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Misfit Mama Bear Haven is reader supported. This means that when you purchase through affiliate links on this site, I may receive a small commission, at no cost to you. Misfit Mama Bear Haven is a participant in the Amazon Services LLC Associates Program, an affiliate advertising program designed to provide a means for sites to earn advertising fees by advertising and linking to amazon.com. As we have been changing up some of our homeschool routine, we recently added IXL Learning to the mix. Before having the opportunity to review of IXL, I heard great things from a few friends who used it with their kids for math, language arts, social studies, and science. My friends were not wrong! IXL has been a super beneficial edition to our homeschool mix! For this review, I will be sharing about the IXL Annual Membership which we received for each of the older kids in exchange for this honest review. What is IXL? IXL is a comprehensive K-12 curriculum providing education for Language Arts, Math, Science, Social Studies, and even Spanish! It is adaptive in that it adjusts its difficulty to fit your child's needs. It's interactive and offers incentives to your child to keep going. For homeschooling families, it works as a nice addition to your homeschooling routine as it provides a way for your child to get extra practice on various subjects. You can also get notifications via email and can track your child's progress via the website. If you are concerned about state standards, IXL is a super handy tool to have at your disposal because this program is set to state standards. We were provided an annual membership for each of my older kids to IXL. How We Use It with Bubby My son has been using IXL primarily to help with his math capabilities. While he excels at many subjects, math has not come to him naturally. He hopes to go into engineering someday, so he wants to do all he can to catch up and excel in math. Currently he is at 8th/9th level with most of his subjects. He has been using it to test his math skills and find out where he needs more practice. He actually looks forward to spending time every day doing this, and he loves the rewards system. He says it is easy to use, and he likes the interface. How we Use it with Sissy My older daughter is at a 6th/7th grade level with her subjects. She mostly uses IXL for Language Arts and Math practice. She loves the pins, and she says that getting a new pin is motivation for her to do more. She uses IXL for practice, and I don't even have to tell her to get on the computer and do it. She likes it enough to log on independently. She also likes how simple it is to use. Final Thoughts I love using IXL as a tool to enhance the kids' education. The design, structure and fact that they teach state standards helps my kids learn and gain confidence in learning. While we don't use this as a core curriculum, having this as a supplement has helped my kids enhance their skills and gain confidence! You can find out more by checking out their website and also finding them on Facebook, Pinterest, Twitter, and You Tube. Also, don't forget to check out some of the other reviews by the Homeschool Review Crew about IXL Learning! Skip to content Home>Simplifying Expressions – Tricks & Examples GCSE Tutoring Programme Our chosen students improved 1.19 of a grade on average - 0.45 more than those who didn't have the tutoring. Teacher-trusted tutoring Here is everything you need to know about simplifying algebraic expressions for GCSE maths (Edexcel, AQA and OCR). You'll learn how to collect like terms, write and simplify expressions, and how to simplify algebraic fractions. Look out for the simplifying expressions worksheets with correct answers, word problems and exam questions at the end. Simplifying an algebraic expression is when we use a variety of techniques to make algebraic expressions more efficient and compact – in their simplest form – without changing the value of the original expression. Get your free simplifying expressions worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE x Get your free simplifying expressions worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE To simplify expressions first expand any brackets, next multiply or divide any terms and use the laws of indices if necessary, then collect like terms by adding or subtracting and finally rewrite the expression. For example to simplify 2Collect like terms \ [\begin{aligned} 8 x+6 x&=14 x \\ 4-9&=-5 \end{aligned} \] 3Rewrite the expression \[\begin{aligned}8 x+4+3(2 x-3) \\ =14 x-5\end{aligned} \] In order to simplify an algebraic expression we need to 'collect the like terms' by grouping together the terms that are similar: When we highlight the like terms, we must include the sign in front of the term and where necessary identify the negative numbers. Like terms have the same combination of variables and/or numbers as each other, but the coefficients could be different. For example… 4 and 9 are like terms ✔ 3x and 5x are like terms ✔ 2ab and -5ab are like terms ✔ BUT 8 and 3x are not like terms ✘ 4y and 2x are not like terms ✘ x2 and x are not like terms ✘ Example of collecting like terms 1 Identify the like terms The terms involving x are like terms. The terms involving y are like terms. The constant terms are like terms. The plus (or minus) sign belongs to the term before it. 2 