

- The length of the longest toy is the space diagonal of the box. Therefore, the longest toy that can fit is  $\sqrt{4^2 + 7^2 + 11^2} = \boxed{\sqrt{186}}$ .
- The time Sruthi began to change her clothes can be found by adding the times previous to that to the time she woke up, so you would add 14 minutes and 17 minutes to 6:27 which is 6:58. The formula for any angle on a clock is  $|\frac{1}{2}(60H - 11M)|$  with M = minutes and H = hours. Substituting values, you find that the angle is  $139^\circ$ , so the larger angle is  $\boxed{221^\circ}$ .
- By adding all the values in the question and subtracting that value from 150, the total number of students, you are left with  $\boxed{7}$  students who took all three classes.
- The first 10 whole numbers include 0, so the product would simply be  $\boxed{0}$ .
- Using order of operations, you find that the correct answer to the teacher's question is 350. The sum of someone's answer and how far it is from the correct answer is simply going to be 350, so the sum of all the components necessary for the final answer is just  $350 \times 3 = 1050$ . Dividing 1050 by 5, we get the final answer of  $\boxed{210}$ .
- You first want to set up a system of equations:  $0.05x + 0.1y = 0.09(10)$  and  $x + y = 10$ . After solving for  $y$ , you get that  $y = \boxed{8}$ .
- The shortest distance between two parallel lines is going to be the distance between two corresponding points of a perpendicular line. So, let's take the perpendicular line of  $y = -\frac{1}{3}x + 2$  since we know from the top of our head that it shares a point with one of the walker's equation (they have the same y-intercept). Now, we equate the second equation to the perpendicular line equation to find the point they intersect. We get that they intersect at  $(-3,3)$ . Then, we find the distance between these two intersections, the points  $(-3,3)$  and  $(0,2)$ , is  $\boxed{\sqrt{10}}$  using the distance formula.
- Since this is an inequality with an absolute value, you have to solve for  $5x + 12 > 47$  and  $5x + 12 < -47$ . Because of this, you can already eliminate every single answer choice since they only go on one direction. After solving, you find that the answer is  $\boxed{x > 7 \text{ or } x < -59/5}$ .
- The rule for dividing exponents is that you subtract the values, so the fraction would become  $(x^6y^{-4}z - 2)^{\frac{1}{2}}$ . However, you want to keep positive exponents at all time, so those would move to the denominator:  $(x^6/y^4z^2)^{1/2}$ .  
The rule for raising a power by another exponent is that you multiply them, so it would become  $\boxed{\frac{x^3}{y^2z}}$ .
- The prime factors of 2021 are 43 and 47. The sum of those two is  $\boxed{90}$ .
- In this stem plot, the stem is the tens digit, and the leaf is the ones digit of the time. To find the median, you simply find the middle number. Since there are 19 times, the 10th from the start would be the median which is  $\boxed{32}$ .
- The mode is the number that appears the most, which is clearly 57 as it is present 3 times. The mean is the sum of all the numbers divided by the number of numbers, so that would be 703 divided by 19 which is 37. The average of 37 and 57 is 47. The range is the largest number minus the smallest number, so that is  $59 - 17$  which is 42. Dividing that by 2, you get 21.  $47 - 21$  is  $\boxed{26}$ , which is Michael's time.
- The least common multiple of 3,7, and 15 is basically the least common multiple of 7 and 15 since 15 is a multiple of 3, so all multiples of 15 are multiples of 3. Since 7 and 15 have no common factors, it is safe to assume that the least common multiple of the two is simply the product of the two numbers, which is  $\boxed{105}$ .
- Using the distance formula,  $d = \sqrt{(x_1 + x_2)^2 + (y_1 + y_2)^2}$ , you find that the distance is 13 units. However, since one unit is 20 feet, the distance is 13 times 20 which is  $\boxed{260}$ .
