Contents: Chapter 3

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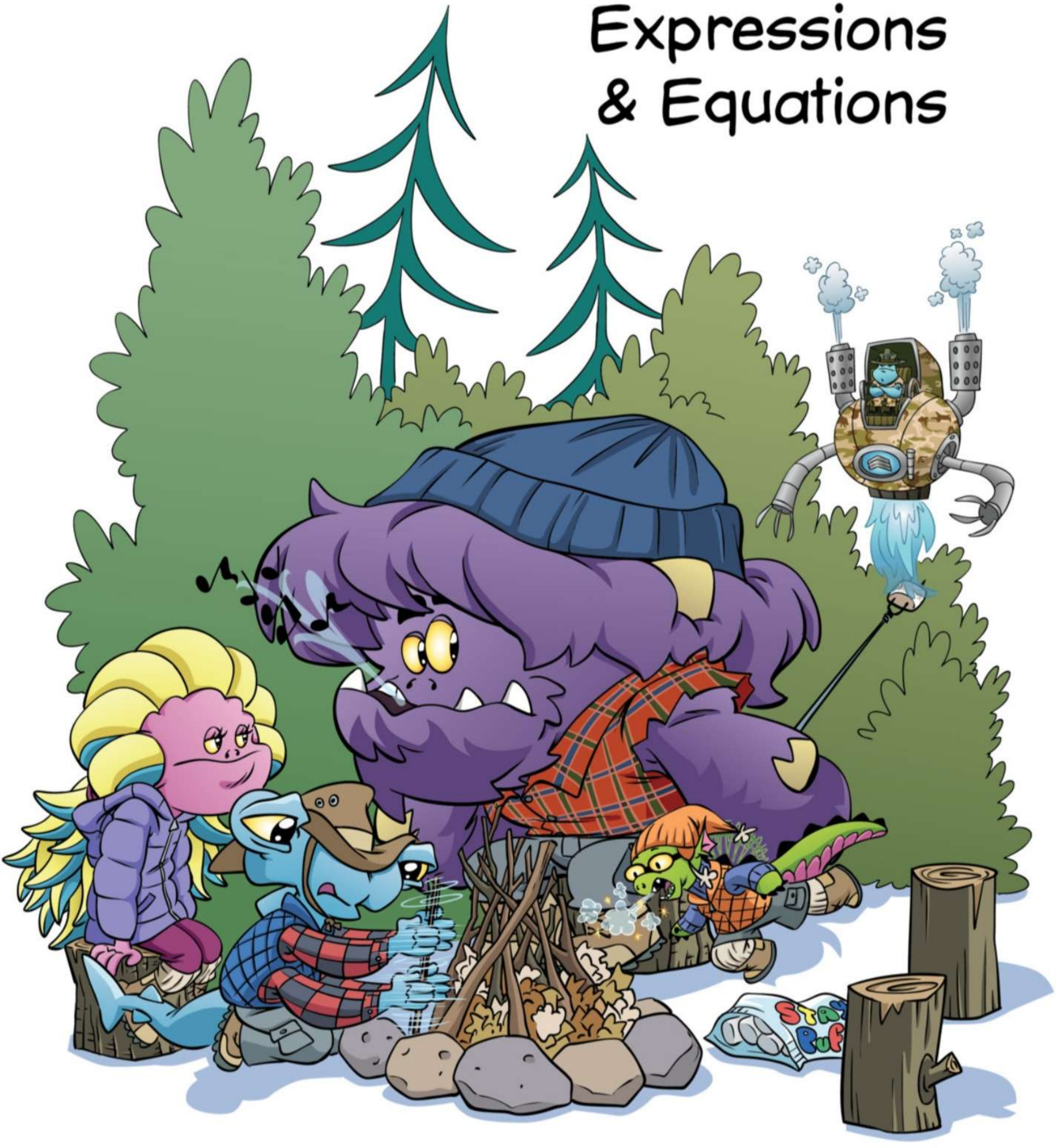
Chapter 3:
Expressions & Equations



G*Y*M NOTATION

Ten-hut!

Until now, you little monsters have only been using the most basic math symbols.