Group the like terms 3 Combine the like terms by adding or subtracting \begin{aligned} 5 x-2 x=3 x \\\ 3 y+8 y=11 y \\\ 4-7=-3 \end{aligned} So, \begin{aligned} 5 x+3 y+4-2 x+8 y-7 \\\\ =3 x+11 y-3 \end{aligned} Step-by-step guide: Collecting like terms Example of multiplying and dividing algebra \[\frac{3 a b \times 4 a c}{2 a}\] 1 Simplify the numerator \[3 a b \times 4 a c=12 a^{2} b c\] 2 Divide by the denominator \[12 a^{2} b c \div 2 a=6 a b c\] So, \[\frac{3 a b \times 4 a c}{2 a}=6 a b c\] Example of expanding brackets: 1 Multiply the term outside of the bracket by the first term inside the bracket 2 Multiply the term outside the bracket by the second term inside the bracket. So, Step-by-step guide: Expanding brackets See also: Expand and simplify Example of algebraic fractions Simplify 1 Find the highest common factor (HCF) of the numerator and denominator. The HCF of 12xy and 8x is 4x 2 Divide the numerator and the denominator by this value. Numerator Denominator 3 Rewrite the simplified fraction Step-by-step guide: Algebraic fractions See also: Simplifying algebraic fractions We can write algebraic expressions to help simplify problems. We will often be able to make a linear equation or a quadratic equation and solve it. Example of writing and simplifying expressions Write an expression for the perimeter of the shape. Read the question carefully and highlight the key information. Key words: Expression: a set of terms that are combined using (+, −, × and ÷) Perimeter: the distance around the edge of a shape We need to add together each of the lengths of the shape. 2Write an expression and simplify. We then simplify the following expression by adding and subtracting the terms. \[\begin{aligned} Perimeter&=\color{#00BC89}{2x}\color{#7C4DFF}{+3}\color{#00BC89}{+x}\color{#7C4DFF}{-2}\color{#00BC89}{+2x}\color{#7C4DFF}{+3}\color{#00BC89}{+x}\color{#7C4DFF}{-2}\\ &=\color{#00BC89}{6x}\color{#7C4DFF}{+2} \end{aligned}\] Simplify Underline the similar terms in the expression and combine them. \begin{aligned}8 x-2 x=6 x \\\\ 5+6=11 \end{aligned} 2Rewrite the expression. \begin{aligned} 8 x+5-2 x+6 \\\ =6 x+11 \end{aligned} Simplify Underline the similar terms in the expression \begin{aligned} 5 x y-2 x y=3 x y \\\ 3 y-8 y=-5 y \\\ -4+7=3 \end{aligned} \begin{aligned} 5 x y+3 y-4-2 x y-8 y+7 \\\\ =3 x y-5 y+3 \end{aligned} Expand: \[3 x\left(3-2 y+5 x^{2}\right)\] Multiply the term outside of the bracket by the first term inside the bracket Multiply the term outside the bracket by the second term inside the bracket. \[3 x \times-2 y=-6 x y\] Multiply the term outside the bracket by the third term inside the bracket. \[3 x \times 5 x^{2}=15 x^{3}\] So, \begin{aligned} 3 x\left(3-2 y+5 x^{2}\right) \\\\ =9 x-6 x y+15 x^{3} \end{aligned} Simplify \[\frac{9x^{2}y}{15x^{3}}\] Find the highest common factor (HCF) of the numerator and denominator. The HCF of 9 x2 y and 15x3 is Divide the numerator and the denominator by this value. Numerator \[9 x^{2} y \div 3 x^{2}=3 y\] Denominator \[15 x^{3} \div 3 x^{2}=5 x\] Rewrite the simplified fraction \[\frac{9x^{2}y}{15x^{3}}\] Simplify \[\frac{8x^{3}-6xy}{4x^{2}y}\] Find the highest common factor (HCF) of the numerator and denominator. It is easier to find the HCF for this example if we factorise the numerator. 8x3 − 6xy can be written as 2x(4x2 − 3y). It is now easier to see that the HCF of 8x3 − 6xy and 4x2y is 2x Divide the numerator and the denominator by this value. Numerator \[\left(8 x^{3}-6 x y\right) \div 2 x=4 x^{2}-3 y\] We have to divide both terms by 2x Denominator \[4 x^{2} y \div 2 x=2 x y\] Rewrite the simplified fraction \[\frac{8x^{3}-6xy}{4x^{2}y}\] \[=\frac{4x^{2}-3y}{2xy}\] Simplify \[=\frac{x^{2}-2x-15}{x^{2}-9}\] We will need to factorise quadratics to simplify this algebraic fraction Fully factorise the numerator and the denominator Numerator \[x^{2}-2 x-15=(x+3)(x-5)\] Denominator Cancel any brackets that are common to the numerator and denominator \[=\frac{\color{#FF0C3E}{(x+3)}\color{#62F030}{(x-5)}}{\color{#FF0C3E}{(x+3)}\color{#92009E}{(x-3)}}\] Rewrite the simplified fraction \[\frac{x^{2}-2 x-15}{x^{2}-9}\] Step-by-step guide: Factorising quadratics Step-by-step guide: Difference of two squares Write an expression for the area of the shape. Read the question carefully and highlight the key information. Key words: Expression: a set of terms that are combined using (+, −, × and ÷) Area: the 2D space inside a shape. This shape is a triangle. We know the formula to find the area of a triangle is: \ [\text { Area of triangle }=\frac{\text { base } \times \text { height }}{2}\] We need to multiply the base and height of the shape then divide by 2. Write an expression and simplify. \[\frac{(2x+2)(3x+2)}{2}\] \[= \frac{6x^{2}+10x+4}{2}\] Sophie is x years old, Emily is three years younger than Sophie Ameila is four times older than Sophie. Write an expression for each of their ages. Read the question carefully and underline the key information. We are told that Sophie is x years old Emily is three years younger than Sophie, so three less than x is x − 3 Ameila is four times older than Sophie, so four lots of x − 3 is 4(x − 3). We need brackets because we are multiplying all of x − 3 by 4 Write an expression and simplify. Sophie is x years old Emily is x − 3 years old Ameila is 4(x − 3) = 4x − 12 years old The sign in front of the term is part of it When we underline the like terms, we must include the sign in front of the Terms with a coefficient of 1 For terms with a coefficient of 1 we don't need to write the 1 \begin{aligned} 1x&=x\\ 1ab&=ab\\ 1y^{2}&=y^{2}\\ \end{aligned} When adding and multiplying, the order in which we calculate doesn't matter and This is not the case for subtracting and dividing. In order for two terms to be 'like terms' they need the same combination of variables. 