THE DREGG DISASTER
AMAZING FREE DOWNLOAD

BY CHRIS MATTHEWS

WITH CHRIS BAKKE

THE DREGG DISASTER

AMAZING FREE DOWNLOAD

BY CHRIS MATTHEWS
WITH CHRIS BAKKE

ILLUSTRATED BY MARÍA PESADO
COVER ILLUSTRATED BY EOIN COVENEY

CONTENTS

INTRODUCTION

Hello and welcome to The Dregg Disaster Amazing Free Download!

This set of math problems was designed to help you practice some of the most important math skills from an Algebra I class. There are over 250 algebra problems in here covering a wide range of math skills, and each one is drawn by our amazing art team.

It's printable and it's write-on-able too.

This download also follows along with our book *The Dregg Disaster.* All the math problems and explanations from that book are included here, and they are in the order that you will encounter them if you are reading the book.

There is also way more space provided here to play around with the equations, proportions, linear patterns, quadratic patterns, and statistics that you might come across as you explore Dregg Tower.

Good luck!

CHAPTER 1
AMAZING FREE DOWNLOAD

This problem type is asking us to figure out what number makes the first equation true (in this case, what number do we multiply by 3 to get 30). Once we have found that number, *then* we can plug that same number into the second expression.

$$\text{If } 3x = 30, \text{ what is } 4x + 2?$$

$$\boxed{3x = 30}$$
$$3x = 30$$
$$\div 3 \quad \div 3$$
$$\overline{}$$
$$x = 10$$

STEP ONE: Solve the first equation. When a variable is up against a number (like 3x in this problem), they are being multiplied. We can use inverse operations to find the value of x. 3 is being multiplied by x, so we can divide both sides by 3. So x = 10, but we're not done!

STEP TWO: Substitute and solve. Because we know that x = 10, we can plug in 10 for x and solve. Order of operations tells us to multiply first (4 times 10), and then add 2 last.

$$\boxed{4x + 2}$$
$$4x + 2 \quad {\scriptstyle 10}$$
$$4(10) + 2$$
$$40 + 2$$
$$42$$

Using one-step equations

Answer the following question.   If $x+8=10$, what is $x+16$?

Answer the following question.   If $3x=30$, what is $4x+2$?

Answer the following question.   If $x - 2 = 6$, what is $x + 3$?

Answer the following question.   If $4x = 20$, what is $7x$?

Using one-step equations

Answer the following question.   If $\frac{x}{3} = 4$, what is $2x-8$?

Using one-step equations

Answer the following question.   If $x + 7 = 11$, what is $5x - 10$?

Order of operations

Order of operations! These problems are asking us to take a number sentence and make it simpler. Sometimes, though, our number sentence has more than one step, so where do we start? Remembering the acronym PEMDAS will help: Parentheses (P), Exponents (E), Multiplication and Division (MD), Addition and Subtraction (AS).

$$2 + 3 \cdot (4 - 2) + 6^2$$

$$2 + 3 \cdot (4 - 2) + 6^2$$
$$2 + 3 \cdot \quad 2 \quad + 6^2$$

STEP ONE: Parentheses. The first thing we look for is any math inside parentheses. In this problem, $4 - 2$ is in parentheses, so we would combine those numbers (giving us 2).

STEP TWO: Exponents. Next we look for exponents. This problem has 6^2, and 6 to the power of 2 is 36. Let's change that before we move on to Step Three.

$$2 + 3 \cdot 2 + 6^2$$
$$2 + 3 \cdot 2 + 36$$

$$2 + 3 \cdot 2 + 36$$
$$2 + \quad 6 \quad + 36$$

STEP THREE: Multiplication and Division. If we have both, we just go from left to right. In this problem, we would multiply 3 by 2 (giving us 6). There is no more multiplication or division in this problem, so we are ready to move on to Step Four.

STEP FOUR: Addition and Subtraction. Again, if we have both, we go from left to right. In this problem, what we have left is the $2 + 6 + 36$. Add those together to get 44, and continue to that page!

$$2 + 6 + 36$$
$$44$$

This applies to Chapter 1 page 52 in *The Dregg Disaster Algebra I Gamebook*.

Order of operations

Use order of operations to simplify the following expression.

$$2 + 3 \cdot (4 - 2) + 6^2$$

Order of operations

Use order of operations to simplify the following expression.

$$-3 + 4 \cdot (5-1) + 5^2$$

Use order of operations to simplify the following expression.

$$4^3 - 2 \cdot 10 - 3$$

Order of operations

Use order of operations to simplify the following expression.

$$-6 + 2 \cdot (9 - 2) + 4^2$$

Order of operations

Use order of operations to simplify the following expression.

$$2 \cdot (7-2) + 7^2 - 40$$

Order of operations

Use order of operations to simplify the following expression.

$$5 + (3+2)^2 - \frac{8}{4} - 2$$

Order of operations

Use order of operations to simplify the following expression.

$$8 + (3+1)^2 + \dfrac{10}{2} + 5$$

Visual equations

This problem is a visual version of a two-step equation. We want to find out how many donuts come in each box. There is some number (x) of donuts in each box, and we have 3 boxes (3 x's). Knowing that, we can see this problem as an equation (3x + 4 = 43). This is an equation that we can solve!

$$\begin{array}{r} 3x + 4 = 43 \\ -4 \quad -4 \\ \hline 3x = 39 \end{array}$$

STEP ONE: Get rid of the 4 extra donuts. If we take away the 4 extra donuts, we will know how many donuts are in the boxes. To keep our equation equal on both sides of the equation, we need to subtract 4 on the right side too. This tells us that there are 39 donuts in the boxes!

STEP TWO: Find out how many donuts are in each box. If we divide the 3x by 3, it will isolate our variable, and it will tell us how many donuts are in each box! We also have to divide by 3 on the right side of the equation to keep both sides of our equation equal. There are 13 donuts in each box, so continue to that page!

$$\begin{array}{r} 3x = 39 \\ \div 3 \quad \div 3 \\ \hline x = 13 \end{array}$$

This applies to Chapter 1 page 53 in *The Dregg Disaster Algebra I Gamebook*.

17

You have some Dregg Chocolate Chompers® cookies to share with your friends. You have two unopened pouches, plus three extra. If there are 15 Chocolate Chompers® total, how many are in each pouch?

Visual equations

Three giant diamonds have the same weight. When they are placed on a scale with a 5-ounce metal block, they weigh the same as one 50-ounce metal block. How much does each diamond weigh?

Dregg sells pigeon-pâté cat food. Your cat has three unopened boxes of it left, plus two extra cans. In total, there are 26 cans. How many are in each box?
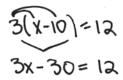
The cafeteria has 34 slices of pepperoni pizza left. There are 5 full pizzas, plus four extra slices. How many slices are in each pizza?

Visual equations

Your cousin has a bunch of Dregg Cola in the garage. There are three full cases, and three more cans in the fridge. If there are 63 cans total, how many are in each case?
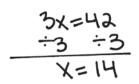
Equations and distribution

This equation is asking us to figure out what number x has to be so that the left side of the equation equals 12. There are a couple ways we could solve this, but one good strategy is the distributive property.

$$3(x-10)=12$$

$$3(x-10)=12$$
$$3x-30=12$$

STEP ONE: Distribution. We want to multiply 3 by (x − 10). The distributive property lets us rewrite that number sentence by multiplying the 3 by each term inside the parentheses. So 3(x − 10) can be rewritten as 3x − 30.

STEP TWO: Get rid of 30 with inverse operations. From here, we will use inverse operations to isolate the variable. The 3 is part of the same term as the variable, so it will be easier to get rid of the 30 first. Right now, we are subtracting 30, and the inverse operation to subtraction is adding. If we *add* 30, it will cancel with the *subtract* 30 that we already have, and both 30s will go away. If we add 30 on the left, though, we need to do the same thing on the right so that the two sides of the equation stay equal.

$$3x-30=12$$
$$+30 \quad +30$$
$$\overline{\quad 3x = 42 \quad}$$

$$3x=42$$
$$\div 3 \quad \div 3$$
$$\overline{\quad x = 14 \quad}$$

STEP THREE: Get rid of the 3 with inverse operations. We're close! The last number we need to get rid of is the 3. In this problem, the 3 is being multiplied by the variable, so to get rid of it we will need to divide. Dividing by 3 cancels with the "multiply by 3" that we have in the problem and leaves us with just the variable! Again, if we do something on one side of the equation, we have to do the same thing on the other side, so we have to divide our 42 by 3 as well. This gives us 14, and we will continue to that page.

AUTHOR'S NOTE: This problem can also be solved by dividing both sides by 3 first. Either way will give you the same solution!

This applies to Chapter 1 page 54 in *The Dregg Disaster Algebra I Gamebook*.

23

Equations and distribution

Solve the following equation for x. $2(x-21)=18$

Equations and distribution

Solve the following equation for x. $-2(x-8) = -12$

Solve the following equation for x. $-3(x-18) = -36$

Equations and distribution

Solve the following equation for x.

$$-4(x-11) = -44$$

Equations and distribution

Solve the following equation for x. $-3(x - 24) = -78$

Equations and distribution

Solve the following equation for x.

$$2(2x - 26) = 36$$

Equations and distribution

Solve the following equation for x. $2(2x - 50) = 100$

Equations with like terms

What a mess! Look at all the stuff packed into this equation. We can solve this, but a good first step would be to make the equation less messy.

$$-4x + 11 + 2x + 16 = -35$$

$$-4x + 11 + 2x + 16 = -35$$
$$-2x + 27 \quad = -35$$

STEP ONE: Combine like terms. There are four parts of the equation on the left side, and we call those parts *terms.* They're all being added together, and if we want we can group together the ones that go together. We know 11 + 16 = 27, and if we take away 4 x's from 2 x's we will get −2x. Rewriting this equation as −2x + 27 = −35 makes it a little less messy.

STEP TWO: Get rid of 27 with inverse operations. First, take away 27 on both sides. Remember, subtraction is the inverse of addition, so the 27s will cancel out on the left and leave us with −2x. We need to subtract on the right, too, to keep the equation equal, and we end up with an equation that says −2x = −62.

$$-2x + 27 = -35$$
$$\underline{\quad -27 \quad -27 \quad}$$
$$-2x \quad = -62$$

$$-2x = -62$$
$$\div -2 \quad \div -2$$
$$x = 31$$

STEP THREE: Get rid of the −2 with inverse operations. Think of this 2 as "negative 2," not "minus 2." It's being multiplied by our variable, so to get rid of it, we need to divide. If we divide both sides by "negative 2," we find out that our variable has to equal 31 for this equation to be true! Continue to that page.

Equations with like terms

Solve the following equation for x. $-10x - 16 + 6x + 10 = -66$

Equations with like terms

Solve the following equation for x. $-6x + 17 + 4x + 8 = -15$

Solve the following equation for x.

$$-7x + 8 + 3x + 7 = 3$$

Equations with like terms

Solve the following equation for x.

$$10x + 20 - 15x - 2 = -2$$

Equations with like terms

Solve the following equation for x.

$$10x + 10 - 13x + 13 = -7$$

Equations with like terms

Solve the following equation for x. $-8 - 8x + 38 + 5x = -30$

Equations with like terms

Solve the following equation for x.

$$-42 - 7x + 50 + 9x = 100$$

Equations with like terms

Solve the following equation for x.

$$-2x - 3x - 2 + 20 = -22$$

Variables on both sides

We have a variable on both sides of our equation in this problem. The best way to solve this type of problem is to first get the variables together on one side of the equals sign.

$$2x + 15 = {}^-3 + 5x$$

$$2x + 15 = {}^-3 + 5x$$
$$\underline{{}^-2x \qquad\qquad {}^-2x}$$
$$15 = {}^-3 + 3x$$

STEP ONE: Get all the variables on the same side of the equal sign. Subtracting either 2x or 5x from both sides will work, but I'm going to pick 2x so I don't need to deal with negative numbers quite as much. If I subtract 2x on both sides, the equation that I'm left with is $15 = -3 + 3x$, and all the variables are on the same side of the equal sign!

STEP TWO: Get rid of the "negative 3" with inverse operations. The negative 3 is a separate term, so it'll be easier to get rid of first. If I add 3 to both sides, it will cancel out, leaving me with $18 = 3x$. Remember, we need to add on both sides to keep our equation equal.

$$15 = {}^-3 + 3x$$
$$\underline{+3 \qquad +3}$$
$$18 = 3x$$

$$18 = 3x$$
$$\underline{\div 3 \qquad \div 3}$$
$$6 = x$$

STEP THREE: Get rid of the coefficient with inverse operations. The 3 in front of the variable is being multiplied by x, so to get rid of it, we need to divide on both sides. What we end up with is $x = 6$, so I'm going to continue to that page.

This applies to Chapter 1 page 56 in *The Dregg Disaster Algebra I Gamebook*.

Variables on both sides

Solve the following equation for x.

$$5x + 23 = -19 + 7x$$

Variables on both sides

Solve the following equation for x. $-6x - 30 = 70 - 10x$

Variables on both sides

Solve the following equation for x.

$$-2x - 22 = 26 - 5x$$

Solve the following equation for x.

$$15 - 7p = p + 7$$

Variables on both sides

Solve the following equation for x.

$$7x + 6 = -14 - 3x$$

Formulas

Where did all the numbers go? Formulas are one way to show relationships between variables, and sometimes it is helpful to solve them for a different variable. This question is asking us to isolate the variable y, and we will know that we're done when our y variable is alone on one side of our equal sign. Lucky for us, the steps are the same. We just need to make sure we solve as if there are numbers in the problem.

$$ax + by = c$$

$$ax + by = c$$
$$\underline{-ax \qquad\qquad -ax}$$
$$by = c - ax$$

STEP ONE: Get rid of the ax term with inverse operations. We are trying to get y by itself, and the ax term can be easily removed with subtraction. On the left, that leaves us with just by, but on the right we get $c - ax$. Even though that looks weird, we can't actually simplify it any further, because we don't have any numbers! The equation we're left with says $by = c - ax$.

STEP TWO: Get rid of the b with inverse operations. We're close! The y variable is being multiplied by b, so to get it all by itself, we can divide both sides by b. What we're left with is $y = (c - ax/b)$. This looks messy, but without any numbers we can't simplify it any further. This matches the second answer choice, so I'm going to continue to page 37.

$$by = c - ax$$
$$\div b \qquad\quad \div b$$
$$y = \frac{c - ax}{b}$$

This applies to Chapter 1 page 57 in *The Dregg Disaster Algebra I Gamebook*.

Formulas

Solve the following equation for r.

$pV = nrt$

Formulas

Solve the following equation for y. $ax + by = c$

Formulas

Solve the following equation for x.
$$y = mx + b$$

Formulas

Solve the following equation for w.

$$P = 2w + 2L$$

Solve the following equation for h. $V = Lwh$

Formulas

Solve the following equation for b. $a = \dfrac{bh}{2}$

Basic proportions

Fractions! This specific type of problem is called a "proportion" because we have two fractions with an equal sign in the middle. This type of problem can help us change size by scaling up or down. It can also help us convert between different units, so it's an important one to know how to solve!

$$\frac{x}{14} = \frac{10}{5}$$

$$5 \cdot 14\frac{x}{14} = \frac{10}{5} \cdot 5 \cdot 14$$
$$\overline{x \cdot 5 = 10 \cdot 14}$$

STEP ONE: Get rid of the fractions. This problem would be much easier to solve if we didn't have all these fractions all over the place. The fraction bar tells us that we are dividing, so we can cancel out "divided by 14" by multiplying by 14 on both sides. We can do the same thing with the 5. After canceling out the 14s on the left and the 5s on the right, what we're left with is 5 times x on the left and 14 times 10 on the right.

