

Access To Apprenticeship

HOW TO SOLVE MATH PROBLEMS

A Summary

Some math problems are simple; they require basic operations like adding or subtracting in order to solve them. More complex problems involve the use of formulas. Although each problem is different, some general steps can help you find the right solution:

Step 1: Read through the whole problem carefully.

Step 2: List the facts and figures that are given in the question.

Step 3: Decide what needs to be found or calculated, rereading the question if necessary.

Check for clues. They are usually indicated by words or phrases like these:

- how much ...
- find the total amount...
- what is the ...
- calculate ...

Whatever follows those words is what you need to find out. The question could be worded:

How many *holes do you need to drill* if ...?

or

Calculate *the number of hours it takes* to ...

Note: You may need to use a formula that is not given in the question. You then need to figure out what formula to use and where to find it.

Step 4: Decide what methods can be used to find the answer. In fact all math problems are solved using addition, subtraction, multiplication and division.

Ask yourself: “Do I add, subtract, multiply, or divide?” The clues are in the question. Go through the question again, to find directions on what operations to use.

Recognizing the right math operations

The following phrases help to indicate which operation to use:

Use addition when the question uses words like the following:

- find the sum,
- what is the total,
- more than,
- increased by,
- find all.

Use multiplication with words like these:

- if each find all,
- so many hours at ... so much per hour,
- find the total,
- find all.

Since these last two phrases can indicate either addition or multiplication, you will have to decide based on the other facts in the problem.

Use subtraction with words like:

- the difference between,
- how much more, or larger, or greater,
- how much less,
- how many fewer,
- take away,
- subtract,
- decreased by.

Use division with words like:

- how much is each if ...
- find the cost or rate per ...
- divided by,
- divided into.

Step 5: Do the calculations using the operations decided on. Follow the correct order of operations. Be aware that some information in the question is not needed to solve the problem.

Just be careful to get the correct answer. If you are using a calculator, do the calculations twice to make sure you didn't make an error when punching in the numbers.

Step 6: Write your answer including any units or dollar signs.

Step 7: Check to see that your answer seems reasonable and that it provides the answer (the unknown quantity) to the problem.

Example A : A gasoline tank has a volume of 6.34 cubic feet. How many liters does it hold? 1 cu ft = 28.3 liters.

Step 1. Read the problem.

Steps 2 and 3. Note what information is provided (Step 2) and what needs to be found (Step 3): 6.34 cu ft need to be converted to liters; the conversion factor is 28.3.

Step 4. Decide what method to use.
The numbers given must be multiplied.

Step 5. Do the multiplication to solve the problem.

$$6.34 \text{ cu ft} \times 28.3 = 179.4 \text{ liters}$$

Step 6. Write the answer including units.

$$179.4 \text{ liters}$$

Step 7. 6.34 cu ft equals 179.4 liters – this seems like a reasonable answer.

Example B : What is the volume of a cylindrical tank that measures 1.5 meters high and has a diameter of .6 meters? The formula for finding the volume of a cylinder is $V = \pi r^2 h$. ($\pi = 3.14$)

Step 1 Read the question carefully.

Step 2 List facts and figures given.

$$\text{height (h)} = 1.5 \text{ m}$$

$$\text{diameter} = .6 \text{ m}$$

$$\text{formula is } V = \pi r^2 h$$

$$\pi = 3.14$$

Step 3 Decide what the question wants you to find.

The words “What is the volume...” tell you to calculate the tank’s volume using the formula.

Step 4 Decide what method to use. The formula tells you to multiply π times r^2 times h. Before you can use the formula, you need to find the radius from the diameter.

$$r = d \div 2$$

$$= .6 \div 2$$

$$= .3 \text{ m}$$

Fill in the given amounts in the formula.

$$V = 3.14 \times .3^2 \times 1.5$$

Step 5 Now multiply.