3x2and 5x2are like terms 2a2b and -5a2bare like terms BUT 3x2and 5x are not like terms 2a2b and -5ab are not like terms Using brackets (parentheses) When multiplying an expression by a value we need to use brackets so that each term is multiplied. For the constant terms, we have 7-9=-2 For the variable terms, we have 2a+6a=8a This means 7+2a-9+6a=-2+8a By considering like terms, we have 8ab-7ab=ab and -8a-3a=-11a . This means 8ab-8a-7ab-3a=ab-11a . By considering like terms, we have -2xy-6xy=-8xy and 3x^{2}y+5x^{2}y=8x^{2}y and 7x . This means -2xy+3x^{2}y+7x+5x^{2}y-6xy=-8xy+8x^{2}y+7x . By working out the missing side lengths as algebraic expressions, and adding together all side lengths we have: Perimeter =2 x+5+x+1+x+3+x+5+x+2+2 x+6 =8 x+22 The shape can be split into rectangles in more than one way (2x+5)(x+1)=2x^{2}+7x+5 (x+5)(x+2)=x^{2}+7x+10 Area=3x^{2}+14x+15 OR (x+1)(x+3)=x^{2}+4x+3 (2x+6)(x+2)=x^{2}+10x+12 Area=3x^{2}+14x+15 Steve's age = x Rachel's age = x+11 Barry's age = 2(x+11)=2x+22 Total ages =x+x+11+2x+22 \\ & =4x+33 \end{aligned} [/katex] The highest common factor of the numerator and denominator is 6 , so we divide numerator and denominator by 6 , resulting in the simplified fraction. The highest common factor of the numerator and denominator is 4ab , so we divide numerator and denominator by 4ab , resulting in the simplified fraction. \frac{3a(3a-2b)}{15ab^{2}} \frac{3a^{2}-2ab}{5ab^{2}} The numerator can be factorised, giving \frac{3a(3a-2b)}{15ab^{2}} after which the numerator and denominator can be divided by the highest common factor of 3a , resulting in the simplified fraction. We can factorise the numerator and denominator into double brackets, giving \frac{(x+1)(x+2)}{(x+1)(2x-1)} and then cancel the common bracket from numerator and denominator, which results in the simplified fraction. With a single bracket expansion, we must be sure to multiply each term inside the bracket by the number in front of the bracket. Make sure to include the correct index numbers. 1. Simplify: 4f – 2e + 3f + 5e (2 marks) 2. Expand and simplify: 4a(a + b) – 2(a2 – 2b) (2 marks) 4. Expand and simplify: \[\frac{2x^{2}+7x-4}{x^{2}+2x-8}\] (3 marks) Simplify and manipulate algebraic expressions to maintain equivalence by taking out common factors. Model situations or procedures by translating them into algebraic expressions. Simplify and manipulate algebraic expressions and algebraic fractions. Translate simple situations or procedures into algebraic expressions. Factorising Solving equations Simultaneous equations Rearranging equations Prepare your KS4 students for maths GCSEs success with Third Space Learning. Weekly online one to one GCSE maths revision lessons delivered by expert maths tutors. Find out more about our GCSE maths tuition programme. We use essential and non-essential cookies to improve the experience on our website. Please read our Cookies Policy for information on how we use cookies and how to manage or change your cookie settings.AcceptPrivacy & Cookies Policy Simplify: to make simpler! One of the big jobs we do in Algebra is simplification. You will often be asked to put something "in simplest form" What is the Simplest Form? In general, it is simpler when it is easier to use. And: Start with: 3 6 Simplify the fraction by dividing top and bottom by 3: 1 2 "Half" is definitely simpler than "three sixths", unless it is important to know that something was cut into sixths. And: And: Start with: 2x2 − 6x + 2 x − 3 Polynomial long division: 2x + 2 x − 3 And: Start with: x2 − 2x − 3 Factoring: (x−3)(x+1) That last example can be argued with! Some people say to remove parentheses to make it "simpler", but (x−3)(x+1) is usually a lot easier to use. The moral of the story: "Simplified" is sometimes obvious, but can also depend on what you want to do. How to Simplify There are many ways to simplify! When we simplify we use similar skills to solving equations, and that page has some good advice. Some of these things might help: And Which Is Simpler Here? Here is one more interesting case: This: 1√2 seems simple enough But this: √22 has a rationalized denominator (normally considered simpler, and preferred by teachers!) Which is simpler? You decide! 