Lesson 7: Percents

PREREQUISITE ASSUMPTIONS

Before beginning this lesson, students should

- Have experience calculating 10% overhead
- Know how to calculate % on the Construction Master Calculator

Competencies covered in the lesson and associated homework

Unit 4. Percent Problems

Students will be able to:

A. Perform basic mathematical operations with numbers expressed as percents

A.1. you convert fractions or decimals into percentages and vice versa

A.2. you solve percent problems for the missing variable (amount, base, or percentage)

A.3. you use a construction calculator to compute the answer to percent problems

B. Use percents in solving word problems

B.1. you translate a verbally stated application involving percentages into performing an equivalent computation

B.2. you solve percent problems that arise in personal (business) finance

B.3. you interpret the computed answer to a word problem

Notes to Self

- One thing I want to do during this lesson ….
- One thing I want to pay attention in my students' thinking...
- One connection or idea I want to remember is ...

Suggested Timeline

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
2 minutes	Question 1	Individual
3 minutes	Review Question 1 & Definition	Whole Class

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2 minutes	Question 2	Groups
8 minutes	Discuss Question 2	Whole Class
4 minutes	Question 3	Groups
2 minutes	Discuss Question 3	Whole Class
18 minutes	Questions 4 and 5	Groups
8 minutes	Discussion on 4 and 5	Whole Class
10 minutes	% mini-lesson	Instructor Led
BREAK		
15 minutes	Questions 6 - 7	Groups
8 minutes	Discussion on 6 - 7	Whole Class
5 minutes	Questions 8 - 9	Groups
2 minutes	Discussion on 8 - 9	Whole Class
15 minutes	Questions 10 - 12	Groups
12 minutes	Discussion on 10 - 12	Whole Class
8 minutes	Question 13	Groups
2 minutes	Discussion on 13	Whole Class
10 minutes	Making Connections and mini-lesson	Instructor Lead

[Student Handout]

SPECIFIC OBJECTIVES

Use addition, subtraction, multiplication and division to determine information needed to install a floor in a home.

By the end of this lesson you will understand that...

- Markup and Margin are different ways to calculate profit
- Discount is a subtraction problem
- Percent problems can often be solved in either one or two steps

By the end of this lesson you will be able to...

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- Correctly interpret words in a problem statement and use the necessary operations to find the result
- Use the construction calculator to compute the answer to percent problems and interpret the results
- Check the reasonableness of computed answers to percent word problem.

Problem Situation #1: Purchasing Materials for a floor

Students need to have Lesson 1 handy as it is referred to in this first problem situation

Commented [SA1]: There will be some who won't have it. Reminder the previous class period to bring next time?

At the beginning of the semester you got a job as the general contractor to build a brand new house. Go through your materials and find your in class notes for Lesson 1. We are going to revisit parts of that lesson today.

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
2 minutes 3 minutes	Question 1 Review Question 1 and Definition	Individually Whole Class

Notes: this problem forces students to go back and look at previous work that they did. This allows them to see how far they have come, and the value of looking back. It also makes explicit connections between the different parts of the course.

Tell students… ***"You've got 2 minutes to work on your own to review Questions 1-4 from Lesson 1. Take the time to remember what you did, then go ahead and rewrite your Question 4 work in the space under Question 1."***

Walk around the room while students are working. If some students don't have their Lesson 1 materials, make sure they look at a neighbor's work.

When doing the share out, the point is to help the students remember that we *didn't* use the simple calculation (120' / 12') because that would have underestimated how many pieces of 12' lumber we needed.

THEN, we can move into discussing what tools they have learned (if any) that would allow them to figure out that they needed 11 or 12 pieces without having to go through the effort of counting per side.

- In lesson 4, Question #6 the students were introduced to the idea of 10% overhead. Hoping a student brings it out during the discussion.

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If no one brings up the 10% overhead stuff then just move on.

Now that you have some experience under your belt, we are going to go back to Problem Situation #1 in Lesson 1 and come up with a more accurate calculation for the material costs for the sill plate.

1. Take a minute to review Problem Situation 1 from Lesson 1. Write down the work you did in question #4 from that lesson below:

   From Lesson 1 #4: You can purchase the plate material in 12' lengths, but you cannot use any scraps shorter than 6 feet. Based on these limitations, how many pieces of 12' sill plate material will you need? Be sure to show or explain how you determined your answer.

