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Constant rate of change

scoresvideos A rate of change is a rate that describes how one quantity changes in relation to another quantity.Constant rate is also called as uniform rate which involves something travelling at fixed and steady pace or else moving at some average speed. For example, A car travels 3 hours. It travels 30 miles in the first hour, 45 miles in the second hour and 75 miles in the third hour. Speed in the first hour = 30 miles/hourSpeed in the second hour = 45 miles/hourSpeed in the third hour = 75 miles/hourWe have three different speeds in the three hour journey.If we want to find the constant rate for the whole journey of three hours, we have to find the ratio between the total distance covered and total time taken. That is, constant rate = (30 + 45 + 75)/3 = 150/3 = 50 miles/hour Based on the above example, the formula is to find the constant speed is given below. If a person travels from A to B at some speed, say x miles per hour. He comes back from B to A at different speed, say y miles per hour. Both the ways, he covers the same distance, but at different speeds. Then, the formula is to find the constant speed for the whole journey is given below. Solved Examples Example 1 : David drove for 3 hours at a rate of 50 miles per hour, for 2 hours at 60 miles per hour and for 4 hours at a rate of 70 miles per hour. What was his constant-speed for the whole journey ?Solution :Step 1 :Formula for constant speed := Total distance/Total time takenFormula for distance : = Rate x Time Step 2 :Distance covered in the first 3 hours : = 50 x 3= 150 milesDistance covered in the next 2 hours := 60 x 2 = 120 milesDistance covered in the last 4 hours= 70 x 5 = 350 milesStep 3 :Then, total distance = 150 + 120 + 350 = 620 milestotal time = 3 + 2 + 5 = 10 hours Step 4 :So, constant speed is= Total distance/Total time taken= 620/10= 62 miles per hourExample 2 : A person travels from New York to Washington at the rate of 45 miles per hour and comes backs to the New York at the rate of 55 miles per hour. What is his constant-speed for the whole journey ? Solution : Step 1 :Here, both the ways, he covers the same distance.Then, formula for constant speed = 2xy/(x + y)Step 2 :x ----> Rate at which he travels from New York to Washington. x = 45y ----> Rate at which he travels from New York to Washington y = 55Step 3 :So, constant speed is = 2(45)(55)/(45 + 55)= 4950/100= 49.5 miles per hourExample 3 : A man takes 10 hours to go to a place and come back by walking both the ways. He could have gained 2 hours by riding both the ways. The distance covered in the whole journey is 18 miles. Find the constant speed for the whole journey if he goes by walking and comes back by riding. Solution : Step 1 :Walking + Walking = 10 hours -----> walking = 5 hoursRiding + Riding = 8 hours (Because 2 hours gained)Then, Riding = 4 hoursWalking + Riding -----> (5 + 4) = 9 hoursStep 2 :Total time taken = 9 hoursTotal distance covered = 18 miles Step 3 :So, constant speed is = Total distance/Total time taken= 18/9= 2 miles per hourExample 4 : David travels from the place A to place B at a certain speed. When he comes back from place B to place A, he increases his speed 2 times. If the constant-speed for the whole journey is 80 miles per hour, find his speed when he travels from the place A to B. Solution : Step 1 :Let 'a' be the speed from place A to B.Then, speed from place B to A = 2aStep 2 :Here, both the ways, he covers the same distance.Then, formula for constant speed = 2xy/(x + y)Step 3 :x ----> Speed from place A to Bx = ay ----> Speed from place B to Ay = 2aStep 4 :Given : Constant speed = 80 miles/hour2(a)(2a)/(a + 2a) = 804a2/3a = 804a/3 = 80a = 60Speed from place A to B is 60 miles per hour.Example 5 : Kemka is preparing 20 cups of apple juice in the first 4 minutes and 60 cups in the next 12 minutes. How many cups does she prepare per minute ? Solution : Step 1 :Total no. of cups of apple juice prepared is= 20 + 60= 80 cupsStep 2 :Total time taken is= 4 + 12= 16 minutesStep 3 :Number of cups of apple juice prepared per minute is = Total number of cups/Total time taken= 80/16= 5 Kemka prepares 5 cups of apple juice per minutes. Kindly mail your feedback to v4formath@gmail.comWe always appreciate your feedback. ©All rights reserved. onlinemath4all.com Retas paralelas são um conceito fundamental na geometria. São duas ou mais retas que, estando no mesmo plano, nunca se encontram, independentemente de quanto sejam prolongadas. Vamos explorar este conceito com mais detalhes. Definição Características Principais Mesma Inclinação: Retas paralelas têm a mesma inclinação ou coeficiente angular. Isso significa