STEP TWO: Finish solving with inverse operations. 14 times 10 is 140. If we want to get the variable by itself, we need to get rid of the 5, which is being multiplied. To cancel that 5, we need to divide by 5 on both sides, which leaves us with x = 28. Continue to that page!

$$x \cdot 5 = 10 \cdot 14$$
$$5x = 140$$
$$\div 5 \quad \div 5$$
$$\overline{x = 28}$$

AUTHOR'S NOTE: You may have learned how to solve this type of problem differently. Some teachers use "cross multiplication," "the butterfly method," or "the rule of three" to explain proportions. If one of those strategies makes more sense to you, solve it your own way!

Basic proportions

Solve the following equation for x.

$$\frac{x}{15} = \frac{21}{7}$$

Basic proportions

Solve the following equation for x.

$$\frac{x}{14} = \frac{10}{5}$$

Basic proportions

Solve the following equation for x.

$$\frac{10}{5} = \frac{x}{3}$$

Basic proportions

Solve the following equation for k.

$$\frac{k}{9} = \frac{4}{3}$$

Basic proportions

Solve the following equation for n.

$$\frac{n}{5} = \frac{6}{9}$$

Basic proportions

Solve the following equation for a.

$$\frac{a}{6} = \frac{4}{9}$$

Basic proportions

Solve the following equation for x.

$$\frac{10}{7} = \frac{x}{10}$$

Proportions with binomials

Fractions! This specific type of problem is called a "proportion" because we have two fractions with an equal sign in the middle. This type of problem can help us change size by scaling up or down. It can also help convert between different units, so it's an important one to know how to solve!

$$\frac{x+3}{6} = \frac{4}{3}$$

$$\cdot 6 \cdot 3 \ \frac{x+3}{6} = \frac{4}{3} \cdot 6 \cdot 3$$
$$\overline{3 \cdot (x+3) = 4 \cdot 6}$$

STEP ONE: Get rid of the fractions. This problem would be much easier to solve if we didn't have all these fractions all over the place. The fraction bar tells us that we are dividing, so we can cancel out "divided by 6" by multiplying by 6 on both sides. We can do the same thing with the 3. After canceling out the 6s on the left and the 3s on the right, what we're left with is 3 times (x + 3) on the left and 6 times 4 on the right.

STEP TWO: Simplify the equation with the distributive property. On the right, we have 6 times 4. That's 24. The left side is a little trickier. We are multiplying 3 by (x + 3) which means we need to multiply 3 by the x *and* by the 3 in the parentheses. That side reduces to 3x + 9.

$$3(x+3) = 4 \cdot 6$$
$$3x + 9 = 24$$

$$3x + 9 = 24$$
$$\underline{-9 \quad -9}$$
$$3x = 15$$
$$\div 3 \quad \div 3$$
$$\overline{x = 5}$$

STEP THREE: Finish solving with inverse operations. If we want to get the variable by itself, we can get rid of the 9 first by subtracting 9 on both sides. This leaves us with 3x = 15. Now we need to get rid of the 3 that is being multiplied by the variable. To cancel that 3, we need to divide by 3 on both sides, which leaves us with x = 5. Continue to that page!

This applies to Chapter 1 page 59 in *The Dregg Disaster Algebra I Gamebook*.

61

Proportions with binomials

Solve the following equation for x.

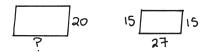$$\frac{x+1}{3} = \frac{24}{9}$$

Proportions with binomials

Solve the following equation for x.

$$\frac{x+3}{5} = \frac{30}{3}$$

Proportions with binomials

Solve the following equation for x.
$$\frac{x-6}{2} = \frac{25}{10}$$
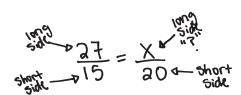
Proportions with binomials

Solve the following equation for x.

$$\frac{2x+5}{12} = \frac{3}{4}$$

Proportions with binomials

Solve the following equation for x.

$$\frac{1}{5} = \frac{9}{3x+9}$$

Proportions with binomials

Solve the following equation for x.

$$\frac{x+2}{15} = \frac{26}{30}$$

Proportions with binomials

Solve the following equation for x.

$$\frac{x+1}{6} = \frac{15}{3}$$

Proportions with binomials

Solve the following equation for x.
$$\frac{x+2}{21} = \frac{1}{3}$$

Proportions with binomials

Solve the following equation for x.
$$\frac{x-4}{14} = \frac{1}{2}$$

Similar shapes

"Similar shapes" is what you call shapes that are the same shape but not necessarily the same size. All the angles are the same, and the sides are *proportional*. The trick to this problem is recognizing that you can solve it with a proportion!

STEP ONE: Set up a proportion. The smaller shape on the left has a short side of 15 and a long side of 27. In other words, the long side is *almost twice* as long. If these shapes are similar, the other shape needs a long side that is *almost twice* as long as well! We can find the exact length by saying that 27/15 (almost 2) is equal to the missing side divided by 20. That relationship needs to be equal between the two shapes!

STEP TWO: Get rid of the fractions. This problem would be much easier to solve if we didn't have all these fractions all over the place. The fraction bar tells us that we are dividing, so we can cancel out "divided by 15" by multiplying by 15 on both sides. We can do the same thing with the 20. After canceling out the 15s on the left and the 20s on the right, what we're left with is 27 times 20 on the left and x times 15 on the right.
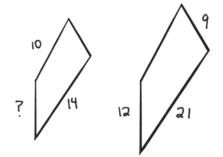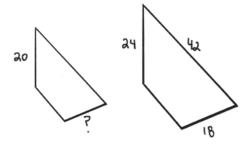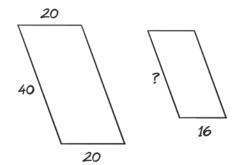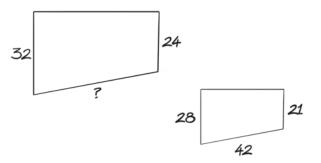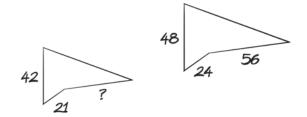

STEP THREE: Finish solving with inverse operations. 27 times 20 is 540. If we want to get the variable by itself, we need to get rid of the 15, which is being multiplied. To cancel that 15, we need to divide by 15 on both sides, which leaves us with x = 36. Continue to that page!

Similar shapes

The following shapes are similar. Find the missing side length.

The following shapes are similar. Find the missing side length.

20

24

42

?

18

Similar shapes

The following shapes are similar. Find the missing side length.

20

40

20

?

16

Similar shapes

The following shapes are similar. Find the missing side length.

Similar shapes

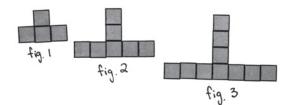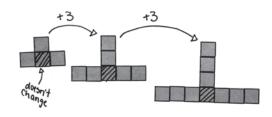The following shapes are similar. Find the missing side length.
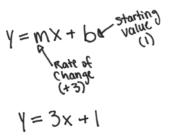
CHAPTER 2
AMAZING FREE DOWNLOAD

Visual patterns

This problem gives us a pattern and asks for the 8th figure in the pattern. There are a bunch of strategies you can use to solve this question, and I hope you tried it in your own way!
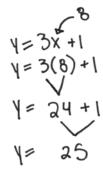

fig. 1
fig. 2
fig. 3

+3   +3

doesn't change

STEP ONE: Identify the pattern. The three shapes that we were given have 4, 7, and 10 blocks. This pattern has a constant rate of change. It's adding 3 blocks each time! (One way to solve this is to just keep adding 3 over and over until you get to figure 8!) We also have that one block in the middle of our figure that isn't changing between figures.
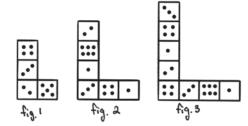
STEP TWO: Model the pattern with an equation. Adding patterns can be modeled with y = mx + b equations. b (the y-intercept) is the starting value. In this problem, the starting value is the *one* block that we start with in the middle of each shape. m (the slope) is the rate of change. In this problem, we are adding *three* blocks each time, so the slope is 3. y = 3x + 1 will model this pattern!

$$y = mx + b$$

starting value (1)

Rate of Change (+3)

$$y = 3x + 1$$
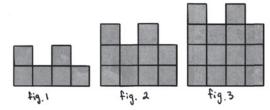
STEP THREE: Plug in 8 for x and solve. If we plug 8 (the figure that we're looking for) into the equation, it will tell us how many blocks we need. Follow order of operations and we get 25 blocks! Continue to that page.

$$y = 3x + 1$$
$$y = 3(8) + 1$$
$$y = 24 + 1$$
$$y = 25$$

8

This applies to Chapter 2 page 51 in *The Dregg Disaster Algebra I Gamebook*.

Consider the pattern. How many dice will be in figure 11?
Which figure will have 38 dice?

fig. 1   fig. 2   fig. 3

Consider the pattern. How many blocks will there be in figure 9? Which figure will have 82 blocks?

Consider the pattern. How many dice will there be in figure 8?
Which figure will have 47 dice?

fig.1

fig.2

fig.3

Slope from two points

This problem is asking about slope: basically, how *steep* a line is. It gives us two points that fall on that line and asks us to figure out: is this line really steep (is it going up quickly) or is it growing more slowly?

$(-5, -8)$ and $(-1, 4)$

STEP ONE: Find the rise (aka "ryse"). I like to misspell "rise" as "ryse" to remind myself that the rise is the change in the y-direction. Rise te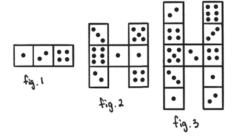lls us how far the line is going up (or down) between these two points. In our problem, we are going from −8 all the way up to 4. That distance is 12 spots, and we are going up from *negative* 8 to *positive* 4. We can say our rise (or ryse) is 12.

STEP TWO: Find the run. We know our line is going up 12, but over how long of a distance? We need to figure out how fast our line is climbing those 12 spots, and for that we find run. In this problem, we are going from −5 to −1, which is a distance of 4, and we are going up. This means our run is 4.
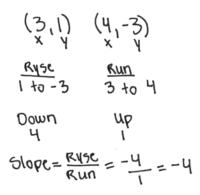
STEP THREE: Find the slope. Slope is a ratio. You can think of it as comparing change in y (ryse) to change in x (run). It compares how fast our line is going up (or down) with how fast it is going side to side. Our problem is going up 12 for every 4 spots it moves to the right, meaning our ryse/run ratio would be 12/4.

$$\text{Slope} = \frac{\text{Ryse}}{\text{Run}} = \frac{12}{4}$$

STEP FOUR: Reduce our slope. This ratio can be reduced. 12/4 is the same thing as 3/1 (it goes up 3 for every 1 space on the graph). 3/1 is the same as 3. Continue to that page!

$$\frac{12}{4} = \frac{3}{1} = 3$$

This applies to Chapter 2 page 52 in *The Dregg Disaster Algebra I Gamebook*.

Slope from two points

Find the slope of the line through the following two points.

$(9, 13)$ and $(5; 15)$

Slope from two points

Find the slope of the line through the following two points. $(-12, -9)$ and $(-11, 1)$

Slope from two points

Find the slope of the line through the following two points. $(-2, -19)$ and $(2, 29)$

Find the slope of the line through the following two points.

$(9, -5)$ and $(-12, -11)$

Slope from two points

Find the slope of the line through the following two points.

$(3, -1)$ and $(6, -4)$

y-intercept from two points

This problem gives us two points on a line and asks us to find where that line starts (where that line crosses the y-axis).

$(3,1)$ and $(4,-3)$

$$(3,1) \quad (4,-3)$$
$$\text{x} \quad \text{y} \qquad \text{x} \quad \text{y}$$

$$\frac{\text{Ryse}}{1 \text{ to } -3} \qquad \frac{\text{Run}}{3 \text{ to } 4}$$

$$\begin{array}{cc} \text{Down} & \text{up} \\ 4 & 1 \end{array}$$

$$\text{Slope} = \frac{\text{Ryse}}{\text{Run}} = \frac{-4}{1} = -4$$

STEP ONE: Find the slope. The first thing that we need to do is find the slope between these two points. Slope will tell us how steep our line is, and for these two points our line is going down 4 for every 1 that it goes side to side, meaning the slope is −4. (There is a much more detailed explanation of slope on page 52 of this chapter's Adventurer's Advice.)

STEP TWO: Plug what we know into the equation for a line. This line has a slope of −4. Where does a line that has a steepness of −4 need to start in order to go through (3,1)? Or (4,−3) for that matter? It helps us to know that the equation for any line can be written as y = mx + b. The m in this equation is the slope (−4 in this problem) and the b is the y-intercept (what we are looking for). The x and y values in our equation are just the x and y values for any point along the line. We have two points on this line to choose from, and I'm going to pick (3,1). When I plug in m, x, and y, I get a y = mx + b equation that says 1 = (3)(−4) + b.

$$\begin{array}{cc} \text{y value} & \text{slope} \\ & \searrow \quad \swarrow \end{array}$$
$$y = mx + b$$
$$\text{x value} \nearrow$$

$$\text{Slope} = -4 \qquad (3,1)$$
$$\qquad\qquad\qquad \text{x} \quad \text{y}$$

$$y = mx + b$$
$$(1) = (-4)(3) + b$$

STEP THREE: Solve for b. 3 times −4 is −12, and we can get the variable b by itself by adding 12 to both sides of our equation. We end up with b = 13, which means that a line that goes through the two points we were given has to start at 13. Continue to that page!

$$(1) = (-4)(3) + b$$
$$1 = -12 + b$$
$$\underline{+12 \qquad +12}$$
$$13 = b$$

This applies to Chapter 2 page 53 in *The Dregg Disaster Algebra I Gamebook*.

y-intercept from two points

Find the y-intercept of the line that connects these two points.

$(2,5)$ and $(3,3)$

y-intercept from two points

Find the y-intercept of the line that connects these two points.   (-5, -9) and (2, 12)

y-intercept from two points

Find the y-intercept of the line that connects these two points.

$(5,7)$ and $(-1,1)$

y-intercept from two points
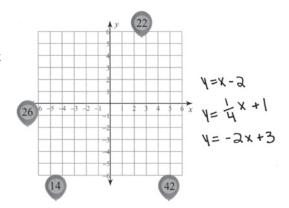
Find the y-intercept of the line that connects these two points. $(-2, 15)$ and $(3, 5)$
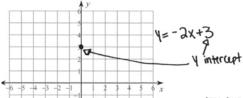
y-intercept from two points

Find the y-intercept of the line that connects these two points.