From Question #4 answer:

Possible answers *are:*

Simplest: *take the answer from #3 and divide it by 12: 120/12 = 10 pieces* ← least accurate because it assumes all waste is used, which it typically is not.

More Realistic: *Typically, scraps shorter than 6 feet are not used.* So, based on the drawing,

1. *look at each wall separately: 3 pieces on the 27' wall, 1 piece on each 11' wall, 4 pieces on the 38' wall, 2 pieces on the 22' wall = 12 pieces*
2. *BEST: use not a full 12' length on the 27' wall, instead use a 9' length and a 6' length. Then, use the extra 6' length on the 38 foot wall which allows for 1 less piece… = 11 pieces*

11 or 12 pieces are both reasonable numbers to use for #5. Let each group use their answer (as long as it is 11 or 12)

Definition:

Give students the definition for 'Waste Factor' (by writing it on the board or doc cam) and have them put it in the space above.

Waste Factor: The percentage of framing material ordered in excess of the estimated material needed for construction due to waste, unusable pieces and errors.

Commented [SA2]: Let's discuss this definition

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
2 minutes 8 minutes	Question 2 Review Question 2	Groups Whole Class

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Notes: the problem itself is not complicated. The goal is to make sure it comes out that the % calculation can be done in either one or two steps.

Cruise the room while students work on #2. Have ALL groups put work on the whiteboards. Highlight differences:

- 1 step vs 2 steps
- Written as a %, written as a decimal
- Calculation of % done on the total length vs done on the # of pieces

Ask the class ***"why do the answers end up the same in 1 step vs 2 steps? Is it luck or will that work every time?"***

Have a student that calculated it as *10% then add to original explain their work first. Have them demonstrate or explain how to do it on the calculator.

Show that 10% on the calculator is 0.1

Now have another student explain how they did it using the method of *1.1.

Point out that they did the same stuff. The second student multiplied by 110% so, draw it with parentheses to help make the connection.

Take Away for #2 (write it on the board or Doc Cam):
There is an algebraic explanation and an explanation based on the meaning of percent.

- The algebraic explanation is based on adding like terms: x + 0.1x = 1.1x.
- Using the meaning of percent, x is 100% of itself: 0.1x is 10% of x. So, x + 0.1x is 110% of x (100% + 10%). Point out that 110% of x can be written as 1.1x

2. Redo your calculation for the number of pieces of 12' sill plate material you will need using a waste factor of 10%.

Answer: 11 pieces
120/12 = 10 pieces
10 pieces * 10% = 1 piece
10 + 1 = 11 pieces total
OR
10 pieces *110% = 11 pieces total

OR
120*10% = 12 so 132 total feet
132/12 = 11 pieces
OR
120*110% = 132
132/12 = 11 pieces

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Duration	Activity (Indicate question number)	Suggested Structure (Indicate group, whole class or individual work)
4 minutes 2 minutes	Question 3 Review Question 3	Groups Whole Class
Notes: This problem allows students to practice what they did in #2. Encourage students to do the calculation in a single step, but don't force it. Try to get students to use the unrounded numbers if they have them since that is what they would pay at the check-out. Don't allow students to move on to Question #4 if done early. Let students take a brief break if they need to so that everyone finishes #3 together. Review answers quickly just to make sure everyone is clear on the math and the answers are correct.		

3. Questions 5 and 7 from Lesson 1 asked you to calculate how much the materials cost for the sill plate material and the subfloor (what would you pay at the check-out?). Write your answers down below from those two questions and then calculate **the total cost**, this time, include tax of 5.5%.

   Question #5 (Sill Plate Material Cost) _____

   Question #7 (Subfloor Material Cost) _____

   Total cost (including tax) _____

Commented [SA3]: Is it clear they should add this together for 1 final answer?

ANSWER: $777.30

Question 5 answer: 8.67 x 11 = $95.37 so $95 OR 8.67 x 12 = $104.04 so $104
Question 7 answer: 539 sq. ft. * $1.19 per sq. ft = $641.41

Using the unrounded numbers: (95.37 + 641.41)*1.055 = $777.30

Problem Situation #2: Calculating Labor Costs

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In your estimating class you will be using the book 'Craftsman Labor Cost Estimator.' This problem situation is designed to give you a taste of the work you will be doing in that class. Your instructor will hand out two pages out of the book to get you started.