que elas se movem na mesma direção e nunca convergem ou divergem. Distância Constante: A distância entre duas retas paralelas é sempre a mesma em qualquer ponto. Exemplos no Cotidiano Trilhos de Trem Os trilhos de trem são um exemplo clássico de retas paralelas. Eles mantêm uma distância constante entre si para garantir que o trem possa se mover suavemente. Linhas em um Caderno As linhas horizontais em um caderno são projetadas para serem paralelas, ajudando a manter a escrita reta e organizada. Representação Matemática Equações de Retas Se duas retas são paralelas, suas equações podem ser representadas como: $$y = mx + c_{1}$$y=mx+c1 e $$y = mx + c_{2}$$y=mx+c2 Onde $$m$$m é o coeficiente angular (a inclinação) e $$c_{1}$$c1 e $$c_{2}$$c2 são as ordenadas na origem. O fato de $$m$$m ser o mesmo em ambas as equações confirma que as retas são paralelas. Exemplo Considere as retas dadas pelas equações $$y = 2x + 3$$y=2x+3 e $$y = 2x - 4$$y=2x−4. Ambas têm o mesmo coeficiente angular ($$m = 2$$m=2), o que indica que são paralelas. Propriedades Importantes Ângulos Correspondentes Quando duas retas paralelas são cortadas por uma transversal, os ângulos correspondentes são iguais. Isso é útil em muitas provas geométricas. Ângulos Alternados Internos Os ângulos alternados internos também são iguais quando duas retas paralelas são cortadas por uma transversal. Aplicações Práticas Engenharia e Arquitetura Na engenharia e arquitetura, o conceito de retas paralelas é crucial para garantir que estruturas sejam construídas de forma estável e simétrica. Design Gráfico Designers gráficos usam o conceito de paralelismo para criar layouts equilibrados e visualmente agradáveis. Conclusão Entender o conceito de retas paralelas é essencial não só para resolver problemas geométricos, mas também para aplicá-lo em diversas áreas práticas do nosso dia a dia. Seja em trilhos de trem, na arquitetura ou mesmo em um simples caderno, as retas paralelas desempenham um papel fundamental. AnswerVerifiedHint: In order to answer this question, you must recall the concepts and formulae of Chemical Kinetics. Use the formula for finding the rate constant of the reaction and then put all the correct values with proper units and then make the calculation accurately, and hence you will get the required answer.Complete answer:The rate constant is a proportionality factor in the rate law of chemical kinetics that relates the molar concentration of reactants to reaction rate. It is also known as the reaction rate constant or reaction rate coefficient and is indicated in an equation by the letter k. Step 1: In this step we will enlist the given quantities:The Given quantities in the question are: Time, $t\, = \,$2 \times {10^4}\,\sec $Initial concentration of the reactant, $a\, = \,800\,mol/d{m^3}$ Final concentration of the reactant, $a - x\, = \,50\,mol/d{m^3}$ Step 2: In this step we will use the General formula of rate constant and put all the values to find the required value of rate constant:$k\, = \,\,\frac{{2.303}}{t}{\log _{10}}\frac{a}{{a - x}}$ Put the values from step 1:$k\, = \,\,\frac{{2.303}}{{2 \times {{10}^4}}}{\log _{10}}\frac{{800}}{{50}}$ $k\, = \,\,1.386 \times {10^{ - 4}}\,\sec $ Hence, we got the required value of rate constant i.e. $k\, = \,\,1.386 \times {10^{ - 4}}\,\sec $ Hence the correct answer is option C.Note:The rate constant is defined as the proportionality constant which explains the relationship between the molar concentration of the reactants and the rate of a chemical reaction. The rate constant is denoted by k and is also known as reaction rate constant or reaction rate coefficient. It is dependent on the temperature. There are two possible ways to calculate rate constant and they are Using the Arrhenius equation and Using the molar concentrations of the reactants and the order of the reaction. Hello, budding mathematicians! Today, we're going to tackle the concept of the Constant Rate of Change. By understanding this, you'll have a much better grasp of mathematics, especially when dealing with linear relationships. Let's dive in! When you think of constancy, you might think of something that never changes, always remains the same. In mathematics, this constancy plays a pivotal role, especially when we talk about linear relationships. It's called the Constant Rate of Change. In mathematics, the Constant Rate of Change refers to a consistent change in the value of a quantity over a specific period of time. It's an essential concept in understanding linear relationships and is often associated with the slope of a line in graphing. The first step in determining the Constant Rate of Change is understanding the scenario. Are you dealing with a problem