Math Help Sheet: Solving Percentage Problems

We encounter percentage problems in everyday life, such as when a sales tax is added to the cost of purchase or we determine the tip at a restaurant.

To determine what percentage of the full amount you would pay, first add the percentage of the full price (100%) and the percentage of the full price you plan to add to the full amount. If the sales tax on an item is 7.5%, then you are paying 100% + 7.5%; your total will be 107.5% of the item price at checkout.

Let's look at an example where the item cost $60 and the sales tax is 7.5%.

You pay 107.5% of $60

1.00 + .075 = 1. 075

1.075 × 60 = 64.50

The total you would pay is $64.50

We handle percentage problems by first writing them in the form A% × B = C, where one of the three values is unknown. This leads us to three types of problems.

A% × B = _?_	→	_?_ = A% × B is the procedure.
A% × _?_ = C	→	_?_ = C ÷ A% is the procedure.
_?_ % × B = C	→	_?_ % = C ÷ B is the procedure.

While in the store you noticed an item priced at $36. The store adds 7.5% sales tax. How much would it cost with tax?

So, A% = 100% + 7.5% = 107.5% = 1.075

A% × B = C	We start by writing the general formula.
1.075 × 36 = _?_	We plug in our known values.
_?_ = A% × B	Use the proper procedure.
1.075 × 36 = 38.70 or $38.70	Calculate.

You go back to the store at a later date with $15 in your pocket. How much can you buy and not exceed $15 at checkout? We know A% = 1.075.

A% × B = C	We start by writing the general formula.
1.075 × _?_ = 15	We plug in our known values.
_?_ = C ÷ A%	Use the proper procedure.
_?_ = 15 ÷ 1.075 = 13.95 or $13.95	Calculate.

Suppose you paid $21.50 for a $20 item at a store. What was the percentage of sales tax?
The amount of tax added is $21.50 - $20 = $1.50. So what percent of $20 is $1.50?

A% × B = C	We start by writing the general formula.
_?_% × 20 = 1.50	We plug in our known values.
_?_% = C ÷ B	Use the proper procedure.
_?_% = 1.50 ÷ 20 = 0.075 = 7.5%	Calculate.

Now You Try It!

Many restaurant patrons leave cash amounting to at least 15% of the total bill (including tax) on the table in appreciation for good wait service. This gratuity is important income for the wait staff.

Problem 1
You and a friend have enjoyed a fine meal with attentive service. The total bill amounted to $18.33, which your friend agrees to pay provided you leave a good tip on the table. How much money should you leave if you wish to give the standard 15% gratuity?

Problem 2
Suppose the total bill amounted to $29.41, which your friend agrees to pay provided you leave a good tip on the table. You consider leaving $5 since you have no change. What percentage tip would this be?

Problem 3
You have $30 and plan to treat a friend to a fine meal. You plan to pay the standard 15% gratuity, plus 7.5% tax. What is the maximum amount on a total bill that you can have and still leave a 15% tip on the table with out exceeding $30 for the bill plus tip?
(Hint: 100% + 15% + 7.5% = 122.5%)

Multiple Discounts
Suppose you are at a checkout paying for a $120 item with discounts of 25% and 10%, with 7% sales tax. $120 x 0.75 x 0.9 x 1.07 = $86.67 to pay at the checkout counter.

Answers : 1) yes; $2.75 2) 17% 3) $24.49