Today, we take off our training wheels and learn to write like true math beasts!

Hammerhead, how would you write "three times x"?

Sir, like this, sir?

That multiplication symbol looks just like an x!

$3 \times x$

In the heat of mathematical computation, we can't afford that kind of confusion!

Starting today, you will replace the rudimentary multiplication symbol with a dot.

A dot?

That's right, Grape Ape.

From now on, the symbol we use for multiplication will be a dot.

$2 \cdot 5 = 10$

$7 \cdot 6 = 42$

$8 \cdot 4 = 32$

$3 \cdot 9 = 27$

The dot is just like this VR-960A hoversphere...

...it's quick, efficient, and looks nothing like a variable.

Sometimes, we ditch the dot entirely.

$3 \cdot x = 3x$

The product of a number and a variable is written without a dot.

"Three times x" is written "$3x$."

WHEN WE WRITE THE PRODUCT OF A NUMBER AND A VARIABLE, THE NUMBER IS WRITTEN BEFORE THE VARIABLE. ($3x$, NOT $x3$.)

$4 \cdot (-5) = 4(-5) = -20$

$9 \cdot (-7) = 9(-7) = -63$

For most products, the dot is unnecessary.

We can use parentheses to represent multiplication.

THE EXPRESSIONS $9 \times (-7)$, $9 \cdot (-7)$, $9(-7)$, AND $(9)(-7)$ ALL MEAN "9 TIMES NEGATIVE 7."

These expressions may look weird and unfamiliar to you now, but with practice you will learn to use dots and parentheses to write multiplication.

Time to drill!

Evaluate these four expressions.

$-9 \cdot 2$

$-7(-6)$

$8(6-9)$

$(3+4)(1-5)$

Try all four.

The dot between -9 and 2 means we multiply -9 times 2.

$-9 \cdot 2$

$= -18$

-9•2 =-18.

Here, we multiply -7 times -6. The product of two negatives is positive.

So, -7 times -6 is 42.

$-7(-6)$

$= 42$

Since 6-9 is in parentheses, we subtract first. 6-9=-3.

Then, 8 times -3 is -24.

$8(6-9)$

$= 8(-3)$

$= -24$

And for this last one, we evaluate what's in both pairs of parentheses.

$(3+4)(1-5)$

$= (7)(-4)$

$= -28$

Then, we multiply (7)(-4) =-28.

Good work, polliwogs.

Next, not only will your multiplication expressions look different from now on...

...we will also phase out this symbol for division.

Sir, what symbol will replace the division symbol, sir?!

It is a symbol you are familiar with already.

From now on, we will use a fraction bar.

Pinkie! How do we write 45÷9 using a fraction bar?

$45 \div 9 =$

Sir, 45 over 9, sir!

$45 \div 9 = \frac{45}{9}$

$(9+7) \div (9-1) =$

Well done! Try this one, Tinkerbell!

Sir, we write 9+7 above the fraction bar...

...and 9−1 below the fraction bar, sir!

Sir, the parentheses are unnecessary, sir!

What happened to the parentheses?

$(9+7) \div (9-1) = \frac{9+7}{9-1}$

The fraction bar is a grouping symbol.

In a fraction, you evaluate the numerator and the denominator.

Then, divide the numerator by the denominator.

$$\frac{9+7}{9-1} = \frac{16}{8} = 2$$

It's like having parentheses around the whole numerator and the whole denominator.

$$\frac{(9+7)}{(9-1)}$$

Well done, tadpoles.

That's enough introductory expressions.

It's time to put on your big-beast pants and start computing more operations in a single expression.

$$\frac{3(5-7)^2}{-2\cdot 3} =$$

You must be able to do so with speed and accuracy.

How do we evaluate this expression?

Sir, we evaluate the numerator and denominator separately.

In the numerator, we start with $5-7=-2$.

Then, in the numerator, exponents come before multiplication.

$(-2)^2=4$.

$$\frac{3(5-7)^2}{-2\cdot 3} = \frac{3(-2)^2}{-2\cdot 3} = \frac{3(4)}{-2\cdot 3}$$

Now, we can compute the numerator and the denominator.