related to distance, time, or perhaps a financial situation? Recognize the variables involved in your situation. Next, you need to identify how much your variables change. For example, if you're dealing with a distance-time scenario, how much distance is covered over a certain period? You would subtract the initial value from the final value to find this change. After determining the change in your variables, you can now calculate the Constant Rate of Change. This is simply the ratio of the change in your dependent variable (like distance in a distance-time scenario) to the change in your independent variable (like time in the same scenario). In simpler terms, it's \(\frac{(change in\ y)}{(change in\ x)}\). For instance, if a car covers \(60\) miles in \(2\) hours, the change in distance is \(60\) miles, and the change in time is \(2\) hours. The Constant Rate of Change, or the speed of the car, would be \(\frac{60}{2} = 30\) miles per hour. That's it! You've now learned what the Constant Rate of Change is and how to calculate it. Remember, practice makes perfect, so don't hesitate to try out more examples to strengthen your understanding. Happy calculating! The rate constant is a proportionality factor in the rate law of chemical kinetics that relates the molar concentration of reactants to reaction rate. It is also known as the reaction rate constant or reaction rate coefficient and is indicated in an equation by the letter k. The rate constant, k, is a proportionality constant that indicates the relationship between the molar concentration of reactants and the rate of a chemical reaction. The rate constant may be found experimentally, using the molar concentrations of the reactants and the order of reaction. Alternatively, it may be calculated using the Arrhenius equation. The units of the rate constant depend on the order of reaction.The rate constant isn't a true constant, since its value depends on temperature and other factors. There are a few different ways to write the rate constant equation. There is a form for a general reaction, a first order reaction, and a second order reaction. Also, you can find the rate constant using the Arrhenius equation. For a general chemical reaction: aA + bB → cC + dD the rate of the chemical reaction may be calculated as: Rate = k[A]a[B]b Rearranging the terms, the rate constant is: rate constant (k) = Rate / ([A]a[B]a) Here, k is the rate constant and [A] and [B] are the molar concentrations of the reactants A and B. The letters a and b represent the order of the reaction with respect to A and the order of the reaction with respect to b. Their values are determined experimentally. Together, they give the order of the reaction, n: a + b = n For example, if doubling the concentration of A doubles the reaction rate or quadrupling the concentration of A quadruples the reaction rate, then the reaction is first order with respect to A. The rate constant is: k = Rate / [A] If you double the concentration of A and the reaction rate increases four times, the rate of the reaction is proportional to the square of the concentration of A. The reaction is second order with respect to A. k = Rate / [A]2 The rate constant may also be expressed using the Arrhenius equation: k = Ae-Ea/RT Here, A is a constant for the frequency of particle collisions, Ea is the activation energy of the reaction, R is the universal gas constant, and T is the absolute temperature. From the Arrhenius equation, it is apparent that temperature is the main factor that affects the rate of a chemical reaction. Ideally, the rate constant accounts for all of the variables impacting reaction rate. The units of the rate constant depend on the order of reaction. In general, for a reaction with order a + b, the units of the rate constant are mol1−(m+n)·L(m+n)−1·s−1 For a zero order reaction, the rate constant has units molar per second (M/s) or mole per liter per second (mol·L−1·s−1)For a first order reaction, the rate constant has units of per second of s-1For a second order reaction, the rate constant has units of liter per mole per second (L·mol−1·s−1) or (M−1·s−1)For a third order reaction, the rate constant has units of liter squared per mole squares per second (L2·mol−2·s−1) or (M−2·s−1) For higher order reactions or for dynamic chemical reactions, chemists apply a variety of molecular dynamics simulations using computer software. These methods include Divided Saddle Theory, the Bennett Chandler procedure, and Milestoning. Despite its name, the rate constant isn't actually a constant. It only holds true at a constant temperature. It's affected by adding or changing a catalyst, changing the pressure, or even by stirring the chemicals. It doesn't apply if anything changes in a reaction besides the concentration of the reactants. Also, it doesn't work very well if a reaction contains large molecules at a high concentration because the Arrhenius equation assumes reactants are perfect spheres that perform ideal collisions. Connors, Kenneth (1990). Chemical Kinetics: The Study of Reaction Rates in Solution. John Wiley & Sons. ISBN 978-0-471-72020-1. Daru, János; Stirling, András (2014). "Divided Saddle Theory: A New Idea for Rate Constant Calculation". J. Chem. Theory Comput. 