8709, 8710, 8711, 8712, 8713, 8714, 8715, 8716, 8717, 8718, 8719, 8720 Copyright © 2024 Rod Pierce Simplifying expressions mean rewriting the same algebraic expression with no like terms and in a compact manner. To simplify expressions, we combine all the like terms and solve all the given brackets, if any, and then in the simplified expression, we will be only left with unlike terms that cannot be reduced further. Let us learn more about simplifying expressions in this article. How to Simplify Expressions? Before learning about simplifying expressions, let us quickly go through the meaning of expressions in math. Expressions refer to mathematical statements having a minimum of two terms containing either numbers, variables, or both connected through an addition/subtraction operator in between. The general rule to simplify expressions is PEMDAS - stands for Parentheses, Exponents, Multiplication, Division, Addition, Subtraction. In this article, we will be focussing more on how to simplify algebraic expressions. Let's begin! We need to learn how to simplify expressions as it allows us to work more efficiently with algebraic expressions and ease out our calculations. To simplify algebraic expressions, follow the steps given below: Step 1: Solve parentheses by adding/subtracting like terms inside and by multiplying the terms inside the brackets with the factor written outside. For example, 2x (x + y) can be simplified as 2x2 + 2xy. Step 2: Use the exponent rules to simplify terms containing exponents. Step 3: Add or subtract the like terms. Step 4: At last, write the expression obtained in the standard form (from highest power to the lowest power). Let us take an example for a better understanding. Simplify the expression: x (6 – x) – x (3 – x). Here, there are two parentheses both having two unlike terms. So, we will be solving the brackets first by multiplying x to the terms written inside. x(6 - x) can be simplified as 6x - x2, and -x(3 - x) can be simplified as -3x + x2. Now, combining all the terms will result in 6x - x2 - 3x + x2. In this expression, 6x and -3x are like terms, and -x2 and x2 are like terms. So, adding these two pairs of like terms will result in (6x - 3x) + (-x2 + x2). By simplifying it further, we will get 3x, which will be the final answer. Therefore, x (6 – x) – x (3 – x) = 3x. Look at the image given below showing another simplifying expression example. Rules for Simplifying Algebraic Expressions The basic rule for simplifying expressions is to combine like terms together and write unlike terms as it is. Some of the rules for simplifying expressions are listed below: To add two or more like terms, add their coefficients and write the common variable with it. Use the distributive property to open up brackets in the expression which says that a (b + c) = ab + ac. If there is a negative sign just outside parentheses, change the sign of all the terms written inside that bracket to simplify it. If there is a 'plus' or a positive sign outside the bracket, just remove the bracket and write the terms as it is, retaining their original signs. Simplifying Expressions with Exponents To simplify expressions with exponents is done by applying the rules of exponents on the terms. For example, (3x2)(2x) can be simplified as 6x3. The exponent rules chart that can be used for simplifying algebraic expressions is given below: Zero Exponent Rule a0 = 1 Identity Exponent Rule a1 = a Product Rule am × an = am+n Quotient Rule am/an = am-n Negative Exponents Rule a-m = 1/am; (a/b)-m = (b/a)m Power of a Power Rule (am)n = amn Power of a Product Rule (ab)m = ambm Power of a Quotient Rule (a/b)m = am/bm Example: Simplify: 2ab + 4b (b2 - 2a). To simplify this expression, let us first open the bracket by multiplying 4b to both the terms written inside. This implies, 2ab + 4b (b2) - 4b (2a). By using the product rule of exponents, it can be written as 2ab + 4b3 - 8ab, which is equal to 4b3 - 6ab. This is how we can simplify expressions with exponents using the rules of exponents. Simplifying Expressions with Distributive Property Distributive property states that an expression given in the form of x (y + z) can be simplified as xy + xz. It can be very useful while simplifying expressions. Look at the above examples, and see whether and how we have used this property for the simplification of expressions. Let us take another example of simplifying 4(2a + 3a + 4) + 6b using the distributive property. Therefore, 4(2a + 3a + 4) + 6b is simplified as 20a + 6b + 16. Now, let us learn how to use the distributive property to simplify expressions with fractions. Simplifying Expressions with Fractions When fractions are given in an expression, then we can use the distributive property and the exponent rules to simplify such expression. For example, 1/2 (x + 4) can be simplified as x/2 + 2. Let us take one more example to understand it. Example: Simplify the expression: 3/4x + y/2 (4x + 7). By using the distributive property, the given expression can be written as 3/4x + y/2 (4x) + y/2 (7). Now, to multiply fractions, we multiply the numerators and the denominators separately. So, y/2 × 4x/1 = (y × 4x)/2 = 4xy/2 = 2xy. And, y/2 × 7/1 = 7y/2. Therefore, 3/4x + y/2 (4x + 7) = 3/4x + 2xy + 7y/2. All three are unlike terms, so it is the simplified form of the given expression. While simplifying expressions with fractions, we have to make sure that the fractions should be in the simplest form and only unlike terms should be present in the simplified expression. For an instance, (2/4)x + 3/6y is not the simplified expression, as fractions are not reduced to their lowest form. On the other hand, x/2 + 1/2y is in a simplified form as fractions are in the reduced form and both are unlike terms. ► Related Topics: Check these interesting articles related to the concept of simplifying expressions in math. Example 1: Find the simplified form of the expression formed by the following statement: "Addition of k and 8 multiplied by the subtraction of k from 16". Solution: From the given statement, the expression formed is (k + 8)(16 - k). To simplify this expression, we need to use the concept of multiplication of algebraic