LESSON TITLE: Math in Fashion (by Deborah L. Ives, Ed.D.)

GRADE LEVEL: 7-10

SUBJECT MATTER: Algebra

TIME ALLOTMENT: Two 45-minute class periods

OVERVIEW

Using video segments and web interactives from *Get the Math,* students engage in an exploration of mathematics, specifically proportional reasoning and sense making, to solve real world problems. In this lesson, students focus on understanding the Big Ideas of Algebra: patterns, relationships, equivalence and linearity; learn to use a variety of representations, including modeling with variables; build connections between numeric and algebraic expressions; and use what they have learned previously about number and operations, measurement, proportionality, and discrete mathematics as applications of algebra. Methodology includes guided instruction, student-partner investigations, and communication of problem solving strategies and solutions.

In the Introductory Activity, students view a brief profile of a young professional who shares her passion for fashion design and who presents a fashion-related math challenge. In Learning Activity 1, students work in small groups to calculate the wholesale price of the garment and to determine what changes could be made to the garment to meet the target retail price point. (Students can solve the problem using handouts provided in the lesson and/or by using an online simulation.) Students summarize how they solved the problem and view the strategies and solutions used by the *Get the Math* teams. In Learning Activity 2, students explore an online simulation on the *Get the Math* website to tackle other similar fashion-related challenges. In the Culminating Activity, students reflect upon and discuss their reasoning and talk about the ways in which algebra can be used in the world of fashion and beyond.

LEARNING OBJECTIVES

Students will be able to:

- Describe scenarios that require artists to use mathematics and algebraic reasoning in fashion design.
- Identify a strategy and create a model for problem solving.
- Explain the difference between a wholesale and retail price and demonstrate how to determine the wholesale price when the retail price is known and vice versa.
- Recognize, describe, and represent linear relationships using words, tables, numerical patterns, graphs, and/or equations.
- Solve problems using rates (percents), ratios, and proportional reasoning.
- Solve problems using measures that are determined through calculations with measurements that can be taken directly (i.e., derived measures).

- Represent and solve inequalities using multiple representations.
- Understand, explain, and use algebraic and numeric expressions, equations, and inequalities that are interconnected and build on one another to produce a coherent whole.

MEDIA RESOURCES FROM THE *GET THE MATH* WEBSITE
www.getthemath.org

- The Setup **(video)** *Optional*
  An introduction to **Get the Math** and the professionals and student teams featured in the program.
- Math in Fashion: Introduction **(video)**
  This video segment introduces Chloe Dao as she shares her path to becoming the *Project Runway* Season 2 winner. The mathematics used in fashion design is explained to viewers and a challenge is presented.
- Math in Fashion: Take the challenge **(web interactive)**
  In this interactive activity users try to solve the challenge posed by Chloe Dao in the video segment, Math in Fashion: Introduction.
- Math in Fashion: See how the teams solved the challenge **(video)**
  The teams use algebra to solve a mathematical fashion challenge presented by Chloe Dao.
- Math in Fashion: Try other fashion challenges **(web interactive)**
  In this activity students are challenged to use mathematical reasoning and skills to modify original designs (cargo pants, a jacket and a dress) to meet specified price points.

MATERIALS/RESOURCES
For the class:

- Computer, projection screen, and speakers (for class viewing of online/downloaded video segments)
- One copy of the "Math in Fashion: Take the challenge" answer key
- One copy of the "Math in Fashion: Try other fashion challenges" answer key

For each student:

- One copy of the "Math in Fashion: Take the challenge" handout
- One copy of the "Math in Fashion: Try other fashion challenges" handout
- One calculator for use in Learning Activities 1 and 2 (Optional)
- Grid paper, chart paper, whiteboards/markers, overhead transparencies or other materials for students to display their math strategies used to solve the challenges in the Learning Activities.
- Computers with internet access for Learning Activities 1 and 2. (Optional)
  (Note: These activities can either be conducted with handouts provided in the lesson and/or by using an online simulation on the **Get the Math** website.)

BEFORE THE LESSON
Prior to teaching this lesson, you will need to:
- Preview all of the video segments and web interactives used in this lesson.
- Download the video clips used in the lesson to your classroom computer(s) or prepare to watch them using your classroom's internet connection.
- Bookmark all web interactives you plan to use in the lesson on each computer in your classroom. Using an online bookmarking tool (such as delicious, diigo, or portaportal) will allow you to organize all the links in a central location.
- Make one copy of the "Math in Fashion: Take the challenge" handout for each student.
- Make one copy of the "Math in Fashion: Try other fashion challenges" handout for each student.
- Print out one copy of the "Math in Fashion: Take the challenge" and "Math in Fashion: Try other fashion challenges" answer keys.

THE LESSON

INTRODUCTORY ACTIVITY

1. Begin with a brief discussion about clothing and fashion. For example, ask if any of the students make their own clothes.

2. Let students know that today's lesson will focus on the world of fashion and will include mathematical challenges related to fashion. Ask students to brainstorm where they think mathematics may be used in fashion. *(Measuring clothing, calculating costs, etc.)*

3. Explain that in today's lesson they will be watching video segments and using interactives from *Get the Math*, a program that highlights how math is used in the real world. If this is your first time using the program with this class, you may choose to play the video segment The Setup, which introduces the professionals and student teams featured in *Get the Math*.

4. Introduce the video segment Math in Fashion: Introduction by explaining that you are about to show a video segment which highlights how fashion designer and *Project Runway Season 2* winner Chloe Dao uses algebraic reasoning in her work. Ask students to watch for the math the designer uses and to write down ideas to share with the class.

5. Play Math in Fashion: Introduction. After showing the segment, ask students to discuss the different ways Chloe Dao uses math in her work. (*Sample responses: order of operations with whole numbers, decimals, and fractions; measurement, percents, inequalities.)*

6. Ask students to describe the challenge that Chloe Dao posed to the teams in the video segment. *(Chloe designed a beaded top which has a retail cost of $40.65. The price needs to come down to $35 or less. Chloe challenged the teams to change the*

*original design hit that price point, keeping in mind that there is a 220% markup from wholesale to retail.)*

LEARNING ACTIVITY 1

1. Let students know that they will now have an opportunity to solve the problem. Explain that when Chloe's designs are sold, the wholesale cost of her item is increased to 220% of the original amount to determine the retail price.