$(-5, -2)$ and $(-4, 0)$

Graphing lines
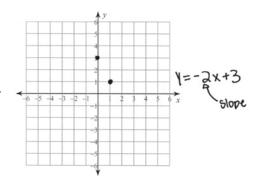
This problem is asking us to graph some lines, and all the lines are given in y = mx + b format. Let's graph y = −2x + 3.

$y = x - 2$

$y = \frac{1}{4}x + 1$
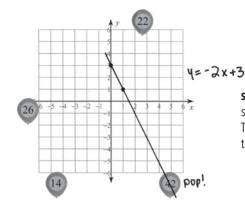
$y = -2x + 3$

$y = -2x + 3$

y intercept

STEP ONE: Plot your y-intercept. The y-intercept on a graph is the starting point, and it's where our line crosses (or *intercepts*) the y-axis. This line needs a y-intercept at 3.
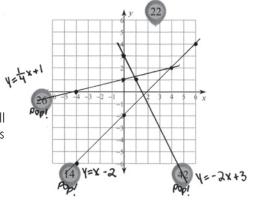
STEP TWO: Use your slope to plot the next point. This slope has a slope of −2, which means that it goes down 2 for every 1 space that it goes over. It can help to think of −2 as a fraction. −2/1 is the exact same number as −2. Count down 2 spaces, over 1, and place your next point.

$y = -2x + 3$

slope

$y = -2x + 3$

STEP THREE: Continue your pattern. Continue following your slope pattern (down 2, right 1) until your line is complete. This line pops the 42 balloon, meaning that we *don't* want to go to that page.

pop!
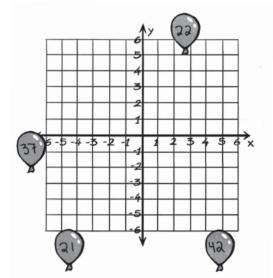
STEP FOUR: Graph the other lines. Follow Steps One through Three with the other two lines. These lines will pop the 14 and 26 balloons, leaving the 22 balloon as the only one left. Continue to that page!

$y = \frac{1}{4}x + 1$

Pop!

$y = x - 2$

pop!

$y = -2x + 3$

pop!

This applies to Chapter 2 page 54 in *The Dregg Disaster Algebra I Gamebook*.

Graphing lines

Graph the lines. The lines will pop all but one balloon.

$$y = x - 2$$

$$y = \frac{1}{4}x + 1$$

$$y = -2x + 3$$

Graphing lines

Graph the lines. The lines will pop all but one balloon.

$$y = \frac{1}{2}x - 3$$

$$y = -\frac{5}{2}x + 3$$

$$y = x$$

Graphing lines

Graph the lines. The lines will pop all but one balloon.

$$y = \frac{1}{3}x - 4$$

$$y = -\frac{1}{3}x - 2$$

$$y = 3x + 1$$

Graph the lines. The lines will pop all but one balloon.

$$y = x + 1$$

$$y = -\frac{3}{2}x - 4$$

$$y = 3x + 2$$

Graphing lines

Graph the lines. The lines will pop all but one balloon.

$$y = -x + 1$$

$$y = \frac{1}{2}x + 4$$

$$y = -3x + 1$$

Graphing lines

Graph the lines. The lines will pop all but one balloon.

$$y = -3x + 4$$

$$y = \frac{1}{2}x - 3$$

$$y = 5x - 2$$

Graphing lines

Graph the lines. The lines will pop all but one balloon.

$$y = -\frac{3}{2}x + 4$$

$$y = \frac{1}{2}x - 4$$

$$y = x - 2$$

Visual systems of equations

This question is sort of like the other systems of equations problems that we have looked at in this chapter, but this one uses barnyard animals instead of variables like x, y, or z.

🐑 + 🐷 + 🐑 = 19

2 🐔 = 🐑

🐔 + 🐔 + 🐔 = 9

To continue your adventure, find...

🐑 + 🐔 + 🐷
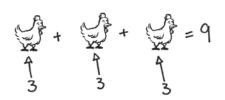
And continue to the page that matches your answer.

This could be
2,3,4,10,-100,0...

🐑 + 🐷 + 🐑 = 19

This equation we can solve!

🐔 + 🐔 + 🐔 = 9
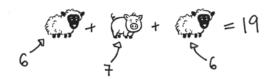
STEP ONE: Find a place to start. The first equation with the sheep and the pig will help us later, but right now it has too many variables. Until we get some more information, the sheep could be any number! If we keep looking, the third equation only has chickens. This is an equation that we can solve right now!
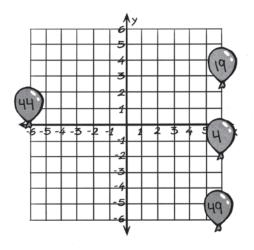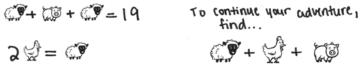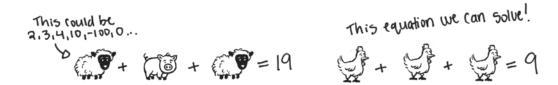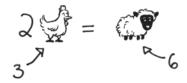
🐔 + 🐔 + 🐔 = 9
↑   ↑   ↑
3   3   3

STEP TWO: Solve for the first variable. The third equation is a great place to start, and if we know that three chickens are worth 9, each chicken must be worth 3, since 3 + 3 + 3 = 9..
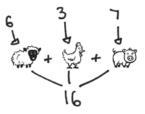
STEP THREE: Solve for the second variable. We know that the chicken is worth 3 now, and that will help us in the second equation! The second equation tells us that a sheep is worth 2 chickens. We know what a chicken is worth, so the sheep must equal 6, since 2 * 3 = 6.

2 🐔 = 🐑
3 ↗   ↖ 6
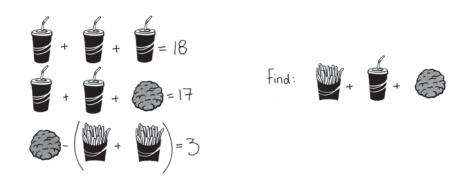
STEP FOUR: Solve for the third variable. If the sheep is 6, then we can use the first equation to solve for the pig! Each one of the sheep is worth 6. That means that the pig must equal 7 so that we get to 19 (6 + 7 + 6 = 19). Now we have all three variables figured out!

🐑 + 🐷 + 🐑 = 19
6 ↗   ↑   ↖ 6
      7

STEP FIVE: Find the page! We know the pig, the sheep, and the chicken now, but this question is asking what sheep + chicken + pig equals. Substitute in the values that we found in Steps Two, Three, and Four, and we can see that we should continue to page 16!

6   3   7
↓   ↓   ↓
🐑 + 🐔 + 🐷
        └──┬──┘
          16

This applies to Chapter 2 page 55 in *The Dregg Disaster Algebra I Gamebook*.

$$\text{🥤} + \text{🥤} + \text{🥤} = 18$$

$$\text{🥤} + \text{🥤} + \text{🧠} = 17$$

$$\text{🧠} - (\text{🍟} + \text{🍟}) = 3$$

find: $\text{🍟} + \text{🥤} + \text{🧠}$

🐀 × 🐀 × 🐀 = 27

⚗ × 🐀 = 24

⚗ − 3 🪰 = 2

Find: ⚗ + 🐀 + 🪰

$$\text{🍩} = 5 \cdot \text{☕}$$

$$\text{☕} + \text{☕} + 5 = 11$$

$$\text{🍎} = \text{🍩} + \text{🍩} - \text{☕}$$

Find: $\text{☕} + \text{🍎} + \text{🍩}$
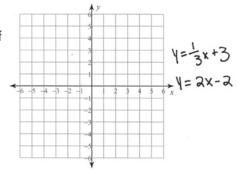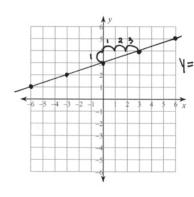
Visual systems of equations

$$\text{♗} = \text{♙} + \text{♙}$$

$$\text{♗} + \text{♗} + \text{♗} = 18$$

$$\text{♘} = \text{♗} \times \text{♙} - 4$$

Find: $\text{♙} + \text{♘} + \text{♗}$

Solving systems by graphing

This problem is looking for the *solution* to this system of equations. The solution is the place where the two equations are exactly equal, and on a graph, that point is where the lines cross.

$$\left(\square,\square\right) \rightarrow \square\square$$

$$y = \frac{1}{3}x + 3$$
$$y = 2x - 2$$
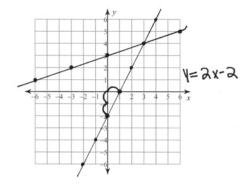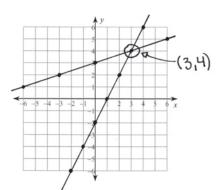
STEP ONE: Graph the first line. y = 1/3x + 3 starts at 3 and goes up 1 spot for every 3 it goes to the right. There is a much more detailed explanation for how to graph lines on page 54 of this chapter's Adventurer's Advice.

$$y = \frac{1}{3}x + 3$$
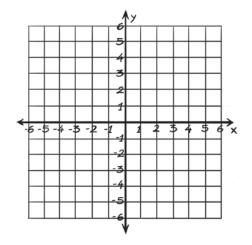
STEP TWO: Repeat with the second line.

$$y = 2x - 2$$
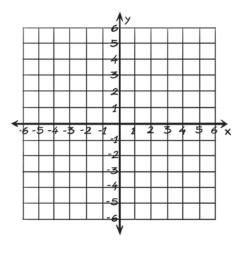
STEP THREE: Find the place where the two lines cross. In this problem, our two lines cross at the point (3,4). If we turn that point into a page number, we get 34, so we will continue to that page.

$$(3,4)$$

This applies to Chapter 2 page 56 in *The Dregg Disaster Algebra I Gamebook*.

107

Solving systems by graphing

Solve this system of equations using graphing.

$$y = \frac{1}{2}x + 2$$
$$y = -x + 5$$

Solving systems by graphing

Solve this system of equations using graphing.

$$y = \frac{3}{2}x - 4$$

$$y = -2x + 3$$

Solving systems by graphing

Solve this system of equations using graphing.

$$y = -x + 1$$
$$y = \frac{2}{3}x - 4$$

This problem is looking for a solution to this system. The solution is the place where these lines cross and these equations are equal. Before we start, it helps to remember that the places these lines are going to cross is going to be an (x,y) ordered pair, so we need to find a solution in that format. For this problem, both equations are solved for y, which makes it easy to solve with a strategy called *substitution*.

$$y = 6x - 8$$
$$y = 8x - 12$$

$$(\square, \square) \rightarrow \square\square$$

$$y = 6x - 8$$
$$y = \boxed{8x - 12}$$

This expression equals "y"!

$$8x - 12 = 6x - 8$$

STEP ONE: Substitute. The second equation tells us that y is equal to 8x − 12. Those two quantities are exactly the same, so we can look to the first equation. Instead of y in the first equation, we can write in the thing that y is equal to: 8x − 12. This gives us the new equation 8x − 12 = 6x − 8. This helps us because now we have only one variable and we can solve!

STEP TWO: Solve for x. Take away 6x on both sides, then add 12 to both sides, before dividing both sides by 2. (There is a more detailed breakdown of this solving strategy on page 51 of Chapter 1 Adventurer's Advice.) We find that the place the lines cross happens when x is equal to 2. This isn't our final solution, but we do know that the x in our (x,y) ordered pair is going to be 2.

$$8x - 12 = 6x - 8$$
$$\underline{-6x \qquad -6x}$$
$$2x - 12 = -8$$
$$\underline{+12 \qquad +12}$$
$$2x = 4$$
$$\underline{\div 2 \qquad \div 2}$$
$$x = 2$$

$$x = 2$$
$$y = 6x - 8$$
$$y = 6(2) - 8$$
$$y = 12 - 8$$
$$y = 4$$

STEP THREE: Plug in our x-value and solve for y. From here, we need to find where our lines are when x is equal to 2. We do that by plugging in 2 for x. It doesn't actually matter which equation we pick, because this is the *one place* where the two lines are at the same place on our graph! I'm going to use y = 6x − 8, but you can use the other equation if you want. Follow order of operations, and we find that if we multiply 6 by 2 then take away 8, we're left with a y-value of 4.

STEP FOUR: Put your x and y values together to find the solution. We have already done all the math, now we just need to plug 2 and 4 into an (x,y) ordered pair. Step Two told us that x = 2, and Step Three told us that y = 4, so the solution is (2,4). Turn that point into a page number (24) and continue to that page!

$$x = 2 \qquad y = 4$$
$$(x, y)$$
$$(2, 4)$$

Solve this system of equations using substitution

$$y = 8x - 4$$
$$y = 6x - 2$$

Systems and substitutions

Solve this system of equations using substitution

$$y = -7x + 18$$
$$y = 6x - 8$$

Systems and substitutions

Solve this system of equations using substitution

$$y = 8x - 4$$
$$y = 2x + 2$$

Systems and substitutions

Solve this system of equations using substitution

$$y = 7x - 10$$
$$y = -2x + 8$$

Systems and substitutions

Solve this system of equations using substitution

$$y = 6x - 2$$
$$y = -2x + 6$$

Systems and substitutions

Solve this system of equations using substitution

$$y = 4x - 4$$
$$y = 7x - 10$$

This problem is looking for a solution to this system. The solution is the place where these lines cross and these equations are equal. Before we start, it helps to remember that the places these lines are going to cross is going to be an (x,y) ordered pair, so we need to find a solution in that format. For this problem, neither equation is solved for x or y, which means substitution would be difficult. Instead, we're going to use a strategy called *elimination*.

$$4x + 4y = 28$$
$$-2x + 6y = 10$$

$$(\square, \square) \rightarrow \square\square$$

$$4x + 4y = 28 \text{ (equation 1)}$$
$$-2x + 6y = 10 \text{ (equation 2)}$$
pick this one!
$$\cdot 2 \quad -4x + 12y = 20$$

STEP ONE: Look for a way to make one of our variables cancel (add to zero). In Step Two, we're going to make one of our variables cancel out. To do that we need equal and opposite numbers of x's or y's in the two equations. (For example, *positive* 5y in the first equation with a *negative* 5y in the second equation. Those terms are equal and opposite, and would cancel out.) In our problem, if I double my second equation, I will get a "negative 4x," and that will cancel out with the "positive 4x" in our first equation. When we multiply the *entire* second equation by two, we get a new equation: $-4x + 12y = 20$.

STEP TWO: Stack the equations and combine the like terms, now that we know one variable will cancel. Using our new, doubled version of equation 2 and the original version of equation 1, we can add both equations together. The positive 4x and the negative 4x cancel (that's why we multiplied the second equation by two) and leave us with 16y = 48. Divide both sides by 16, and we get y = 3. This isn't our final solution, but it tells us that when these two lines cross, they are at a height of 3. The y in our (x,y) point will be 3.

$$4x + 4y = 28 \text{ (original equation \# 1)}$$
$$-4x + 12y = 20 \text{ (new equation \# 2)}$$
ADD
$$0x + 16y = 48$$
$$16y = 48$$
$$\div 16 \quad \div 16$$
$$y = 3$$

$$y = 3$$
$$-2x + 6y = 10$$
$$-2x + 6(3) = 10$$
$$-2x + 18 = 10$$
$$-18 \quad -18$$
$$-2x = -8$$
$$\div -2 \quad \div -2$$
$$x = 4$$

STEP THREE: Plug our value into one of our original equations to find the other variable. From here, we need to find where our lines are when y is equal to 3. We do that by plugging in 3 for y. It doesn't actually matter which equation we pick, because this is the *one place* where the two lines are at the same place on our graph. I'm going to pick $-2x + 6y = 10$, but you can use the other equation if you want. After we plug in 3, we can solve and find that when y = 3, x = 4 (for a detailed explanation of this solving strategy, go to page 51 in Chapter 1 Adventurer's Advice).

