Jakarta International School

7th Grade

Name: SOLUTIONS

Date: _____

Score: ___/50

Practice Test - Green

Factors, Fractions, and Exponents

Clearly show required work. Check Carefully!

1. Is the first number divisible by the second? Explain how you know without doing the actual division problem. (2 points)

   378 by 3? YES. The sum of 3, 7, and 8 is 18. Since 18 is divisible by 3, 378 is divisible by 3

   487 by 2? No. 487 is not an even number, so it is not divisible by 2.

2. Find the missing digit that will make the number divisible by 9. Explain your method. (1 point)

   3_8,817 For a number to be divisible by 9, the sum of its digits must be divisible by 9. The sum of 3, 8, 1, and 7 is 19. The closest number that is divisible by 9 is 27, so the missing digit must be (8) in order for the digits' sum to be 27.

   If a number is divisible by 6, is it also divisible by 2? Explain (1 point)

   YES Any number that is divisible by 6 must also be divisible by 2 and 3 (divisibility rule for 6) since 2 and 3 are factors of 6.

3. There are 20 choral students singing at a school concert. Each row of singers must have the same number of students. If there are least 5 students in each row, what are all the possible arrangements of singers? (1 point)

   20 choral students could be arranged as follows:

1 row of 20 students	5 rows of 4 students	Only the first 3 possibilities have at least 5 students in each row.
2 rows of 10 students	10 rows of 2 students	
4 rows of 5 students	20 rows of 1 student.	

4. Explain what problem number four has to do with our study of factors. (2 points)

   The possible arrangements all consist of numbers that are factor pairs of 20.

   1, 2, 4, 5, 10, 20

5. List the factors of 96 (1 point)

   1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 96

6. Write using exponents (2 points)

A. The product of x cubed and w squared. $x^3 \cdot w^2$

B. $-30 \bullet x \bullet x \bullet x \bullet 2 \bullet -1 \bullet -1 \bullet w \bullet w \bullet w \bullet w = -60x^3w^4$

7. Evaluate the expression if a=3, b=-4, and c=5 (2 points)

$$\frac{[a-b+(-c^2)]}{c-b} = \frac{3-(-4)+(-5^2)}{5-(-4)} = \frac{3+4+-25}{5+4} = \frac{-18}{9} = -2$$

8. Simplify (2 points)

A. $5 \bullet 10^6 = 5{,}000{,}000$

$5 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$

$5 \cdot 1{,}000{,}000$

B. $(-2)^5 = -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2$

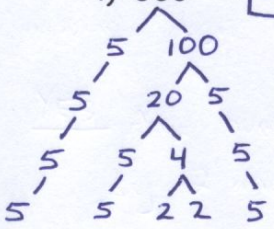
$4 \cdot -2 \cdot -2 \cdot -2$

$-8 \cdot -2 \cdot -2$

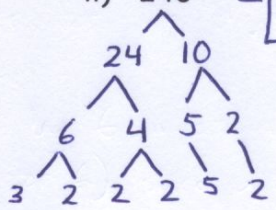
$16 \cdot -2 = -32$

10. Use exponents to write the prime factorization of the following numbers: (2 points)

i) 500 $= 5^3 \cdot 2^2$



ii) 240 $= 2^4 \cdot 3 \cdot 5$



11. Using the prime factorization of 500 and 240, find their greatest common factor (GCF). (1 point)

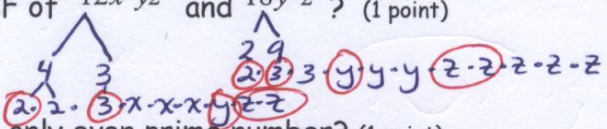
$500 = 5 \cdot 5 \cdot 2 \cdot 2 \cdot 5$

$240 = 3 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 2$

Common Prime Factors are $5 \cdot 2 \cdot 2$

So their GCF is 20

12. What is the GCF of $12x^3yz^2$ and $18y^3z^5$? (1 point)



$GCF = 6yz^2$

13. Why is two the only even prime number? (1 point)

Prime numbers are only divisible by themselves and 1. Even numbers besides 2 are divisible by themselves, 1 and 2, making them composite numbers instead of prime numbers.