10 (3): 1121–1127. doi:10.1021/ct400970y Isaacs, Neil S. (1995). "Section 2.8.3". Physical Organic Chemistry (2nd ed.). Harlow: Addison Wesley Longman. ISBN 9780582218635. IUPAC (1997). (Compendium of Chemical Terminology2nd ed.) (the "Gold Book"). Laidler, K. J., Meiser, J.H. (1982). Physical Chemistry. Benjamin/Cummings. ISBN 0-8053-5682-7. Janae Pritchett and Anton Kriksunov contributed Contents The tile pattern below is growing by three tiles per figure. Therefore, the tile pattern has a growth rate of 3. InputOutput 011 35 51 8-5 The rate of change between the pairs \((0,11)\) and \((3,5)\) is \(\dfrac{11-5}{0-} = \dfrac{6}{-3}=-2.\) The rate of change between the pairs \((3,5)\) and \((5,1)\) is \(\dfrac{5-1}{3-5} = \dfrac{4}{-2}=-2.\) The rate of change between the pairs \((5,1)\) and \((8,-5)\) is \(\dfrac{1-(-5)}{5-8} = \dfrac{6}{-3}=-2.\) The relationship is linear with a rate of change of -2. The slope of a line shows the rate of change in a linear relationship. For example, the graph below shows a rate of change of 10 liters per second. The slope of the line is \(\frac{10}{1}=10.\) We can see that car A travels about 50 miles on one gallon of gas, car B travels about 30 miles on one gallon of gas, and car C travels about 10 miles on one gallon of gas. Equations of lines in the form \(y=mx+b\) represent linear functions with constant rates of change. The rate of change in the relationship is represented by \(m.\) In pattern B the number of dots, \(y,\) in figure \(x\) is given by \(y=7x+6.\) Which dot pattern is growing more quickly? In order to continue enjoying our site, we ask that you confirm your identity as a human. Thank you very much for your cooperation. Calcular medidas em triângulos é uma parte essencial da geometria. Existem várias fórmulas e teoremas que ajudam a encontrar comprimentos de lados, ângulos e áreas de triângulos. Vamos explorar os métodos mais comuns. Teorema de Pitágoras O Teorema de Pitágoras é usado em triângulos retângulos, onde um ângulo é de 90 graus. Ele afirma que o quadrado da hipotenusa (o lado oposto ao ângulo reto) é igual à soma dos quadrados dos outros dois lados. $$c^{2} = a^{2} + b^{2}$$c2=a2+b2 Por exemplo, se um triângulo tem lados de 3 cm e 4 cm, a hipotenusa será: $$c = \sqrt{3^{2} + 4^{2}} = \sqrt{9 + 16} = \sqrt{25} = 5 \, cm$$c=32+42=9+16=25=5cm Lei dos Senos A Lei dos Senos é útil quando você conhece dois ângulos e um lado, ou dois lados e um ângulo oposto a um deles. Ela é expressa como: $$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)}$$sin(A)a=sin(B)b=sin(C)c Se você conhece os ângulos A e B e o lado a, pode encontrar b e c usando essa fórmula. Lei dos Cossenos A Lei dos Cossenos é útil para encontrar um lado ou ângulo em triângulos não retângulos. A fórmula é: $$c^{2} = a^{2} + b^{2} - 2ab \cos(C)$$c2=a2+b2−2abcos(C) Por exemplo, se você conhece os lados a, b e o ângulo C, pode encontrar o lado c. Área de um Triângulo Existem várias maneiras de calcular a área de um triângulo: Fórmula Básica Para um triângulo com base (b) e altura (h), a área é: $$A = \frac{1}{2} \times b \times h$$A=21×b×h Fórmula de Heron Para um triângulo com lados a, b e c, use a Fórmula de Heron: $$s = \frac{a + b + c}{2}$$s=2a+b+c $$A = \sqrt{s(s - a)(s - b)(s - c)}$$A=s(s−a)(s−b)(s−c) Usando Senos Se você conhece dois lados e o ângulo entre eles, a área é: $$A = \frac{1}{2} \times a \times b \times \sin(C)$$A=21×a×b×sin(C) Conclusão Compreender essas fórmulas e teoremas é crucial para resolver problemas envolvendo triângulos. Pratique usando diferentes combinações de lados e ângulos para ganhar confiança. A constant rate in math is the absence of acceleration. In general, a function with a constant rate is one with a second derivative of 0. If you were to plot the function on standard graph paper, it would be a straight line, as the change in y (or rate) would be constant. 