3271186 Revision: 1

Correct: **C**

Rationale:

  A. Student(s) may have added the powers of the exponents with the same base together instead of subtracting them.

  B. Student(s) may have divided the powers of the exponents with the same base instead of subtracting them.

  C. Correct answer

  D. Student(s) may have placed terms in the numerator with negative exponents in the denominator and terms in the denominator with negative exponents in the numerator $\left(\dfrac{5^4 \cdot 5^2 \cdot 9^4}{8^3 \cdot 8^6 \cdot 9^{12}}\right)$, and then multiplied or divided the powers of the terms with a common base instead of adding them.

Rubric: 1 Point(s)

Standards:

    8.EE.A.1

Directions: Answer the following question(s).

21 Simplify. 2^{-4}

A. -16

B. -8

C. $\dfrac{1}{16}$

D. $\dfrac{1}{8}$

Master ID: 3263106 Revision: 1

Correct: C

Rationale:
   A.   Student(s) may have mistakenly believed the sign of the exponent made the value negative.
   B.   Student(s) may have mistakenly believed the sign of the exponent made the value negative and used the product of 2 and 4.
   C.   Correct answer
   D.   Student(s) may have recognized the negative power meant reciprocal, but used the product of 2 and 4.

Rubric: 1 Point(s)

Standards:
      8.EE.A.1

22 Choose the equivalent expression.

   $\left(8^{10}\right)^{2}$

A. 8^{20}

B. 8^{12}

C. 8^{8}

D. 8^{5}

Master ID: 3253401 Revision: 1

Correct: A

Rationale:
   A.   Correct answer
   B.   Student(s) may have added the powers.
   C.   Student(s) may have subtracted the powers.
   D.   Student(s) may have divided the powers.

Rubric: 1 Point(s)

Standards:
      8.EE.A.1

23 Simplify the expression.

   $8(3)^{6} \cdot (3)^{-3}$

A. -1296

B. -72

C. 216

D. 648

Master ID: 3256444 Revision: 1

Correct: C

Rationale:
   A.   Student(s) may have misunderstood exponents, multiplying 3 times 6 and 3 times −3 when solving the equation.
   B.   Student(s) may have divided exponents instead of adding them, then moved the negative sign to the front of the expression before solving.
   C.   Correct answer
   D.   Student(s) may have correctly inverted 3^{-3} to $1/3^{3}$ but may have inadvertently multiplied 3 times 3 instead of calculating 3^{3}.

Rubric: 1 Point(s)

Standards:
      8.EE.A.1

Directions: Answer the following question(s).

24 Which value of *x* will make this expression true?

$$7^5 \cdot 7^x = 7^{15}$$

A. 3

B. 4

C. 10

D. 20

Master ID: 3251493 Revision: 1

Correct: C

Rationale:

A. Student(s) solved as though an exponent were being placed on an already exponentiated number instead of multiplying the two exponentiated numbers.

B. Student(s) did not know how to proceed with the question or guessed without considering the question.

C. Correct answer

D. Student(s) used the rule for division instead of multiplication when applying rules of exponents.

Rubric: 1 Point(s)

Standards:

8.EE.A.1

25 Which expression is equivalent to $(2)^{-3}(4)^0$?

A. $(-2) \times (-2) \times (-2) \times 4$

B. $(-2) \times (-2) \times (-2) \times 1$

C. $\left(\frac{1}{2}\right) \times \left(\frac{1}{2}\right) \times \left(\frac{1}{2}\right) \times 4$

D. $\left(\frac{1}{2}\right) \times \left(\frac{1}{2}\right) \times \left(\frac{1}{2}\right) \times 1$

Master ID: 307148 Revision: 3

Correct: D

Rationale:

A. This is the result of not inverting the first fraction and applying the negative value in the exponent to the sign of the base, and making $4^0 = 4$.

B. This is the result of not inverting the first fraction and applying the negative value in the exponent to the sign of the base.

C. This is the result of correctly inverting 2^{-3} but incorrectly making $4^0 = 4$.

D. This expression is equivalent to the expression in the question.

Rubric: 1 Point(s)

Standards:

8.EE.A.1

Directions: Answer the following question(s).

26 What is the value of the expression $\left(\frac{3}{5}\right)^2(-3)^{-3}$?

A. $-\dfrac{243}{75}$

B. $\dfrac{162}{5}$

C. $\dfrac{243}{75}$

D. $-\dfrac{1}{75}$

Master ID: 307149 Revision: 4

Correct: D

Rationale:

A. This is the result of squaring 3/5 to get 9/25 and incorrectly finding -3^{-3} = -27 in the second part of the expression.