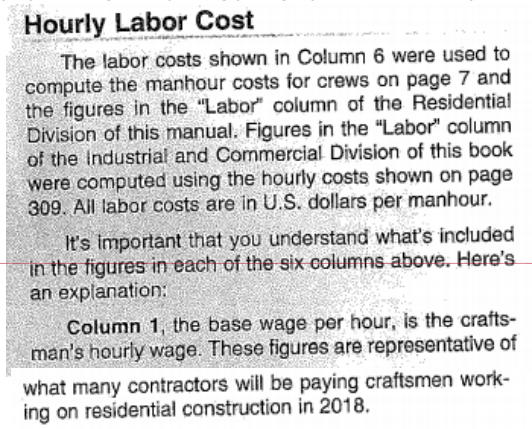
Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
18 minutes 8 minutes	Questions 4 and 5 Review Questions 4 and 5	Groups Whole Class

Notes: Problem #4 gives students a first look at a book and numbers that they use in their estimating class. Question 4 doesn't ask them to do any math beyond interpret the math that is in the table, Question 5 asks them to recreate the math in the table with a different starting number. The table is hard to understand and, especially question 4b will be challenging if students don't read the explanations carefully. To support them, model the 'Think Aloud' process for the beginning. Model it by reading out loud and underlining or drawing a question mark as I go.
Tell the students that each student in the group will read one column description out loud and repeat this process as best they can. Here is a link to the Instructor Support document for Think Aloud and a video you can watch to see the process in action

Handout the 'Craftsman Labor Cost Estimator' pages 10 and 11 and the Think Aloud roles sheet

Model the 'Think Aloud' Reading strategy by reading the opening paragraph and the description of Column 1 out loud:

"The labor costs shown in column 6 ... wait, where is column 6. Oh here it is. It's title is 'Total Hourly Costs Used in this book.' Hmm... I don't have the book, hope that won't be a problem ... were used to compute the manhour ... guess it doesn't apply to me since I'm a woman... costs for crews on page 7 and the figures in the "labor" column of the...read through 'page 309'... I really hope it doesn't matter that I don't have the book because I only have pages 10 and 11 here ... All labor costs are in U.S. dollars per manhour... ok, $/person-hour



Hourly Labor Cost

The labor costs shown in Column 6 were used to compute the manhour costs for crews on page 7 and the figures in the "Labor" column of the Residential Division of this manual. Figures in the "Labor" column of the Industrial and Commercial Division of this book were computed using the hourly costs shown on page 309. All labor costs are in U.S. dollars per manhour.

It's important that you understand what's included in the figures in each of the six columns above. Here's an explanation:

Column 1, the base wage per hour, is the crafts-man's hourly wage. These figures are representative of what many contractors will be paying craftsmen work-ing on residential construction in 2018.

It's important that you understand what's included in the figures in each of the six columns above... Agreed!.... Here's an explanation... oh good, they are going to describe each column...

Column 1, the base wage per hour is the crafts-man's hourly wage... does that mean it is how much I make per hour? I think yes. I'll check with my group to see if they agree just to be sure... These figures

Commented [CP4]: Love this...metacognition is one of my favorite words....

Commented [SA5R4]: I think Bethany just wanted to use the word "metacognition"? I feel the word should be spoken from a superhero voice.. METACOGNITION!!!!!

Commented [CP6]: I think the Think Aloud roles sheet is a great resource. However, I think it will not be completely clear to students what they should do. Where should they be recording this information? Should they be recording it?

Commented [SA7R6]: agreed

Commented [SA8R6]: But i think it's an excellent idea. The wording from the book is not clear. This will help. Does that mean if your doing it, you're metacogitating??

Commented [SA9]: This is a very anti-patriarchal thought....

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are representative of what many contractors will be paying craftsmen working on residential construction in 2018... that means I could be making... carpenter... over $25 per hour!!!

Commented [SA10]: "experienced" is important here.

Give students 3 minutes to read. Each person in the group does 'think aloud' process using the problem solver role sheet for guidance... one person for each column. Repeat until done. As students are doing the reading, cruise the room and listen for questions.

AFTER they are done reading, bring the class together and answer questions that came up during the cruise around the room. Key questions that may come up...