STEP FOUR: Put your x and y values together to find the solution. We have already done all the math, now we just need to plug 3 and 4 into an (x,y) ordered pair. Step Two told us that y = 3, and Step Three told us that x = 4, so the solution is (4,3). Turn that point into a page number (43) and continue to that page!

$$x = 4 \quad y = 3$$
$$(x, y)$$
$$(4, 3)$$

Systems and elimination

Solve this system of equations using elimination.

$$14x - 3y = 27$$
$$-7x + 7y = 14$$

Solve this system of equations using elimination.

$$-8x + 3y = -17$$
$$4x - 6y = -14$$

Solve this system of equations using elimination.

$$12x - 5y = -11$$
$$6x - 3y = -9$$

Solve this system of equations using elimination.

$$-x - y = -10$$
$$7x - 5y = -2$$

Solve this system of equations using elimination.

$$-6x + 3y = 18$$
$$8x - 3y = -16$$
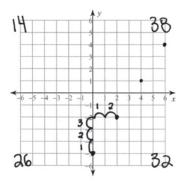
Solve this system of equations using elimination.

$$6x - 7y = -24$$
$$-6x + y = -12$$

Solve this system of equations using elimination.

$$-6x + 5y = -13$$
$$4x + 15y = 27$$

Solve this system of equations using elimination.

$$-15x + 6y = 27$$
$$-5x + y = 2$$

Graphing linear inequalities
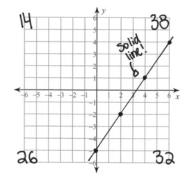
Most of the other problems in this chapter ask us to graph an equation where y *is equal* to some version of x. This problem is different. It's an *inequality* and there are a lot more places where y is *unequal* to some version of x. We read "≤" as "less than or equal to," so this problem in particular is asking us to show all the places on the graph where y is *less than OR equal to* 3/2x − 5.
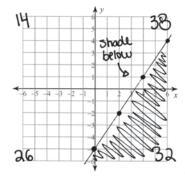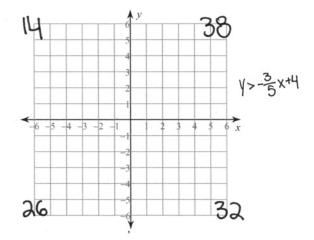
STEP ONE: Graph the line, same as normal. Check page 54 of this chapter's Adventurer's Advice for a more detailed breakdown, but we start this line with a y-intercept of negative 5, and the slope tells us to go "up 3, over 2" to create a linear pattern. Plot all the points that follow this pattern. This line is the "3/2x − 5" part of our inequality.
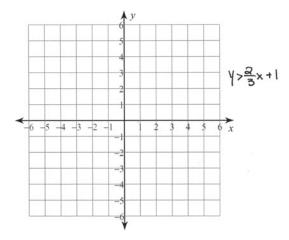
STEP TWO: Decide if the line is solid or dotted. A solid line means that we are *including* the points on the line. A dotted line means that we are *not including* the points on the line. In this problem, we are graphing all the places on the graph where y is less than *or equal to* the line. That "or equal to" part means that we are including the points on the line, so this line would be solid.
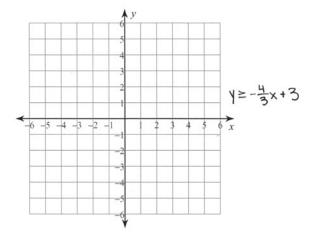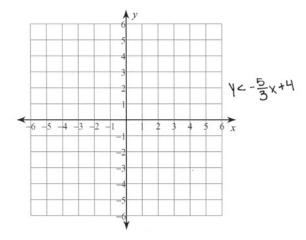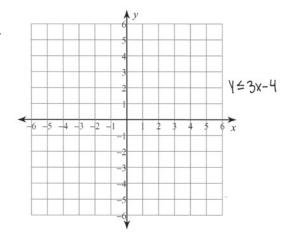
STEP THREE: Shade. This problem wants us to show all the places that y is *less than* or equal to the line. The "less than" part means we want to shade "less than" or below our line. The only page number in this shaded portion of our graph (called the "solution set") is 32, so continue to that page!

Graphing linear inequalities

Graph the following inequality.

14

38

$$y > -\frac{3}{5}x + 4$$

26

32

Graphing linear inequalities

Graph the following inequality.

$$y > \frac{2}{3}x + 1$$

Graphing linear inequalities

Graph the following inequality.

$$y \geq -\frac{4}{3}x + 3$$

130

Graphing linear inequalities

Graph the following inequality.

$$y < -\frac{5}{3}x + 4$$

Graphing linear inequalities

Graph the following inequality.

$y \leq 3x - 4$
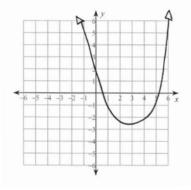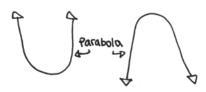
CHAPTER 3
AMAZING FREE DOWNLOAD

Quadratic vocabulary
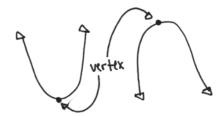
In which *quadrant* is the *vertex* of this *parabola* located?
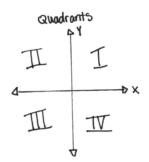
STEP ONE: This question uses a few pieces of key vocabulary that we need to understand if we are going to find the answer. First off: a parabola. Any function or pattern with x^2 as the biggest term is called "quadratic" and the shape that it makes on a graph is called a parabola. Some parabolas are fat, some are skinny, but they are always shaped like a "u." This chapter focuses on the math that we can use with parabolas and quadratic functions.

STEP TWO: This u-shaped parabola can open upward or downward, but either way, we will get one point that is lower (or higher) than all the other points on the parabola. This point is called the vertex.
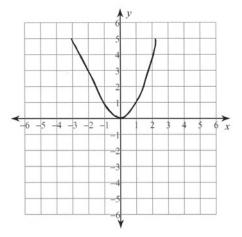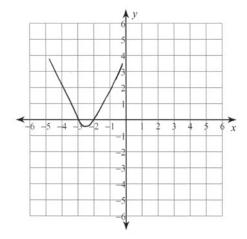
STEP THREE: Finally, we need to think back to what we know about a coordinate plane. The x and y axes split the coordinate plane into four parts called quadrants, and we typically number them 1–4, like the labels shown at left.

When we put all those things together, we can see that the vertex of the parabola shown in this question is in quadrant 4, so we will continue to page 4!

This applies to Chapter 3 page 51 in *The Dregg Disaster Algebra I Gamebook*.

Quadratic vocabulary

What are the coordinates of the vertex of this quadratic?

Quadratic vocabulary

By looking at the graph below, what are the solutions to the quadratic function?

Quadratic vocabulary

By looking at the quadratic equation below, will the graph open up or open down?

$$y = -x^2 - 12x + 20$$

Polynomial addition

This is an addition problem, even though it looks more confusing. We need to add one thing (7x + 1) to another thing (4x^2 + 9x − 5). These things are called polynomials, and every polynomial has terms that are separated by addition or subtraction. So (7x + 1) has two terms, 7x and 1.

$$(7x+1)+(4x^2+9x-5)$$
$$4x^2 + \boxed{}\,x - 4$$

$$(7x+1)+(4x^2+9x-5)$$
$$7x+1+4x^2+9x-5$$

STEP ONE: Add. When we add the two polynomials together, we need to add the 4x^2 + 9x − 5 terms from the first polynomial to the 7x + 1 terms from the second polynomial.

STEP TWO: Combine like terms. We have a mess of terms now and we can make our answer simpler by combining like terms. Like terms need to have the same variable *and* the same exponent. Otherwise, we can't count them together. In our problem, 4x^2 doesn't have any like terms, but 9x does. The first polynomial has a 7x that we can combine with 9x for 16 total x's. −5 can also be combined with +1, so our final answer will be 4x^2 + 16x − 4. Our page number is the coefficient with the x, so we will continue to page 16!

$$7x+1+4x^2+9x-5$$
$$16x+1+4x^2-5$$
$$16x-4+4x^2$$
$$\text{Rearrange}$$
$$4x^2+16x-4$$

This applies to Chapter 3 page 52 in *The Dregg Disaster Algebra I Gamebook*.

Polynomial addition

Simplify the following expression.

$$(2x^2 - 5x) + (3x^2 + 3x - 7)$$

Polynomial addition

Simplify the following expression.

$$(-7x^2 + 3x - 10) + (2x^2 + 9)$$

Polynomial addition

Simplify the following expression.

$$(x^2 - x - 1) + (-x^2 + 6x - 5)$$

Polynomial addition

Simplify the following expression.

$$(11x^2 - 4x + 8) + (3x^2 + 9x - 12)$$

Polynomial addition

Simplify the following expression.

$$(-7x^2 - 4x + 2) + (5x^2 - 2x - 15)$$

Polynomial subtraction

This is a subtraction problem, even though it looks much more complicated. We are starting with one thing ($9x^2 + 5x$) and subtracting away another thing ($4x^2 - 7x - 5$). The "things" in that explanation are called polynomials, and they have more than one piece, or term. This problem wants us to take away *all three* terms of our second polynomial.

$$(9x^2 + 5x) - (4x^2 - 7x - 5)$$
$$5x^2 + \boxed{}\, x + 5$$

STEP ONE: Take away the first term. If we take away $4x^2$ from $9x^2 + 5x$, it will leave us with $5x^2 + 5x$. The $9x^2$ and the $4x^2$ are like terms.

$$(9x^2 + 5x) - (4x^2 - 7x - 5)$$
$$(9x^2 + 5x) - (4x^2) \leftarrow \text{Term} ①$$
$$5x^2 + 12x$$

STEP TWO: Take away the second term. This time we are subtracting a $-7x$. If we subtract a negative, it helps to think of those negative signs canceling out. We actually end up *adding* $7x$ on in this problem. ($5x^2 + 5x$) becomes ($5x^2 + 12x$) when we add 7 more x's.

$$(5x^2 + 5x) - (-7x - 5)$$
$$(5x^2 + 5x) - (-7x) \leftarrow \text{Term} ②$$
$$5x^2 + 5x + 7x$$
$$5x^2 + 12x$$

STEP THREE: Take away the third term. Again, we are subtracting a number that is *already* negative. Subtracting a negative means we end up adding it, so when we subtract -5, we end up with $4x^2 + 12x + 5$.

$$(5x^2 + 12x) - (-5)$$
$$5x^2 + 12x + 5$$
$$\text{No like terms}$$
$$5x^2 + 12x + 5$$

A faster way to think through this problem is to distribute the negative sign to all the things that are being taken away ($4x^2$ and $-7x$ and -5) and then combine like terms. Either way, to solve this, you end up with $4x^2 + 12x + 5$, and the book wants us to continue to the page that matches our x coefficient. For this problem, that means continuing to page 12!

This applies to Chapter 3 page 53 in *The Dregg Disaster Algebra I Gamebook*.

Polynomial subtraction

Subtract the following expression. Find the coefficient on the x term.

$$(9x^2 + 5x) - (4x^2 - 7x - 5)$$

Polynomial subtraction

Subtract the following expression. Find the coefficient on the x term.

$$(7x^2 + 4x) - (4x^2 - 6x + 11)$$

Polynomial subtraction

Subtract the following expression. Find the coefficient on the x term.

$$(2x^2 + 3x) - (6x^2 - 9x + 8)$$

Subtract the following expression. Find the coefficient on the x term.

$$(12x^2 + 9x) - (2x^2 - 3x + 7)$$

Polynomial subtraction

Subtract the following expression. Find the coefficient on the x term.

$$(10x^2 + 4x) - (5x^2 - 6x - 8)$$

Polynomial subtraction

Subtract the following expression. Find the coefficient on the x term.

$$\left(14x^2 + 11x\right) - \left(11x^2 - x + 8\right)$$

Polynomial subtraction

Subtract the following expression. Find the coefficient on the x term.

$$(9x^2 + 5x) - (2x^2 - 7x - 14)$$

Polynomial multiplication

This is a multiplication problem, even though it looks way more complicated. When we have parentheses touching parentheses, there is a hidden multiplication sign in between. We are multiplying one thing $(3x - 2)$ by another thing $(4x + 5)$. You can think of these problems lots of ways (area model, FOIL, etc.). My favorite strategy is to use double distribution.

$$(3x - 2)(4x + 5)$$
$$12x^2 + \boxed{}\, x - 10$$
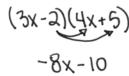
When we see a problem like the one to the left, we know that we can use the distributive property to help us multiply the 5 by *both terms* inside of the parentheses.

$$5(2x + 7)$$
$$5(2x + 7)$$
$$10x + 35$$

Our problem works the same way, but we just have to distribute an extra time: once with 3x and again with the −2.

STEP ONE: Distribute the 3x. We want to multiply the 3x by both terms in the other polynomial. This will give us $12x^2$ and 15x.

$$(3x - 2)(4x + 5)$$
$$(3x - 2)(4x + 5)$$
$$12x^2 + 15x$$

STEP TWO: Distribute the −2. Be careful here. The negative sign goes with the 2, so we need to distribute a −2! When we multiply, we get −8x and −10.

$$(3x - 2)(4x + 5)$$
$$-8x - 10$$

STEP THREE: Combine like terms. After distributing both the 3x and the −2, we are left with the terms $12x^2$, 15x, −8x, and −10. The 15x and the −8x terms are both regular old "x's" so we can combine them. 15 x's minus 8 x's leaves us with 7 x's, so our final answer can be written as $12x^2 + 7x$ − 10. The book wants the coefficient with the x so we would continue to page 7!

$$12x^2 + 15x - 8x - 10$$
$$12x^2 + 7x - 10$$

This applies to Chapter 3 page 54 in *The Dregg Disaster Algebra I Gamebook*.

