Solutions

1. By looking at the 7 distances provided, we can see that 123 is the greatest number on the list. A distance of 123 light years is the distance from Dubhe to Earth, thus the answer is **C (Dubhe).**
2. The average of the distances can be calculated by adding up all the numbers in list n, then dividing by how many numbers are in the list. Since we will be rounding to the nearest thousandth place, we need to divide to the ten-thousandth, then round.

(104 + 86 + 83 + 81 + 83 + 80 + 123) / 7 = 640/7 = 91.4285 thus we round up to **91.429; D.**

1. The mode of a dataset is the number that is repeated the most. Ordering the distances from least to greatest, we get 80, 81, 83, 83, 86, 104, 123. Since 83 is repeated the most out of the list, we are able to conclude that it is the mode. **D**
2. When we draw out a 5-pointed star, we see that it is actually a decagon with 10 sides. Since all of the sides are the same length and there are 10 sides, we can solve the perimeter by multiplying the number of sides by the length of each side which gives us 5x10 = 50 cm. BUT WAIT! The answer choices are in mm and 1 cm = 10 mm, so the perimeter is 500 mm. This is not an answer choice, so the answer is **E (500).**
3. We are asked to solve the number of different possible combinations. Given 5 stars in the first row and only one can be chosen, we have 5 different options. Moving onto the second row, there are 4 stars but 2 have to be chosen this time. Since order does not matter, we do 4C2.

= 6 possible combinations for row 2.

Moving onto the third row, there are 8 stars with 4 required stars, so we compute 8C4.

= 70 possible combinations for the third row.

Since there are 5 options for row 1, 6 for row 2, and 70 for row 3, we multiply these together to get the total number of constellations of ; **D.**

1. Since we have an inequality with an absolute value sign around it, we have to solve for the two possible cases; one by simply removing the absolute value sign, and the other by switching the inequality sign and flipping the number that is not absolute valued.

Case 1:

OR

Case 2:

Finally, we have to solve the last inequality

So we are left with these three inequalities and then we plug and chug the answer choices and find that –1 is the only number that satisfies one of the cases, and the last inequality. **A**

1. Applying the Pythagorean theorem of , where a and b are the legs of the right triangle and c is the hypotenuse, we get and computing this gives c the value of **41 (D).**
2. Since there are 12 possible zodiac signs, and each person’s zodiac sign is independent of each other, the answer is 12^3 = **1728; A.**
3. Plugging 12,000 into the formula for r, we get **B**
4. Since there is a 2/5’ths chance of seeing, and we look up at the sky 1000 times, this is an expected number question. This can be solved by multiplying 1000 by 2/5 to get the expected number of times of seeing Canis Major is 400 times; **B**
5. The surface area has a squared relationship with its side so if the ratio of the side length is 3:5, then the ratio of their surface area would be ; **C.**
6. Since we are asked the number of houses to make 5 stars, we will be working backwards. One star is equal to 30 planets, and one planet is equal to 75 houses so one star is equal to 2250 houses. Since there are 5 stars, 5x2250 = 11250 houses for 5 stars. **D**
7. 1000 grains of rice is equal to 1 house and 3000 grains of rice is equal to 20 minutes, we can skip out on a lot of hefty arithmetic. Using our answer from the previous question of 11250 houses for 5 stars, we can write it out and cancel out a lot of numbers. There are 24 hours in a day, and 60 minutes in an hour.

years so the answer is **B.**

1. The probability of getting rice is 98% and the only other option is a star, so the probaility of getting a star is 100-98=2%. **B**
2. Solving the system of equations by setting the y’s equal to each other, we multiply the first equation by a factor of 2.

and using the same second equation,

Adding these two equations gives us 13x = 39, so x = 3. Since the question asks for the abscissa, which is the x coordinate of their point of intersection, the answer is 3. **B**

1. Asks for percent increase so (24 – 12) / 12 = 1 = 100% **A**
2. The greatest number of constellations they can name together is the case in which they can name all different constellations. In that case, they would be able to name 10+8 = 18 constellations. The least number of constellations they can name together is when Nick can only name constellations that Cyrus also knows. Together, they can name 10 distinct constellations. 18-10 = 8. **E**
3. The formula for the area of a trapezoid is . , which makes the answer B.
4. There is a chance of correctly guessing the zodiac sign of one person, because there are 12 possible signs. Because the second person cannot have the same sign as the first one, that leaves 11 possible signs to guess from, giving you a chance of guessing their sign. Multiplying these probabilities together leaves you with , or C.
5. 88 has 8 factors: 1, 2, 4, 8, 11, 22, 44, and 88. The 3rd smallest factor is 4, meaning the answer is A.
6. Nelson is 3 units away from James in the x direction, and 4 units away in the y direction. The line directly between these two points can be represented by the equation , therefore the answer is D.
7. Driving 5 miles at 30 mph would take Jiayi 10 minutes. Jiayi goes 2/3rds of the speed on the way home, which is 20 mph. Driving 5 miles at 20 mph would take Jiayi 15 minutes. The trip would take 25 minutes in total, meaning the answer is E.
8. The portion of the earth from 90 degrees north to 25 degrees south of the equator can be represented by the fraction , which simplifies to . Therefore, the answer is C.
9. The number of unique ways you can rearrange the word “ORION” can be represented by . Therefore, the answer is C.
10. The number of stars in 8 clusters can be represented by the equation meaning the answer is A.
11. =0.340909…, which means the answer is B
12. 0.17 percent can be converted to a decimal by dividing by 100, giving us the decimal 0.0017, which makes the answer D.
13. The rate at which constellations would be named can be represented by . Therefore, a new constellation would be named about every 46 years, meaning the answer is C.
14. Rectangles, squares, and trapezoids all can have diagonals of equal length. Therefore, the answer is a kite, A.
15. The formula for the area of a circle is , where r is the radius. Plugging in for the missing variable, we get , which is D.
16. 96% can be represented as the fraction ; however, by dividing the numerator and denominator by 4, we can simplify the fraction down to . Therefore, the answer is B.
17. The number 40,208,000,000,000 written in scientific notation is , or B.
18. , or C.
19. The factors of 323 are 1, 17, 19, and 323. Its greatest factor other than itself is 19, or C.