expressions. By using the distributive property of simplifying expression, it can be simplified as, ⇒ k (16 - k) + 8 (16 - k) ⇒ 16k - k2 + 128 - 8k ⇒ - k2 + 16k - 8k + 128 ⇒ - k2 + 8k + 128 Therefore, - k2 + 8k + 128 is the simplified form of the given expression. Example 2: Simplify the expression: 4ps - 2s - 3(ps +1) - 2s . Solution: By using the rules of simplifying expressions, 4ps - 2s - 3(ps +1) - 2s can be simplified as, ⇒ 4ps - 2s - 3(ps +1) - 2s ⇒ 4ps - 2s - 3ps - 3 - 2s ⇒ 4ps - 3ps - 2s - 2s - 3 ⇒ ps - 4s - 3 Therefore, 4ps - 2s - 3(ps +1) - 2s = ps - 4s - 3. Example 3: Daniel bought 5 pencils each costing $x, and Victoria bought 6 pencils each costing $x. Find the total cost of buying pencils by both of them. Solution: Given, Daniel bought 5 pencils each for $x. The cost of all 5 pencils = $5x. And, Victoria bought 6 pencils each for $x, so the cost of 6 pencils = $6x. Therefore, the total cost of pencils bought by them = $5x + $6x = $11x. View Answer > go to slidego to slidego to slide Great learning in high school using simple cues Indulging in rote learning, you are likely to forget concepts. With Cuemath, you will learn visually and be surprised by the outcomes. Book a Free Trial Class FAQs on Simplifying Expressions In math, simplifying expressions is a way to write an expression in its lowest form by combining all like terms together. It requires one to be familiar with the concepts of arithmetic operations on algebraic expressions, fractions, and exponents. We follow the same PEMDAS rule to simplify algebraic expressions as we do for simple arithmetic expressions. Along with PEMDAS, exponent rules, and the knowledge about operations on expressions also need to be used while simplifying algebraic expressions. What Mathematical Concepts are Important in Simplifying Expressions? The mathematical concepts that are important in simplifying algebraic expressions are given below: What are the Rules for Simplifying Expressions? The rules for simplifying expressions are given below: Follow the PEMDAS rule to determine the order of terms to be simplified in an expression. Distributive property can be used to simplify the multiplication of two terms in an algebraic expression. Exponent rules can be used to simplify terms with exponents. First, we open the brackets, if any. Then we simplify the terms containing exponents. After that, combine all the like terms. The simplified expression will only have unlike terms connected by addition/subtraction operators that cannot be simplified further. How to do Simplifying Expressions? Follow the steps given below to learn how to simplify expressions: Open up brackets, if any. If there is a positive sign outside the bracket, then remove the bracket and write all the terms retaining their original signs. If there is a negative sign outside the bracket, then remove the bracket and change the signs of all the terms written inside from + to -, and - to +. And if there is a number or variable written just outside the bracket, then multiply it with all the terms inside using the distributive property. Use exponent rules to simplify terms with exponents, if any. Add/subtract all like terms. Write the simplified expression in the standard form (from the highest power term to the lowest power term). How do Simplifying Expressions and Solving Equations Differ? Equations refer to those statements that have an equal to "=" sign between the term(s) written on the left side and the term(s) written on the right side. Solving equations mean finding the value of the unknown variable given. On the other hand, simplifying expressions mean only reducing the expression to its lowest form. It does not intend to find the value of an unknown quantity. What is an Example of Simplifying Expressions? Simplifying algebraic expressions refer to the process of reducing the expression to its lowest form. An example of simplifying algebraic expressions is given below: 2x + 6x (y - 7) - 8 = 2x + 6xy - 42x - 8 = 6xy - 40x - 8 Have you ever tried to assemble a jigsaw puzzle with missing pieces and pondered how to find which pieces fit where? Welcome into the realm of algebra! In an amazing mathematical puzzle, letters and symbols take place of unknown numbers. This fundamental branch of mathematics helps us to apply mathematical equations and formulas to visually represent real-world problems. Algebra is there to assist you in everything from determining your monthly budget to calculating how long it takes to get anywhere to even developing a computer program. Origin of Algebra: Algebra originated in ancient Egypt and Babylonia. Algebra comes from an Arabic term meaning "restoration" or "completion." Often credited with giving algebra its name, Diophantus in Greece, Brahmagupta in India, and al-Khwarizmi in Baghdad made significant contributions. What is algebra? Algebra, then, is essentially a branch of mathematics focused on variables, symbols and their operations under guidelines. Mostly letters x, y, and z, these symbols—which stand for quantities without set values—are called variables. Algebra provides general formulas and lets us solve problems for many distinct values.Fundamental ideas Fundamental Concepts: Variables: Symbols that represent changeable or unknown numbers. Constants: Fixed values that do not change. Expressions: Integration of variables, constants, and operations—like addition and multiplication. Equations: Mathematical statements that show the equality of two expressions constitute equations. Understanding Variables and Constants Variables are like empty boxes that can hold any number. They're placeholders for values we don't know yet or that can change. Example: In the expression $5x+3$, x is a variable. Constants are numbers that have a fixed value. Example: In the same expression 5x+3, 3 is a constant. Variables and constants work together in expressions and equations to model real-world situations. The Language of Algebra Algebra has its own language and symbols: Operations: Addition (+), subtraction (−), multiplication (× or implied by juxtaposition), and division (÷ or /). Coefficients: Numbers multiplied by variables. In 5x, 5 is the coefficient. Terms: The parts of an expression separated by addition or subtraction. In 3x+2, 3x and 2 are terms. Solving algebraic problems would require understanding this language. Simplification of Algebraic Expressions Why Simplify Expressions? Simplifying expressions helps one to grasp and work with them. It combines similar terms and applies mathematical concepts to create as simple expressions as possible. Combining Like Terms Like terms are terms that have the same variables with same exponents. Example: 7x and 3x are like terms because they both contain x. Combine Like Terms: Identify like terms in the expression. Add or subtract the coefficients of like terms. Rewrite the expression with combined terms. Example: Simplify 4x+5−2x+3. Combine the like terms (4x and −2x): 4x−2x=2x. Combine constants (5 and 3; 5 + 3 = 8). Rewrite the simplified expression: 2x+8. Distributive Property The distributive property of multiplication helps you to remove parentheses. Distributive Property Formula: a(b+c) = ab+ac How to Use It: 1.Multiply the term outside the parentheses by each term inside. 2.Simplify the resulting expression by combining like terms if necessary. Example: Simplify 3(2x + 4). a. Multiply 3 to each term inside the parentheses: 3. 2x + 3 . 4 b. Multiply: 6x + 12 Simplifying Complex Expressions For expressions with multiple parentheses and terms, use the distributive property to multiply the terms or the constants with the terms given inside the parentheses then combine like terms step by step. Example: Simplify 3(x+2) + 5(x−1). Multiply 3 to each term inside the first set of parentheses: 3. x + 3. 2 = 3x + 6 Multiply 5 to each term inside the second set of parentheses: 5. x – 5. 1 = 5x − 5 Combine the results: 3x + 6 + 5x − 5 Combine like terms: (3x + 5x) + (6 − 5) = 8x + 1 So, 3(x + 2) + 5(x − 1) simplifies to 8x + 1. Solving Algebraic Equations What's an equation? An equation refers to the mathematical statement that represents the balance between two expressions' equality, made with an equals sign (=). Solving an equation is determining the value(s) of the variables that satisfy it. An equation is a mathematical statement that asserts the equality of two expressions, using an equals sign (=). Solving an equation is determining the value(s) of the variables that satisfy it. Objective of Solving Equations The main objective is to separate the variable on one side of the equation to find its value. Solving One-Step Equations Addition or Subtraction Equations Example: Solve x+8=12. Subtract 8 from both sides: x=12−8 Solution: x=4 Multiplication or Division Equations Example: Solve 4x=24. Divide both sides by 4: x = 24 ÷ 4. Solution: x=6. Solving Two-Step Equations Example: Solve 4x-5=7. 1.Add 5 to both sides: 4x=12. 2.Divide both sides by 4: x=3 Solving Multi-Step Equations Example: Solve 7(x−2)+3=10. 1.Distribute: 7x−14+3=10. 2.Combine like terms: 7x−11=10. 3.Add 11 to both sides: 7x=21. 4.Divide by 7: x=3. Solving equations with variables on both sides Example: Solve 5x+2=x+10. 1.Subtract x from both sides: 5x−x+2=10. 2.Simplify: 4x+2=10. 3.Subtract 2 from both sides: 4x = 8. 4.Divide by 4 on both sides: x = 2. Verifying the Solution Substitute your solution into the original equation to verify that it satisfies the equation. Check: Does 5(2)+2=2+10? Left Side: 10+2=12 Right Side: 12=12 Both sides are equal, so x=2 is correct. Understanding Inequalities What Are Inequalities? An inequality refers to the comparison of two expressions and represents that one is greater than, less than, greater than or equal to, or less than or equal to the other. Inequality Symbols: > : Greater than < : Less than ≥ : Greater than or equal to ≤ : Less than or equal to Solving Inequalities Though there is a basic difference when multiply or divide both sides by a negative number—check and reverse the inequality sign. Solving inequalities is like solving equations. Example: Solve 2x − 5 < 9. 1.Add 5 to both sides: 2x < 14. 2.Divide both sides by 2: x < 7. 3.Solution: All real numbers less than 7. Special Rule: multiplying or dividing by negative numbers Example: Solve −3x > 9. 1.Divide both sides by −3 and reverse the inequality sign: x < −3. 2.Solution: All real numbers less than −3. Algebra in the Real World Solving Word Problems Translating real-world situations into algebraic expressions or equations allows us to solve problems efficiently. Example: Problem: A movie theatre charges 10 for adults and 8. If the theatre sells 250 tickets for a total of 1,050, what is the number of adult tickets sold? Solution: 1.Let a be the number of adult tickets and c the number of child tickets. 