2. How do you find the rate? To find the unit rate, divide the numerator and denominator of the given rate by the denominator of the given rate. So in this case, divide the numerator and denominator of 70/5 by 5, to get 14/1, or 14 students per class, which is the unit rate. 3. What does it mean to have a constant rate of change? When the value of x increases, the value of y remains constant. That is, there is no change in y value and the graph is a horizontal line. Example: Use the table to find the rate of change. Then graph it. 4. How do you figure out the rate of something? To find the number of hours she will work in 12 weeks, write a ratio equal to 60/3 that has a second term of 12. Tonya will work 240 hours in 12 weeks. You could also solve this problem by first finding the unit rate and multiplying it by 12. 5. What is a constant rate of change in math? A constant rate of change refers to a consistent change between two variables. In simpler terms, it means that as one variable increases or decreases, the other changes at a consistent, predictable rate. This concept is foundational in understanding linear relationships, where the graph of the relationship is a straight line. For example, if you earn $10 for every hour worked, the rate of change between time and money earned is constant: $10 per hour. In Grade 7 math, understanding this concept is essential for learning how to analyze and interpret linear relationships and how to represent them using tables, graphs, and equations. 6. How do you calculate the constant rate of change from a table? Choose two data points from the table. Subtract the values of the dependent variable (usually y) to find the change in y. Subtract the values of the independent variable (usually x) to find the change in x. Divide the change in y by the change in x: Constant Rate of Change = Δy/Δx If the result is the same for all pairs of data points, the rate of change is constant. 7. How do you determine if a relationship has a constant rate of change? From a table: Check if the ratio of change in y to change in x remains the same across all pairs. From a graph: If the graph is a straight line, the relationship has a constant rate of change. From an equation: If the equation is in the form y = mx + b, where m is a constant, the rate of change is constant. For example, in the equation y = 4x + 2, the rate of change is 4. 8. What does the constant rate of change tell us about a graph? A constant rate of change on a graph indicates that the line is straight, meaning the relationship between the variables is linear. The slope of this line represents the rate of change. If the slope is positive, the line rises from left to right. If it's negative, the line falls. A constant rate of change helps us predict future values and understand the behavior of variables over time. 9. Why is understanding the constant rate of change important in real life? The concept of constant rate of change is important in real life because it appears in many everyday situations, such as: Speed: If a car travels at 60 miles per hour, the rate of change between time and distance is constant. Wages: If a worker earns $15 per hour, the earnings change at a constant rate with respect to hours worked. Cooking: If you add one cup of water for every two cups of rice, the ratio remains constant. Recognizing and interpreting constant rates of change helps in budgeting, planning, and problem-solving in real-world scenarios. 10. How does the constant rate of change relate to slope? The constant rate of change and the slope of a line mean the same thing in a linear relationship. In math, the slope is defined as: Slope (m) = Change in y / Change in x This is identical to the formula used to calculate the constant rate of change. So, when you determine a constant rate of change from a table or graph, you're essentially finding the slope of the line that represents the relationship between variables. 11. Can a graph have a constant rate of change of zero? Yes, a graph can have a constant rate of change of zero. This occurs when the dependent variable y does not change as the independent variable x increases. The result is a horizontal line, which indicates no change in output regardless of input. For example, the equation y = 5 has a rate of change of zero because y always equals 5, no matter what x is. 12. What are some common examples of constant rate of change in Grade 7 problems? Here are some typical examples students encounter in Grade 7 math: Distance traveled over time at a constant speed Amount earned at a consistent hourly wage Temperature change per hour Water filling into a tank at a constant rate Each of these scenarios involves a situation where one quantity increases or decreases in relation to another at a steady pace, making them ideal for understanding constant rates of change. 