

1. The nation of Pentonia has a bicameral legislature, meaning it has two houses in its legislature. 27563 people have served only as members of the House of Magic and 12578 people have served only in the higher House of Math. If 31415 people have served in either or both of the houses, how many legislators have served in both houses? (Hint: drawing a Venn Diagram may help.)
2. Consider two consecutive, non-zero integers x and y that are each one digit. When x is raised to the power of y , the result is equal to the product of x and y plus x . Find x and y and express your answer as a coordinate pair.
3. Assign a 1 to the following statements that are correct and a 0 to each that is incorrect. When you have determined the nature of each statement, find the sum of the numbers assigned and square the sum. Assume $0 < a < b < c$.
 - a. $a + b + c = a + c + b$
 - b. $abc = a(b + c)$
 - c. $a \div (b \div c) = a \div b \times c^{-1}$
 - d. $c(ab)^2 = ca^2 + cb^2$
4. Natalie has a circle with a radius of 1 inch, but she is making more circles, each with different radii. Your task is to find the ratios of the areas of the new circles (radii listed below) to her original circle and to find the product of these ratios as your final answer. (Use 3.14 to approximate π , if necessary.)
 - a. 2 inches
 - b. 10 inches
 - c. $\frac{1}{2}$ inch
 - d. 0.1 inches
5. Solve each equation for x , and then find the mean of the different values for x .
 - a. $7x + 5 = 40$
 - b. $6(x - 5) = 30$
 - c. $3(x + 7) + 3x = -9(2x + 3)$
 - d. $\frac{5(x+6)}{13} = 5$
6. Evaluate each expression and find the median of the set created by the solutions.
 - a. $10 - \frac{(15-6) \times 3}{144 \div 16}$
 - b. $\frac{63}{4} \div \frac{9}{8} - 8$
 - c. $\sqrt{32} \times \sqrt{2}$
 - d. $|5 - 14|$
7. If 10 painters can paint 7 walls in 20 minutes, how many walls can 30 men paint in 1 hour? (The number of painters is directly proportional to the number of walls painted and inversely proportional to the amount of time it takes).
8. Isaac Newton can solve 30 calculus problems in 40 minutes, and Gottfried Wilhelm Leibniz can solve 15 calculus problems in 20 minutes. Working together, how many hours does it take for Newton and Leibniz to solve 50 calculus problems? Give your answer in simplest form.
9. Skoufis is filling a fish tank in the shape of a triangular prism for his pet piranha. The water is flowing from the faucet at a rate of 130 cubic centimeters per minute. If the prism's base has an area of 65 square centimeters and a height of 40 cm, how many minutes will have passed when the tank is 30% full?

Answers

- The nation of Pentonia has a bicameral legislature, meaning it has two houses in its legislature. 27563 people have served only as members of the House of Magic and 12578 people have served only in the higher House of Math. If 31415 people have served in either or both of the houses, how many legislators have served in both houses? (Hint: drawing a Venn Diagram may help.)
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- Consider two consecutive, non-zero integers x and y that are each one digit. When x is raised to the power of y , the result is equal to the product of x and y plus x . Find x and y and express your answer as a coordinate pair. **(2, 3)**
- Assign a 1 to the following statements that are correct and a 0 to each that is incorrect. When you have determined the nature of each statement, find the sum of the numbers assigned and square the sum. Assume $0 < a < b < c$. **1**
 - $a + b + c = a + c + b$ **1**
 - $abc = a(b + c)$ **0**
 - $a \div (b \div c) = a \div b \times c^{-1}$ **0**
 - $c(ab)^2 = ca^2 + cb^2$ **0**
- Natalie has a circle with a radius of 1 inch, but she is making more circles, each with different radii. Your task is to find the ratios of the areas of the new circles (radii listed below) to her original circle and to find the product of these ratios as your final answer. (Use 3.14 to approximate π , if necessary.) **1**
 - 2 inches **4**
 - 10 inches **100**
 - $\frac{1}{2}$ inch **$\frac{1}{4}$**
 - 0.1 inches **1/100**
- Solve each equation for x , and then find the mean of the different values for x . **6**
 - $7x + 5 = 40$ **5**
 - $6(x - 5) = 30$ **10**
 - $3(x + 7) + 3x = -9(2x + 3)$ **2**
 - $\frac{5(x+6)}{13} = 5$ **7**
- Evaluate each expression and find the median of the set created by the solutions. **7.5**
 - $10 - \frac{(15-6) \times 3}{144 \div 16}$ **7**
 - $\frac{63}{4} \div \frac{9}{8} - 8$ **6**
 - $\sqrt{32} \times \sqrt{2}$ **8**
 - $|5 - 14|$ **9**
- If 10 painters can paint 7 walls in 20 minutes, how many walls can 30 men paint in 1 hour? (The number of painters is directly proportional to the number of walls painted and inversely proportional to the amount of time it takes). **63**
- Isaac Newton can solve 30 calculus problems in 40 minutes, and Gottfried Wilhelm Leibniz can solve 15 calculus problems in 20 minutes. Working together, how many hours does it take for Newton and Leibniz to solve 50 calculus problems? Give your answer in simplest form. **$\frac{5}{9}$**
- Skoufis is filling a fish tank in the shape of a triangular prism for his pet piranha. The water is flowing from the faucet at a rate of 130 cubic centimeters per minute. If the prism's base has an

area of 65 square centimeters and a height of 40 cm, how many minutes will have passed when the tank is 30% full? **6**

10. This is the tenth anniversary of the PI Math Competition. If the average score on the Algebra I Individual test can be represented by the function $S(t) = 0.05t + 2.49$, where t represents the number of years the PI Competition has been held, what will be the average score on the Algebra I exam next year? **3.14**

11. Charlie is terrible at fractions, so when he was assigned homework involving fractions at college he felt sad. Help him feel better by evaluating the following fraction problems from his homework and then giving the greatest fraction as you answer. $\frac{71}{90}$

- a. $\frac{2}{5} + \frac{7}{18}$ $\frac{71}{90}$
- b. $\frac{5}{6} - \frac{3}{7}$ $\frac{17}{42}$
- c. $\frac{16}{5} \times \frac{1}{8}$ $\frac{2}{5}$
- d. $\frac{7}{9} \div 9$ $\frac{7}{81}$

12. For each scenario, determine the radius of the circle or sphere based on the given information. Express your answer as the mode of the answers for each part. (Hint: $SA = 4\pi r^2$, $V = \frac{4}{3}\pi r^3$)

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- a. Diameter = 6 **3**
- b. Circumference = 6π **3**
- c. Area = 36π **6**
- d. Surface Area = 144π **6**
- e. Volume = 48π **6**

13. Jett has a pile of coins consisting of quarters and dimes only. He knows that the total monetary values of the pile is \$2.45 and that there are 17 coins in the pile. Find the number of quarters times the number of dimes. **60**

14. Levi is paddling in a canoe on a river. It takes him 5 hours to paddle 6 miles with the current and 8 hours paddling at the same rate 3 miles against the current. How fast is the current moving, in miles per hour? Express your answer in simplest form. $\frac{33}{80}$

15. Evaluate:

$$2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \frac{1}{2 - \dots}}}}$$

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