14. The Little Theater is getting set up for the Middle School musical. 72 seats at the front have been set up for students and 180 seats have been reserved for parents at the back. If all rows have the same number of chairs, what is the greatest number of chairs possible for a row? (2 points)

Since the student and parent seats must be arranged separately, we need to find the largest number number that each can be divided by, their GCF.

15. Find two fractions equivalent to $\frac{8}{12}$. (1 point)

$\frac{8 \div 2}{12 \div 2} = \frac{4}{6} \div 2 = \frac{2}{3}$

180 → 18, 10 → 6, 3, 5, 2 → 3, 2, 3, 5, 2

72 → 8, 9 → 4, 2, 3, 3 → 2, 2, 2, 3, 3

36 chairs

16. Write in simplest form (3 points)

a) $\frac{6m^2n \div 6mn}{18mn \div 6mn} = \frac{m}{3}$

b) $\frac{7j \div 7j}{28jk \div 7j} = \frac{1}{4k}$

c) $\frac{x^2y \div y}{5yz \div y} = \frac{x^2}{5z}$

17. I spend 3 hours a day on a computer. What fraction of the day do I spend this way? Write your answer in simplest form. (1 point)

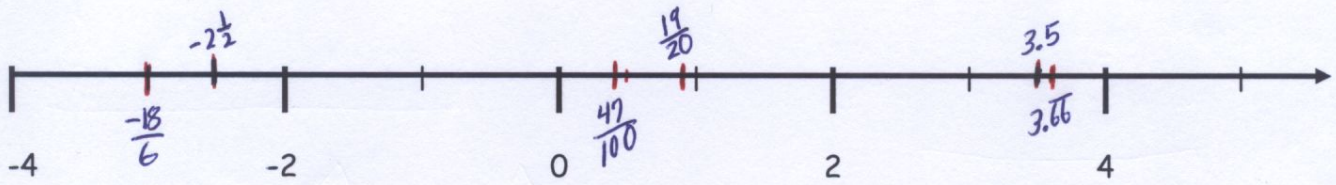
One day has 24 hours. So $\frac{3}{24} = \frac{1}{8}$ of the day

18. Write two expressions whose GCF is $7b^2$ (1 point)

$14b^2$ and $7b^2$

19. Graph each rational number as close as possible to their correct locations on the number line below. (3 points)

A) 3.5 B) $-2\frac{1}{2}$ C) $\frac{19}{20}$ D) $3.\overline{66}$ E) $-\frac{18}{6} = -3$ F) $\frac{47}{100}$

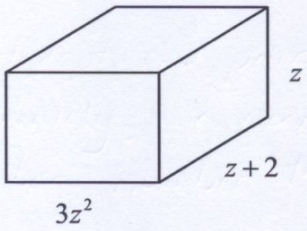


20. Evaluate. Write in simplest form. (1 point)

$\frac{a(ab-4)}{10}$, for a = 5 and b = 2

$\frac{5(5 \cdot 2 - 4)}{10} = \frac{5(10-4)}{10} = \frac{5 \cdot 6}{10} = \frac{30}{10} = 3$

21. Write a simplified expression for the volume of the rectangular prism (2 points)



Volume $= \ell \cdot w \cdot h$

$= 3z^2(z+2) \cdot z$

$3 \cdot z \cdot z \cdot z \,(z+2)$

$3z^3(z+2)$

$3z^3 \cdot z + 3z^3 \cdot 2 = \boxed{3z^4 + 6z^3}$

22. Simplify each expression. Show work that leaves no doubt that you fully understand why the answer is what it is. (4 points)

A. $-5r^6 \bullet 4r^2 \bullet x = -5 \cdot r \cdot r \cdot r \cdot r \cdot r \cdot r \cdot 4 \cdot r \cdot r \cdot x = \boxed{-20r^8x}$

B. $10^4 \bullet 10^7 = \underbrace{10 \cdot 10 \cdot 10 \cdot 10}_{10^4} \cdot \underbrace{10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10}_{10^7} = \boxed{10^{11}}$