- *What is fringe? Do I get paid that extra amount?* No. fringe helps a company pay for your vacation and sick time, among other things.
- *I don't understand what they mean about column 4.* Basically, column 3 is the % that is paid in insurance and taxes. If you have a really risky job, that % is higher (ask students to confirm that using the table... roofers have the highest number in column 3). Your salary is taxable, and so are your 'taxable fringe benefits.' So, column 4 is the $$ amount paid in insurance and taxes on column 1 and 2. You get to work out that calculation for yourself in question 4b.

Then, have them move on to #4.

If an entire group finished #4 early, have them all show the answers to 4b and 4c. If correct, let them move on to problem #5.

4. Review the handout for the 'Craftsman Labor Cost Estimator' pages 10 and 11 and find the row for Carpenter.
    a. What is the Carpenter's 'Base Wage per Hour?'

    b. Using the numbers for the Carpenter, show the math that was done to get the number ($8.56) in Column 4.

    Commented [SA11]: based on percentage from column 3..

    c. Show the calculations below to get from the Carpenter's 'Base Wage per Hour' to the 'Total Hourly Cost.'

Answers:

a) $25.72

b) 31.56% (column 3) OF [$25.72 (column 1) + $1.41 (column 2)] IS $8.56 (column 4)

- **a.** The explanation for column 4 says that it applies to both the base wage and the taxable fringe benefits

c) Column 1 + column 2 + column 4 + column 5 = column 6

- **a.** 25.72+1.41+8.56+1.25=36.94

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	1	2	3	4	5	6
Craft	Base wage per hour	Taxable fringe benefits (@5.50% of base wage)	Insurance and employer taxes (%)	Insurance and employer taxes ($)	Non-taxable fringe benefits (@4.86% of base wage)	Total hourly cost used in this book
Bricklayer	$27.34	$1.50	25.30%	$7.30	$1.33	$37.47
Bricklayer's Helper	20.26	1.11	25.30	5.41	0.98	27.76
Building Laborer	20.67	1.14	32.66	7.12	1.00	29.93
Carpenter	25.72	1.41	31.56	8.56	1.25	36.94
Cement Mason	26.00	1.43	23.12	6.34	1.26	35.03
Drywall installer	26.60	1.46	23.53	6.60	1.29	35.95

5. What if, instead of the Base wage per hour being $25.72, it is $34. Use the column calculations as a guide to determine the new Total hourly cost. To help you, the table from the handout is re-created below. Show your work in the space below and fill in values for columns 1, 2, 4, 5 & 6.

Craft	Base wage per hour	Taxable fringe benefits	Insurance & employer taxes (%)	Insurance & employer taxes ($)	Non-taxable fringe benefits	**Total hourly cost**
Carpenter			31.56			

Answers:

Craft	Base wage per hour	Taxable fringe benefits	Insurance & employer taxes (%)	Insurance & employer taxes ($)	Non-taxable fringe benefits	**Total hourly cost**
Carpenter	$34	$1.87	31.56	$11.32	$1.65	$48.84

Calcs:
Taxable fringe = 5.5% of base wage. So $34*0.055 = 1.87
Taxes: = (34+1.87)*31.56% =11.32
Nontaxable fringe = 4.86% of base wage. So $34*0.0486 = 1.65

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Total: 34+1.87+11.32+1.65 = 48.84

Duration	Activity (Indicate question number)	Suggested Structure (Indicate group, whole class or individual work)
10 minutes	% mini-lesson	Instructor Led/Whole Class

Notes – the goal of the mini lesson is to have the class help solve these problems. Don't do it as a pure lecture. Put the problems up and ask volunteers to help. Then demonstrate and make sure everyone (especially the weaker students) is showing that they are writing it down.

This first part is to make sure everyone is converting % to decimals on their calculator.
Talk about fractions... ask the class ***"what is ½ as a %? What is ¼ as a %? What math are you doing to get those numbers? Take a minute and do:***

- ***1/5 as a %***
- ***2/3 as a %***

Put the answers up on the board and demo the math on the calculator.

This second part is to help students convert the words in the next two problem situations into math.
Translating words into math for % calculations.
OF means **multiply**
IS means **=**

5.5% OF the base wage IS the taxable fringe. Convert to math equation with ? for fringe and solve (0.055 * 34 = ?)
31.56% OF the base wage AND the taxable fringe IS taxes. Convert. Use parentheses for the and
80% of the time, I'm happy... ask students to help. The word 'IS' is not in the statement. What time am I talking about? A day, only when I'm awake? After we agree on 'the time' then make an equation.