Polynomial multiplication

Multiply the following equation. Find the coefficient on the x term.

$$(5x-4)(2x+5)$$

Multiply the following equation. Find the coefficient on the x term.

$$(2x+9)(x+3)$$

Multiply the following equation. Find the coefficient on the x term.

$$(5x-3)(3x+3)$$

Polynomial multiplication

Simplify the following expression.

$$(4n+2)(4n-2)$$

Polynomial multiplication
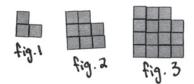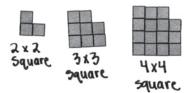
Simplify the following expression.

$$(3r-8)(7r + 4)$$

Visual patterns
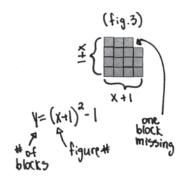
This problem gives us a pattern and asks for the 6th figure in the pattern. There are a bunch of strategies you can use to solve this question, and I hope you tried it in your own way!
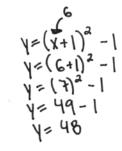
STEP ONE: Identify the pattern. The three shapes that we were given have 3, 8, and 15 blocks. This pattern isn't adding the same thing each time, but it does look like a square getting bigger. This pattern deals with an x-squared (x^2) pattern.
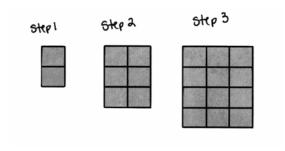
STEP TWO: Model the pattern with an equation. Square patterns can be modeled with $y = x^2$ equations. In this one, each side of the square looks like it is one longer than the figure number, or x + 1. After we create the right size square, all the figures take away one tile from the top corner. So if we take the side length (x + 1), then square it, then take away the tile in the corner, we end up with $y = (x + 1)^2 - 1$.
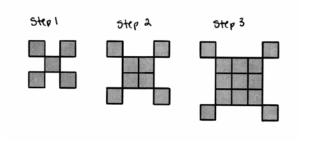
STEP THREE: Plug in 6 for x and solve. If we plug 6 (the figure that we're looking for) into the equation, it will tell us how many blocks we need. Follow order of operations and we get 48 blocks! Continue to that page.

$$y = (x+1)^2 - 1$$
$$y = (6+1)^2 - 1$$
$$y = (7)^2 - 1$$
$$y = 49 - 1$$
$$y = 48$$

This applies to Chapter 3 page 55 in *The Dregg Disaster Algebra I Gamebook*.

Visual patterns
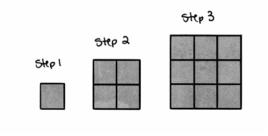
How many tiles will be used in step 7? Which step will use 182 tiles?

Step 1   Step 2   Step 3

Visual patterns

How many tiles will be used in step 11? Which step will use 445 tiles?

Step 1   Step 2   Step 3

How many tiles will be used in step 15? Which step will use 961 tiles?

Step 1

Step 2

Step 3

Factoring (solve first)

We can think of this problem a few different ways. It can be the line 11x crossing the parabola $x^2 + 28$, or we can think of it as an equation for just a parabola that we need to rearrange first. The roots/zeroes/solutions of a parabola are the places that the parabola crosses the x-axis, and we can find those points with our algebra skills.

$$x^2 + 28 = 11x$$
$$x = \square$$
$$x = \square \longrightarrow \square\,\square$$

$$x^2 + 28 = 11x$$
$$-11x \qquad -11x$$
$$\overline{x^2 - 11x + 28 = 0}$$

STEP ONE: Rearrange the equation so that all the terms are on one side. We are looking for where our parabola equals zero, so we can rewrite our equation as $0 = x^2 - 11x + 28$.

STEP TWO: This type of equation is one that we can solve with factoring, and there is a more thorough explanation on page 56 of this chapter's Adventurer's Advice. When we look for numbers that multiply to 28, but add to -11, we end up with -7 and -4. This means we can rewrite our equation as $0 = (x - 7)(x - 4)$. We are looking for the places where the parabola is actually *equal to zero*, and those two places (our solutions) would be at 7 and 4.

$$x^2 - 11x + 28 = 0$$
$$(x - 7)(x - 4) = 0$$

If this x equals 7 the whole equation equals 0

If this x equals 4 the whole equation equals 0

$$x = 7 \qquad\qquad x = 4$$

Now that we have our two solutions, we can find our page number. Put the two solutions together, smaller number first, and continue to page 47.

This applies to Chapter 3 page 58 in *The Dregg Disaster Algebra I Gamebook*.

Use factoring to find the solutions to the
following quadratic equation.

$$x^2 - 3x + 24 = 8x$$

Factoring (solve first)

Use factoring to find the solutions to the
following quadratic equation.

$$2x^2 - 10x + 20 = x^2 - 4$$

Use factoring to find the solutions to the following quadratic equation.

$$x^2 + 21 = 10x$$

Factoring (solve first)

Use factoring to find the solutions to the following quadratic equation.

$$x^2 + 18 = 11x$$

Factoring (solve first)

Use factoring to find the solutions to the following quadratic equation.

$$x^2 - 6x + 8 = 3x$$

Factoring (solve first)

Use factoring to find the solutions to the following quadratic equation.

$$x^2 - 10x + 36 = 3x$$

Factoring (solve first)

Use factoring to find the solutions to the following quadratic equation.

$$x^2 - 5x + 14 = 4x$$

Factoring (solve first)

Use factoring to find the solutions to the following quadratic equation.

$$x^2 - 8x + 27 = 4x$$

Factoring (solve first)

Use factoring to find the solutions to the following quadratic equation.

$$x^2 - 2x + 16 = 8x$$

Solving with square roots

There are a few ways to solve this one. We could graph it or solve it with factoring. Because it has the variable (x) in only one place, we can also use our equation-solving skills here and solve with square roots.

$$x^2 + 20 = 101$$

$$\begin{array}{r} x^2 + 20 = 101 \\ -20 \quad -20 \\ \hline x^2 = 81 \end{array}$$

STEP ONE: Get rid of 20 with inverse operations. The x's are in only one place in our equation, so we can get to our answers by isolating the variable. We can get rid of +20 by subtracting 20 on both sides.

STEP TWO: Get rid of the exponent with inverse operations. The inverse operation to squaring a number is to take the square root. Square rooting an x^2 will leave us with just a normal x. When we take the square root of 81, we are answering the question: "What number, if I multiply it by itself, will give me 81?" 9 times 9 is 81, so 9 is one solution. Negative 9 times negative 9 will also give us 81, so 9 *and* −9 are solutions. The instructions on this problem tell me to disregard the −9, so continue the story on page 9!

$$x^2 = 81$$
$$\sqrt{x^2} = \sqrt{81}$$
$$x = 9$$
$$x = -9$$

This applies to Chapter 3 page 59 in *The Dregg Disaster Algebra I Gamebook*.

Solving with square roots

Solve the following equation by isolating the variable.

$$x^2 - 20 = 101$$

Solving with square roots

Solve the following equation by isolating the variable.

$$m^2 - 4 = 77$$

Solve the following equation by isolating the variable.

$$n^2 + 3 = 67$$

Solving with square roots

Solve the following equation by isolating the variable.

$$b^2 - 2 = 7$$

Solve the following equation by isolating the variable.

$$7p^2 + 4 = 704$$

Quadratic formula

Sometimes we have quadratic (x^2) equations that don't easily factor (or equations that are impossible to factor). The one on this page has a 2 as its lead coefficient, and we can't divide the whole thing by 2 because 11/2 will give us a decimal. You can still solve this a few ways, but they will all take more time than factoring. We could graph it and see where the roots are that way. You could also solve this with strategies called "grouping" or "completing the square," but we are going to walk through this problem with the quadratic formula. The quadratic formula is helpful because it works for *any* quadratic equation, and the steps remain the same. It looks like a mess, but we just need to plug in our values and follow our order of operations.

$$y = 2x^2 - 11x - 40$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 2 \quad b = -11 \quad c = -40$$

$$x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(2)(-40)}}{2(2)}$$

STEP ONE: Plug values into the equation. The quadratic formula uses a, b, and c, and those letters correspond to our coefficients in our equation. A is 2, B is −11, and C is −40 (make sure you catch the negatives!).
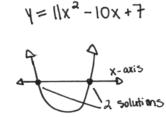
STEP TWO: Simplify the discriminant. The rest of this problem is going to involve simplifying this big mess of numbers and operations until we get our solutions. The best place to start is with the discriminant, which is the name that we sometimes give to the part of the formula under the square root symbol. −11 squared is 121, and when we multiply −4, 2, and −40, we get 320. The negatives on the 4 and the 40 cancel, and we end up adding 121 to 320 to get 441. The square root of 441 is 21.

$$\sqrt{(-11)^2 - 4(2)(-40)}$$
$$\downarrow$$
$$\sqrt{121 - 4(2)(-40)}$$
$$\downarrow$$
$$\sqrt{121 + 320}$$
$$\downarrow$$
$$\sqrt{441}$$
$$\downarrow$$
$$21$$

$$\frac{-(-11) \pm 21}{2(2)}$$
$$\downarrow$$
$$\frac{11 \pm 21}{4}$$

$$(+) \swarrow \qquad \searrow (-)$$

$$\frac{11 + 21}{4} \qquad \frac{11 - 21}{4}$$
$$\downarrow \qquad \qquad \downarrow$$
$$\frac{32}{4} \qquad \qquad \frac{-10}{4}$$
$$\downarrow \qquad \qquad \downarrow$$
$$x = 8 \qquad \qquad x = -2.5$$
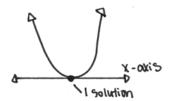
STEP THREE: Simplify the rest of the formula. The discriminant turned into 21, and when we look at what we have left, we can continue to simplify. −(−11) is just a positive 11, and 2(2) is multiplying, so the denominator is 4. The "±" sign is weird, but all it is telling us to do is find one answer by adding (+) and one by subtracting (−). I like to split the formula into one branch with each operation, and then solve.

The book tells us to disregard the negative solution (−2.5), so we would continue to page 8!

This applies to Chapter 3 page 60 in *The Dregg Disaster Algebra I Gamebook*.

Quadratic formula

Solve the following equation using the quadratic formula.

$$y = 4x^2 + 2x - 72$$

Quadratic formula

Solve the following equation using the
quadratic formula.

$$y = 4x^2 - 4x - 99$$

Quadratic formula

Solve the following equation using the quadratic formula.

$$y = 2x^2 - 3x - 5$$

Solve the following equation using the quadratic formula.

$$y = 5x^2 - 11x + 2$$

Solve the following equation using the quadratic formula.

$$y = 2x^2 - 11x - 63$$

Discriminant

Remember what the solutions (or roots, or zeroes) mean in context of a parabolic graph. They are the places that the parabola equals zero, and where the parabola hits the x-axis.

$$y = 11x^2 - 10x + 7$$

What happens when our parabola is shifted up? This parabola (at left) has only one solution.

And this parabola (at right) doesn't have any real solutions at all.
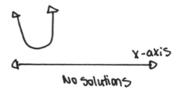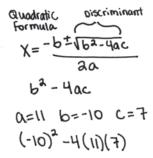
Telling these types of graphs apart (2 solutions vs. 1 solution vs. 0 solutions) can be important, and there is a sneaky way to check how many solutions a parabola has. It involves the quadratic formula, and specifically the part of the quadratic formula under the square root. This little piece of the quadratic formula is called the "discriminant," and let's see what happens when we plug the values from this problem into the discriminant.

Quadratic Formula   Discriminant

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac$$

$$a = 11 \quad b = -10 \quad c = 7$$

$$(-10)^2 - 4(11)(7)$$

STEP ONE: Substitute values into discriminant. Just like in the quadratic formula, the values a, b, and c correspond to the coefficients in our quadratic equation. In this case, 11 (a), −10 (b), and 7 (c).

STEP TWO: Simplify the discriminant. If we follow order of operations, we want to square (−10) first. Then we multiply (−4) by (11) and (7). Finally, we subtract. Our equation will give us a discriminant of −208.

$$(-10)^2 - 4(11)(7)$$
$$100 - 4(11)(7)$$
$$100 - 308$$
$$-208$$

This applies to Chapter 3 page 61 in *The Dregg Disaster Algebra I Gamebook*.

-208

A negative discriminant means <u>no real roots!</u>

STEP THREE: Evaluate. The negative that we got with our 208 on the last step is important here. The very next step in the quadratic formula would be to take the square root of that -208 number, but we have a problem. A negative under a square root is impossible (unless we get into imaginary numbers).

Remember, the square root of 25 is both 5 (because 5 times 5 equals 25) *and* -5 (because -5 times -5 *also* equals 25). What kind of number is left for the square root of -25? There is no real answer to that question! What this tells us about our parabola is that there aren't real places where the parabola crosses the x-axis. To put that more simply, this parabola doesn't have any real solutions!

If our discriminant is positive, our parabola will have two solutions, and if we get a discriminant that is exactly equal to zero (not positive *or* negative) we have a parabola with one solution!

Discriminant

Use the discriminant to find the number of real solutions to this equation.

$$y = -7x^2 - 7x + 10$$

Discriminant

Use the discriminant to find the number of real solutions to this equation.

$$y = 4x^2 - 12x + 9$$

Use the discriminant to find the number of real solutions to this equation.

$$y = 2x^2 - 4x + 2$$

Discriminant

Use the discriminant to find the number of real solutions to this equation.

$$y = 6x^2 - 3x + 3$$

Discriminant

Use the discriminant to find the number of real solutions to this equation.

$$y = 5x^2 - 3x + 10$$

Discriminant

Use the discriminant to find the number of real solutions to this equation.

$$y = -3x^2 - 8x + 12$$

Discriminant

Use the discriminant to find the number of real solutions to this equation.

$$y = -2x^2 + 12x - 18$$

Finding the vertex

$$y = -2x^2 + 4x + 2$$

$$(\square, \square) \rightarrow \square\,\square$$

The vertex of a parabola is the lowest point (if it opens upward) or the highest point (if it opens downward).

vertex

y-axis

The vertex is right between the y-intercept and the symmetric point!

y-intercept

symmetric point

There are several ways to find this point, but we need to make sure that our answer is an (x,y) ordered pair! One of those ways works by using our y-intercept, and by remembering that parabolas are perfectly symmetrical.

STEP ONE: Find the y-intercept. For this problem, our parabola will cross the y-axis at 2.

$$y = -2x^2 + 4x + 2$$
y-intercept

y-intercept = 2

$$y = -2x^2 + 4x + 2$$
$$2 = -2x^2 + 4x + 2$$

STEP TWO: Plug the y-intercept in for y. After we know one place where our y-value is 2—the y-intercept, at the point (0,2)—we want to find the other place our parabola has a y-value of 2. We can set our parabola equal to 2, and in the next few steps we will solve to find exactly where our parabola reaches up to a value of 2.

STEP THREE: Solve for the y-intercept's symmetrical point. By subtracting 2 from both sides and factoring out an "x," we can rearrange our equation to say 0 = x (−2x + 4). The solutions to this equation will show us both places where the parabola is equal to (has a height of) 2. In this problem, those two places are at zero (that one is the y-intercept) and at the point (2,2).

$$2 = -2x^2 + 4x + 2$$
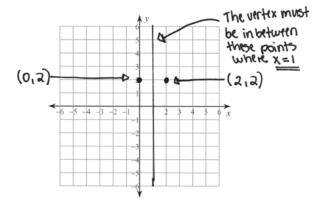$$\underline{-2 \qquad\qquad -2}$$
$$0 = -2x^2 + 4x$$

$$0 = x(-2x + 4)$$

If this x equals 0 the whole equation equals 0

If this x equals 2 the whole equation equals 0

$$x = 0$$
$$(x, y)$$
$$(0, 2)$$
height of 2

$$x = 2$$
$$(x, y)$$
$$(2, 2)$$
height of 2

$$y = -2x^2 + 4x + 2$$
$$x = 1$$
$$y = -2(1)^2 + 4(1) + 2$$
$$y = -2(1) + 4(1) + 2$$
$$y = -2 + 4 + 2$$
$$y = 4$$

$$x = 1 \quad y = 4$$
$$(x, y)$$
$$(1, 4)$$

STEP FOUR: Find the point in between our y-intercept and its symmetric point. This parabola has two points, (0,2) and (2,2), that are the same height. Because we know that a parabola is perfectly symmetrical, the vertex has to be right in between these two points. Our vertex is going to be right in between 0 and 2, at 1.