B. This is the result of making the first part of the expression equal to 6/5 and making the second part of the expression equal to 27.

C. This is the result of squaring 3/5 to get 9/25 and incorrectly finding -3^{-3} = 27 in the second part of the expression.

D. The first fraction is equivalent to 9/25. The second part of the expression is -1/27. The product of these two fractions is -1/75.

Rubric: 1 Point(s)

Standards:

    8.EE.A.1

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27 Simplify the following expression.

$$(2^3)(2^2)(2^0)$$

A. 10

B. 64

C. 0

D. 32

Master ID: 307156 Revision: 3

Correct: D

Rationale:

A. This shows the exponents added to make 5 but then multiplied by 2 to get 10.

B. This is the result of multiplying the first two exponents to get 6, then evaluating 2^6.

C. This is the result of assuming 2^0 equals 0.

D. This shows the expression correctly simplified.

Rubric: 1 Point(s)

Standards:

    8.EE.A.1

Directions: Answer the following question(s).

28 What is $x^3 = \frac{8}{27}$?

A. $\frac{2}{3}$

B. $\sqrt[3]{\frac{2}{3}}$

C. $\sqrt[3]{\frac{3}{2}}$

D. $\frac{3}{2}$

Master ID: 3246754 Revision: 1

Correct: **A**

Rationale:
  A. Correct answer
  B. Student(s) may have forgotten to remove the cube root sign when simplifying the expression.
  C. Student(s) may have forgotten to remove the cube root sign when simplifying the expression, and they may have mistakenly identified the reciprocal of the right answer as correct.
  D. Student(s) may have mistakenly identified the reciprocal of the right answer as correct.

Rubric: 1 Point(s)

Standards:
      8.EE.A.2

29 Which of these is a solution to the equation $x^3 = 36, x^2 = 42$, or $x^3 = 55$? Select *three* that apply.

A. $x = \sqrt{36}$

B. $x = \sqrt{42}$

C. $x = \sqrt{55}$

D. $x = \sqrt[3]{36}$

E. $x = \sqrt[3]{42}$

F. $x = \sqrt[3]{55}$

Master ID: 3231206 Revision: 1

Correct: **BDF**

Rationale:
  A. Student(s) may have mistakenly chosen this answer due to the fact that the number under the square root sign is a perfect square.
  B. Correct answer
  C. Student(s) may have not noticed that this answer does not include an index of 3, when it should.
  D. Correct answer
  E. Student(s) may have not noticed that this answer contains an index of 3, when it should not.
  F. Correct answer

Rubric: 1 Point(s)

Standards:
      8.EE.A.2

Directions: Answer the following question(s).

30 Given that $x^3 = p$, which is true?

A. $\sqrt[3]{p} = x^3$

B. $\sqrt[3]{x} = p^3$

C. $\sqrt[3]{p} = x$

D. $\sqrt[3]{x} = p$

Master ID: 307171 Revision: 4

Correct: C

Rationale:

  A. This is the result of mistakenly cubing the cube root x.

  B. This is the result of switching the positions of the cube (p) and the cube root (x) and then compounding this error by cubing p.

  C. Since $\sqrt[3]{p}$ is defined to mean the solution to the equation $x^3 = p$, this equation is true.

  D. This is the result of switching the positions of the cube (p) and the cube root (x).

Rubric: 1 Point(s)

Standards:

  8.EE.A.2

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31 Given that $x^2 = 81$, which is true?

A. $x = \pm\sqrt{81}$

B. $x^2 = \pm\sqrt{9^2}$

C. $x = \pm\sqrt{9}$

D. $x^2 = \pm\sqrt{81}$

Master ID: 307172 Revision: 3

Correct: A

Rationale:

  A. Taking the square root of both sides of the equation yields this correct answer.

  B. Since 9^2 is not equal to 81, this answer is not correct.

  C. This is the result of taking the square root of both sides of the equation, but then incorrectly taking the square root of the right side a second time.

  D. Since $x^2 = 81$, x^2 cannot also be equal to 81.

Rubric: 1 Point(s)

Standards:

  8.EE.A.2

Directions: Answer the following question(s).