Trickier
15% of what amount is $45?
20 feet is 40% of the total length. What is the total length?
110% of what is 80?

Commented [CP12]: What should be here?

Problem Situation #3: Lumberyard Purchases

As you know, figuring out how much lumber you need to buy is just the first step in determining how much to charge a customer for your work. You also need to price out the materials.

Commented [SA13]: Lumber is "materials"??

Duration	Activity (Indicate question number)	Suggested Structure (Indicate group, whole class or individual work)

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15 minutes 8 minutes	Questions 6 and 7 Review Questions 6 and 7	Groups Whole Class

Notes: Problems 6 and 7 are both trickier applications with %. #6 is a discount problem (so, subtraction) and in #7, students find the start knowing the end result (so, division). Students that have better number sense will have an easier time on these problems. It is really important that students think about what the question is asking before diving into the work.

Check in with groups after they do #6. Did they include tax? Did they calculate 8% and subtract or calculate 92%? If they did 8%, challenge them to figure out how to do it 'all at once' where they first find 100% - 8% = 92% and then they find 92% of the original price.
Possible question to ask to encourage this work: ***"What percent of the original total do you pay if you have the 8% discount?"*** if that is too challenging, try... ***"what if it was a 20% discount, what % of the original amount did you pay? What math did you do?"***

#7 is trickier because the students will likely try to find 5.5% of $150.12 and subtract to figure out the price before tax.

Questions to ask to support thinking through the problem... ***"If you take 5.5% of $150.12, you are take 5.5% OF the total paid. But, when we pay tax, in words, what do we pay tax on? 5.5% OF what?"***

OR ***"Think about a way to translate it to a simple % statement where you say _____% OF ____ IS ____. Where does the $150.12 go in that sentence?"***

If most groups go straight to subtraction, ask the questions of the whole class and write the sentence with the blanks on the board. Allow students to ponder it for a few minutes. If half or more of the class is still struggling after a few minutes, bring everyone back together again and ask students to help fill in the sentence. Those that volunteer, ask them to explain how they figured it out.

Once students have the sentence, allow them to continue. If necessary, to individual groups. Remind them that this work is similar to the last example from the mini-lesson.

6. One situation that happens often is that a lumberyard will list the retail price for some lumber. But, they have a different price for contractors. Rather than showing both prices, they just tell you that, as a contractor, you get an 8% discount.
    a. Return to question 3 in problem situation 1. How much will you spend on the sill and sub floor material with your contractor discount?

Answer: $715.12

95.37 + 641.41 = 736.78

Commented [SA14]: Is a what??

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736.78*0.08 = 58.94
736.78-58.94=677.84
677.84*1.055=715.12
OR
736.78*.92*1.055=715.12

7. You are shopping around for the best deal to purchase treated lumber for a deck. You went to the lumberyard and the price for 8' long pressure-treated decking boards that are 6 inches wide costs $6.16 per board. You are sure that you spent less per board when you built a deck on your brother's house last summer. You didn't keep the receipt for that purchase, but, from your credit card receipt, you know you spent $150.12
    a. If you purchased 27 boards when you built your brother's deck, how much did you spend per board (assume you didn't get a contractor discount).

    b. Did you spend less per board on your brother's deck? How much less?

Answers: a) 5.27 per board b) yes. 0.89 (before tax difference) OR 0.94 (after tax difference)
105.5% of the cost = 150.12
SO, the cost for all 27 boards is 150.12 / 1.055
Then, divide the answer by 27 to get the price per board.

b) 6.16-5.27 = 0.89
OR
6.16*27*1.055 = 175.47
175.47-150.12=25.35
25.35/27=0.94

OR
6.16 X 1.055 = $6.50 with tax
150.12/27 = $5.56 with tax
$6.50-$5.56 = $0.94

The answers are different because 5.5% tax on 166.32 is more than 5.5% tax on 142.29. So, the 94 cents includes the increase in tax. Both answers are acceptable.

Commented [CP15]: But wouldn't it be easier to say that one number represents the pre-tax difference and the other is the post-tax difference?

Problem Situation #4: Profit – markup versus margin

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In the world of making money, this is an important formula:

Contractor Cost + Contractor Profit = Charge to Customer

We've spent a lot of time this semester calculating costs. Now it is time to talk about profit. In general, people decide to add a percentage onto their costs to decide how much to charge their customer.