2. Ask students to think of other situations in real life where a total amount of an item might be increased or decreased by a certain percentage. (*Ask the following questions to spark discussion:* When you go shopping, if you total the prices listed on the items you want to buy is that the total amount you will pay as you leave the store? *(Not always.)* What additional costs may be needed to figure this out? *(Sales tax or a percent of increase of the original amount must be included.)* Discuss what you can do if you realize the total cost is too high and over your target for how much you wanted to spend. *(You would have to change what was in your cart and decide on the best choices given the target amount you want to spend.)*

3. Review the following terminology with your students:
   o **Wholesale cost:** *the total cost of materials and labor needed to create a garment.*
   o **Retail price:** *the price of the garment that includes the total cost of materials and labor, increased by a percent of this original amount.*
   o **Markup:** *percent of increase compared to the original cost.*
   o **Labor cost:** *the cost of the work needed to produce a garment, which might include cutting, grading, and sewing the garment.*
   o **Percent:** *a ratio that compares a number to 100.*

4. Distribute the "Math in Fashion: Take the challenge" handout (including the cost sheet) to each student. Ask students to work together to complete the handout. As they complete the challenge, encourage students to examine the cost sheet to see the original costs and Chloe Dao's suggestions for alterations.
   Note: Students can either complete this activity by using the student handout provided in this lesson and/or by completing the challenge on the **Get the Math website.** *To access* Math in Fashion: Take the challenge, *go to* www.getthemath.org, *click on "The Challenges," then scroll down and click on "Math in Fashion: Take the challenge."*
   - ***If you have multiple computers****, ask students to work in small groups to explore the interactive and complete the handout.*
   - ***If you only have one computer****, conduct the activity with your students as a group, or students may work in small groups off-line by using the student handout.*

5. As students complete the challenge, encourage them to use the following 6-step mathematical modeling cycle to solve the problem:

- *Step 1: <u>Understand the problem</u>:* Identify variables in the situation that represent essential features *(For example, let "w" represent the wholesale cost and "r" represent the retail price).*
- *Step 2: <u>Formulate a model</u> by* creating and selecting multiple representations *(For example, students may use symbolic representations such setting up a proportion or an inequality).*
- *Step 3: <u>Compute</u>* by analyzing and performing operations on relationships to draw conclusions *(For example, operations include multiplication and algebraic transformations used to determine cross products as they solve a proportion or inequality).*
- *Step 4: <u>Interpret</u>* the results in terms of the original situation *(The results of the first three steps should be examined in the context of the challenge to change the garment to meet the maximum retail price point).*
- *Step 5:* Ask students to <u>validate</u> their conclusions by comparing them with the situation, and then either improving the model or, if acceptable,
- *Step 6: <u>Report</u>* on the conclusions and the reasoning behind them. *(This step allows a student to explain their strategy and justify their choices in a specific context.)*
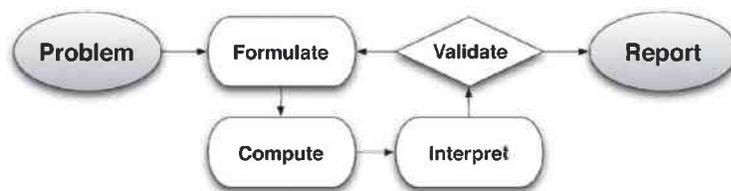
Assess the reasoning process and product by asking students to articulate how they are   solving the challenge:
- What strategy are you using to find the maximum wholesale cost?
- How will your strategy for selecting changes to the design help you to meet the retail target price? Why did you select these choices?

6. After students have completed the handout, ask each group to share their solutions and problem-solving strategies with the class using whiteboards, overhead transparencies, chart paper, or other tools. Refer to the "Math in Fashion: Take the challenge" answer key, as needed, to provide more details about possible strategies and solutions.

7. As students present their solutions, ask them to discuss the mathematics they used in solving the challenge. (*Possible responses: fractions, proportions, ratios, percents, inequalities, multiplication, division, rounding.*)

8. Introduce the <u>Math in Fashion: See how the teams solved the challenge</u> video segment by letting students know that they will now be seeing how the teams in the video solved Chloe Dao's challenge. Ask students to observe what strategies the teams used and whether they were similar to or different from the strategies presented by the class.

9. Play <u>Math in Fashion: See how the teams solved the challenge</u>. After showing the video, ask students to discuss the strategies the teams used and to compare them to the strategies presented by the class. During the discussion, point out that the teams in the video solved the challenge in two distinct ways. Discuss the strategies listed in the "Math in Fashion: Take the challenge" answer key, which you have not yet discussed.

LEARNING ACTIVITY 2:

1. Go to <u>Math in Fashion: Try other fashion challenges </u>(from <u>www.getthemath.org</u>, click on "The Challenges," then scroll down and click on "Math in Fashion: Try other fashion challenges.")

2. Let your students know that they will now use a web interactive to solve additional fashion challenges. They will be able to redesign cargo pants, a prom dress, and a jacket to hit specific price points.

    Note: You can conduct this activity with one computer and an LCD projector in front of the entire class or, if you have multiple computers, your students can work in small groups on computers to complete the activity. If you are using one computer, examine each garment as a group and have your students determine the wholesale price and the changes they would make in order to hit the retail price point. If you are using multiple computers, encourage students to brainstorm strategies and solutions with each other. This activity can also be assigned to students to complete as an independent project or as homework using the "Math in Fashion: Try other fashion challenges" handout as a guide.

3. Distribute the "Math in Fashion: Try other fashion challenges" handout. Clarify and discuss the directions.

4. As in Learning Activity 1, encourage your students to use the 6-step mathematical modeling cycle as they develop their strategies to solve the challenge.

5. After students have completed the activity, lead a group discussion where they can share their strategies and solutions. Refer to and discuss the strategies and solutions presented in the "Math in Fashion: Try other fashion challenges" answer key, as desired.

CULMINATING ACTTIVITY

1. Assess deeper understanding: Ask your students to reflect upon and write down their thoughts about the following:

    •   How did you determine an effective strategy for solving the problem? What are your conclusions and the reasoning behind them?

- Compare and contrast the various numerical and algebraic representations possible for the problem. How does the approach used to solve the challenge affect the choice of representations? *(Sample answers: some approaches use numerical operations in a sequence or order; another approach is to use symbols or variables to represent what is unknown and then write a proportion to solve the problem.)* Are all equivalent? *(Yes.)* Why do you think this is the case? *(There are many different ways to represent and solve a problem; a proportion is an equation that can be written using ratios that are equivalent but in a different order as long as some common element ties the numerators together and a common element ties the denominators together, such as dollars and cents.)*

- Why is it useful to represent real-life situations algebraically? (Sample responses: symbols or variables can be used to represent missing values to set up and solve equations to find a solution; using algebra can be a simpler and efficient way to set up and solve problems by using ratios, rates, or proportions.)

- What are some ways to represent, describe, and analyze patterns that occur in our world? *(Sample responses: patterns can be represented with numbers, symbols, expressions/equations, words, and pictures or graphs.)*

2. After students have written their reflections, lead a group discussion where students can share their thoughts. During the discussion, ask students to discuss how math in general and algebra in particular can be applied to the world of fashion. Ask students to brainstorm other real-world situations which involve the type of math and problem solving they used in this lesson to calculate the target price point and to select and calculate changes to the garments.

LEARNING STANDARDS & SAMPLE END-OF-COURSE (EOC) QUESTIONS

Sample Related End-of-Course (EOC) Questions (available for download in the TEACHERS section at www.getthemath.org)
These sample questions, selected from state end-of-course exams, cover the same algebraic concepts explored in this lesson.

Common Core State Standards 2010
[Note: You may also wish to view Pathways 1 and 2 for Algebra I connections in the CCSS]

Algebra Overview
- Seeing Structure in Expressions
  - Interpret the structure of expressions
  - Write expressions in equivalent forms to solve problems
- Arithmetic with Polynomials and Rational Functions
  - Perform arithmetic operations on polynomials
  - Use polynomial identities to solve problems

- o   Rewrite rational functions
- Creating Equations
  - o   Create equations that describe numbers or relationships
- Reasoning with Equations and Inequalities
  - o   Understand solving equations as a process of reasoning and explain the reasoning
  - o   Solve equations and inequalities in one variable
  - o   Represent and solve equations and inequalities graphically

Functions Overview
- Interpreting Functions
  - ○   Interpret functions that arise in applications in terms of the context
  - ○   Analyze functions using different representations
- Building Functions
  - ○   Build a function that models a relationship between two quantities
  - ○   Build new functions from existing functions
- Linear, Quadratic, and Exponential Models
  - ○   Interpret expressions for functions in terms of the situation they model

Modeling Standards
Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice.