---

32   What is the solution to the equation?

$$x^2 = \frac{7}{3}$$

A. $x = \pm\sqrt[3]{\frac{7}{3}}$

B. $x = \pm\sqrt{\frac{7}{3}}$

C. $x = \frac{7}{6}$

D. $x = \left(\frac{7}{3}\right)^2$

Master ID: 2113690 Revision: 3

Correct: B

Rationale:

A.   This uses the cube root instead of the square root.

B.   To solve the equation, take the square root of both sides. The positive and negative square roots of 7/3 are both solutions.

C.   This results from taking 1/2 of the right side of the equation instead of taking the square root.

D.   This results from squaring the right side of the equation instead of taking the square root.

Rubric: 1 Point(s)

Standards:

     8.EE.A.2

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33   Which is the first step to solving the equation $x^3 = 15$ for x?

A. $x = \sqrt{15}$

B. $x = \frac{15}{3}$

C. $x = \sqrt[3]{15}$

D. $x = 3(15)$

Master ID: 307167 Revision: 4

Correct: C

Rationale:

A.   The radical sign is correct, but there must be indication that it is a cube root.

B.   The inverse operation of a third power is not the same as division by 3.

C.   The inverse of taking a number to the third power is taking the cube root. This is the correct first step to solve for x.

D.   The inverse operation of a cube power is not the same as multiplication by 3.

Rubric: 1 Point(s)

Standards:

     8.EE.A.2

Directions: Answer the following question(s).

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34 What is the solution to the equation below?

$$n^3 = 21$$

A. $n = \sqrt[3]{21}$

B. $n = 7$

C. $n = \sqrt{21}$

D. $n = \dfrac{1}{7}$

Master ID: 2190571 Revision: 3

Correct: A

Rationale:

   A.   This is correct. In order to solve, take the cube root of both sides of the equation.

   B.   This is 1/3 of 21.

   C.   This uses the square root symbol instead of the cube root.

   D.   This finds 1/3 of 21 and uses it for a denominator.

Rubric: 1 Point(s)

Standards:

     8.EE.A.2

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35 Which of the following names the solution(s) to the equation below?

$$x^2 = 8$$

A. $x = 4$

B. $x = \sqrt{8}$

C. $x = 4, -4$

D. $x = \sqrt{8}, -\sqrt{8}$

Master ID: 2190570 Revision: 3

Correct: D

Rationale:

   A.   This divides by 2 instead of taking the square root.

   B.   This ignores the negative solution.

   C.   This divides by 2 instead of taking the square root, and gives the result and its opposite.

   D.   The square root of 8 is either positive or negative.

Rubric: 1 Point(s)

Standards:

     8.EE.A.2

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36 In 2030, it is estimated the United States' population will be 4.0×10^8 and the world's population will be 8.0×10^9. About how many times greater will the world's population be than the United States' population in 2030?

A.   2 times

B.   5 times

C.   20 times

D.   40 times

Master ID: 2258898 Revision: 3

Correct: C

Rationale:

   A.   This is the result of finding the quotient of 8 and 4 as 2 but not identifying 10^9 as ten times larger than 10^8.

   B.   This is the result of finding the quotient of 10^9 and 10^8 as 10 but incorrectly including the quotient of 4/8 (0.5) instead of 8/4.

   C.   This is the result of dividing the world's population by the population of the United States. The quotient of 8 and 4 is 2 and the quotient of 10^9 and 10^8 is 10^1 or 10. The product of 2 and 10 is 20.

   D.   This is the result of incorrectly subtracting 4 from 8 to get 4 and multiplying this by a factor of 10 (because 10^9 is 10 times larger than 10^8).

Rubric: 1 Point(s)

Standards:

     8.EE.A.3

Directions: Answer the following question(s).

37 The mass of the Sun is approximately 2×10^{30} kilograms. The mass of Venus is approximately 5×10^{24} kilograms. About how many times greater is the mass of the Sun than the mass of Venus?

A. 25,000

B. 40,000

C. 250,000

D. 400,000

Master ID: 2190594 Revision: 3

Correct: **D**

Rationale:

  A. This results from dividing 5 ÷ 2 and making a place-value error.

  B. This results from making a place-value error.

  C. This results from dividing 5 ÷ 2 instead of 2 ÷ 5.

  D. Dividing 2 × 10^{30} by 5 × 10^{24} gives 0.4 × 10^6, which equals 0.4 × 1,000,000, which is 400,000.

Rubric: 1 Point(s)

Standards:

    8.EE.A.3

38 A scientist observed a bacterium in a microscope. It measured about 0.0000029 meter in diameter. Which of the following is closest to 0.0000029?