3 times 4 is 12, and -2 times 3 is -6.

$$\frac{3(5-7)^2}{-2\cdot 3} = \frac{3(-2)^2}{-2\cdot 3} = \frac{3(4)}{-2\cdot 3} = \frac{12}{-6} = -2$$

And to finish, we divide 12 by -6 to get -2, sir!

That's right.

Your math skills are in peak condition.

But, your physical skills need work before this weekend's outdoor retreat.

It's time for physical fitness drills!

Ms. Q. Simplifying

What is the value of $15x$ when x is 6?

$15x$ means 15 times x.

If $x=6$, then we have $15x=15\cdot6$.

$$15x = 15\cdot6 = 90$$

So, when x is 6, $15x$ is 90.

Very good.

What is the value of $7n+3n$, when n is 27?

First, we replace the n's with 27's and find the products: $7n=7(27)$ and $3n=3(27)$.

So, we have 189+81, which is 270.

$$7n + 3n = 7(27) + 3(27) = 189 + 81 = 270$$

I think I know a better way to compute $7n+3n$.

How, Winnie?

We can ***simplify*** the expression by adding $7n+3n$.

How do we add $7n+3n$?

Simplify $7n+3n$.

We can use the distributive property.

We factor the n out of each term to get $7n+3n=(7+3)n$...

...which is $10n$.

$$7n + 3n = (7+3)n$$
$$= 10n$$

That makes sense, because $7n=n+n+n+n+n+n+n$, and $3n=n+n+n$.

So, $7n+3n$ $=(n+n+n+n+n+n+n)$ $+(n+n+n)$.

That makes $10n$.

$$7n + 3n = (n+n+n+n+n+n+n)+(n+n+n)$$
$$= 10n$$

Wait... Why did we do that?

Because computing $10n$ when n is 27 is easy!

10 times 27 is 270.

$$7n + 3n = (7+3)n$$
$$= 10n$$
$$= 10(27)$$
$$= 270$$

Very good. Simplifying expressions can be very useful.

How would you simplify each of these expressions?

$5a - 3a$

$x + 2x + 3x$

$2j + 3k + 5j - k$

Try all three.

We can factor out the a in $5a-3a$ to get $(5-3)a$.

So, $5a-3a=2a$.

$$5a-3a$$
$$=(5-3)a$$
$$=2a$$

Of course!

If I have 5 somethings, and you take 3 somethings away...

...I'm left with 2 somethings.

For the second problem, it's important to see that x can be written as $1x$.

We can factor out the x.

So, $1x+2x+3x=(1+2+3)x=6x$.

$$1x+2x+3x$$
$$=(1+2+3)x$$
$$=6x$$

Elementary! 1+2+3 of anything gives us 6 of that thing. Adding x's is no different.

So, $1x+2x+3x=6x$.

For this problem, we have j's and k's.

We can't factor j or k from the whole expression.

$$2j+3k+5j-k$$

We can simplify the j's and k's separately.

Great idea. Let's do some rearranging.

We can put the j's together and the k's together...

...and write a 1 in front of the k, if we want.

Then, $2j+5j=7j$, and $3k-1k=2k$.

So, we get $7j+2k$.

$$2j+3k+5j-k$$
$$=2\check{j}+5\check{j}+3k-1k$$
$$=7j+2k$$

Well done, little monsters.

This kind of simplifying is called ***combining like terms.***

What do we mean by "like terms?"

$5a-3a$
$=(5-3)a$
$=2a$

$1x+2x+3x$
$=(1+2+3)x$
$=6x$

$2j+3k+5j-k$
$=2j+5j+3k-1k$
$=7j+2k$

Like terms have the same variables.

For example, $5a$ and $3a$ are like terms because they both have the variable a.

But $5x$ and $5y$ are ***not*** like terms because they have different variables.

Like terms are the terms we can add or subtract.

LIKE TERMS MUST ALSO HAVE THE SAME EXPONENTS. FOR EXAMPLE, $4x^2$ AND $-9x^2$ ARE LIKE TERMS, BUT $7a^2$ AND $7a^3$ ARE NOT.