Mathematical Practices
- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure

Look for and express regularity in repeated reasoning**American Diploma Project: Algebra I**

Students will be able to represent and solve problems in the following areas:

O: Operations on Numbers and Expressions
O1. Number Sense and Operations
O1.a Reasoning with real numbers
O1.b Using ratios (percents), rates, and proportions
O2. Algebraic Expressions
O2.b Operating with polynomial expressions

L: Linear Relationships
L1. Linear Functions
L1.a Representing linear functions in multiple ways

L1.b Analyzing linear function
L1.d Using linear models
L2. Linear Equations and Inequalities
L2.a Solving linear equations and inequalities
L2.e Modeling with single variable linear equations and inequalities

Name:_____   Date:_____

Math in Fashion: Take the Challenge
Student Handout

Chloe Dao, *Project Runway* **Season 2 winner, uses math in her work as a fashion designer. She uses algebraic reasoning to figure out how much money to charge for finished clothing. Chloe designed a top whose retail price is $40.65, but she needs to bring the retail price down to $35 or less. Your challenge is to change the design in order to hit that price point.**

(This activity can also be completed online. Go to www.getthemath.org*, click on "The Challenges," then scroll down and click on "Math in Fashion: Take the Challenge.")*

FIND THE MAXIMUM WHOLESALE COST

1. **Identify what you already know. Look at Chloe Dao's cost sheet (following the last question in the handout) for information.**
   - The total retail price is _____. The retail price is 220% of the wholesale cost (what it costs the make the top, which includes materials plus labor).
   - The wholesale cost is _____.

2. **Plan it out**. What is the relationship between the wholesale cost and the retail price? Try explaining it with a representation, such as a numerical or algebraic expression, equation, table, picture, chart, etc.

3. **Solve the problem**: If the retail price needs to be $35 or less, **what is the highest possible wholesale cost?** Show all your steps.

Name:_____   Date:_____

Your solution: The maximum wholesale cost that meets the target retail price of $35 or less is: _____ (Round your answer to the nearest cent.)

MAKE YOUR CHANGES

1. **Identify what you know**. Look at the numbers on Chloe Dao's original cost sheet and her ideas for possible changes (on the next page).

2. **Plan it out.**   What changes would you make to the design? Why?

3. **Solve the problem**. Calculate the wholesale and retail costs of the new garment. Show all your steps below. Use the blank cost sheet on the last page to record each value you chose.
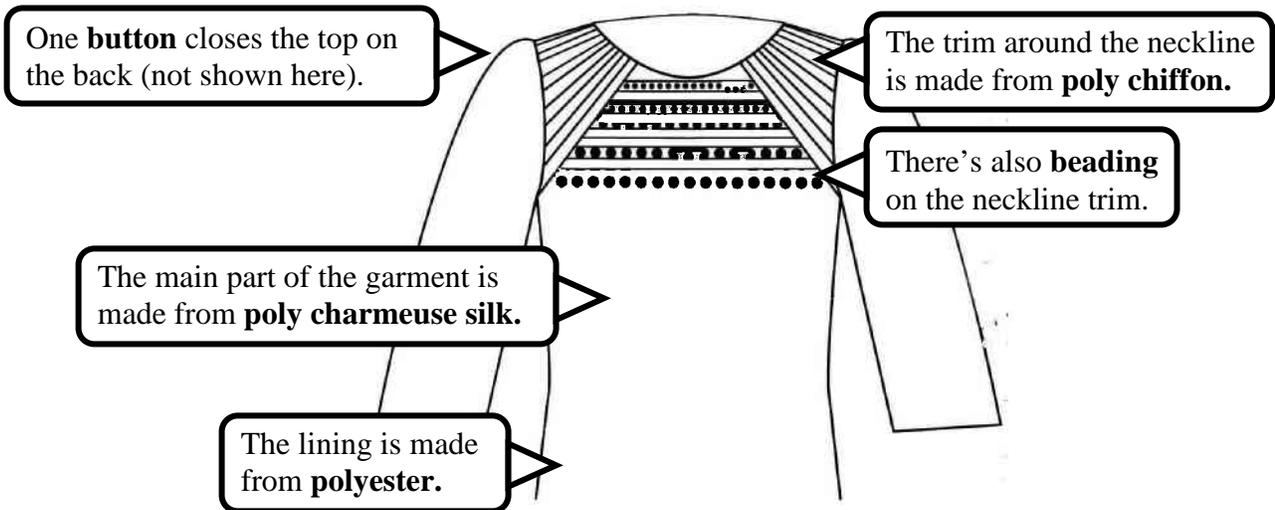
    Your solution: (Round your numbers to the nearest cent)
    With your changes, the wholesale cost of the new garment is: _____
    The retail cost of the new garment is: _____

4. **How did you figure out your final answer?** If you were going to email Chloe to **explain your strategy**, what would you tell her?

Chloe Dao's Original Design

One **button** closes the top on the back (not shown here).

The trim around the neckline is made from **poly chiffon.**

There's also **beading** on the neckline trim.

The main part of the garment is made from **poly charmeuse silk.**

The lining is made from **polyester.**

Chloe Dao's Cost Sheet
(Costs for Chloe's Original Design)

Item		Quantity		Cost		Total
Fabric	Poly charmeuse silk	2	yards	× $3.00	per yard	$6.00
	Poly chiffon	0.5	yards	× $2.25	per yard	$1.13
	Lining - Polyester	1.5	yards	× $2.50	per yard	$3.75
Trim	Beading	1	packet	× $0.75	per packet	$0.75
	Button	1	button	× $0.10	per button	$0.10
Labor	Cutting	1		× $0.50		$0.50
	Grading	1		× $2.00		$2.00
	Sewing	1		× $4.25		$4.25
Total Wholesale Cost						$18.48
Retail Price (Including Markup)	$18.48				× 220%	$40.65

Chloe's suggestions for possible alterations to reduce the cost of the shirt:

- **Remove the sleeves.** This would cut ½ yard of poly charmeuse silk.

- **Change the chiffon trim along the neckline to the same charmeuse silk fabric as the rest of the top.** This eliminates the poly chiffon entirely. The amount of poly charmeuse silk would remain the same (2 yards).

- **Remove the beading.** This would eliminate the cost of the beading and $0.75 in sewing labor.

- **Remove the lining.** This takes off 1.5 yards of polyester.

Name:_____   Date:_____

Blank Cost Sheet
(for your changes to Chloe's design)

Item		Quantity		Cost		Total
Fabric	Poly charmeuse silk		yards	$3.00	per yard	
	Poly chiffon		yards	$2.25	per yard	
	Lining – Polyester		yards	$2.50	per yard	
Trim	Beading		packet	$0.75	per packet	
	Button		button	$0.10	per button	
Labor	Cutting	1		$0.50		
	Grading	1		$2.00		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Student Handout

Your challenge is to find a way to bring a retail price down by changing the design of a garment.

(This activity can also be completed online. Go to www.getthemath.org, click on "The Challenges," then scroll down and click on "Math in Fashion: Try Other Fashion Challenges.")