2.Set up equations: Total tickets: a + c = 250. Total sales: 10a + 8c = 1,050. 3.Solve the system using substitution or elimination. Simplify the solution. Use the Algebra Calculator to solve algebraic equations. Make Math Easier The Algebra Calculator is an adaptable online tool designed to simplify algebraic problem- compatible to solve the problems for all levels of users. Here's how to make the most of it: Begin by entering the algebraic expression into the above input field or upload the image of the problem. After entering the equation, click the 'Go' button to generate instant solutions. The calculator provides detailed step-by-step solutions, aiding in understanding the underlying concepts. How to Use an Algebra Calculator Enter Your Problem: Type in your equation, expression, or system into the calculator's input field. Select the operation: Choose the function you need: solve, simplify, factor, graph, etc. Click Calculate: The calculator processes your input and provides a detailed solution. Review the Steps: The step-by-step explanation helps you understand the process and learn how to solve similar problems. Example: Problem: Solve 5x - 6 = 3x - 8. Calculator Solution: Move 6 to the right side—> 5x = 3x - 2 Move 3x to the left side—> 2x = -2 Divide both sides by -2—> x = -1 Benefits of Using an Algebra Calculator Saves Time: Resolves complex problems. Enhances Learning: Steps that are specific help people understand. Accessible Anywhere: Use it on any device with internet access. Boosts Confidence: Check your work and work on your problem-solving skills. Conclusion Mastering algebra simplifies the world, despite its initial appearance as a confusing network of symbols and equations. Algebra is the language of describing the workings of everything from financial calculations to engineering marvels. Gain access to limitless opportunities by developing strong analytical skills through regular practice, mastery of the fundamentals, and the use of useful tools such as our Algebra Calculator. Remember, even the most experienced professionals began their journey much later. Discover the captivating realm of algebra by embracing its challenges, remaining persistent, and savoring the ride! Frequently Asked Questions (FAQ) How do you solve algebraic expressions? To solve an algebraic expression, simplify the expression by combining like terms, isolate the variable on one side of the equation by using inverse operations. Then, solve the equation by finding the value of the variable that makes the equation true. What are the basics of algebra? The basics of algebra are the commutative, associative, and distributive laws. What are the 3 rules of algebra? The basic rules of algebra are the commutative, associative, and distributive laws. What is the golden rule of algebra? The golden rule of algebra states Do unto one side of the equation what you do to others. Meaning, whatever operation is being used on one side of equation, the same will be used on the other side too. What are the 5 basic laws of algebra? The basic laws of algebra are the Commutative Law For Addition, Commutative Law For Multiplication, Associative Law For Addition, Associative Law For Multiplication, and the Distributive Law. 1 Define "like terms" by their variables and powers. In algebra, "like terms" have the same configuration of variables, raised to the same powers. In other words, for two terms to be "like", they must have the same variable or variables, or none at all, and each variable must be raised to the same power, or no power at all. The order of variables within the term does not matter.[1] For example, 3x2 and 4x2 are like terms because each contains the variable x raised to the second power. However, x and x2 are not like terms because each term has x raised to a different power. Similarly, -3yx and 5xz are not like terms because each term has a different set of variables. 2 Factor by writing numbers as the product of two factors. Factoring is the concept of representing a given number as the product of two factors multiplied together. Numbers can have more than one set of factors - for instance, the number 12 can be formed by 1 × 12, 2 × 6, and 3 × 4, so we can say that 1, 2, 3, 4, 6, and 12 are all factors of 12. Another way of thinking of this is that a number's factors are the numbers by which it is evenly divisible.[2] For example, if we wanted to factor 20, we might write it as 4 × 5. Note that variable terms can also be factored - 20x, for instance, can be written as 4(5x). Prime numbers can't be factored because they are only evenly divisible by themselves and 1. Advertisement 3 Use the acronym PEMDAS to remember the order of operations. Sometimes, simplifying an expression means nothing more than performing the operations in the expression until no more can be done. In these cases, it's important to remember the order of operations so that no arithmetic errors are made. The acronym PEMDAS can help you remember the order of operations - the letters correspond to the types of operations you should perform, in order. If there is multiplication and division in the same problem, you must complete those operations from left to right when you get to that point. The same goes for addition and subtraction. The image above gives the incorrect answer. The last step did not work the addition and subtraction from left to right. It did the addition first. It should show 25-20 = 5 and then 5 + 6 = 11.