You are bidding for a job to build a garden shed. The total cost for the job is $1700. You need to decide how much money you are going to charge your customer, so you need to calculate how much profit you want to earn for the job.

There are two common ways to calculate Profit. Using Markup or Margin. Since both methods use a Percent, we are going to compare them by selecting a % and using it in both calculations.

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
5 minutes 2 minutes	Questions 8 - 9 Review Questions 8 - 9	Groups Whole Class

Notes: This is another topic from the estimating class. After much research, we found that contractors calculating their profit by using Markup or using Margin. This activity demonstrates the difference between the two. A discussion should follow about which one is 'right' (both are) and which one is 'better' (it depends).

Put up the definitions (in bold below) without the explanation of HOW to calculate it.

Definitions: Have student write them in

Markup: The profit as a % OF the cost. (The markup is calculated by taking the chosen % and multiplying it by the cost.)

Margin: The profit as a % OF the amount charged to the customer. (The margin is calculated by taking the chosen % and subtracting it from 100%. That tells us what % of the Charge to Customer is made up of the cost. Then, DIVIDE the Cost by that % to determine the total Revenue. Subtract the Cost from the total revenue to get margin.)

After writing the definitions, tell students: ***"Take 30 seconds now to work with your group to do # 8."***

After 30 seconds, ask each table to share out their chosen %. If they vary widely, ask how people chose their #.

Next tell students ***"For question #9, take 30 seconds on your own, to come up with a prediction for #9. After the time is up you will share your prediction with their group."***

Commented [SA16]: either define "revenue" or say "total bill"?? THoughts?

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After groups are done predicting, ask for a show of hands (everyone in the group does NOT have to agree) and put a tally on the board for same, margin more, markup more.

Save the discussion about 'who is right' for after the calculations are done in questions 10 and 11.

Definitions:

- **Markup**:
- **Margin**:

8. Choose your % that you will use to calculate Markup or Margin and write it here _____%
9. Based only on the definitions, PREDICT: will your profit for the job be the same or different with the two methods? If different, which one will be more? State your prediction and explain why you think that.

Commented [SA17]: What basis should they use? Internet search? guess something? Many of them won't have a concept of what "markup" is, so won't have a point of reverence to come up with a number.

Commented [SP18R17]: we'll see what they come up with and regroup.

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
15 minutes 8 minutes	Questions 10 - 11 Review Questions 10 - 11	Groups Whole Class

Notes: The markup calculation is really straight forward, the margin calculation needs guidance.

Let the students work on Questions 10 and 11. They should be able to do #10 without much assistance. Those that finish #10 should move on to #11. It is highly unlikely anyone will be able to get through #11 without intervention. So, once the slowest group starts on #11, stop the whole class and bring them together to review #10 and give tips for #11.

#10 – highlight the '1 step' AND '2 step' methods. One method gives profit in the first step. The other method gives charge to customer in the first step.

Generalize for #10 using 20% and use that to lead into #11:

In method 1: 100% of the Cost + 20% of the Cost = Charge to Customer, so 120% of the Cost = Charge to Customer

Method 2: Margin → In this case, profit is 20% of the Charge to Customer.

In the Margin calculation, you don't know the Charge to Customer, so how do you figure out the profit???

Let's go back to the equation in the box at the top of the problem situation:

Contractor Cost + Contractor Profit = Charge to Customer

Replace the Contractor Profit with '20% of the Charge to Customer'
Cost + 20% of the Charge to Customer = 100% of the Charge to Customer
So, in this case, Cost is (100% of the Charge to Customer – 20% of the Charge to Customer) so,

cost = 80% OF the Charge to Customer OR, more generally,

Cost = 100% of the Charge to Customer - % of the Charge to Customer (second term is the profit)

OR

Cost = (100% - profit%) * Charge to Customer

Basically, this is saying that the Cost makes up 80% of the Charge to Customer.

At this point, let the students work on the calculation for Charge to Customer and Profit. They still have to figure out that this is a division problem. If they get stuck, point them to the mini-lesson and question #7 for similarities

Be sure to have students put their work on the board for 10 and 11.

Commented [CP19]: Would a percent triangle help at all?