C. $(x^5)^3 = (x^5)(x^5)(x^5) = \underbrace{x \cdot x \cdot x \cdot x \cdot x} \cdot \underbrace{x \cdot x \cdot x \cdot x \cdot x} \cdot \underbrace{x \cdot x \cdot x \cdot x \cdot x} = \boxed{x^{15}}$

D. $m^5 \bullet m^7$ $\underbrace{m \cdot m \cdot m \cdot m \cdot m} \cdot \underbrace{m \cdot m \cdot m \cdot m \cdot m \cdot m \cdot m} = \boxed{m^{12}}$

23. Complete each equation. Show work that leaves no doubt that you fully understand why the answer is what it is. (2 points)

A. $x^{\square} \bullet x^4 = x^8$ $\underbrace{\quad}_{x^{\square}} \cdot \underbrace{x \cdot x \cdot x \cdot x}_{x^4} = \underbrace{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x}_{x^8}$ so $\boxed{\square = 4}$

B. $(y^7)^{\square} = y^{14}$ $\underbrace{y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y}_{y^7} \cdot \underbrace{\quad} \cdot \underbrace{\quad} \underbrace{y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y}$

$\boxed{\square = 2}$

24. Simplify each side. Then, compare using <, >, or =. Show work that leaves no doubt that you fully understand why the answer is what it is. (1 point)

$(7^4 \bullet 7^2)^3 \square (7^2)^{12}$

$(7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7) \cdot (7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7)(7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7) = 7^{18}$

$(7^4 \cdot 7^2) \cdot (7^4 \cdot 7^2) \cdot (7^4 \cdot 7^2) = 7^{18}$

$(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7)(7 \cdot 7) = 7^{24}$

$7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 \cdot 7^2 = 7^{24}$

so $\boxed{<}$

25. Simplify (1 point)

$$\frac{6x^7y^2}{8x^2y^5} \qquad \frac{3\cdot 2\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot y\cdot y}{4\cdot 2\cdot x\cdot x\cdot y\cdot y\cdot y\cdot y\cdot y} = \boxed{\frac{3x^5}{4y^3}}$$

26. Complete the equation. (1 point)

$$\frac{y^{\square}}{y^9} = y^{-4} \quad = \frac{1}{y^4} = \frac{y\cdot y\cdot y\cdot y\cdot y}{y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y\cdot y} = \frac{1}{y^4} \quad \text{so } \boxed{\square = 5}$$

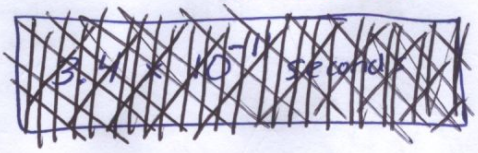
27. First, write the expression without a fraction bar. Then, evaluate the expression. (1 point)

$$\frac{7}{10^2} = \boxed{7\cdot 10^{-2}} = \boxed{.07}$$

28. Write the number in scientific notation. (2 points)

A. The time it takes for light to travel one meter is .0000000003334 seconds.

$\boxed{3.334\times 10^{-10}}$



B. The distance from earth to the star Vega is 239,000,000,000,000,000 meters

$\boxed{2.39\times 10^{17}}$

30. Write the number in standard form. (2 points)

A. The cruising speed of a supersonic jet is 1.336×10^3 miles per hour.

$1.336 \times 10^3 = \boxed{1,336}$

B. The thickness of the human retina is 1.2×10^{-4} meters

$1.2 \times 10^{-4} = \boxed{.00012}$

31. Solve. Write your result in scientific notation. (1 point)

The wolffia plant is the smallest plant in the world. One wolffia plant has a mass of about 1.5×10^{-4} gram. 5×10^3 wolffia plants can fit in a thimble the sign of your thumb. What is the mass of that many wolffia plants?

$$1.5\times10^{-4}\cdot 5\times10^3 = \frac{1.5\times5\times10^3}{10^4}$$

$$= \frac{1.5\times5\times10\times10\times10}{10\times10\times10\times10} = \frac{7.5}{10} = \boxed{7.5\times10^{-1}\text{ grams}}$$

32. (2 points)

The CD Collection Crisis

"This guy is furious, Lump!" Emma said. "He keeps telling us, 'I want my half! I want my half!'"