STEP FIVE: Plug the vertex value into the parabola equation. We're close! We know that the vertex has an x-value of 1, but we need to find how high up or low down our vertex is. In order to do that, we will plug 1 into our parabola equation and use order of operations to solve. We find that when our x-value is 1, our y-value is 4. Our vertex is at the point (1,4).

The vertex must be in between these points where $x = 1$

$(0,2)$ $(2,2)$

Turn (1,4) into the page number 14, and continue to that page!
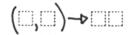
AUTHOR'S NOTE: There is a great shortcut we can use on problems like this, and it comes from the quadratic formula. Turn back to page 60 of this chapter's Adventurer's Advice for a reminder of quadratic formula, but the "–b/2a" portion of the quadratic formula will give us the x-value between the y-intercept and the symmetric point. In this problem, "b" is +4 and "a" is −2 (just like we would find if we were using the quadratic formula). When we substitute those values into –b/2a, we get −4/2(−2), which reduces to 1. We still need to plug 1 into the equation (Step Five), but this shortcut will save us quite a bit of time!

Finding the vertex

Find the vertex of the following parabola.

$$y = x^2 - 4x + 5$$

Finding the vertex

Find the vertex of the following parabola.

$$y = -2x^2 + 4x + 1$$

Finding the vertex

Find the vertex of the following parabola. $y = -2x^2 + 12x - 15$

Finding the vertex

Find the vertex of the following parabola.

$$y = -x^2 + 8x - 13$$

Finding the vertex

Find the vertex of the following parabola.

$$y = x^2 - 4x + 7$$

Finding the vertex

Find the vertex of the following parabola.

$$y = 2x^2 - 12x + 19$$

Finding the vertex

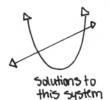Find the vertex of the following parabola. $y = 2x^2 - 16x + 33$

Quadratic system (substitution)

$y = x^2 - 4x + 5$
$y = -2x + 8$

The parabola $y = x^2 - 4x + 5$ crosses the line $y = -2x + 8$ in two places. One of those places is $(-1, 10)$ and the other is . . .

$\left(\square, \square\right) \rightarrow \square\square$
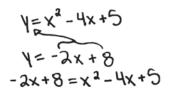

parabola

line

Solutions to this system

This problem is looking for a solution to this system. The solution is the place where these lines cross and these equations are equal. Because we are dealing with a parabola and a line, this problem is going to have up to two places where the line and the parabola meet.

Before we start, it helps to remember that the places these lines are going to cross is going to be an (x,y) ordered pair, so we need to find a solution in that format. For this problem, both equations are solved for y, which makes it easy to solve with a strategy called *substitution*.

$y = x^2 - 4x + 5$
$y = -2x + 8$
$-2x + 8 = x^2 - 4x + 5$

STEP ONE: Substitute. The second equation tells us that y is equal to $-2x + 8$. Those two quantities are exactly the same, so we can look to the first equation. Instead of y in the first equation, we can write in the thing that y is equal to: $-2x + 8$. This gives us the new equation: $-2x + 8 = x^2 - 4x + 5$. This helps us, because now we only have one variable and we can solve!

STEP TWO: Get all the terms to one side. This problem involves a quadratic equation, so we can't solve it with inverse operations. Instead, we need to factor, and before we can do that, we need to get all the terms to one side by adding 2x on both sides and subtracting 8 on both sides. The resulting equation is $0 = x^2 - 2x - 3$.
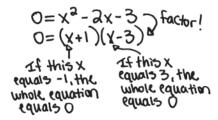
$$-2x + 8 = x^2 - 4x + 5$$
$$\underline{+2x \qquad\qquad\quad +2x}$$
$$8 = x^2 - 2x + 5$$
$$\underline{-8 \qquad\qquad -8}$$
$$0 = x^2 - 2x - 3$$

$0 = x^2 - 2x - 3 \,\big)$ factor!
$0 = (x+1)(x-3)$

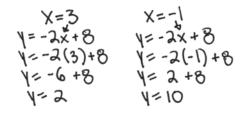If this x equals -1, the whole equation equals 0

If this x equals 3, the whole equation equals 0

STEP THREE: Solve the equation using factoring. For a more detailed breakdown, check out page 58 of this chapter's Adventurer's Advice. The numbers that *multiply* to give us -3 but *add* to give us -2 are -3 and a positive 1. That means that we can rewrite this equation in factored form as $0 = (x + 1)(x - 3)$. The places where this equation is *actually equal to zero*, like the equation says, are at positive 3 and negative 1.

This applies to Chapter 3 page 65 in *The Dregg Disaster Algebra I Gamebook*.

Quadratic system (substitution)

STEP FOUR: Plug in our x-values and solve for y. Even though we have already done a bunch of work, we still have a few steps left. From here, we need to find where our lines are when x is equal to −1 and at +3. We do that by plugging *our x values* for x into one of the equations. It doesn't actually matter which equation we pick, because these are the *only places* where the two lines are at the same place on our graph! I'm going to use y = −2x + 8, but you can use the other equation if you want. Follow order of operations, and we find that when we plug in −1, we get 10, and when we plug in 3, we get 2.

$$x = 3$$
$$y = -2x + 8$$
$$y = -2(3) + 8$$
$$y = -6 + 8$$
$$y = 2$$

$$x = -1$$
$$y = -2x + 8$$
$$y = -2(-1) + 8$$
$$y = 2 + 8$$
$$y = 10$$

STEP FIVE: Put your x and y values together to find the solutions. We have already done all the math, now we just need to plug in our numbers to get two (x,y) ordered pairs. The first ordered pair is (−1,10), but this problem told us to disregard that point. The other one is at (3,2), and when we put those together to create a page number, we get 32. Continue to that page!

$$x = 3 \quad y = 2$$
$$(x, y)$$
$$(3, 2)$$

$$x = -1 \quad y = 10$$
$$(x, y)$$
$$(-1, 10)$$

Quadratic system (substitution)

The parabola $y = x^2 - 8x + 19$

Cross the line $y = x + 1$ in two places.

One of those points is (6,7). Find the other point.

The parabola $y = x^2 - 8x + 18$

Cross the line $y = -x + 6$ in two places.

One of those points is (3,3). Find the other point.

Quadratic system (substitution)

The parabola $y = x^2 + 7x - 13$

Cross the line $y = 2x + 1$ in two places.

One of those points is (-7, -13). Find the other point.

Solve the following system by using substitution.

The parabola $y = x^2 - 12x + 27$ crosses the line $y = -2x + 3$

Solve the following system by using substitution.

The parabola $y = x^2 + 11x - 12$ crosses the line $y = 8x + 6$

CHAPTER 4
AMAZING FREE DOWNLOAD

Probablility

This problem asks us to find the probability that the spinner lands on a 1 or a 3.

Space 1
or → 2
Space 3 _____
5 possible → 5
spaces on
Spinner

STEP ONE: Find the probability as a fraction. There are 5 even spaces on the spinner, and assuming all the spaces are equally likely, we have a 2/5 chance of hitting 1 or 3.

STEP TWO: Find the solution as a percent. We can do this a couple ways. The easiest way is to turn that fraction into a decimal, and then make that decimal into a percentage. 2/5 = 0.40. We have found our percent as a decimal, and to turn that decimal into a percent, we need to multiply it by 100. Remember that "percent" means "per 100."

$$\underbrace{\frac{2}{5}}_{\text{fraction}} = \underbrace{0.40}_{\text{decimal}} = \underbrace{40\%}_{\text{percent}}$$

We know that 0.40 represents "forty hundredths," "40 per 100," or "40 percent."
Continue to that page!

This applies to Chapter 4 page 51 in *The Dregg Disaster Algebra I Gamebook*.

Probablility

If you roll a traditional 6-sided dice, what is the chance of rolling a 3 or a 5?

If you hit one balloon at random, what are the odds that the balloon says "grand prize"?

Probablility

The cooler has three cans of sparkling water, two cans of soda water, and five cans of sparkling soda. Confusing! If you grab one at random, what are the chance you get a sparkling soda?

In a full deck of 52 cards, what is the chance that you get a king or an ace as your first card?

In a bag of frooty looty candies, there are 8 green apple, 10 blue raspberry, 5 orange orange, and 2 yellow yam. What is the chance that you randomly pick a green apple candy from the bag?

Finding a new price

This problem gives us a $40 tennis racket and asks us to find the new price after a 12.5% discount.

12.5% → 0.125
percent   decimal
$40.00 × 0.125 = $5.00

STEP ONE: Find the amount of the discount. How much money is 12.5%? It helps to remember that *percent* means "per 100." How do we write that "per 100" with decimals? The second place after the decimal point is the hundredths place, so 0.01 would be 1 per 100. 12.5 percent is 12.5 per 100 and can be written as 0.125. If we multiply that discount by our price, we find that we will save $5.

STEP TWO: Find the new price. We are saving $5 off of a $40 item, so to find the new price, we need to subtract: 40 − 5 = 35. The new price of the racket is $35, so continue to page 35.

$40.00 − $5.00 = $35.00
price   discount   new price

AUTHOR'S NOTE: Another great way to solve this is to think of what percent of the racket we will actually be paying for. If we are *saving* 12.5%, that leaves 87.5% of the racket that we *still need to pay for*. $40 times 0.875 will also give us a price of $35.

This applies to Chapter 4 page 52 in *The Dregg Disaster Algebra I Gamebook*.

Finding a new price

The Dregg Corporation sells this curling iron. It's on sale for 5% off. What's the new price?

Finding a new price

The Dregg Corporation sells this teddy bear. It's on sale for 8% off. What's the new price?

Finding a new price

The Dregg Corporation sells this toaster. It's on sale for 12.5% off. What's the new price?

The Dregg Corporation sells this stapler. It's on sale for 25% off. What's the new price?

Finding a new price

The Dregg Corporation sells this snare drum. It's on sale for 20% off. What's the new price?

Finding a new price

The Dregg Corporation sells this warm winter hat. It's on sale for 37.5% off. What's the new price?

The Dregg Corporation sells this vase. Classy! It's
on sale for 20% off. What's the new price?

Finding a new price

The Dregg Corporation sells these shoes. They're on sale for 20% off. What's the new price?

The Dregg Corporation sells these sandals. They're on sale for 10% off. What's the new price?

Finding a missing percent

This problem deals with percents, and it asks how much tax we paid on a roll of tape if the original price was $22 and the price after tax is $24.20.

$24.20 − $22.00 = $2.20
final price   price before tax   amount of tax

STEP ONE: Find the amount the price changed. In this problem, our price increased from $22 to $24.20. The difference between prices is $2.20.

STEP TWO: Represent the percent change as a fraction. Our $22 roll of tape increased in price by $2.20. We paid $2.20 in tax per $22. We can express this as a fraction: 2.20/22.

$$\frac{\$2.20 \leftarrow tax}{\$22.00 \leftarrow price\ before\ tax}$$

$$\frac{\$2.20}{\$22.00} \rightarrow 0.10 \rightarrow 10\%$$
fraction   decimal   percent

STEP THREE: Find the tax as a percent. We can do this a couple ways. The easiest way is to turn that fraction into a decimal, and then make that decimal into a percentage. 2.20/22 = 0.10. We have found our percent as a decimal, and to turn that decimal into a percent, we need to multiply it by 100.

Remember that "percent" means "per 100." We know that 0.10 represents "ten hundredths," "10 per 100," or "10 percent." Continue to that page!

AUTHOR'S NOTE: We could also solve Step Three by setting up a proportion. Remember that "percent" means "per 100." If we find the missing numerator that makes x/100 equal to 2.20/22, we can also find our missing percentage. Check back to Chapter 1, page 58 of the Chapter 1 Adventurer's Advice, for a reminder on how to solve this problem with that strategy!

This applies to Chapter 4 page 53 in *The Dregg Disaster Algebra I Gamebook*.

Finding a missing percent

Dregg Corp sells bad guy rope, perfect for kidnapping scientists. If the final price is $34.80, what percent was the tax?

Dregg Corp sells hamster wheels. The price of one wheel costs $15 before tax. If the final price is $16.80, what percent was the tax?

Finding a missing percent

Dregg Corp sells toasters. Their brave li'l toaster model costs $40 but it is on sale. If the current price is $34, what percent was the sale?

Dregg Corp sells fake watches. They usually keep time pretty well. The price of the Timax digital watch was $24 before tax. If the final price is $24.96, what percent was the tax?

Dregg Corp sells sour gummy worms. The price of the biggest package was $12 before tax. If the final price was $12.60, what percent was the tax?

Dregg Corp sells wigs for Halloween. After Halloween, the wigs go on sale. If the price went from $18 to $12.60, what percent was the discount?

Median

This question is asking us to find the median of this set of numbers. Median is a *measure of center*. Measures of center (commonly median or mean/average) tell us about the middle of the group of numbers. Where are these numbers clumped up at?

Median specifically wants us to identify the middle-est value from our data set.

62, 37, 56, 40, 15, 22, 65, 42, 25, 47

STEP ONE: Put the data in order from smallest to largest. It will be easier to identify the middle data point if we are looking at the data in order.

In order:
15, 22, 25, 37, 40, 42, 47, 56, 62, 65

STEP TWO: Cross off pairs: 1 minimum and 1 maximum. Cross off the smallest and the biggest value. Repeat until you have only one value left. That number is your median.

Cross off in pairs
15, 22, 25, 37, 40, 42, 47, 56, 62, 65
15, 22, 25, 37, 40, 42, 47, 56, 62, 65
etc...
15, 22, 25, 37, 40, 42, 47, 56, 62, 65

STEP THREE (IF NECESSARY): Find the average/mean of the two central data points. There are an even number of data points in this set, which means that we don't have *one* most central data point. We have *two.* For our data set, 40 and 42 are the central data points. If we find the number between those two points, we have our median for this data set! The number between 42 and 40 is 41. 41 is our median, so continue to that page!

2 data points left!
40, 42 median in between!

Median

Find the median of the following data set.

8, 5, 20, 11, 6, 2, 13, 3

Median

Find the median of the following data set.

32, 60, 49, 51, 27, 65, 42

Median

Find the median of the following data set.

35, 44, 52, 46, 36, 50, 53, 51, 47, 50, 46

Median

Find the median of the following data set.

8, 2, 1, 4, 4, 3, 12, 6, 6, 7

Median

Find the median of the following data set.

10, 9.5, 9.5, 7.5, 8.5, 11, 6, 7, 5, 4, 7, 10

Median from a stemplot

This data representation is called a stemplot or sometimes a stem-and-leaf plot. It uses discrete values (no decimals or fractions), and it can be a good way to visualize the shape of a set of data. The left column labeled "stem" represents our 10s, so this stemplot includes numbers in the tens, twenties, thirties, and forties. The right column, labeled "leaf," represents our ones, and each value in the leaf column represents a different number. A stem of 1 with a leaf of 6 together make 16. This stemplot includes 16, 16, 17, 18, 19, 19, 20, 21 . . .

