

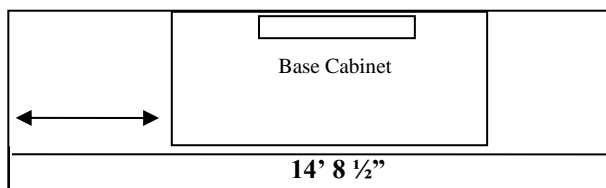
Determine wall length and convert units to solve for usable measurements

Program Task: A cabinetmaker must determine the length of the wall of a kitchen. Plans have one window centered on the wall. The sink base cabinet is to be centered directly below the window.

Program Associated Vocabulary:
DIMENSION, FRACTION, DECIMAL, INCH, CONVERSION

Program Formulas and Procedures:

Cabinetmakers will be required to find the dimensions of a kitchen wall in order to install a sink base cabinet directly below that window. The cabinetmaker will need to use a tape measure to determine the wall length for total cabinet installation. The cabinetmaker will then find the centerline which will be in the middle of the window. Since the base cabinet will be 36", the cabinetmaker will divide this in half and mark the installation dimensions of this cabinet along the wall. The cabinetmaker will then determine the amount of remaining space along each side of the kitchen wall so he can then design custom cabinets to fit this space.



Example: Kitchen wall length is $14' 8 \frac{1}{2}'' = 14' 8.5''$. Convert 8.5" to decimal feet by dividing by 12.

$$8.5 \div 12 = 0.708333333'$$

$$14' + 0.708333333' = 14.708333333'$$

Divide this number by 2 to find the center point.

$$14.708333333' / 2 = 7.354166667'$$

Rewrite the number to the nearest thousandths digit.

$$7.354166667' \longrightarrow 7.354'$$

The center of the window is 7.354' in from the wall.

Convert this measurement to feet and inches by multiplying 0.354' by 12.

$$0.354 \times 12 = 4.248'' \text{ which is closest to } 4 \frac{1}{4}''$$

$$7.354' \longrightarrow 7' 4 \frac{1}{4}''$$

Since the sink cabinet will be 36" wide which is 3' wide, a cabinet maker must divide this in half and subtract this from the center measurement.

$$3' / 2 = 1.5' \longrightarrow 7.354' - 1.5' = 5.854'$$

Convert this measurement to feet and inches by multiplying 0.854' by 12.

$$0.854 \times 12 = 10.248'' \text{ which is closest to } 10 \frac{1}{4}''$$

$$5.854' \longrightarrow 5' 10 \frac{1}{4}''$$

The cabinetmaker measures in $5' 10 \frac{1}{4}''$ from the left wall to place the base cabinet.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities

PA Core Standard: CC.2.1.HS.F.5

Description: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Math Associated Vocabulary:
ROUNDING, PLACE VALUE, MENTAL MATH, AVERAGE

Formulas and Procedures:

It is often more practical to use estimation to solve problems, using mental math, so that a calculator is not necessary. Usually the situations presented require you to either round to the nearest whole number, tens, hundreds, or thousands, or require you to take an average of the range of numbers given. The two examples below demonstrate specific situations where rounding and averaging are useful.

Rounding:

Henry just purchased a cell phone plan that will cost him \$38.99 per month. His friend, Elizabeth, just purchased a cell phone plan that will cost her \$59.99 per month. Estimate how much more money Elizabeth will spend on her cell phone plan in one year.

1. To estimate, round to the nearest tens. Henry will spend about \$40/mo. and Elizabeth will spend \$60/mo.
2. Take the difference between the two: $\$60 - \$40 = \$20$ to determine how much more Elizabeth will spend in one month.
3. Multiply by 12. $\$20 \times 12 = \240 more per year.

Averaging:

Billy notices that 4-6 cars pass by his house each hour. Estimate the number of cars that will pass by his house in 8 hours.

1. Find the average of 4 and 6. Average = $(4 + 6) \div 2 = 5$
2. Multiply this by 8 hours: $5 \times 8 = 40$
Approximately 40 cars should pass by his house.

Instructor's Script - Comparing and Contrasting

Many times as a cabinetmaker, you will need to work with irrational numbers that are non-repeating and non-terminating decimals. You will need to convert these measurements into fractions of an inch in order to work with these numbers when using a tape measure. You will need to decide what units will work better in various situations. Many times you will need to use these numbers to determine quantities needed to order materials.

Common Mistakes Made By Students

Problems arise when the students do not consider the limitations of estimating and how the situation determines when to estimate. For instance, it is not okay to round up 85 psi to 100 psi. However, if a faulty component will cost the customer \$85, it would be okay to round it to \$100 when estimating the cost.

CTE Instructor's Extended Discussion

In the cabinetmaking field, all of our dimensions should be converted to the hundredth digit and then converted to the nearest 16th of an inch. This allows the dimensions to be in a workable format.