That's right, Grogg. We can only combine like terms.

How can combining like terms help you evaluate the following expression for $e=12$ and $f=13$?

$7f+3-5e-4f+9e+10$

Evaluate the expression above for $e=12$ and $f=13$.

First, we put the e's together and the f's together.
We can change all the subtraction to addition, then rearrange.

That way, the like terms are together.

$$7f+3-5e-4f+9e+10$$
$$=7f+3+(-5e)+(-4f)+9e+10$$
$$=\underbrace{7f+(-4f)}+\underbrace{(-5e)+9e}+\underbrace{3+10}$$

Then we add the e's, the f's, and the numbers separately.

$$7f+3-5e-4f+9e+10$$
$$=7f+3+(-5e)+(-4f)+9e+10$$
$$=\underbrace{7f+(-4f)}+\underbrace{(-5e)+9e}+\underbrace{3+10}$$
$$=3f+4e+13$$

Then, since $e=12$ and $f=13$, we have $3(13)+4(12)+13$.

$$7f+3-5e-4f+9e+10$$
$$=7f+3+(-5e)+(-4f)+9e+10$$
$$=\underbrace{7f+(-4f)}+\underbrace{(-5e)+9e}+\underbrace{3+10}$$
$$=3f+4e+13$$
$$=3(13)+4(12)+13$$

That gives us $39+48+13$, which is 100!

$$7f+3-5e-4f+9e+10$$
$$=7f+3+(-5e)+(-4f)+9e+10$$
$$=\underbrace{7f+(-4f)}+\underbrace{(-5e)+9e}+\underbrace{3+10}$$
$$=3f+4e+13$$
$$=3(13)+4(12)+13$$
$$=39+48+13$$
$$=100$$

Adding math terms is like adding other stuff.

You only add items that are alike.

For example, if I put three more markers in this cup of markers and scissors...

...it only increases the number of markers in the cup, not the number of scissors.

Whoa!

Ms. Q., is this a picture of you and Alex Trebeast?

It is! Do you like his show?

My family watches it all the time.

I bet you were an amazing contestant.

Did you win?

What do *you* think?

FAMOUS WRAPPERS | POTPOURRI | SWORDS | POTENT POTABLE

$200 | $200 | $200 | $200

$400 | $400 | $400 | $400

$600 | $600

$800

What is a sabre?

FOOD THAT STARTS WITH "Q"

What is a quince?

$200

What was the Great Unicorn Rebellion of '49?

$230,872

Who are the three blind yetis?

$0

Who are three monsters who've never been in my theater?

R&G
Isolating x

We spend a lot of time *un*doing things.

What do you mean?

We unclog clogs...

...unlock locks...

...unpack packages...

WRINGER PRO 3000

...unspill spills...

...untangle tangles...

...ungrow growth...

BZZZZZZ

...un--

Okay, I see your point.

Math beasts spend a lot of time undoing things, too.

How so?

Try this.

I am thinking of a number.

If I divide my number by 5, then add 7 to the result, I get 15.

What is my number?

I can work backwards to undo those two steps.

Try it.

1. Divide my number by 5.
2. Add 7 to the result to get 15.
   What is my number?

2. Add 7 to the result to get 15.

$\square + 7 = 15$

$15 - 7 = \boxed{8}$

To find the number that you ***added*** 7 to to get 15, we ***subtract 7*** from 15.
15 − 7 = 8.

1. Divide my number by 5.

$\square \div 5 = 8$

That means that when you ***divided*** your number by 5, you got 8.

$\square \div 5 = 8$

$8 \times 5 = \boxed{40}$

So, we can ***multiply*** 8 by 5 to find your number!

8×5 =***40.***

Perfect! You figured out my number.

That's how math beasts solve equations... by undoing operations.*

Really?

Yep.

I'll show you. Start by turning these sentences into an equation.

1. Divide my number by 5.
2. Add 7 to the result to get 15.
   What is my number?

Write an equation. Use x to represent the unknown number.

*MATH ***OPERATIONS*** ARE THE THINGS WE DO TO NUMBERS, LIKE ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION.