Stem	Leaf
1	667899
2	011 366
3	478
4	29

(Note that "0" actually represents 20 because the 0 is with a stem of 2.)

This question is asking us to find the median of this set of numbers. Median is a *measure of center*. Measures of center (commonly median or mean/average) tell us about the middle of the group of numbers. Where are these numbers clumped up at?

Median specifically wants us to identify the middle-est value from our data set.

Stem	Leaf
1	667899
2	011 366
3	478
4	29

16, 16, 17, 18, 19, 19, 20, 21, 21,
23, 26, 26, 34, 37, 38, 42, 49

STEP ONE: List out the values from the stemplot. If you feel comfortable with stemplots, you can skip this step because the values are already in order, but it makes it easier to see all the values if we list them out in order.

STEP TWO: Cross off pairs: 1 minimum and 1 maximum. Cross off the smallest and the biggest value. Repeat until you have only one value left. That number, 21, is your median.

16, 16, 17, 18, 19, 19, 20, 21, 21,
23, 26, 26, 34, 37, 38, 42, 49

16, 16, 17, 18, 19, 19, 20, 21, 21,
23, 26, 26, 34, 37, 38, 42, 49
Continue until...

16, 16, 17, 18, 19, 19, 20, 21, (21,)
23, 26, 26, 34, 37, 38, 42, 49

This applies to Chapter 4 page 55 in *The Dregg Disaster Algebra I Gamebook*.

239

Median from a stemplot

Find the median from the following stemplot

Stem	Leaf
0	344578
1	011 248
2	34799

Median from a stemplot

Find the median from the following stemplot

Stem	Leaf
1	4467888899
2	13488
3	016

Find the median from the following stemplot

Stem	Leaf
1	9
2	2778
3	0112457 7
4	69
5	3
6	01
7	
8	5

Mean

This question is asking us to find the mean of this set of numbers. Mean is a *measure of center.* Measures of center (commonly mean/average or median) tell us about the middle of the group of numbers. Median asks for the middle number while mean asks how much value each data point would have if they were all equal.

$$38, 51, 19, 44, 60, 46$$

$$38 + 51 + 19 + 44 + 60 + 46 = 258$$

STEP ONE: Find the total. Add up all the numbers in the data set. The total for this data set is 258.

STEP TWO: Divide by the number of data points in the set. We have six data points, so we will evenly divide the 258 from Step One into six even groups. The average for this data set is 43, so continue to that page!

$$\frac{258}{6} = 43$$

This applies to Chapter 4 page 56 in *The Dregg Disaster Algebra I Gamebook*.

243

Mean

Find the mean (average) from the following data set.

$$35, 20, 17, 21, 43, 32$$

Mean

Find the mean (average) from the following data set.

41, 23, 35, 19, 47, 21

Mean

Find the mean (average) from the following data set.

6,3,4,1,5,5,1,5,6

Mean

Find the mean (average) from the following data set.

7, 9, 7, 3, 3, 1, 10, 7, 3, 5, 5

Mean

Find the mean (average) from the following data set.

46, 50, 46, 43, 50, 47, 53, 50, 51, 53, 50

Mean

Find the mean (average) from the following data set.

40, 30, 15, 22, 15, 6, 75, 16, 20, 15, 20

This is called a two-way frequency table, and these tables are a good way to collect data when we are measuring more than one characteristic. This table is looking at a group of Dregg employees. Each cell on the table shows a different group of those employees. The 17 in the table tells us that there are 17 researchers that have worked at Dregg for 0 to 5 years. The 40 tells us that there are 40 total developers. We need to find the numbers for the missing cells, and to do that we need to use our "total" column and row.

	0-5 years	6-10 years	11-15 years	Total
Researchers	17			
Developers	13		15	40
Total		42		100

STEP ONE: Look for a value we can find. We know how many researchers have worked at Dregg for 0 to 5 years (17) and how many developers have worked at Dregg for 0 to 5 years (13). That means that there are a total of 30 employees who have worked for 0 to 5 years in this data set. We can put 30 in that cell, and it will help us find other values in the table.

	0-5 years	6-10 years	11-15 years	Total
Researchers	17			
Developers	13		15	40
Total	30	42		100

STEP TWO: Repeat Step One until the table is completed. There are 30 employees who have worked for 0 to 5 years and 42 who have worked for 6 to 10 years. We also know that there are 100 total employees in the data set, so that means that there are 28 employees left who have worked for 11 to 15 years, and we can enter that value in the corresponding cell.

	0-5 years	6-10 years	11-15 years	Total
Researchers	17	30	13	60
Developers	13	12	15	40
Total	30	42	28	100

	0-5 years	6-10 years	11-15 years	Total
Researchers	17	30	(13)	60
Developers	13	12	15	40
Total	30	42	28	100

If we want to find the number of researchers who have worked at Dregg for 11 to 15 years, find the cell that corresponds with that "researchers" and "11–15 years." There are 13 employees who fit both criteria, so continue to page 13!

This applies to Chapter 4 page 57 in *The Dregg Disaster Algebra I Gamebook*.

Use the two-way frequency table below. How many
employees have worked between 0 and 5 years?

	0-5 years	6-10 years	11-15 years	Total
Researchers	17			
Developers	13		15	40
Total		42		100

Use the two-way frequency table below. How many employees have worked between 11 and 15 years?

	0-5 years	6-10 years	11-15 years	Total
Researchers	17			
Developers	13		15	40
Total		42		100

Missing values on a two-way frequency table

There is a bunch of cake left after Levi Dregg's birthday party. How many of the pieces left are chocolate "middle" pieces?

	Corner Piece	Edge Piece	Middle Piece	Total
Chocolate	7			37
Red Velvet	4		5	16
Total		25		

The Dregg Corporation is considering a hostile takeover of your cousin's lemonade stand. Little Hattie is only nine years old, but capitalism comes at you fast. Using this data from last week's orders, how many customers at the lemonade stand ordered a soda and no snack?

	Cookie	Pretzels	No Snack	Total
Lemonade	10	5		19
Soda	11			
Total		18		44

Missing values on a two-way frequency table

The frequency table below describe the donuts that Dregg Corp ordered for a shareholder meeting. How many of the donuts are jelly filled?

	Glazed	Powdered	Sprinkles	Total
Jelly filled			38	
Not jelly filled	25	22		57
Total	27	32		

The frequency table below shows the drink orders from one morning at Sundrip Cafe. How many plain teas were sold?

	With Cream	With Sugar	Plain	Total
Coffee	21		9	45
Tea	6			
Total		29		88

Missing values on a two-way frequency table

The frequency table below describes the lunch rush sales at Colonel Fluster's Cluckin' Chicken. How many wings with no sauce did they sell?

	Buffalo Sauce	Teriyaki Sauce	No Sauce	Total
Chicken Wings	24	10		
Chicken Tenders		10	15	
Total	42			89

This problem asks us to look at mean (aka average) a little differently. It gives us *most* of the numbers: 15, 5, 10, 16, 22, and 7. What it doesn't give us is the missing number. To help us find that missing number, we know that the mean for all the numbers together will be 12.

$$15, 5, 10, 16, 22, 7$$

STEP ONE: Set up an equation. In this problem, let's pick the variable x to represent the number we are missing. Check out page 56 of this chapter's Adventurer's Advice if you forgot how to find the mean, but basically we add all the values together and divide by *how many* values we have. If we count x, we have 7 values, so our expression would say (15 + 5 + 10 + 16 + 22 + 7 + x)/7.

The problem also tells us that the mean with our x value is 12, so we can set our big fraction equal to 12.

Mean Calculation:

$$\frac{15+5+10+16+22+7+x}{7}$$

$$\frac{15+5+10+16+22+7+x}{7} = 12$$

STEP TWO: Solve the equation that we just made. Combine the like terms in the numerator to get (75 + x)/7 = 12. Use inverse operations to get rid of the "divided by 7" first, and then subtract 75 on both sides. We find that the missing value has to be 9, so continue to page 9!

$$\frac{15+5+10+16+22+7+x}{7} = 12$$

$$(.7)\frac{75+x}{7} = 12(.7)$$

$$75 + x = 84$$
$$ -75 \quad\quad -75$$
$$x = 9$$

This applies to Chapter 4 page 58 in *The Dregg Disaster Algebra I Gamebook*.

A mystery number is added to the following data set. The mean (average) of the resulting data set is 18. What must the value of the mystery number be?
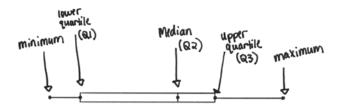
25, 11, 21, 15, 9, 19

A mystery number is added to the following data set. The mean (average) of the resulting data set is 18. What must the value of the mystery number be?

16, 12, 23, 15, 9, 14

A mystery number is added to the following data set. The mean (average) of the resulting data set is 19. What must the value of the mystery number be?

22, 6, 15, 32, 11, 43

A mystery number is added to the following data set. The mean (average) of the resulting data set is 15. What must the value of the mystery number be?

13, 9, 26, 14, 23, 17

A mystery number is added to the following data set. The mean (average) of the resulting data set is 11. What must the value of the mystery number be?

10, 18, 15, 8, 10, 14
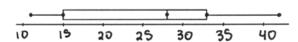
A mystery number is added to the following data set. The mean (average) of the resulting data set is 14. What must the value of the mystery number be?

16, 12, 23, 15, 9, 17

A mystery number is added to the following data set. The mean (average) of the resulting data set is 15. What must the value of the mystery number be?

13, 9, 26, 14, 23, 17

A mystery number is added to the data set below. The mean (average) of the resulting data set is 11. What must the value of the mystery number be?

10, 18, 15, 8, 10, 14

A mystery number is added to the data set below. The mean (average) of the resulting data set is 25. What must the value of the mystery number be?

28, 31, 20, 19, 22, 26

Interquartile range
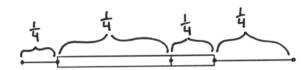
This data representation is called a boxplot, or sometimes a box-and-whisker plot. It can be a great way to visualize the way the data is distributed, and it shows a number of important features of our data set. The center of the box is located at the median, and the end of each whisker shows us the minimum and maximum.

A boxplot also divides up the data into four equal sections at values called "quartiles" The median is the middle quartile and it splits the data set in half. Each half is again split with the lower and upper quartiles. The lower quartile is sometimes called the "first quartile" or "Q1." Similarly, the upper quartile can also be called the "third quartile" or "Q3." If our data set has 20 data points, the quartiles would divide our data into four sections with 5 data points each. Each quarter of the data is easy to see on a boxplot as each of the two whiskers and the two halves of the box contain one fourth of the data points.

Quartiles are convenient, because we can easily see where the "top half" of the data are. In the example above, the top half would be between the median (28) and the largest value (42).
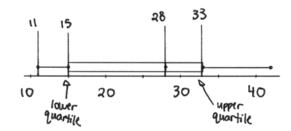
We can also find the half of the data that is most central. The middle half of the data in the example above would be between (15) and (33). The *interquartile range* (IQR) is a measure of how big that "middle half" of the data is. It's basically the range of the box, from Q1 to Q3. This measurement in particular is important, because it will omit any outliers below or above the rest of the data points and give us a measure of how spread out our data is with any outliers removed.
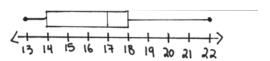
$$33 - 15 = 18$$

STEP ONE: Identify the values of the lower quartile and the upper quartile. These points are at the edges of the box in the boxplot. The lower quartile in this boxplot is at 15 and the upper quartile is at 33.
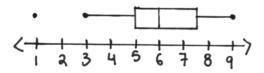
STEP TWO: Find the difference. The lower quartile is 15, and the upper quartile is 33. To find the interquartile range, subtract: $33 - 15 = 18$. That means that the middle half of our data points are spread across the 18-size interval from 15 up to 33, so continue to page 18!

This applies to Chapter 4 page 59 in *The Dregg Disaster Algebra I Gamebook*.
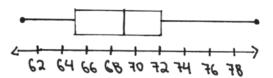
Interquartile range

Below is a box and whisker plot describing the wingspan (in inches) of some new robot-drone prototypes. What is the interquartile range of this data set?
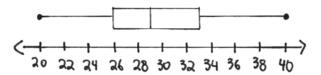
Interquartile range

Below is a box and whisker plot describing the number of runs that a softball team scored in the Dregg Corp after-work league throughout the season. What is the median number of runs this team scored this season?
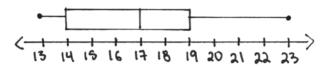
Interquartile range

From Blizzard Blueberry Blaster to Arctic Anise, Dregg Corp sells dozens of flavors of sports drinks. The grams of sugar per serving are shown in the boxplot below. What percent of the flavors have more than 72 grams of sugar per serving?

Interquartile range

Below is a box and whisker plot describing how many minutes it took a group of runners to finish a 5k fun-run. What percent of the runners took less than 29 minutes?

Interquartile range

Ol' Bud Ransom's World of Wild West Fun is a popular amusement park in town. Below is a box and whisker plot showing wait times for the Tunnel of Love attraction. What was the longest amount of time that it took for someone to reach the front of the line?

Range from a stemplot

This data representation is called a stemplot or sometimes a stem-and-leaf plot. It uses discrete values (no decimals or fractions) and it can be a good way to visualize the shape of a set of data. The left column labeled "stem" represents our 10s, so this stemplot includes numbers in the tens, twenties, thirties, and forties. The right column, labeled "leaf," represents our ones, and each value in the leaf column represents a different number. A stem of 1 with a leaf of 6 together make 16. This stemplot includes 16, 16, 17, 18, 19, 19, 20, 21 . . .

Stem	Leaf
1	667899
2	011366
3	478
4	29

(Note that "0" actually represents 20 because the 0 is with a stem of 2.)

This question is asking us to find the range from this set of data. Range is a "measure of spread," which means it tells us about how spread apart or bunched together a group of numbers is. This question is asking us to find how big the *range* of numbers is.

Stem	Leaf
1	667899
2	011366
3	478
4	29

Smallest: 16
largest: 49

STEP ONE: Identify the smallest and largest data points. For this data, our smallest value is 16 and our largest value is 49.

STEP TWO: Find the difference. The smallest value is 7 and the largest is 15. To find the range, subtract: $49 - 16 = 33$. That means that all our data points are spread across the 33-size interval from 16 up to 49, so continue to page 33!

$$49 - 16 = 33$$

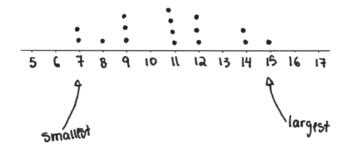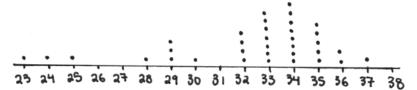This applies to Chapter 4 page 60 in *The Dregg Disaster Algebra I Gamebook*.

Range from a stemplot

Find the range from the following stemplot.

Stem	Leaf
1	446788899
2	13488
3	016

Range from a stemplot

Find the range from the following stemplot.