1. **Identify what you know.**
   - Select a garment: *Item: Cargo shorts____   Prom dress___   Jacket___*
   - Use the **Original Cost Sheets** (online or at the end of this handout) to record the:

     Target retail price _____ Original retail price_____
   - The retail price is the wholesale cost (materials plus labor) marked up by _____ %

2. **Plan it out.** What is the relationship between the wholesale cost and the retail price? Try explaining it with a representation, such as a numerical or algebraic expression, equation, table, picture, chart, etc.

3. **Solve the problem: What is the highest possible wholesale cost?** Show all your steps.

   Your solution: The maximum wholesale cost that meets the target retail price is: _____
   (Round your answer to the nearest cent.)

Name:_____   Date:_____

MAKE YOUR CHANGES

1. **Identify what you know**. Look at the numbers on the original cost sheet and ideas for possible changes.

2. **Plan it out.**   What changes would you make to the design? Why?

3. **Solve the problem.** Calculate the wholesale and retail costs of the new garment. Show all your steps below. Use the blank cost sheet on the final pages to record each value you chose.

   Your solution: (Round your numbers to the nearest cent)

   With your changes, the wholesale cost of the new garment is: _____

   The retail cost of the new garment is: _____

4. **How did you figure out your final answer?** If you were going to email Chloe to **explain your strategy**, what would you tell her? (Use separate paper if needed.)

Name:_____   Date:_____

Click on "Try Another Garment" to do the activity again. Follow the steps online or use the questions and cost sheets (located at the end of this handout).

1. Select and record your choice below:
    Item: Cargo shorts_____   Prom dress____   Jacket____

2. Record the following information: **Target retail price _____ Original retail price_____**

3. The retail price is the wholesale cost (materials plus labor) marked up by 220%. Based on your target retail price, **what is the highest possible wholesale cost?** Solve your problem in the space below. Show all your steps and be sure to label.

    Your solution: The maximum wholesale cost that meets the target retail price is: _____
    (Round your answer to the nearest cent.)

4. Look at the numbers on the original cost sheet and **make changes to the design** that bring the retail price down to your target price point.

5. What changes would you make to the design? Why?

6. Calculate the wholesale and retail costs of the new garment. Show all your steps. Use the blank cost sheet for this garment to record the values you chose.

    Cost of your garment: Wholesale cost: _____ Retail cost: _____

7. **How did you figure out your answer?** Explain your strategy.

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Blank Cost Sheet: Cargo Shorts

	Item	Quantity		Cost		Total
Fabric	Self 1:	1	yard		per yard	
Trim	Trim 1:				per	
	Trim 2:		pieces		per piece	
	Trim 3:		piece	$1.00	per piece	
	Trim 4:		yards	$0.50	per yard	
Labor	Cutting	1		$1.00		
	Grading	1		$3.25		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Original Cost Sheet: Cargo Shorts

	Item	Quantity		Cost		Total
Fabric	Self 1: 100% cotton twill	1	Yard	$5.00	per yard	$5.00
Trim	Trim 1: Button fly front	5	Buttons	$0.25	per button	$1.25
	Trim 2: 2 4-button pockets	2	pieces	$2.00	per piece	$4.00
	Trim 3: Welt pockets	2	pieces	$1.00	per piece	$2.00
	Trim 4: 3-color embroidery	3	yards	$0.50	per yard	$1.50
Labor	Cutting	1		$1.00		$1.00
	Grading	1		$3.25		$3.25
	Sewing	1		$6.25		$6.25
Total Wholesale Cost						$ 24.25
Retail Price (Including Markup)					x 220%	$ 53.35

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Blank Cost Sheet: Prom Dress

	Item	Quantity		Cost		Total
Fabric	Self 1: Poly charmeuse silk		yards	$3.00	per yard	
	Self 2:		yards	$3.00	per yard	
	Lining 1: Polyester lining		yards	$2.50	per yard	
Trim	Trim 1: Embroidery thread		yards	$0.50	per yard	
	Trim 2:	1				
Labor	Cutting	1		$1.50		
	Grading	1		$5.00		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Original Cost Sheet: Prom Dress

	Item	Quantity		Cost		Total
Fabric	Self 1: Poly charmeuse silk	4.5	yards	$3.00	per yard	$13.50
	Self 2: Silk – sleeves & straps	0.5	yards	$3.00	per yard	$1.50
	Lining 1: Polyester lining	4	yards	$2.50	per yard	$10.00
Trim	Trim 1: Embroidery thread	12	yards	$0.50	per yard	$6.00
	Trim 2: Lace-up closure	1	piece	$2.00	per piece	$2.00
Labor	Cutting	1		$1.50		$1.50
	Grading	1		$5.00		$5.00
	Sewing	1		$13.50		$13.50
Total Wholesale Cost						$ 53.00
Retail Price (Including Markup)					x 220%	$ 116.60

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Blank Cost Sheet: Jacket

	Item	Quantity		Cost		Total
Fabric	Self 1:	2	yards	$5.50	per yard	
	Self 2:	1	yard	$8.50	per yard	
	Self 3:		yards	$4.00	per yard	
Trim	Trim 1: Name embroidery		yard	$0.50	per yard	
	Trim 2: Logos		pieces			
	Trim 3: Buttons	5	buttons	$0.25	per button	
Labor	Cutting & Grading	1		$4.50		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Original Cost Sheet: Jacket

Item		Quantity		Cost		Total
Fabric	Self 1: Wool	2	yards	$5.50	per yard	$11.00
	Self 2: Leather (sleeves)	1	yard	$8.50	per yard	$8.50
	Self 3: Cotton (hood)	0.5	yards	$4.00	per yard	$2.00
Trim	Trim 1: Name embroidery	1	yard	$0.50	per yard	$0.50
	Trim 2: Back & front logos	2	pieces	$2..25	two pieces	$2.25
	Trim 3: Buttons	5	buttons	$0.25	per button	$1.25
Labor	Cutting & Grading	1		$4.50		$4.50
	Sewing	1		$8.50		$8.50
Total Wholesale Cost						$ 38.50
Retail Price (Including Markup)					x 220%	$ 84.70

Math in Fashion: Take the Challenge
Answer Key

Chloe Dao, *Project Runway* Season 2 winner, uses math in her work as a fashion designer. She uses algebraic reasoning to figure out how much money to charge for finished clothing. Chloe designed a top whose retail price is $40.65, but she needs to bring the retail price down to $35 or less. Your challenge is to change the design in order to hit that price point.

(This activity can also be completed online. Go to www.getthemath.org, click on "The Challenges," then scroll down and click on "Math in Fashion: Take the Challenge.")

FIND THE MAXIMUM WHOLESALE COST
1. **Identify what you already know.** Look at Chloe Dao's cost sheet (following the last question in the handout) for information.
   - The total retail price is ___$40.65_____. The retail price is 220% of the wholesale cost (what it costs the make the top, which includes materials plus labor).
   - The wholesale cost is ___$18.48_____.

2. **Plan it out.** What is the relationship between the wholesale cost and the retail price? Try explaining it with a representation, such as a numerical or algebraic expression, equation, table, picture, chart, etc. [Student responses will vary depending on the strategy selected.]

3. **Solve the problem**: If the retail price needs to be $35 or less, **what is the highest possible wholesale cost?** Show all your steps.