- The degree of a term is the sum of the exponents and the degree of a polynomial is the term with the highest degree. The first term has a degree of  $4 + 3 + 1 = 8$ , the second term has a degree of  $3 + 2 = 5$ , and the last term has a degree of  $1 + 1 = 2$ . Therefore, the degree of the polynomial is  $\boxed{8}$ .
- Simply plug in the two numbers to get  $15x^y - 10y^x = 15(64) - 10(36) = 960 - 360 = \boxed{600}$ .

17. This is equivalent to  $10^{2022} \cdot 125 \cdot 7 \cdot 11 = 10^{2022} \cdot 9625$ . This is just 9625 followed by 2022 zeros, so the sum of the digits is  $9 + 6 + 2 + 5 = \boxed{22}$ .
18. We know that  $13^9 + 9^7$  is even because it is the sum of two odd numbers. All even numbers are divisible by 2, and 2 is the lowest prime number. Thus the least prime factor of  $13^9 + 9^7$  is  $\boxed{2}$ .
19. The midpoint of the two points is  $(\frac{4+13}{2}, \frac{5+9}{2}) = (\frac{17}{2}, 7)$ . The abscissa is the  $x$ -coordinate, or  $\boxed{\frac{17}{2}}$ .
20. There are two  $C$ , two  $L$ , and two  $U$ . Thus we divide the total number of permutations by  $2! \cdot 2! \cdot 2! = 2^3 = 8$ .  $CALCULUS$  has 8 letters, so the total number of permutations is  $8!$ . Dividing by 8 gives  $7! = \boxed{5040}$ .
21. Let the number be  $x$ . Then  $3x - 4 = 2x + 8$  so  $x = \boxed{12}$ .
22.  $f(x) = (x^2 + 4x + 4) + 4x + 17 = x^2 + 8x + 21 = (x + 4)^2 + 5$ . This is a parabola with axis of symmetry  $\boxed{x = -4}$ .
23. **D.** The side lengths of ROCK will be  $2x$  and  $4x$ , as the rectangles are similar.  $\frac{\text{area of } AOMG}{\text{area of } ROCK} = \frac{8}{8x^2} = \frac{1}{9}$ . Solve for  $x$  to get 3. You can then find side lengths of ROCK to be 6 and 12. The perimeter is  $(6)(2) + 12(2) = 36$ .
24. **C.**  $\sqrt{-12} = 2i\sqrt{3}$ .  $\sqrt{-25} = 5i$ .  $2i\sqrt{3} \cdot 5i = 10i^2\sqrt{3} = -10\sqrt{3}$
25. **A.** The volume of a sphere is  $\frac{4}{3}\pi r^3$ . We have  $288\pi = \frac{4}{3}\pi r^3$ . Solve for  $r$  to get 6. The formula for the surface area of a sphere is  $4\pi r^2$ . Plug in 6 to get  $144\pi$ . The difference is  $144\pi$ .
26. **D.** In order to finish 55 crackers in 4 minutes, or 240 seconds, Navya must eat  $11/48$  of a cracker each second. She usually eats  $2/15$  of a cracker in one second. Subtract  $2/15$  from  $11/48$  to get  $169/720$  as the answer.
27. **B.** The sum of the reciprocal of the roots of a quadratic equation is  $-B/C$ . In this case,  $-B/C = 13/4$ . Multiply that by 2 to get  $13/2$  which is how many comments he makes every 5 minutes. Multiply by 12 to get the number of comments he makes in an hour which is 78.
28. **E (14).** If you solve the system correctly, you should obtain 5 as the  $x$  value and  $-2$  as the  $y$  value.  $2(x - y) = 2(5 - (-2)) = 14$ .
29. **C.** The shortest diagonal of a hexagon with side lengths 6 is  $6\sqrt{3}$ . If the hypotenuse of Geetika's favorite right triangle is  $6\sqrt{3}$ , using the pythagorean theorem ( $a^2 + b^2 = c^2$ ), we know the sum of the squares of the other two sides in  $(6\sqrt{3})^2 = 108$ .
30. **A.**  $8 \cdot \frac{6!}{2! \cdot 4!} \cdot 4 = 480$  ways.