Stem	Leaf
0	344578
1	011 248
2	34799

Range from a stemplot

Find the range from the following stemplot.

Stem	Leaf
1	89
2	0233567899
3	0245

Range from a dotplot

This data representation is called a dotplot. It uses discrete values (no decimals or fractions) and it can be a good way to visualize the shape of a set of data. There are two dots above 7, which indicate two 7s in this data: 7, 7, 8, 9, 9, 9, 11, 11, 11, 11, etc.
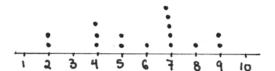
This question is asking us to find the range from this set of data. Range is a "measure of spread," which means it tells us about how spread apart or bunched together a group of numbers is. This question is asking us to find how big the range of numbers is.
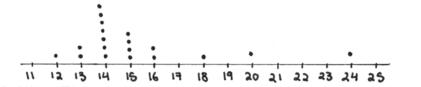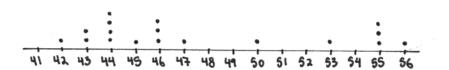
STEP ONE: Identify the smallest and largest data points. For this data, our smallest value is 7 and our largest value is 15.
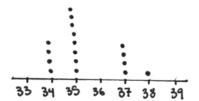
$$15 - 7 = 8$$

STEP TWO: Find the difference. The smallest value is 7 and the largest is 15. To find the range, subtract: $15 - 7 = 8$. That means that all our data points are spread across the 8-sized interval from 7 up to 15, so continue to page 8!

This applies to Chapter 4 page 61 in *The Dregg Disaster Algebra I Gamebook*.

Range from a dotplot

Find the range from the following dotplot.

Range from a dotplot

Find the range from the following dotplot.

Find the range from the following dotplot.

Range from a dotplot

Find the range from the following dotplot.

Find the range from the following dotplot.

Percent from a two-way frequency table

	Sparkly	Shiny	Total
Jewels	9	51	60
Gems	14	16	30
Total	23	67	90

What percent of the stolen jewels are sparkly?

This question asks us to find what percent of the stolen jewels are sparkly. How do we find that percentage? How do we even know which cells from this table are important?

	Sparkly	Shiny	Total
Jewels	9	51	(60)
Gems	14	16	30
Total	23	67	90

STEP ONE: Identify the correct total. *This* question is only asking us about the stolen jewels. (We could add sparkly gems, or take them away, and that won't change our answer one bit!) On the right side of the table, we can see that there are 60 jewels, and for this problem that is our total.

STEP TWO: Answer the question as a fraction. Of the 60 jewels that we identified in Step One, only 9 are in the "sparkly" column. That means that 9 jewels *out of 60* are sparkly, or 9/60.

$$\frac{9 \leftarrow \text{sparkly jewels}}{60 \leftarrow \text{total jewels}}$$

$$\frac{9}{60} \rightarrow 0.15 \rightarrow 15\%$$
$$\text{fraction} \qquad \text{decimal} \qquad \text{percent}$$

STEP THREE: Find your solution as a percent. We can do this a couple ways. The easiest way is to turn that fraction into a decimal, and then make that decimal into a percentage. 9/60 = 0.15. We have found our percent as a decimal, and to turn that decimal into a percent, we need to multiply it by 100. Remember that "percent" means "per 100." We know that 0.15 represents "fifteen hundredths," "15 per 100," or "15 percent." Continue to page 15!

This applies to Chapter 4 page 62 in *The Dregg Disaster Algebra I Gamebook*.

Percent from a two-way frequency table

Use the two-way frequency table below. What percent of all those surveyed are warehouse workers who work the day shift?

	Day Shift	Night Shift	Total
Security Guards	18	4	22
Warehouse Workers	12	16	28
Total	30	20	50

Percent from a two-way frequency table

Use the two-way frequency table below. What percent of night shift employees are security guards ?

	Day Shift	Night Shift	Total
Security Guards	18	4	22
Warehouse Workers	12	16	28
Total	30	20	50

Percent from a two-way frequency table

Use the two-way frequency table below. What percent of day-shift employees are Dregg employees?

	Day shift	Night Shift	Total
Museum Employees	24	16	40
Dregg Employees	8	2	10
Total	32	18	50

Percent from a two-way frequency table

Use the two-way frequency table below. What percent of all those surveyed are museum employees who work the night shift?

	Day Shift	Night Shift	Total
Museum Employees	24	16	40
Gregg Employees	8	2	10
Total	32	18	50

Percent from a two-way frequency table

What percent of the employees in the special ops department are getaway drivers? What percent of the enforcers are old?

	Young	Old	Total
Getaway Driver	3	12	15
Enforcer	11	5	16
Total	14	17	31

ABOUT THE ARTISTS

Illustrator: María Pesado is an illustrator from Barcelona, Spain. After graduating in Graphic Arts and Illustration, she worked as a decorative painter, muralist, and teacher in art workshops. Her paintings have been shown at several exhibitions, and she has directed multidisciplinary events of illustration and scenic arts. In the editorial field, she has published illustrated children's books, and she is currently making her way into comics, collaborating with sci-fi and horror magazines. She lives with her partner, by the sea, and loves books and fantasy movies.

Cover Artist: Eoin Coveney is an Irish illustrator who lives and works in Southern Ireland. After a couple of years in the UK and Germany working as a graphic designer, he returned to Ireland in the mid-1990s. For the last twenty-five years, he has been working with a diverse client base on a wide variety of commercial projects. His aesthetic has been shaped by European comics, horror films, and early twentieth-century illustration. Early in his illustration career, he worked with Will Eisner (renowned comic creator and inventor of the term "Graphic Novel"). From this experience, he gained valuable insight into the process of telling stories through pictures.

ABOUT THE AUTHORS

Chris Matthews is a middle school math teacher from Spokane, Washington, but right now he teaches 7th and 8th grade math in Bucaramanga, Colombia. He loves working with students and creating games that encourage mathematical exploration. When he is not teaching or writing, Chris spends time riding his bike and watching bad movies.

Chris has been teaching math for ten years, and he earned his Masters Degree in Education in 2020. He is also a proud alumnus of Bike & Build, Americorps NCCC, WWU, and Camp Reed. *The Dregg Disaster* is his first book.

Chris Bakke is a high school math teacher who has taught algebra 1, algebra 2, geometry, and pre-calculus over the last 12 years, but is currently acting as a Dean of Instruction in Denver, Colorado. He loves bringing a huge amount of fun and theatrical energy to a math class that is differentiated to the point that all students feel like they are in the healthy and productive realm of struggling where learning thrives. When he is not in the school building, Chris loves to start the day in the mountains hiking or skiing, and end the day at the theatre. Chris also has delivered math professional development sessions with Denver Public Schools, 360 Degree Math, and Teach for America.

Answer key

Page 3: solution x=2 | x+16=18
Page 4: solution x=10 | 4x+2=42
Page 5: solution x=8 | x+3=11
Page 6: solution x=5 | 7x=35
Page 7: solution x=12 | 2x-8=16
Page 8: solution x=4 | 5x-10=10

Page 10: 44
Page 11: 38
Page 12: 41
Page 13: 24
Page 14: 19
Page 15: 26
Page 16: 34

Page 18: Each pouch has 6 cookies.
Page 19: Each diamond weighs 15 ounces.
Page 20: Each box has 8 cans.
Page 21: Each pizza has 6 slices.
Page 22: Each case has 20 cans.

Page 24: x=30
Page 25: x=14
Page 26: x=30
Page 27: x=22
Page 28: x=50
Page 29: x=22
Page 30: x=50

Page 32: x=15
Page 33: x=20
Page 34: x=30
Page 35: x=4
Page 36: x=10
Page 37: x=20
Page 38: x=46
Page 39: x=8

Page 41: x=21
Page 42: x=25
Page 43: x=16
Page 44: p=1
Page 45: x=-2

Page 47: r= $\dfrac{pv}{nt}$

Page 48: y= $\dfrac{c-ax}{b}$

Page 49: x= $\dfrac{y-b}{m}$

Page 50: w= $\dfrac{p-2L}{2}$

Page 51: h= $\dfrac{V}{Lw}$

Page 52: b= $\dfrac{2a}{H}$

Page 54: x=45
Page 55: x=28
Page 56: x=6
Page 57: k=12
Page 58: n=3.33
Page 59: a=2.67
Page 60: x=14.29

Page 62: x=7
Page 63: x=47
Page 64: x=11
Page 65: x=2
Page 66: x=12
Page 67: x=11
Page 68: x=29
Page 69: x=5
Page 70: x=11

Page 72: x=8
Page 73: x=15
Page 74: x=32
Page 75: x=48
Page 76: x=49

Page 79: 24 dice; Figure 18
Page 80: 38 blocks; Figure 20
Page 81: 31 dice; Figure 12

Page 83: 7
Page 84: 10
Page 85: 12

Page 86: $\dfrac{2}{7}$

Page 87: -1

Page 89: 9
Page 90: 6
Page 91: 2
Page 92: 11
Page 93: 8

Page 95: 22
Page 96: 47
Page 97: 48
Page 98: 50
Page 99: 41
Page 100: 33
Page 101: 44

Answer key

Page 103: 12 (Shake=6, Meatball=5, Fries=1)
Page 104: 13 (Rat=3, Beaker=8, Fly=2)
Page 105: 45 (Coffee=3, Donut=15, Apple=27)
Page 106: 23 (Bishop=6, Pawn=3, Knight=14)

Page 108: 2,3
Page 109: 2,-1
Page 110: 3,-2

Page 112: 1,4
Page 113: 2,4
Page 114: 1,4
Page 115: 2,4
Page 116: 1,4
Page 117: 2,4
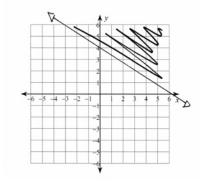
Page 119: 3,5
Page 120: 4,5
Page 121: 2,7
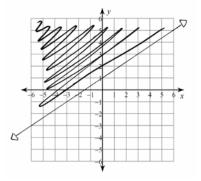Page 122: 4,6
Page 123: 1,8
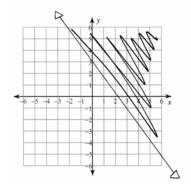Page 124: 3,6
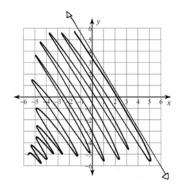Page 125: 3,1
Page 126: 1,7

Page 128:

Page 129:
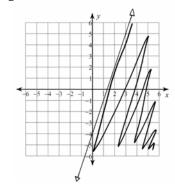
Page 130:

Page 131:

Page 132:

Page 135: The vertex is at the origin (0,0).
Page 136: The solutions are at (-3,0) and (-2,0).
Page 137: The graph will open down because the coefficient of the quadratic term is negative.

Page 139: $5x^2-2x-7$
Page 140: $-9x^2+3x-1$
Page 141: $5x-6$
Page 142: $14x^2+5x-4$
Page 143: $-2x^2-6x-13$

Page 145: 12 ($5x^2+12x+5$)
Page 146: 10 ($3x^2+10x-11$)
Page 147: 12 ($-4x^2+12x-8$)

Answer key

Page 148: 12 (10x²+12x-7)
Page 149: 10 (5x²+10x+8)
Page 150: 12 (3x²+12x-8)
Page 151: 12 (7x²+12x+14)

Page 153: 17 (10x²+17x-20)
Page 154: 15 (2x²+15x+27)
Page 155: 6 (15x²+6x-9)
Page 156: 16n²-4
Page 157: 21r²-44r-32

Page 159: 56 tiles; Step 13
Page 160: 125 tiles; Step 21
Page 161: 225 tiles; Step 31

Page 163: x=3 x=8
Page 164: x=4 x=6
Page 165: x=2 x=9
Page 166: x=3 x=7
Page 167: x=1 x=8
Page 168: x=4 x=9
Page 169: x=2 x=7
Page 170: x=3 x=9
Page 171: x=2 x=8

Page 173: x=11 x=-11
Page 174: m=9 m=-9
Page 175: n=8 n=-8
Page 176: b=3 b=-3
Page 177: p=10 p=-10

Page 179: x=4 x=-4.5
Page 180: x=5.5 x=-4.5
Page 181: x=2.5 x=-1
Page 182: x=2 x=0.2
Page 183: x=9 x=-3.5

Page 186: 2 solutions
Page 187: 1 solution
Page 188: 1 solution
Page 189: 0 solutions
Page 190: 0 solutions
Page 191: 2 solutions
Page 192: 1 solution

Page 195: (2,1)
Page 196: (1,3)
Page 197: (3,3)
Page 198: (4,3)
Page 199: (2,3)
Page 200: (3,1)
Page 201: (4,1)

Page 204: (3,4)
Page 205: (4,2)
Page 206: (2,5)
Page 207: x=4 x=6
Page 208: x=3 x=6

Page 211: 2/6=33.3%
Page 212: 1/18=5.6%
Page 213: 5/10=50%
Page 214: 8/52=15.4%
Page 215: 8/25=32%

Page 217: $38
Page 218: $46
Page 219: $42
Page 220: $45
Page 221:$48
Page 222: $50
Page 223: $36
Page 224: $44
Page 225: $27

Page 227: 16%
Page 228: 12%
Page 229: 15%
Page 230: 4%
Page 231: 5%
Page 232: 30%

Page 234: 7
Page 235: 49
Page 236: 47
Page 237: 5
Page 238: 8

Page 240: 11
Page 241: 19
Page 242: 34

Page 244: 28
Page 245: 31
Page 246: 4
Page 247: 5.45
Page 248: 49
Page 249: 24.9

Page 251: 30
Page 252: 28
Page 253: 12 pieces
Page 254: 1 person
Page 255: 50 donuts

Answer key

Page 256: 23 plain teas
Page 257: 12 chicken wings (no sauce)

Page 259: 12
Page 260: 37
Page 261: 4
Page 262: 3
Page 263: 2
Page 264: 6
Page 265: 3
Page 266: 2
Page 267: 29

Page 269: 4 (Q3=18 Q1=14)
Page 270: Median=6
Page 271: 25% of the flavors.
Page 272: 50% of the runners.
Page 273: 23 minutes.

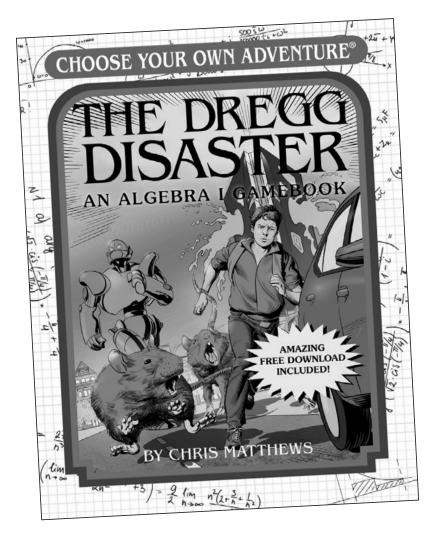Page 275: 22
Page 276: 26
Page 277: 17

Page 279: 14
Page 280: 7
Page 281: 12
Page 282: 14
Page 283: 4

Page 285: 24%
Page 286: 20%
Page 287: 25%
Page 288: 32%
Page 294: 48.4%; 31.3%