Let's see...

I'll use x to represent your number.

Dividing your number by 5 gives us $\frac{x}{5}$.

1. Divide my number by 5. $\longrightarrow \frac{x}{5}$
2. Add 7 to the result to get 15.

What is my number?

Then, we add 7 to the result.

That gives us $\frac{x}{5}+7$.

1. Divide my number by 5. $\longrightarrow \frac{x}{5}$
2. Add 7 to the result $\longrightarrow \frac{x}{5}+7$ to get 15.

What is my number?

Dividing your number by 5 and adding 7, we get 15.

So, $\frac{x}{5}+7=15$.

1. Divide my number by 5. $\longrightarrow \frac{x}{5}$
2. Add 7 to the result $\longrightarrow \frac{x}{5}+7=15$ to get 15.

What is my number?

But, how do we figure out what x is?

The same way you figured out my number before...

...by working backwards!

Our goal is to ***isolate the variable***.

Huh?

That just means we try to get x by itself on one side of the equation.

$\frac{x}{5}+7=15$

How could you solve this equation for x?

x is divided by 5, then 7 is added to the result.

To undo the +7, we subtract 7 from both sides of the equation.

$\frac{x}{5}+7=15$

$-7 \quad -7$

Both sides?

The two sides of an equation are equal.

For the two sides to stay equal, whatever we do to one side of the equation has to be done to the other.

REVIEW THE VARIABLES CHAPTER OF BEAST ACADEMY 3C FOR AN INTRODUCTION TO SOLVING EQUATIONS.

Since $\frac{x}{5}+7-7=\frac{x}{5}$, and $15-7=8$...

...subtracting 7 from both sides of the equation gives us $\frac{x}{5}=8$.

POP!

$\frac{x}{5}+7=15$

$-7 \quad -7$

$\frac{x}{5} = 8$

Adding 7 and subtracting 7 are called ***inverse operations***.

Addition and subtraction are opposites...

...they undo each other.

$\frac{x}{5}+7=15$

$-7 \quad -7$

$\frac{x}{5} = 8$

klang klang klang

How could you finish solving the equation?

Division and multiplication are opposites, too!

To undo ***dividing*** by 5, we ***multiply*** both sides of the equation by 5.

That gives us $x = 40$.

That's the same answer I got before.

$$\frac{x}{5} + 7 = 15$$
$$-7 \quad -7$$
$$\frac{x}{5} \cdot 5 = 8 \cdot 5$$
$$x = 40$$

How could you check to make sure your answer is correct?

Plug it in!

"PLUGGING IN" THE SOLUTION TO AN EQUATION MEANS REPLACING THE VARIABLE WITH THE SOLUTION.

$\frac{40}{5} + 7$ equals $8 + 7$...

...which is 15!

My answer works.

$\frac{x}{5} + 7 = 15$
$\frac{40}{5} + 7 = 15$
$8 + 7 = 15$
$15 = 15$ ✓

Plugging stuff in is a great way to make sure it works.

Wait, don't--

SHHPLASH

MATH TEAM
Solving Equations

You'll be expected to know how to solve all sorts of equations in tomorrow's Math Meet against the bots.

The bots are incredibly fast at this sort of thing, so you'll need lots of practice to have any chance at keeping up.

Start by solving for x in each of these equations.

$3x+1=7$

$\frac{x}{4}-6=5$

$5(x-6)=15$

To solve $3x+1=7$, first we subtract 1 from both sides of the equation.

$$3x+1=7$$
$$-1 \quad -1$$
$$3x = 6$$

We get $3x=6$.

Then, we divide both sides by 3 to get $x=2$.

$$3x+1=7$$
$$-1 \quad -1$$
$$\frac{3x}{3} = \frac{6}{3}$$
$$x = 2$$

We can check our work by plugging in 2 for x.

$3x+1=7$

$3(2)+1=7$

$6+1=7$

$7=7$ ✓

Solve the other two equations.