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Key info:

Part or "is word":

Whole or "of word":

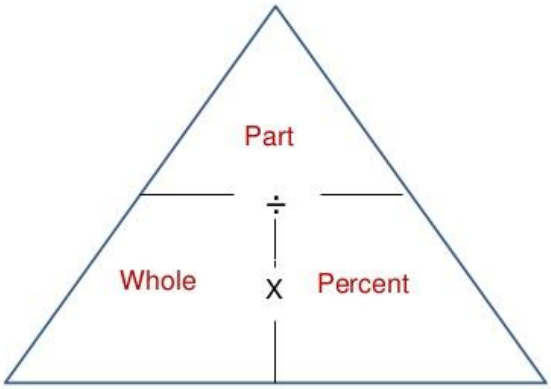
Percent:

One way to solve percent problems is to use the **Percent Pyramid**.
The pyramid will explain what operation is necessary to solve the problem.

In other words:

When given the **PART**, division is required.

When given the **WHOLE** and the **PERCENT**, multiplication is required.



After reviewing #11, put up the fraction (formula)

Charge to Customer = Cost/(100% - margin%)

Give the class time to reflect on whether or not their prediction was correct and give a clap to the students that predicted correctly.

NOTE: This concept comes up again in the estimating class. Additional questions can be saved for that class.

Method 1: Markup

10. Using the definition for markup, and the percent you selected in question 8, calculate the following. Use your calculator, and show your calculations in the space below:
    a. What is the amount you Charge your Customer?

    b. What is your Profit?

Answers: Since everyone could be using a different % markup, all answers will be different. Calcs: 2 steps: % * 1700 = profit Profit + 1700 = charge to customer 1 step: (100% + Markup%)*1700 = charge to customer Charge to Customer – 1700 = profit

Method 2: Margin

11. Using the definition for margin, and the percent you selected in question 8, calculate (use your calculator, and show your calculations in the space below):
    a. What is the amount you Charge your Customer?

    b. What is your Profit?

Lesson 7: Percents

Answers: Since everyone could be using a different % margin, all answers will be different. Calcs: $1700/(100% - Margin%) = charge to customer Charge to Customer – 1700 = profit

12. Was your prediction in 9 correct? Discuss with your group and show or explain why.

Markup Formula: Margin Formula:

Markup: **Profit = markup % * Cost** Margin: **Charge to Customer = Cost/(100% - margin%)** **Charge to Customer = Cost + Profit** **Profit = Charge to Customer - Cost**

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
8 minutes 2 minutes	Question 13 Review Question 13	Groups Whole Class
Notes: Now that students are provided the formulas. Give them a chance to practice in class on #13. Be sure groups are checking in with each other and all of their answers match. When just a couple of people are still working, ask for two students to put their work for a and b on the board. Limit the discussion to reviewing their work. NOTE: This concept comes up again in the estimating class. Additional questions can be saved for that class.		

13. Assume a percentage for your profit of 20%. If the cost for your job is $800, calculate
    a. Charge to the Customer using Markup

b. Charge to the Customer using Margin

Answers:

A) Profit = 20% x 800 = $160 and Customer Charge = $800 + $160 → $960

B) Customer Charge = $800/80% → $1000 and Profit = $1000 - $800 → $200

Making Connections

What you are taking the % OF is important.

Mini-Lesson

Duration	**Activity** (Indicate question number)	**Suggested Structure** (Indicate group, whole class or individual work)
8 minutes	Mini-lesson	Instructor Led
Create procedures for the students using the formulas provided after Question #12. Be sure to show the math for each bullet		

Markup: calculating the profit by taking a % OF your costs.	
Example (2 steps): • Cost = $100 • Choose your Markup % _____ • Calculate the Markup (profit) _____ • Calculate the Customer Charge_____	Example (1 step): • Cost = $100 • Choose your Markup % _____ • Calculate the total *Percent* (100% Cost + % Markup) _____ • Calculate the Customer Charge _____ • Calculate the Profit

Margin: calculating the profit by taking a % OF the Customer Charge.
Example: • Cost = $100 • Choose your Margin % _____ • Calculate the *Percent* of the Customer Charge that is the cost (100% Cost - % Margin) _____ • Calculate the Profit _____

Lesson 7: Percents

- Calculate the Customer Charge _____

Practice/Homework

Pg 59 #1, #3, #5
Pg 60, #13, #14, #15
Pg 61 #25
For #25, calculate the amount you charge the customer if you desire a 12% margin.
Pg 61, #29