[3] Parentheses Exponents Multiplication Division Addition Subtraction Advertisement 1 Write your equation. The simplest algebraic equations, those involving just a few variable terms with whole number coefficients and no fractions, radicals, etc., can often be solved in just a few steps. As with most math problems, the first step to simplifying your equation is to write it out![4] As an example problem, for the next few steps, let's consider the expression 1 + 2x - 3 + 4x. 2 Identify like terms. Next, search your equation for like terms. Remember that like terms have both the same variable(s) and exponent(s).[5] For example, let's identify like terms in our equation 1 + 2x - 3 + 4x. 2x and 4x both have the same variable raised to the same exponent (in this case, the x's aren't raised to any exponent at all). In addition, 1 and -3 are like terms, as neither has any variables. So, in our equation, 2x and 4x and 1 and -3 are like terms. 3 Combine like terms. Now that you've identified like terms, you can combine them to simplify your equation. Add terms together (or subtract in the case of negative terms) to reduce each set of terms with the same variables and exponents to one singular term.[6] Let's add the like terms in our example. 4 Create a simplified expression from your simplified terms. After combining your like terms, construct an expression from your new, smaller set of terms. You should get a simpler expression that has one term for each different set of variables and exponents in the original expression. This new expression is equal to the first. In our example, our simplified terms are 6x and -2, so our new expression is 6x - 2. This simplified expression is equal to the original (1 + 2x - 3 + 4x), but is shorter and easier to manage. It's also easier to factor, which, as we'll see below, is another important simplifying skill. 5 Obey the order of operation when combining like terms. In extremely simple expressions like the one dealt with in the example problems above, identifying like terms is simple. However, in more complex expressions, like ones that involve terms in parentheses, fractions, and radicals, like terms which can be combined may not be immediately apparent. In these cases, follow the order of operations, performing operations on the terms in your expression as necessary until only addition and subtraction operations remain.[7] For example, let's consider the equation 5(3x-1) + x((2x)/(2)) + 8 - 3x. It would be incorrect to immediately identify 3x and 2x as like terms and combine them because the parentheses in the expression dictate that we're supposed to do other operations first. First, let's perform the arithmetic operations in the expression in accordance with the order of operations to obtain terms we can use. See below: 5(3x-1) + x((2x)/(2)) + 8 - 3x 15x - 5 + x(x) + 8 - 3x 15x - 5 + x2 + 8 - 3x. Now, since the only operations left are addition and subtraction, we can combine like terms. x2 + (15x - 3x) + (8 - 5) x2 + 12x + 3 Advertisement 1 Identify the greatest common factor in the expression. Factoring is a way to simplify expressions by removing factors that are common across all the terms in the expression. To start, find the greatest common factor that all of the terms in the expression share - in other words, the largest number by which all the terms in the expression are evenly divisible. Let's use the equation 9x2 + 27x - 3. Notice that every term in this equation is divisible by 3. Since the terms aren't all evenly divisible by any larger number, we can say that 3 is our expression's greatest common factor. 2 Divide the terms in the expression by the greatest common factor. Next, divide every term in your equation by the greatest common factor you've just found. The resulting terms will all have smaller coefficients than in the original expression. Let's factor our equation by its greatest common factor, 3. To do so, we'll divide each term by 3. 9x2/3 = 3x2 27x/3 = 9x -3/3 = -1 Thus, our new expression is 3x2 + 9x - 1. 3 Represent your expression as the product of the greatest common factor and the remaining terms. Your new expression isn't equal to your old one, so it isn't accurate to say that it's simplified. To make our new expression equal to the old one, we'll need to account for the fact that it has been divided by the greatest common factor. Enclose your new expression in parentheses and set the greatest common factor of the original equation as a coefficient for the expression in parentheses. For our example expression, 3x2 + 9x - 1, we would enclose the expression in parentheses and multiply by the greatest common factor of the original equation to get 3(3x2 + 9x - 1). This equation is equal to the original, 9x2 + 27x - 3. 4 Use factoring to simplify fractions. You may now be wondering why factoring is useful if, after removing the greatest common factor, the new expression must be multiplied by it again. In fact, factoring allows a mathematician to perform a variety of tricks to simplify an expression. One of the easiest of these involves taking advantage of the fact that multiplying a fraction's numerator and denominator by the same number gives an equivalent fraction.[8] See below: Let's say our original example expression, 9x2 + 27x - 3, is the numerator of a larger fraction with 3 in the denominator. This fraction would look like this: (9x2 + 27