Cabinetmaking (48.0703) T-Chart

Problems	Occupational (Contextual) Math Concepts	Solutions
1. A kitchen wall is 14' 10 ½" in length. Convert this to decimal feet.		
2. A kitchen wall is 20' 6 ¼" in length. A window is to be placed in the middle of the wall. What is the center point of the window in feet and inches??		
3. If a room is 20' x 20' and you calculate the diagonal to be $\sqrt{800}$. Convert this to feet and inches (nearest half of an inch).		
Problems	Related, Generic Math Concepts	Solutions
4. A software support contract is quoted for one or two years. One year would cost \$795, but two years would cost \$1,495. Round each price to the nearest hundred dollars and estimate the savings for a two year commitment		
5. Students want to raise \$500 for a field trip. With fundraising, they collected \$127 on Monday, \$130 on Tuesday, \$84 on Wednesday, and \$90 on Thursday. Approximately how much money will they need to collect on Friday to reach their goal?		
6. A car can be rented for \$37.99/day plus \$0.39/mile. Which of the following is the best estimate for the cost of renting the car for 4 days if you are driving 100 miles? a) \$150 b) \$160 c) \$200 d) \$250		
Problems	PA Core Math Look	Solutions
7. A company is offering a salary of \$48,500 per year. If 20% is taken from taxes, how much will a person have made in 5 years after taxes?		
8. Every hour, the store sells between 40-50 items that range from \$1.99 - \$7.99. What would be a good estimate for the amount of money the store generates in a 10 hour day?		
9. Two friends went to dinner. Their bill came to \$37.79. If a fair tip is between 15 and 20 percent, what would be a fair tip to leave their waiter?		

Cabinetmaking (48.0703) T-Chart

Problems	Occupational (Contextual) Math Concepts	Solutions
1. A kitchen wall is 14' 10 ½" in length. Convert this to decimal feet.		$14'10\frac{1}{2}'' \rightarrow 10\frac{1}{2}'' = 10.5''$ $10.5 \div 12 = 0.875' \rightarrow 14' + 0.875' = 14.875'$
2. A kitchen wall is 20' 6 ¼" in length. A window is to be placed in the middle of the wall. What is the center point of the window in feet and inches?		$20'6\frac{1}{4}'' \rightarrow 6\frac{1}{4}'' = 6.25'' \rightarrow 6.25 \div 12 = 0.521'$ $20' + 0.521' = 20.521' \rightarrow 20.521 \div 2 = 10.2605'$ $0.2605 \times 12 = 3.126'' \rightarrow 10' 3 - 1/8''$ is the centerpoint
3. If a room is 20' x 20' and you calculate the diagonal to be $\sqrt{800}$. Convert this to feet and inches (nearest half of an inch).		$\sqrt{800} \approx 28.284' \rightarrow 0.284 \times 12 = 3.408''$ $28' 3.408'' \approx 28' 3 1/2''$
Problems	Related, Generic Math Concepts	Solutions
4. A software support contract is quoted for one or two years. One year would cost \$795, but two years would cost \$1,495. Round each price to the nearest hundred dollars and estimate the savings for a two year commitment		Rounding: One year \approx \$800, while two years \approx \$1,500. $\$1,500/2 = \750 per year \$50 per year savings, or a \$100.00 savings for the two year commitment.
5. Students want to raise \$500 for a field trip. With fundraising, they collected \$127 on Monday, \$130 on Tuesday, \$84 on Wednesday, and \$90 on Thursday. Approximately how much money will they need to collect on Friday to reach their goal?		Rounding the amounts to the nearest ten, $130 + 130 + 80 + 90 = 430$ 500 (their goal) – 430 (the approx. amt. collected) = \$70 is approximate amount they would need to collect on Friday.
A car can be rented for \$37.99/day plus \$0.39/mile. Which of the following is the best estimate for the cost of renting the car for 4 days if you are driving 100 miles? a) \$150 b) \$160 c) \$200 d) \$250		c) \$200 $C = \text{Total Cost}$ $x = \# \text{ of days}$ $y = \# \text{ of miles}$ Equation: $C = 37.99(x) + .39(y)$ Estimate Amounts: $C = 40x + .40x$ Substitute and Solve: $C = 40(4) + .40(100)$ $C = 160 + 40 = \$200$
Problems	PA Core Math Look	Solutions
6. A company is offering a salary of \$48,500 per year. If 20% is taken from taxes, how much will a person have made in 5 years after taxes?		$\$50,000$ salary estimate. 10% is \$5,000, so 20% is \$10,000. $5 \text{ years} \times \$10,000 \text{ tax/year} = \$50,000$ taxes in 5 years. $\$50,000 \text{ salary} \times 5 \text{ years} = \$250,000$ estimated salary for 5 years $\$250,000$ (estimated salary) – $50,000$ (estimated taxes) = $\$200,000$ (estimated net, or after tax income for 5 years)
7. Every hour, the store sells between 40-50 items that range from \$1.99 - \$7.99. What would be a good estimate for the amount of money the store generates in a 10 hour day?		$45 = \text{Average of } 40\text{-}50$ $\$5 = \text{Average } \$1.99 \text{ and } \$7.99$ $45 \text{ items} \times \$5 = \$225$ per hour $\$225 \text{ per hour} \times 10 \text{ hours} = \$2,250.00$ per day
8. Two friends went to dinner. Their bill came to \$37.79. If a fair tip is between 15 and 20 percent, what would be a fair tip to leave their waiter?		Estimate a \$40 bill. 10% is \$4. 20% is \$8 A fair tip would be any dollar amount between \$6 and \$8.