Order of operations tells you to square the radius first.

$$r^2 = .3 \times .3$$

$$= .09 \text{ m}^2$$

$$V = 3.14 \times .09 \times 1.5$$

$$V = .42$$

Step 6 Write your answer with the units.

$$V = .42 \text{ m}^2$$

Step 7 Does that seem about reasonable? It does.

Example C: If an apprentice earned \$569.50 in salary and \$345.75 in overtime in one week, how much did he make in total?

Step 1 Read the question carefully.

Step 2 List facts and figures given.

$$\$569.50 \quad \text{salary for 1 week}$$

$$\$345.75 \quad \text{commission for 1 week}$$

Step 3 Decide what the question wants you to find.

The words “How much did he make...” tell you to figure out what he should be paid.

Step 4 Decide what method to use.

The words “and” along with “in total” tell you to add. So you have to add the two amounts earned.

Step 5 Do the calculations.

$$\$569.50 + \$345.75 = \$915.25$$

or

$$\begin{array}{r} \$569.50 \\ + \$345.75 \quad \text{Add} \\ \hline \$915.25 \quad \text{Total} \end{array}$$

Step 6 Write your answer.

The apprentice made a total of \$915.25.

Step 7 Does that seem about right? Sure.

Note: If the problem deals with money, the answer should show two decimal places (if there are cents) and the \$ sign should be included.

Example D: A warehouse had 18 drills in stock. A shipment arrived with 26 more. During the following week, half the drills were sold. How many drills are now left?

Do the steps in the order in which they are presented.

Add the new drills to the number already in stock.

Since half of the drills were sold, half are still in stock. Divide the total amount by 2 to get the number of drills left in stock.

$$18 + 26 = 44$$

$$44 \div 2 = 22$$

22 drills are still left.

Example E: Kevin bought a truck worth \$18,900 with a down payment of \$4,300. He will pay the rest in 50 monthly instalments of \$320 each. How much interest will he be paying?

You probably need to think for a moment about what the question is asking. To find the amount of interest paid, you have to find the difference between the selling price of the truck and the total amount paid in down payments and instalments.

Amount paid in instalments.

$$\$320 \times 50 = \$16,000$$

Total amount paid by Kevin.

$$\$16,000 + \$4,300 = \$20,300$$

Difference between selling price and amount paid.

$$\$20,300 - \$18,900 = \$1400$$

The amount of interest paid is \$1400.

WORKING WITH NUMBERS THAT HAVE UNITS OF MEASUREMENT

Many of the previous examples involved units of measurement such as meters, gallons and dollars. The units of all quantities in a question must be included in the calculations and the answer. Here are the rules for working with units.

Rule 1. *Units of similar measure*, such as length or weight, ***must be the same*** before they can be added, subtracted, multiplied, or divided. If two units of measure are not the same, one unit must be converted so they are all the same.

You cannot make a calculation meters *and* centimeters. You must convert some of them so you have all centimeters or all meters.

Rule 2. *Two measurement units multiplied together become squared units*. If three measurement units are multiplied together, the units become cubed units.

Meters x meters become square meters (m²).

Rule 3. *If the same units appear above and below a fraction line, they cancel each other out*, eliminating them. But if there is only one unit, it remains in the answer.

Note: *The fraction line is a way of indicating division. 10/5 is the same as 10÷5. Division in mathematics is often shown as a fraction.*

$$\frac{45 \text{ ml}}{15\text{ml}} = 3 \text{ the units cancelled}$$

$$\frac{80 \text{ g}}{40} = 3 \text{ the units cancelled}$$

Rule 4. *When you work with units of different types*, such as gallons and miles, or distance and time, ***the units must be carried through calculations and be shown in the answer***.

Here are two more things to remember:

1. Units of different types cannot be added or subtracted.
2. The number values of units can be multiplied or divided but the units cannot cancel each other out.

$$\frac{100\text{k}}{2 \text{ liters}} = 50 \text{ k/l}$$