Strategies and Solutions:
- *Strategy 1:*
   o Discuss the fact that more than $5 must be reduced from the retail price to reach the price point of $35.
   o Use a ratio to express the fact that every dollar of the wholesale price equals $2.20 in the retail price of the shirt: $\dfrac{\text{Retail}}{\text{Wholesale}} = \dfrac{\$2.20}{1}$
   o To find the wholesale cost needed for a $35 top, set up the following proportion:

   $$\dfrac{35}{w} = \dfrac{2.20}{1}$$

$$35 \quad = \quad 2.20\,w$$

$$\frac{35}{2.20} \quad = \quad \frac{2.20\,w}{2.20}$$

$$\$15.91 \quad = \quad w$$

Chloe's wholesale cost cannot exceed $15.91 to hit a retail price point of $35.

- **Strategy 2:**
    - Discuss the fact that 220% of the costs of materials and labor, or wholesale, must come in under the QVC price point of $35.
    - Write a mathematical model in words:
        220% of the wholesale cost (materials and labor) is less than thirty-five dollars.
    - Translate into an inequality, and solve:
        Let w = wholesale cost

        $$\frac{220}{100}\,w < 35$$

        $$\frac{11}{5}\,w < 35$$

        $$\frac{5}{11} \times \frac{11}{5}\,w < 35 \times \frac{5}{11}$$

        $$w < \$15.91$$

    Chloe's wholesale cost cannot exceed $15.91 to hit a retail price point of $35.00.

Your solution: The maximum wholesale cost that meets the target retail price of $35 or less is: __$15.91___ (Round your answer to the nearest cent.)

Encourage your students to discuss why/where/how we often round.
Maximum wholesale cost: $15.91 (x2.2 = 35.002= $35.00 due to rounding and truncating).

MAKE YOUR CHANGES

1. **Identify what you know**. Look at the numbers on Chloe Dao's original cost sheet and her ideas for possible changes (on the next page).

2. **Plan it out.**   What changes would you make to the design? Why?

3. **Solve the problem.** Calculate the wholesale and retail costs of the new garment. Show all your steps below. Use the blank cost sheet on the last page to record each value you chose.

    Your solution: (Round your numbers to the nearest cent)
    With your changes, the wholesale cost of the new garment is: _(see below)____
    The retail cost of the new garment is: _(see below)____

4. **How did you figure out your final answer?** If you were going to email Chloe to **explain your strategy**, what would you tell her?

Possible Strategies and Solutions:
- **Solution #1: Remove the sleeves and replace the chiffon trim.**
    - Remove the sleeves: ½ yard x $3 = $1.50 and
    - Replace chiffon trim: - $1.13
    - Total costs = $18.48 – ($1.50 + $1.13) = $15.85
    The retail price, at a 220% mark-up, would be: $15.85 x 2.2 = <u>$34.87</u>

- **Solution #2: Remove the sleeves and replace the beading.**
    - Remove the sleeves: ½ yard x $3 = $1.50
    - Replace the beading: - $0.75 beads + $0.75 labor for sewing beads = $1.50
    - Total costs = $18.48 – ($1.50 + $1.50) = $15.48
    The retail price, at a 220% mark-up, would be: $15.48 x 2.2 = <u>$34.06</u>

- **Solution #3: Remove the chiffon trim and replace the beading.**
    - Remove chiffon trim: - $1.13
    - Replace the beading: - $0.75 beads + $0.75 labor for sewing beads = $1.50
    - Total costs = $18.48 – ($1.50 + $1.13) = $15.85
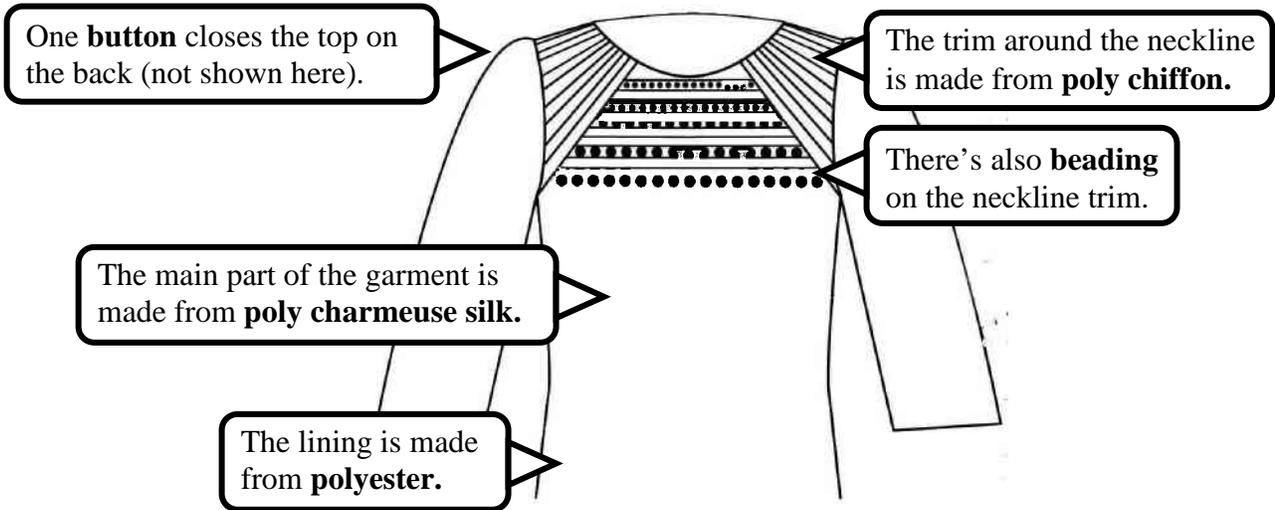   **The retail price, at a 220% mark-up, would be: $15.85 x 2.2 = <u>$34.87</u>**

- **Solution #4: Remove the sleeves, remove the chiffon trim and replace the beading.**
  - Remove the sleeves: ½ yard x $3 = $1.50
  - Remove chiffon trim: - $1.13
  - Replace the beading: - $0.75 beads + $0.75 labor for sewing beads = $1.50
  - Total costs = $18.48 – ($1.50 + $1.13 + $1.50) = $14.35

  The retail price, at a 220% mark-up, would be: $14.35 x 2.2 = <u>$31.57</u>

- **Solution #5: Remove the lining from the shirt.**
  - Remove the lining from the shirt: $3.75
  - Total costs = $18.48 - $3.75 = $14.73

  The retail price, at a 220% mark-up, would be: $14.73 x 2.2 = $32.41

Chloe Dao's Original Design

One **button** closes the top on the back (not shown here).

The trim around the neckline is made from **poly chiffon.**

There's also **beading** on the neckline trim.

The main part of the garment is made from **poly charmeuse silk.**

The lining is made from **polyester.**

Chloe Dao's Cost Sheet
(Costs for Chloe's Original Design)

Item		Quantity		Cost		Total
Fabric	Poly charmeuse silk	2	yards	x $3.00	per yard	$6.00
	Poly chiffon	0.5	yards	x $2.25	per yard	$1.13
	Lining - Polyester	1.5	yards	x $2.50	per yard	$3.75
Trim	Beading	1	packet	x $0.75	per packet	$0.75
	Button	1	button	x $0.10	per button	$0.10
Labor	Cutting	1		x $0.50		$0.50
	Grading	1		x $2.00		$2.00
	Sewing	1		x $4.25		$4.25
Total Wholesale Cost						$18.48
Retail Price (Including Markup)	$18.48				x 220%	$40.65

Chloe's suggestions for possible alterations to reduce the cost of the shirt:

- **Remove the sleeves.** This would cut ½ yard of poly charmeuse silk.