A. 2×10^{-5}

B. 3×10^{-5}

C. 3×10^{-6}

D. 2×10^{-6}

Master ID: 2190597 Revision: 3

Correct: **C**

Rationale:

  A. This results from rounding down to 0.000002, and counting the zeros to the right of the decimal point to determine the exponent.

  B. This results from counting the zeros to the right of the decimal point to determine the exponent.

  C. The decimal 0.0000029 can be rounded to 0.000003. Since 0.000001 = 1 × 10^{-6}, 0.000001 = 1 × 10^{-6}.

  D. This results from rounding down to 0.000002.

Rubric: 1 Point(s)

Standards:

    8.EE.A.3

Directions: Answer the following question(s).

39 The surface areas of Jupiter and Earth are approximately 6.0 x 10^{10} km^2 and 5.1 x 10^8 km^2. About how many times greater is Jupiter's surface area than Earth's surface area?

A. 1.2 times

B. 21 times

C. 100 times

D. 120 times

Master ID: 307183 Revision: 4

Correct: D

Rationale:

  A. This is the result of only finding the quotient of 6 and 5.1 which is 1.2. This answer does not include the quotient of 10^{10} and 10^8.
  B. This is the result of finding the quotient of 6 and 5.1 is 1.2, but instead of subtracting the exponents to find the quotient they are divided to get 10$^{1.25}$. The answer is the equivalent to 1.2 x 10$^{1.25}$.
  C. This is the result of finding the quotient of 10^{10} and 10^8 is 10^2 or 100. But, this answer does not include the correct quotient of 6 and 5 which should be closer to 1.2, not 1.
  D. This is the result of dividing Jupiter's surface area by Earth's surface area. The quotient of 6 and 5 is 1.2 and the quotient of 10^{10} and 10^8 is 10^2. The product of 1.2 and 10^2 is 120.

Rubric: 1 Point(s)

Standards:
    8.EE.A.3

40 According to the U.S. Geological Survey, there are over 300,000,000 cubic miles of water on the planet. How is this number represented in scientific notation?

A. 3×10^8

B. 3×10^9

C. 30×10^8

D. 30×10^9

Master ID: 307185 Revision: 3

Correct: A

Rationale:

  A. Scientific notation represents a number as the product of a single digit times an integer power of 10. When 3 is multiplied by 10^8, the product is 300,000,000.
  B. This number has a value of 3,000,000,000, so it is greater than the original number.
  C. This number has a value of 3,000,000,000, so it is greater than the original number.
  D. This number has a value of 30,000,000,000, so it is greater than the original number.

Rubric: 1 Point(s)

Standards:
    8.EE.A.3

Directions: Answer the following question(s).

41   Which number is written correctly in scientific notation?

A. 5.03×10^{11}

B. $3,892 \times 10^{7}$

C. 0.459×10^{8}

D. 25.6×10^{12}

Master ID: 307186 Revision: 3

Correct: A

Rationale:

A.   This answer is expressed in the correct form of a x 10^{b}, where $1 \leq a < 10$ and b is an integer.

B.   This mistakes a number with a comma separator for thousands with a decimal number of a single whole digit.

C.   This has a decimal number in the leading position, but it is too small.

D.   This has a decimal number in the leading position, but it is too large.

Rubric: 1 Point(s)

Standards:

    8.EE.A.3

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42   How many times smaller is 8×10^{-4} than 2×10^{-1}?

A. 4×10^{-5}

B. 6×10^{-5}

C. 4×10^{-3}

D. 6×10^{4}

Master ID: 3227901 Revision: 1

Correct: C

Rationale:

A.   Student(s) may have mistakenly added the exponents –4 + (–1) to get –5 for the exponent.

B.   Student(s) may have mistakenly subtracted 8 – 2 to get 6 for the single digit. Student(s) may have added the exponents –4 + (–1) to get –5 for the exponent, instead of subtracting.

C.   Correct answer

D.   Student(s) may have mistakenly subtracted 8 – 2 to get 6 for the single digit, instead of dividing. Student(s) may have divided the exponents –4 by –1 to get 4 for the exponent, instead of subtracting.

Rubric: 1 Point(s)

Standards:

    8.EE.A.3

43

Web Only Interaction

Web Only Interaction

Master ID: 3299818 Revision: 1

Rubric: 2 Point(s)

Standards:

    8.EE.A.4

Directions: Answer the following question(s).