Then Will chimed in. "The others are furious, too. They're all furious," he said, "and all three of them are right here in our office being furious together. Today is one of those days I wish I'd had more homework. The office would've been closed."

Emma explained that Hoover and his friends, Amy and Amos, had shown up at the office with a doozy of a dilemma. Their mutual friend, Luis Ruiz, was leaving town. He was moving away but leaving a problem behind. The problem was in the form of a gift. Luis told his friends that he was going to give his valuable collection of CDs to them. The collection contained all the CDs made by Out of Sorts—their favorite singing group.

"Do you follow me so far, Lump?" Emma asked.

"Have you ever known me not to? So where's the problem—did Luis hide the CDs somewhere or lock them up and misplace the key?"

"If it were only that simple," Will interjected. "There are 17 CDs in his collection. The difficult part is how he wants his friends to share the collection."

It seems that Luis wanted Hoover to have half of his collection, Amy to have one-third, and Amos was to get one-ninth.

As I digested the data, the dilemma became all too clear. How does one divide 17 CDs as Luis intended?

"You can't break up CDs, can you?" Emma questioned.

I could hear the exasperation in her voice. I could also hear her visitors, loudly and clearly, even though I held the telephone an arm's length from my ear.

"He said half for me, and I intend to get my half! And 8 is not half of 17!"

"Well, 5 isn't a third of it either!"

"There's no way I'm settling for 1 CD as my ninth! I want 2 CDs!"

While Will tried to calm down the three squabblers, Emma drifted away from the group. She spoke softly into her portable phone. "We tried to figure things every which way using our calculators. Then we tried to get these three to cooperate and divide up the goods in some fair way. Nothing doing. We even called Luis, but he was firm about his wishes. We've hit a roadblock on this one, Lump. Any suggestions?"

I began to tap my pencil on the desk, as is my annoying habit when I do big brain work. Before I hit the desk with my second tap, I hit on a suggestion.

"Emma, why don't you put Will on the phone, so he can hear this, too." I waited for Will to join us. The ruckus was still going full steam ahead in the background.

"I'm not taking one CD less than half the collection! Half the collection!"

"I love Out of Sorts! I demand my third! I won't take less than one third!"

"Don't you dare forget about my ninth! It's only a ninth, but it's my ninth and I want it!"

When I had Emma and Will on the phone again, I started in with the wisdom. "You two have got to change your point of view on this. To solve this mystery, you need to look at the situation from a new perspective."

"A new perspective. OK." I could hear Emma rolling her eyes.

"Change our point of view. Well, all right." I could also hear Will bunching his eyebrows together.

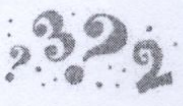
I could tell I wasn't getting through. With a big sigh, I asked Emma and Will if they had any Out of Sorts CDs in the office. They did. "Then use your collection," I told them. "Be good and generous hosts to your 'guests.' You can solve this CD-gift dilemma in two shakes."

There was silence on the line. Their brains were spinning to make sense of my hint. Then I faintly sensed one light bulb going on, then another. I think they heard me loud and clear.

"We hear you loud and clear, Lump," Will yelped. "This thing is all but solved."

"Thanks a million," Emma added. "I think we're ready to adjust Luis's collection so that it can be divided as he requested."

Emma and Will may not know what "two shakes" means, but they know about factors and multiples. In five minutes, the three formerly bickering buddies were on their way. All three were a little puzzled, but they were satisfied. As for our two detectives, they didn't take advantage of the opportunity that presented itself—to swap one of their Out of Sorts CDs for one in Luis's collection that they hadn't heard. Out of Sorts wasn't their favorite music group.



How did Emma and Will use Lump's advice to solve the CD collection crisis?

Add 1 CD to the gift, to make a total of 18 CD's. One-half of 18 is 9; one-third of 18 is 6; and one-ninth is 2. Then, take back the extra CD. 9+6+2=17 ✓!