- **Change the chiffon trim along the neckline to the same charmeuse silk fabric as the rest of the top.** This eliminates the poly chiffon entirely. The amount of poly charmeuse silk would remain the same (2 yards).

- **Remove the beading.** This would eliminate the cost of the beading and $0.75 in sewing labor.

- **Remove the lining.** This takes off 1.5 yards of polyester.

Blank Cost Sheet
(for your changes to Chloe's design)

Item		Quantity		Cost		Total
Fabric	Poly charmeuse Silk		yards	$3.00	per yard	
	Poly chiffon		yards	$2.25	per yard	
	Lining – Polyester		yards	$2.50	per yard	
Trim	Beading		packet	$0.75	per packet	
	Button		button	$0.10	per button	
Labor	Cutting	1		$0.50		
	Grading	1		$2.00		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Answer Key

Your challenge is to find a way to bring a retail price down by changing the design of a garment.

(This activity can also be completed online. Go to www.getthemath.org, click on "The Challenges," then scroll down and click on "Math in Fashion: Try Other Fashion Challenges.")

CARGO SHORTS
Possible Strategies and Solutions:
1. **Identify what you know.**
   - Select a garment: *Item: Cargo shorts__X__   Prom dress___   Jacket___*
   - Use the **Original Cost Sheets** (online or at the end of this handout) to record the:

     Target retail price _$37.00_____   Original retail price__$53.35_____
   - The retail price is the wholesale cost (materials plus labor) marked up by __220___ %

2. **Plan it out**. What is the relationship between the wholesale cost and the retail price? Try explaining it with a representation, such as a numerical or algebraic expression, equation, table, picture, chart, etc. [Student responses will vary depending on their strategies.]

3. **Solve the problem**: **What is the highest possible wholesale cost?** Show all your steps.

   Strategy 1:
   o Use a proportion to express the fact that every dollar of the wholesale price equals $2.20 in the retail price of the shorts:

$$\frac{Retail}{Wholesale} = \frac{2.20}{1}$$

   To find the wholesale cost needed for $37 shorts, set up the following proportion:

$$\frac{37}{w} = \frac{2.20}{1}$$

$$37 = 2.20w$$

$$\frac{37}{2.20} = \frac{2.20w}{2.20}$$

$$\$16.82 = w$$

   The wholesale cost cannot exceed $16.82 to hit a retail price point of $37.

CARGO SHORTS: Strategy 2:
○ Discuss the fact that 220% of the costs of materials and labor, or wholesale, must come in under the retail price point of $37.
○ Write a mathematical model in words:
   220% of the wholesale cost (materials and labor) is less than thirty-seven dollars.

Translate into an inequality, and solve:

Let w = wholesale cost

$$\frac{220}{100}w < 37$$

$$\frac{11}{5}w < 37$$

$$\frac{5}{11} \times \frac{11}{5}w < 37 \times \frac{5}{11}$$

$$w \ < \ \$16.82$$

Your solution: The maximum wholesale cost that meets the target retail price is: **$16.82 (x 2.2 = $37.004 = $37.00 due to rounding and truncating)**

Encourage your students to discuss why/where/how we often round.

MAKE YOUR CHANGES

1. **Identify what you know**. Look at the numbers on the original cost sheet and ideas for possible changes.

2. **Plan it out.**   What changes would you make to the design? Why?
   [Student responses will vary depending on their strategies.]

3. **Solve the problem**. Calculate the wholesale and retail costs of the new garment. Show all your steps below. Use the blank cost sheet on the final pages to record each value you chose.

   Your solution: (Round your numbers to the nearest cent)
   The wholesale cost of the new garment is: _(see below)_
   The retail cost of the new garment is: _(see below)_

4. **How did you figure out your final answer?** If you were going to email Chloe to **explain your strategy**, what would you tell her? (Use separate paper if needed.)

Possible Strategies and Solutions for lowering the price of the CARGO SHORTS:
- **Solution #1: Change main fabric, fly front to zipper, pockets to 2-button, remove back pockets, and use 1-color embroidery.**
  ○ Change main fabric to cotton/poly: $5 – 3.50 = subtract $1.50

- Change to zipper fly front: ($1.25 – .90) = 0.35 + (.25 sewing) = subtract $0.60
- Change to 2-button pockets: ($4 - $2) + (.25 sewing) = subtract $2.25
- Remove back pockets: subtract $2 and .50 sewing = $2.50
- Use 1-color embroidery: subtract $0.75 sewing
- Total costs = $24.25 – ($1.50+$0.60+$2.25+$2.50+$0.75) = $16.65

The retail price, at a 220% mark-up, would be: $16.65 x 2.2 = <u>$36.63</u>

Cost of your new design: Wholesale cost <u>$16.65</u> Retail Price <u>$36.63</u>

- **Solution #2: Change fly front to zipper, remove button pockets, and remove embroidery.**
  - Change to zipper fly front: ($1.25 – .90) = 0.35 + (.25 sewing) = subtract $0.60
  - Remove button pockets: $4 + .50 sewing = subtract $4.50
  - Remove embroidery: $1.50 + $1.25 sewing = subtract $$2.75
  - Total costs = $24.25 – ($0.60+$4.50+$2.75) = $16.40

The retail price, at a 220% mark-up, would be: $16.40 x 2.2 = <u>$36.08</u>

Cost of your new design: Wholesale cost <u>$16.40</u> Retail Price <u>$36.08</u>

- **Solution #3: Change main fabric, fly front to zipper, pockets to 2-button, and remove embroidery.**
  - Change main fabric to poly twill: $5 – 2.50 = subtract $2.50
  - Change to zipper fly front: ($1.25 – .90) = 0.35 + (.25 sewing) = subtract $0.60
  - Change to 2-button pockets: ($4 - $2) + (.25 sewing) = subtract $2.25
  - Remove embroidery: $1.50 + $1.25 sewing = subtract $$2.75
  - Total costs = $24.25 – ($2.50+$0.60+$2.25+$2.75) = $16.15

The retail price, at a 220% mark-up, would be: $16.15 x 2.2 = <u>$35.53</u>

Cost of your new design: Wholesale cost <u>$16.15</u> Retail Price <u>$35.53</u>

- **Solution #4: Change main fabric, remove button pockets, and remove back pockets.**
  - Change main fabric to cotton/poly: $5 – 3.50 = subtract $1.50
  - Remove button pockets: $4 + .50 sewing = subtract $4.50
  - Remove back pockets: subtract $2 and .50 sewing = $2.50
  - Total costs = $24.25 – ($1.50+$4.50+$2.50) = $15.75

The retail price, at a 220% mark-up, would be: $15.75 x 2.2 = <u>$34.65</u>

Cost of your new design: Wholesale cost <u>$15.75</u> Retail Price <u>$34.65</u>

- **Solution #5: Change main fabric, fly front to zipper, remove back pockets, and remove embroidery.**
  - Change main fabric to poly twill: $5 – 2.50 = subtract $2.50
  - Change to zipper fly front: ($1.25 – .90) = 0.35 + (.25 sewing) = subtract $0.60
  - Remove back pockets: subtract $2 and .50 sewing = $2.50
  - Remove embroidery: $1.50 + $1.25 sewing = subtract $$2.75
  - Total costs = $24.25 – ($2.50+$0.60+$2.50+$2.75) = $15.90

The retail price, at a 220% mark-up, would be: $15.90 x 2.2 = <u>$34.98</u>

Cost of your new design: Wholesale cost <u>$15.90</u> Retail Price <u>$34.98</u>

PROM DRESS

<u>**Possible Strategies and Solutions:**</u>

1. Select and record your choice below:

    Item: Cargo shorts_____   Prom dress_X__   Jacket___

2. Record the following information: **Target retail price** $85.00 **Original retail price** $116.65

3. The retail price is the wholesale cost (materials plus labor) marked up by 220%. Based on your target retail price, **what is the highest possible wholesale cost?** Solve your problem in the space below. Show all your steps and be sure to label.