We solve this equation by adding 6 to both sides...

$$\frac{x}{4} - 6 = 5$$
$$+6 \quad +6$$
$$\frac{x}{4} = 11$$

...then multiplying both sides by 4.

$$\frac{x}{4} - 6 = 5$$
$$+6 \quad +6$$
$$\frac{x}{4} \cdot 4 = 11 \cdot 4$$

$$\frac{x}{4} - 6 = 5$$
$$+6 \quad +6$$
$$\frac{x}{4} \cdot 4 = 11 \cdot 4$$
$$x = 44$$

So, $x = 44$.

We can start this problem by distributing the 5.

$$5(x-6) = 15$$
$$5x - 30 = 15$$

Then, we add 30 to both sides...

$$5(x-6) = 15$$
$$5x - 30 = 15$$
$$+30 \quad +30$$
$$5x = 45$$

...and finally, we divide both sides by 5.

$x = 9$.

$$5(x-6) = 15$$
$$5x - 30 = 15$$
$$+30 \quad +30$$
$$\frac{5x}{5} = \frac{45}{5}$$
$$x = 9$$

Neat.

What, Winnie?

I got the same answer without distributing the 5.

How?

How else could you solve $5(x-6)=15$?

Multiplication and division undo each other.

$5(x-6)=15$

In this equation, $(x-6)$ is multiplied by 5.

To undo the multiplication, we start by dividing both sides of the equation by 5.

$$\frac{5(x-6)}{5}=\frac{15}{5}$$

The 5's cancel on the left.

$$\frac{5(x-6)}{5}=\frac{15}{5}$$
$$x-6=3$$

Dividing $5(x-6)$ by 5 gives us $(x-6)$.

So, we have $x-6=3$.

Then, I added 6 to both sides to get $x=9$.

$$\frac{5(x-6)}{5}=\frac{15}{5}$$
$$x-6=3$$
$$+6 \quad +6$$
$$x=9$$

Hmmm... I tried something else that *didn't* work.

$$5(x-6)=15$$
$$+6 \quad +6$$
$$5(x)=21$$

Why doesn't the plus 6 undo the minus 6?

I started by adding 6 to both sides.

Why not?

Adding 6 to $5(x-6)$ doesn't cancel out the minus 6...

...because *everything* inside the parentheses is multiplied by 5.

So, $5(x-6)+6$ doesn't give us $5x$, it gives us $5x-24$.

$$5(x-6)+6$$
$$= 5x-30+6$$
$$= 5x-24$$

There are often several different ways to solve an equation.

It's usually best to consider what happens to x, and in what order.

Then, we work to undo those steps one at a time to isolate the variable.

Sometimes, isolating the variable can be a little tricky.

We can't always isolate the variable just by undoing operations.

Brrriiing

Uh oh! We're out of time.

You'll have to try this last one for homework.

CAR POOL

MALL PARKING

Have you seen the equation Fiona gave us to solve for homework?

Yep.

There are x's all over the place!

EXIT

ENTER

$3(8-x)+x=5x-11$

Where do we begin?

We can start by simplifying the whole left side of the equation.

First, we distribute the 3.

That gives us $24-3x+x$ on the left side of the equation.

$3(8-x)+x=5x-11$

$24-3x+x=5x-11$

What next?

Then, we simplify $24-3x+x$ to get $24-2x$.

$$3(8-x)+x=5x-11$$
$$24-3x+x=5x-11$$
$$24-2x=5x-11$$

But...

...we still have the variable on both sides of the equation.

$$3(8-x)+x=5x-11$$
$$24-3x+x=5x-11$$
$$24-2x=5x-11$$
$$+2x \quad +2x$$

If we add $2x$ to both sides...

...we won't have a variable on the left side of the equation any more!

I see... Since $24-2x+2x=24$, we get 24 on the left side.

And we get $7x-11$ on the right.

$$3(8-x)+x=5x-11$$
$$24-3x+x=5x-11$$
$$24-2x=5x-11$$
$$+2x \quad +2x$$
$$24=7x-11$$

Now, we have a problem just like the ones we've solved before!

To solve $24=7x-11$, we add 11 to both sides.