13. What is the difference between constant and variable rate of change? A constant rate of change means the relationship between two variables is linear and the rate of change is the same throughout. A variable rate of change means the rate is not consistent. The relationship could be exponential, quadratic, or some other non-linear form. For example: Constant: A taxi charges $2 per mile. Variable: A taxi charges a $5 base fare plus $2 per mile. 14. How do you identify a constant rate of change from a graph? Look for a straight line. Check the slope between any two points on the line. If the slope remains the same, the graph shows a constant rate of change. The steeper the line, the greater the rate of change. 15. What skills should 7th-grade students master related to constant rate of change? Identify a constant rate of change from tables, graphs, and equations. Interpret real-world problems involving a constant rate. Understand slope as a measure of the rate of change. Write and solve equations involving linear relationships. Connect proportional relationships to the concept of constant rate of change. 16. What are some tips for solving constant rate of change problems in 7th grade math? Always label your variables clearly. Use the formula Δy/Δx to check for consistency. Plot points when possible to visualize the relationship. In word problems, identify the two variables being compared. Double-check units (e.g., miles per hour, dollars per hour) to ensure your interpretation is correct. 17. How can students practice the constant rate of change online? Students can practice this concept online using interactive tools, worksheets, and sample questions provided on educational websites like Lumos Learning's Constant Rate of Change. These platforms often include: Interactive practice quizzes Graphing tools Step-by-step explanations Real-world application problems 18. What are some keywords associated with the constant rate of change concept? Some relevant keywords that are often used in math standards and assessments include: Slope Linear relationship Rate Ratio Table of values Graphing lines Proportional relationships Equation of a line Real-world applications Dependent and independent variables These keywords are helpful for test preparation and understanding curriculum standards. 19. How does understanding the constant rate of change help in higher math? Mastering the concept of constant rate of change lays the groundwork for: Algebra (working with linear equations and inequalities) Geometry (understanding slope and intercepts) Calculus (exploring variable rates of change) Physics and economics (modeling motion and cost functions) Understanding this topic early on makes it easier to grasp more complex mathematical ideas later. 20. Are there any standard math curriculum standards aligned with this concept? Yes, the constant rate of change aligns with Common Core State Standards (CCSS) for Grade 7, specifically: CCSS.MATH.CONTENT.7.RP.A.2: Recognize and represent proportional relationships between quantities. CCSS.MATH.CONTENT.7.RP.A.2B: Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions. 21. What is the difference between constant rate of change and constant of proportionality? Though related, they are not the same: Constant rate of change applies to any linear relationship, whether or not it passes through the origin. Constant of proportionality is the constant rate of change in a proportional relationship, where y = kx and the graph passes through the origin (0,0). All proportional relationships have a constant rate of change, but not all constant rates of change are proportional. 22. Can a non-linear relationship have a constant rate of change? No. By definition, a non-linear relationship has a variable rate of change. That means the rate at which one variable changes in relation to another is not consistent. Non-linear relationships result in curved graphs rather than straight lines. 23. How is the constant rate of change used in science and technology? In fields like science and technology, the constant rate of change is used to model and predict behavior: Physics: Measuring constant velocity Chemistry: Reaction rates Engineering: Stress and strain under uniform load Computer Science: Algorithmic performance over time Understanding how two variables relate at a steady rate allows scientists and engineers to create models and forecasts. 24. What are some common mistakes students make when working with a constant rate of change? Common errors include: Dividing x by y instead of y by x Not checking for consistency across all data pairs Misinterpreting the graph's direction (e.g., thinking a downward slope is increasing) Mixing up proportional and linear relationships Forgetting to include units in rate descriptions Careful reading of questions and double-checking work can help avoid these mistakes.