<u>*Strategy 1:*</u>
- o   Use a proportion to express the fact that every dollar of the wholesale price equals $2.20 in the retail price of the dress:

$$\frac{Retail}{Wholesale} = \frac{2.20}{1}$$

   To find the wholesale cost needed for the $85 dress, set up the following proportion:

$$\frac{85}{w} = \frac{2.20}{1}$$

$$85 = 2.20w$$

$$\frac{85}{2.20} = \frac{2.20w}{2.20}$$

$$\mathbf{\$38.64} = w$$

   The wholesale cost cannot exceed $38.64 to hit a retail price point of $85.

<u>*Strategy 2:*</u>
- ○   Discuss the fact that 220% of the costs of materials and labor, or wholesale, must come in under the retail price point of $85.
- ○   Write a mathematical model in words:

      220% of the wholesale cost (materials and labor) is less than eighty-five dollars.

   Translate into an inequality, and solve:

   Let w = wholesale cost

$$\frac{220}{100}w < 85$$

$$\frac{11}{5}w < 85$$

$$\frac{5}{11} \times \frac{11}{5}w < 85 \times \frac{5}{11}$$

w < $38.64

The wholesale cost cannot exceed $38.64 to hit a retail price point of $85.

Your solution: The maximum wholesale cost that meets the target retail price is: **$38.64 (x 2.2= $85.008= $85.00 due to rounding & truncating)** *Encourage your students to discuss why/where/how we often round.*

MAKE YOUR CHANGES

5. **Identify what you know**. Look at the numbers on the original cost sheet and ideas for possible changes.

6. **Plan it out.**   What changes would you make to the design? Why?
   [Student responses will vary depending on their strategies.]

7. **Solve the problem**. Calculate the wholesale and retail costs of the new garment. Show all your steps below. Use the blank cost sheet on the final pages to record each value you chose.

   Your solution: (Round your numbers to the nearest cent)
   The wholesale cost of the new garment is: _(see below)_
   The retail cost of the new garment is: _(see below)_

8. **How did you figure out your final answer?** Explain your strategy.

Possible Strategies and Solutions for lowering the price of the PROM DRESS:

- **Solution #1: Shorten the skirt, change the sleeves, remove lining, and change closure.**
  - Shorten skirt: $13.50 – 12 = subtract $1.50
  - Change sleeves to strapless: subtract $1.50
  - Remove lining: subtract $10 and $1.50 sewing = $11.50
  - Change closure to plain zipper: ($2 – 1) = subtract $1.00
  - Total costs = $53.00 – ($1.50+$1.50+11.50+$1.00) = $37.50

  The retail price, at a 220% mark-up, would be: $37.50 x 2.2 = $82.50
  Cost of your new design: Wholesale cost $37.50 Retail Price $82.50

- **Solution #2: Shorten the skirt, change the sleeves, remove lining, and change closure.**
  - Shorten skirt: $13.50 – 12 = subtract $1.50
  - Change sleeves to sleeveless: subtract $0.75
  - Remove lining: subtract $10 and $1.50 sewing = $11.50
  - Change closure to plain zipper: ($2 – 1) = subtract $1.00
  - Total costs = $53.00 – ($1.50+$0.75+11.50+$1.00) = $38.25

  The retail price, at a 220% mark-up, would be: $38.25 x 2.2 = $84.15
  Cost of your new design: Wholesale cost $38.25 Retail Price $84.15

- **Solution #3: Remove the lining and embroidery.**
  - Remove lining: subtract $10 and $1.50 sewing = $11.50
  - Remove embroidery = subtract $9.00
  - Total costs = $53.00 – ($11.50+$9.00) = $32.50

  The retail price, at a 220% mark-up, would be: $32.50 × 2.2 = $71.50
  Cost of your new design: Wholesale cost $32.50 Retail Price $71.50

- **Solution #4: Shorten the skirt, change the sleeves, and remove lining.**
  - Shorten skirt: $13.50 – 12 = subtract $1.50
  - Change sleeves to strapless: subtract $1.50
  - Remove lining: subtract $10 and $1.50 sewing = $11.50
  - Total costs = $53.00 – ($1.50+$1.50+$11.50) = $38.50

  The retail price, at a 220% mark-up, would be: $38.50 × 2.2 = $84.70
  Cost of your new design: Wholesale cost $38.50 Retail Price $84.70

- **Solution #5: Change the sleeves, remove lining, and remove embroidery.**
  - Change sleeves to sleeveless: subtract $0.75
  - Remove lining: subtract $10 and $1.50 sewing = $11.50
  - Remove embroidery = subtract $9.00
  - Total costs = $53.00 – ($0.75+$11.50+$9.00) = $31.75
  - **The retail price, at a 220% mark-up, would be: $31.75 × 2.2 = $69.85**

  Cost of your new design: Wholesale cost $31.75 Retail Price $69.85

JACKET
Possible Strategies and Solutions:
1. Select and record your choice below:
   Item: Cargo shorts_____   Prom dress____   Jacket_X__

2. Record the following information: **Target retail price $85.00 Original retail price $116.65**

3. The retail price is the wholesale cost (materials plus labor) marked up by 220%. Based on your target retail price, **what is the highest possible wholesale cost?** Solve your problem in the space below. Show all your steps and be sure to label.

Strategy 1:
  - Use a proportion to express the fact that every dollar of the wholesale price equals $2.20 in the retail price of the jacket:

$$\frac{Retail}{Wholesale} = \frac{2.20}{1}$$

   To find the wholesale cost needed for the $60 jacket, set up the following proportion:

$$\frac{60}{w} = \frac{2.20}{1}$$

$$60 = 2.20w$$

$$\frac{60}{2.20} = \frac{2.20w}{2.20}$$

$$\$27.27 = w$$

The wholesale cost cannot exceed $27.27 to hit a retail price point of $60.

Strategy 2:
   ○ Discuss the fact that 220% of the costs of materials and labor, or wholesale, must come in under the retail price point of $60.
   ○ Write a mathematical model in words :
           220% of the wholesale cost (materials and labor) is less than sixty dollars.
   o Translate into an inequality, and solve:
           Let w = wholesale cost

$$\frac{220}{100}w < 60$$

$$\frac{11}{5}w < 60$$

$$\frac{5}{11} \times \frac{11}{5}w < 60 \times \frac{5}{11}$$

$$w < \$27.27$$

       The wholesale cost cannot exceed $27.27 to hit a retail price point of $60.
   Your solution: The maximum wholesale cost that meets the target retail price is: **$27.27 (x 2.2 = $59.994 = $60.00 due to rounding)** *Encourage your students to discuss why/where/how we often round.*

MAKE YOUR CHANGES

9. **Identify what you know**. Look at the numbers on the original cost sheet and ideas for possible changes.