That gives us $35=7x$.

$$\begin{array}{rr} 24 = 7x - 11 \\ +11 & +11 \\ \hline 35 = 7x \end{array}$$

To finish, we divide both sides by 7.

$$\frac{35}{7} = \frac{7x}{7}$$

x equals 5.

Check your answer!

$$\frac{35}{7} = \frac{7x}{7}$$

$$5 = x$$

We can just plug in $x=5$ and compute.

$$3(8-x)+x = 5x-11$$

$$3(8-5)+5 = 5(5)-11$$

$$3(3)+5 = 5(5)-11$$

$$9+5 = 25-11$$

$$14 = 14$$

It works!

Great job finding x, boys!

Great job parking, mom!

MATH TEAM
Math Meet

The Math Meet is about to begin.

Most of the questions will require you to solve equations, which is going to make it tough against the bots.

And now...

Buzz in right away if you know an answer.

Good luck!

...please welcome the Little Monsters of Beast Academy and their opponents... the Bots.

Today's Math Meet will consist of 6 questions. The first five are each worth one point, and the final question is worth two. The team with the most points wins the meet. If everyone is ready for the first question, let's begin.

Question 1: Solve for x in the equation: $\frac{x+7}{3} = 17$.

ding!

BZZZT!

The Little Monsters rang in first.

30!

I'm sorry, that is incorrect.

44.

44 is correct. The Bots get the first point.

Oh no! I subtracted 7 first.

Then, I multiplied by 3.

I should have multiplied both sides by 3, ***then*** subtracted.

That's ok. None of us could have beaten the Bots to that answer.

$$\frac{x+7}{3} = 17$$

$$\frac{x}{3} \cdot 3 = 10 \cdot 3$$

$$x = 30$$

$$\frac{x+7}{3} \cdot 3 = 17 \cdot 3$$

$$x+7 = 51$$

$$x = 44 \checkmark$$

BECAUSE ALL OF $x+7$ IS DIVIDED BY 3, WE CANNOT SUBTRACT 7 FROM $\frac{x+7}{3}$ BY SIMPLY SUBTRACTING 7 FROM THE NUMERATOR. $\frac{x+7}{3}-7$ IS NOT EQUAL TO $\frac{x}{3}$.

Question 2: Seven times the sum of x and 4 is 36. Express x as a mixed number in simplest form.

It looks like the Bots are arguing. Let's write an equation.

Is the equation $7x+4=36$, or $7(x+4)=36$?

Which equation is correct?

We multiply 7 times ***the sum*** $(x+4)$.

So, we need to solve $7(x+4)=36$.

$$\frac{7(x+4)}{7} = \frac{36}{7}$$

$$x+4 = 5\frac{1}{7}$$

We divide both sides by 7 to get $\frac{36}{7}$, which equals $5\frac{1}{7}$...

BZZZZT!

Uh-oh.

$1\frac{1}{7}$.

$1\frac{1}{7}$ is correct. The Bots lead, 2 to 0.

Question 3:
What value of x makes this equation true?
$x+2x+3x+4x+5x+6x+7x+8x+9x+10x=11$

We need to combine all of those like terms!

What's $x+2x+3x+4x+5x+6x+7x+8x+9x+10x$?

We can put a 1 in front of the first x.

$$1x+2x+3x+4x+5x+6x+7x+8x+9x+10x = 11$$
$$(1x+10x)+(2x+9x)+(3x+8x)+(4x+7x)+(5x+6x) = 11$$
$$11x + 11x + 11x + 11x + 11x = 11$$

Then, we can rearrange and regroup to make 5 pairs that each add to $11x$.

$1x+2x+3x+4x+5x+6x+7x+8x+9x+10x = 11$

$(1x+10x)+(2x+9x)+(3x+8x)+(4x+7x)+(5x+6x) = 11$

$11x + 11x + 11x + 11x + 11x = 11$

$\frac{55x}{55} = \frac{11}{55}$

That gives us $55x=11$, so we divide both sides by 55 and simplify to get--

BZZZZT!

Oh, come on!

$\frac{1}{5}$.

$\frac{1}{5}$ is correct. The Bots lead, 3 to 0.

The Little Monsters will need to get all of the remaining questions correct to win the Math Meet.

