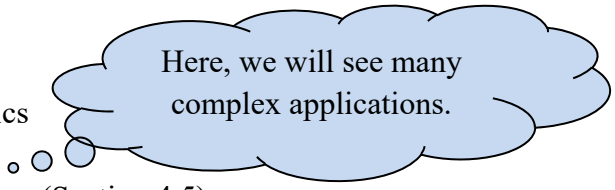


Technology Integrated Mathematics
Class Notes
Ratios: Special Percent Applications (Section 4.5)

We will look at more complex applications here. We will explore discounts, sales tax, efficiency, tolerances, and percent change.

Discounts:
Let's say a store sells a shirt for $50. They have a President's Day sale and discount the shirt by 10%. What does that mean and how much would a customer pay? (Ignore sales tax.)

Here, we are dealing with a **discount**. We'll need some words to help this concept along. The original price is the **list price**. The **discount** is the amount (or percentage) taken off of that original price. The **net price** is the price *after* the discount has been subtracted. Or rather, we have this formula.

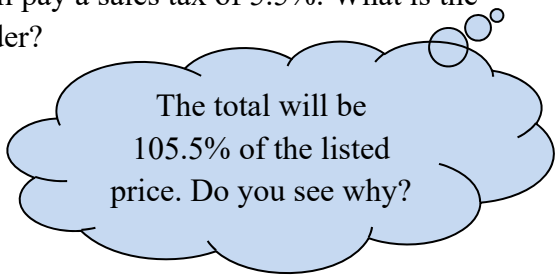
Net price = list price – discount

expl 1: For the above scenario, find the dollar amount of the discount and the net price, which is the price the customer should expect to pay.

expl 2: A contractor pays $125 for a sink that lists at $175. What percent discount did she receive?

Sales Tax:
Here, a percentage of a purchase will be paid to the state or local municipality. It will usually be stated as a percent. We will add the amount of the sales tax to the listed price to get the total cost.

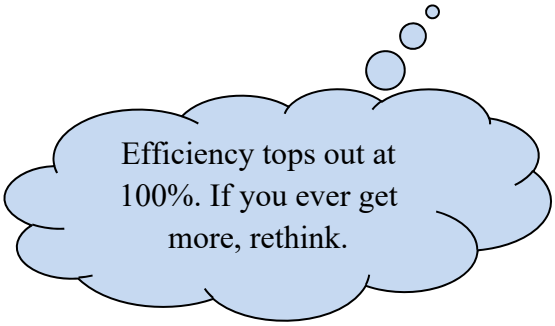
expl 3: The price listed on a sander is $130.99 and you will pay a sales tax of 5.5%. What is the sales tax amount and how much will be owed for this sander?



Efficiency:
Machines convert energy from one form to another. Since they are *not* perfect, energy is lost. The **efficiency** of a process is a fraction comparing the energy or power *output* to the energy or power *input*. We usually express efficiency as a percent. We have the following equation.

$$\frac{\text{output}}{\text{input}} = \frac{\text{efficiency}}{100}$$

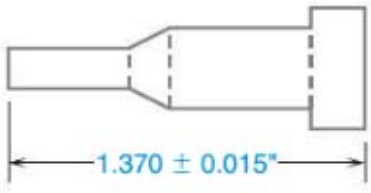
expl 4: An engine supplies 110 hp to an electric generator, and the generator delivers 70 hp of electrical power. What is the efficiency of the process? Write your answer in percent form, rounded to the nearest whole percent.



Tolerances:

When we machine a part, it needs to be accurate. But how accurate? If you use this part in a spaceship, we need it to be *very* accurate. When we build a playhouse in the backyard, we have a bit higher tolerance for being off. **Tolerance** is the allowed error.

For instance, the fitting here is to made with a length of 1.370 ± 0.015 inches. What does that mean?



We will add and subtract this 0.015 from the first number 1.370 to get the minimum and maximum lengths that will be accepted.

Do it now. Include units.

Minimum length:

Maximum length:

Very often, tolerance will be given as a percent of the measurement.

expl 5: A bolt must be 1.655 cm long with a tolerance of ± 0.20%. Find the minimum and maximum lengths allowed for this bolt.

This tolerance is in percent form. It *needs* to be converted to decimal form.

Percent Increase or Decrease:

If a quantity increases or decreases, we can measure the change by subtraction. However, we may want to record this change as a *percentage* of the original amount. We have the following equation to help us out.

$$\frac{\text{amount of increase or decrease}}{\text{original amount}} = \frac{\text{percent of increase or decrease}}{100}$$

We will *always* use the *original* amount as the whole or base.

expl 6: A new tire had a tread depth of 3/8 in. After one year of driving, the tire had 9/32 in. of tread remaining. What percent of the tread was worn? Write your answer in percent form.

Notice how a subtraction is needed to get started.

expl 7: An iron casting is made in a mold with a hot length of 16.40 in. The percentage of shrinkage is known to be 0.91%. How long would you expect the casting to be once it has cooled and shrank? Round to two decimal places.

expl 8: The following table shows the recommended cooling capacity (in Btu per hour) of a room air conditioner based on the area (in square feet) of the room. If more than two people regularly occupy the room, add 600 Btu/hr per additional person (more than the standard two people). If the room is sunny, add 10%. If the room gets very little sun, subtract 10% from the capacity.

Determine the recommended cooling capacity of a room air conditioner for a sunny 320-sq-ft room normally occupied by four people.

Area (sq ft)	Capacity (Btu/hr)
250–300	7,000
300–350	8,000
350–400	9,000
400–450	10,000

Add the 600 Btu per person *before* calculating the ±10% for sun conditions.

Worksheet: Special Percent Applications:
We will practice some of these applications. Be sure to include units in all answers.