10. **Plan it out.**   What changes would you make to the design? Why?
    [Student responses will vary depending on their strategies.]

11. **Solve the problem.** Calculate the wholesale and retail costs of the new garment. Show all your steps below. Use the blank cost sheet on the final pages to record each value you chose.

    Your solution: (Round your numbers to the nearest cent)
    The wholesale cost of the new garment is: _(see below)_____
    The retail cost of the new garment is: _(see below)_____

12. **How did you figure out your final answer?** Explain your strategy.

Possible Strategies and Solutions for lowering the price of the JACKET:

- **Solution #1: Change sleeves, remove hood, and remove logos.**
    o Change sleeves to polyester: $8.50 – 2.50 = subtract $6.00
    o No hood: subtract $2.75
    o No logos: subtract $3.25
    o Total costs = $38.50 – ($6.00+$2.75+$3.25) = $26.50
  The retail price, at a 220% mark-up, would be: $26.50 x 2.2 = <u>$58.30</u>
  Cost of your new design: Wholesale cost <u>$26.50</u> Retail Price <u>$58.30</u>

- **Solution #2: Change main fabric, sleeves, and remove hood.**
    o Change main fabric to polyester: $11- 5 = subtract $6.00
    o Change sleeves to cotton: $8.50 – 4.50 = subtract $4.00
    o No hood: subtract $2.75
    o Total costs = $38.50 – ($6.00+$4.00+$2.75) = $25.75
  The retail price, at a 220% mark-up, would be: $25.75 x 2.2 = <u>$56.65</u>
  Cost of your new design: Wholesale cost <u>$25.75</u> Retail Price <u>$56.65</u>

- **Solution #3: Change main fabric, sleeves, and remove logos.**
    o Change main fabric to denim: $11- $9 = subtract $2.00
    o Change sleeves to polyester: $8.50 – 2.50 = subtract $6.00
    o No logos: subtract $3.25
    o Total costs = $38.50 – ($2.00+$6.00+$3.25) = $27.25
  The retail price, at a 220% mark-up, would be: $27.25 x 2.2 = <u>$59.95</u>
  Cost of your new design: Wholesale cost <u>$27.25</u> Retail Price <u>$59.95</u>

- **Solution #4: Change main fabric, sleeves, remove hood, and change logo.**
    o Change main fabric to polyester: $11- 5 = subtract $6.00
    o Change sleeves to cotton: $8.50 – 4.50 = subtract $4.00
    o No hood: subtract $2.75
    o Change logo – front only: subtract $1.25
    o Total costs = $38.50 – ($6.00+$4.00+$2.75+$1.25) = $24.50
  The retail price, at a 220% mark-up, would be: $24.50 x 2.2 = <u>$53.90</u>
  Cost of your new design: Wholesale cost <u>$24.50</u> Retail Price <u>$53.90</u>

- **Solution #5: Change main fabric, sleeves and remove hood.**
    o Change main fabric to polyester: $11- 5 = subtract $6.00
    o Change sleeves to polyester: $8.50 – 2.50 = subtract $6.00
    o Total costs = $38.50 – ($6.00+$6.00) = $26.50
  The retail price, at a 220% mark-up, would be: $26.50 x 2.2 = <u>$58.30</u>
  Cost of your new design: Wholesale cost <u>$26.50</u> Retail Price <u>$58.30</u>

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Blank Cost Sheet: Cargo Shorts

	Item	Quantity		Cost		Total
Fabric	Self 1:	1	yard		per yard	
Trim	Trim 1:				per	
	Trim 2:		pieces		per piece	
	Trim 3:		piece	$1.00	per piece	
	Trim 4:		yards	$0.50	per yard	
Labor	Cutting	1		$1.00		
	Grading	1		$3.25		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Original Cost Sheet: Cargo Shorts

Item		Quantity		Cost		Total
Fabric	Self 1: 100% cotton twill	1	Yard	$5.00	per yard	$5.00
Trim	Trim 1: Button fly front	5	Buttons	$0.25	per button	$1.25
	Trim 2: 2 4-button pockets	2	pieces	$2.00	per piece	$4.00
	Trim 3: Welt pockets	2	pieces	$1.00	per piece	$2.00
	Trim 4: 3-color embroidery	3	yards	$0.50	per yard	$1.50
Labor	Cutting	1		$1.00		$1.00
	Grading	1		$3.25		$3.25
	Sewing	1		$6.25		$6.25
Total Wholesale Cost						$ 24.25
Retail Price (Including Markup)					x 220%	$ 53.35

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Blank Cost Sheet: Prom Dress

	Item	Quantity		Cost		Total
Fabric	Self 1: Poly charmeuse silk		yards	$3.00	per yard	
	Self 2:		yards	$3.00	per yard	
	Lining 1: Polyester lining		yards	$2.50	per yard	
Trim	Trim 1: Embroidery thread		yards	$0.50	per yard	
	Trim 2:	1				
Labor	Cutting	1		$1.50		
	Grading	1		$5.00		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Original Cost Sheet: Prom Dress

	Item	Quantity		Cost		Total
Fabric	Self 1: Poly charmeuse silk	4.5	yards	$3.00	per yard	$13.50
	Self 2: Silk – sleeves & straps	0.5	yards	$3.00	per yard	$1.50
	Lining 1: Polyester lining	4	yards	$2.50	per yard	$10.00
Trim	Trim 1: Embroidery thread	12	yards	$0.50	per yard	$6.00
	Trim 2: Lace-up closure	1	piece	$2.00	per piece	$2.00
Labor	Cutting	1		$1.50		$1.50
	Grading	1		$5.00		$5.00
	Sewing	1		$13.50		$13.50
Total Wholesale Cost						$ 53.00
Retail Price (Including Markup)					x 220%	$ 116.60

Name:_____   Date:_____

Math in Fashion: Try other fashion challenges
Blank Cost Sheet: Jacket

Item		Quantity		Cost		Total
Fabric	Self 1:	2	yards	$5.50	per yard	
	Self 2:	1	yard	$8.50	per yard	
	Self 3:		yards	$4.00	per yard	
Trim	Trim 1: Name embroidery		yard	$0.50	per yard	
	Trim 2: Logos		pieces			
	Trim 3: Buttons	5	buttons	$0.25	per button	
Labor	Cutting & Grading	1		$4.50		
	Sewing	1				
Total Wholesale Cost						$
Retail Price (Including Markup)					x 220%	$

Math in Fashion: Try other fashion challenges
Original Cost Sheet: Jacket

Item		Quantity		Cost		Total
Fabric	Self 1: Wool	2	yards	$5.50	per yard	$11.00
	Self 2: Leather (sleeves)	1	yard	$8.50	per yard	$8.50
	Self 3: Cotton (hood)	0.5	yards	$4.00	per yard	$2.00
Trim	Trim 1: Name embroidery	1	yard	$0.50	per yard	$0.50
	Trim 2: Back & front logos	2	pieces	$2..25	two pieces	$2.25
	Trim 3: Buttons	5	buttons	$0.25	per button	$1.25
Labor	Cutting & Grading	1		$4.50		$4.50
	Sewing	1		$8.50		$8.50
Total Wholesale Cost						$ 38.50
Retail Price (Including Markup)					x 220%	$ 84.70