Question 4: The equation $|-2x+5|=19$--

BZZZZT!

Urrrgh!

-7.

I'm sorry, -7 is incorrect. I will finish reading the question for the Little Monsters who will then have 3 minutes to answer.

The equation $|-2x+5|=19$ has two solutions. Find their sum.

We've got to get this one.

Try it.

THE TALL BARS IN THE EXPRESSION $|-2X+5|$ INDICATE ABSOLUTE VALUE, WHICH IS A NUMBER'S DISTANCE FROM ZERO. FOR EXAMPLE, $|-7|=7$ AND $|3|=3$. LEARN MORE ABOUT ABSOLUTE VALUE IN THE INTEGERS CHAPTER OF BEAST ACADEMY 4C.

For the absolute value of $-2x+5$ to be 19...

...$-2x+5$ *could* equal 19.

$|-2x+5|=19$

$-2x+5=19$

Or...

Since $|-19|=19$...

$-2x+5=-19$

...for the absolute value of $-2x+5$ to be 19, $-2x+5$ could also equal -19.

We need to find both solutions!

$x=-7$ is the solution the bots gave.

$|-2x+5|=19$

$-2x+5=19$

$-5 \quad -5$

$\frac{-2x}{-2} = \frac{14}{-2}$

$x = -7$

$-2x+5=-19$

$-5 \quad -5$

$\frac{-2x}{-2} = \frac{-24}{-2}$

$x = 12$

$x=12$ is the other solution.

We should check both answers before we add them.

$|-2x+5|=19$

$|-2(-7)+5|=19$

$|14+5|=19$

$|19|=19$

$19=19$

$|-2(12)+5|=19$

$|-24+5|=19$

$|-19|=19$

$19=19$

$x=-7$ works.

So does $x=12$.

So, the sum of the two solutions is $-7+12$...

ding!

5.

5 is correct. The Little Monsters get their first point.

Question 5: Solve for x: $2x^{99} = -2$.

Solve for x :

$$2x^{99} = -2$$

ding! BZZZT!

Again, the Little Monsters beat the Bots to the buzzer.

$x = -1$.

-1 is correct.

Great job, Winnie!

Yeah, that was quick!

I saw that x^{99} had to equal -1. Every odd power of -1 equals -1, so I rang in.

$$\frac{2x^{99}}{2} = \frac{-2}{2}$$

$$x^{99} = -1$$

high four

The last question will determine the winner of the Math Meet.

Question 6: The formula used to compute the volume of a cone is:

$$V = \frac{B \cdot h}{3}$$

V is the volume of the cone. B is the area of the cone's base. And h is the height of the cone.

Find the height of a cone whose base has an area of 7 square centimeters and whose volume is 20 cubic centimeters. Express your answer as a mixed number.

Try it.

Weird. It looks like the Bots are trying to find the radius of the cone's base.

That could give the team the time they need to win!

We start by plugging the values we know into the formula.

The base area is 7 cm².

$$V = \frac{B \cdot h}{3}$$

$$20 = \frac{7 \cdot h}{3}$$

And the volume is 20 cubic centimeters.

We multiply both sides by 3 to get $60 = 7 \cdot h$.

$$V = \frac{B \cdot h}{3}$$

$$20 \cdot 3 = \frac{7 \cdot h}{3} \cdot 3$$

$$60 = 7 \cdot h$$

Then, we divide both sides by 7.

$h = \frac{60}{7}$.

$$V = \frac{B \cdot h}{3}$$

$$20 \cdot 3 = \frac{7 \cdot h}{3} \cdot 3$$

$$\frac{60}{7} = \frac{7 \cdot h}{7}$$

$$\frac{60}{7} = h$$

We convert to a mixed number...

ding!

$8\frac{4}{7}$ centimeters!

$8\frac{4}{7}$ is *correct!* The Little Monsters win in dramatic fashion!

Awesome comeback!

We should definitely form a team for the World Math Olympiad Qualifiers.

I already talked to the Headmaster and he said we can compete this year.

Cool! Does this mean that you are joining the Math Team, Max?

I sure hope so.

See you next practice!