44   Which equations are correct? Select THREE that apply.

A. $\left(6.1 \times 10^5\right) + \left(2.3 \times 10^6\right) = 291,000$

B. $\left(3.3 \times 10^8\right) + \left(5.4 \times 10^7\right) = 87,000,000$

C. $\left(4.2 \times 10^7\right) + \left(3.7 \times 10^6\right) = 45,700,000$

D. $\left(2.4 \times 10^6\right) + \left(4.4 \times 10^5\right) = 6,800,000$

E. $\left(5.8 \times 10^7\right) + \left(2.1 \times 10^8\right) = 268,000,000$

F. $\left(4.3 \times 10^5\right) + \left(5.2 \times 10^4\right) = 482,000$

Master ID: 3230385 Revision: 1

Correct: **CEF**

Rationale:

A.   Student(s) may have correctly converted both numbers on the left side of the equation to decimal notation, but they may have been off by a factor of 10 when finding the sum of the numbers.

B.   Student(s) may not have converted the numbers on the left side of the equation to decimal notation. Student(s) may have instead added 3.3 and 5.4 together and multiplying the result by 10 raised to the smaller of the two exponents in the equation.

C.   Correct answer

D.   Student(s) may not have converted the numbers on the left side of the equation to decimal notation.

E.   Correct answer

F.   Correct answer

Rubric: 1 Point(s)

Standards:
     8.EE.A.4

45   Which of these equations are correct? Select *three* that apply.

A. $\left(4.6 \times 10^5\right) - \left(2.1 \times 10^4\right) = 250,000$

B. $\left(8.8 \times 10^8\right) - \left(6.2 \times 10^7\right) = 818,000,000$

C. $\left(9.9 \times 10^7\right) - \left(5.8 \times 10^6\right) = 9,320,000$

D. $\left(7.3 \times 10^6\right) - \left(4.2 \times 10^5\right) = 6,880,000$

E. $\left(2.9 \times 10^8\right) - \left(1.3 \times 10^7\right) = 16,000,000$

F. $\left(3.6 \times 10^5\right) - \left(1.1 \times 10^4\right) = 349,000$

Master ID: 3231172 Revision: 1

Correct: **BDF**

Rationale:

A.   Student(s) may not have converted the numbers on the left side of the equation to decimal notation, instead subtracting 2.1 from 4.6 and multiplying the result by 10 raised to the larger of the two exponents in the equation.

B.   Correct answer

C.   Student(s) may have correctly converted both numbers on the left side of the equation to decimal notation, but they may have been off by a factor of 10 when finding the difference of the numbers.

D.   Correct answer

E.   Student(s) may not have converted the numbers on the left side of the equation to decimal notation, instead subtracting 1.3 from 2.9 and multiplying the result by 10 raised to the smaller of the two exponents in the equation.

F.   Correct answer

Rubric: 1 Point(s)

Standards:
     8.EE.A.4

Directions: Answer the following question(s).

46   Which value is equivalent to
$(3.6 \times 10^7) + (7.35 \times 10^6)$?

A. 1.095×10^{12}

B. 4.335×10^{13}

C. 10.95×10^{13}

D. 4.335×10^7

Master ID: 2247531 Revision: 5

Correct: **D**

Rationale:

A.   This represents a misapplication of the properties of exponents as well as an error in writing the sum of 3.6 and 7.35 since the digits are not in the same place value.

B.   This is the result of finding the correct numerical value but mistakenly adding the exponents together instead of using the number of place values the decimal was moved.

C.   This represents a misapplication of the properties of exponents as well as an error in writing the sum of 3.6 and 7.35 in correct scientific notation.

D.   This is the correct sum of the two numbers: (36000000 + 7350000) = 43350000 = 4.335 x 10^7.

Rubric: 1 Point(s)

Standards:
     8.EE.A.4

47   What is the solution to the equation?

$$0.2 + 0.05x = 4.2$$

A. $x = 8$

B. $x = 8.38$

C. $x = 80$

D. $x = 83.8$

Master ID: 307250 Revision: 4

Correct: **C**

Rationale:

A.   This is the result of a making a place-value error.

B.   This is the result of dividing 4.2 by 0.05, subtracting 0.2, and then making a place-value error.

C. $0.2 + 0.05x = 4.2 \rightarrow 0.05x = 4 \rightarrow x = 80$

D.   This is the result of dividing 4.2 by 0.05 and then subtracting 0.2.

Rubric: 1 Point(s)

Standards:
     8.EE.C.7.a