

Doubling Up

Overview

Doubling is a straightforward process that is useful for a range of in the head calculations involving multiplication by 2, 4 and 8. Because it relies on remembering only a few simple number facts, it can act provide a remarkable boost to students' numeracy confidence.

This activity describes strategies to assist students move from doubles of numbers from 0 to 10 to a method of doubling that can be applied to numbers and prices and prices of any size.

Skills and Knowledge

- Doubling single digit numbers
- Doubling tens and hundreds
- Doubling many digit numbers
- Multiplication by 4 & 8

Preparation and Materials

- Photocopy Practice Sheet 1 (1 per student)
- 10 sided dice
- Calculators (optional - 1 per pair of students)
- Make some practice sheets or questions cards from local advertising catalogues or newspapers: cut out individual items with their prices (some with dollar only prices and others with prices in dollars and small numbers of cents) and stick on paper or cards.

Suggested Procedure

Introducing doubling

Draw this table on the board

4	8
7	14
8	16
2	
6	
5	10
9	

Explain:

- *The same thing has being done to all of the numbers in column 1 to make the numbers in column 2*
- *Work out what it is and fill in the spaces*

After a few minutes ask:

- *What numbers did you put?*
- *What's happening to the numbers?*



Responses may include:

- *Add the number to itself*
- *Multiply by 2*
- *Times 2*
- *Double the number*

Establish that these processes would all give the same answer, so they are all the same thing really. For the purpose of this activity refer to it as 'doubling' the numbers.

Introduce the activity purpose

Ask:

- *Can you think of times when you would need to double numbers?*

Suggestions may include:

- Paying for two people, such as when buying tickets for a bus or cinema.
- Doubling the quantities in a recipe.
- Working out the total travelling time or distance if you are going to and from a place.

Explain:

- *We are going to look at strategies for doubling*
- *First small numbers and then larger ones*
- *Then you will see how you can use doubling for lots of other calculations*

Doubles of numbers from 0 - 10

Throw a 10 sided dice. Call the number thrown (e.g. 4)

Ask:

- *What is double 4?*

Record on the board:

$$4 + 4 = 8 \quad \text{and} \quad \text{double } 4 = 8$$

Repeat the procedure, encouraging quick recall from students and recording the new number doubles on the board as each is thrown.

As it arises, emphasise that double 0 is 0, since it is a common error to write 2.

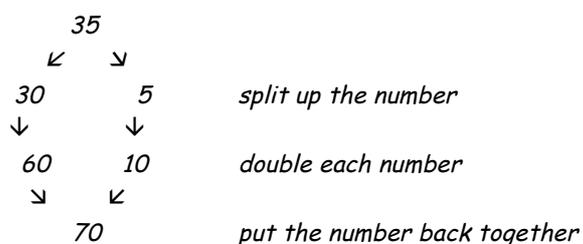
Encourage students to memorise the doubles if they don't know them already.



Doubling larger numbers

Doubling any larger number can be done very simply by imagining that you are splitting the number into its simple components. These are all doubled separately then put back together as the final doubled number.

For example, 35 is split into 30 and 5. In diagram form this would look like:



Numbers such as 142 would be split into 100 and 40 and 2, each component doubled to 200, 80 and 4 then put together as 284.

For some students it may be necessary to backtrack and build up the steps of this process gradually by providing practice at doubling numbers such as 20, 30, 40 .. followed by the hundreds: 200, 300, 400 .. (see below). However, it is good for students to see the point of learning the steps in advance by seeing the more complex examples first.

If any students are ready at this stage, the first column of Practice Sheet 1 provides examples of doubling numbers presented as prices.

Doubling tens and hundreds

Explain:

- *Once we can double these single numbers it's easy to double numbers with 0 on the end, like 20 or 30 ... or even 200, 500 ...*

Ask: *What do we get if we double 30?*

If 60 is not an automatic response ask:

- *What is 30 + 30?*

Remind students that adding 30 to itself gives the same answer as doubling.

Encourage students to work out a series of these calculations by adding until they see the pattern of doubling the tens number and then adding zero.

Double 20 is 20 + 20 = 40

Double 30 is 30 + 30 = 60

Double 40 is 40 + 40 = 80

Double 50 is 50 + 50 = 100 etc.



Once students are comfortable with doubling the tens, move on to the hundreds in a similar manner.

Sets of *Quick Questions* on cards are ideal for practising these with the whole class. For example

- *Double: 80; 30; 400; 60; 90*

See *Quick Questions* activity for further details about using Quick Questions.

If your students need reinforcement at different levels of complexity, create sets of 10 Questions for them to practise individually (see *10 Questions* activity).

Doubling and doubling again (x 4)

Ask:

- *What would I get if I double \$7?*
- *What happens if I double it again?*
- *What else could I have done to \$7 to get \$28?*

Discuss and demonstrate:

$$\$7 + \$7 + \$7 + \$7 = \$28$$

$$\text{And also } \$28 = 4 \times \$7$$

Ask:

- *Do you think this would be the same if we doubled another number twice?*
- *Try it for \$3*
- *What about \$5?*

Let students experiment for themselves with small numbers until they are convinced that multiplying by 4 is the same as doubling twice. [They could use calculators if necessary.]

Explain:

- *You can use this method to find 4 times any number no matter how big it is*
- *You split them up the same way we did before*
- *This time you double the parts twice before you put them back together*
- *Try these examples by doubling twice:*

$$\$32; \$43; \$125; \$314; \$509$$

Encourage students to check these answers, either by using calculators or adding 4 times.



Multiplying by 8

Ask: *Can anyone think of a way you could use this method to multiply by 8? (x 8)*

Use small numbers and the process described above to demonstrate that doubling 3 times is the same as multiplying by 8 or 'times' 8 (x 8). Get students to check the multiplication by 8 on calculators.

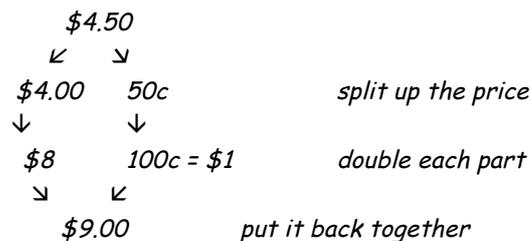
The second column of *Practice Sheet 1* (1- 5) provides practice at multiplying numbers by 4 using this method.

Doubling prices

Ask:

- *It costs \$4.50 to get into the local swimming pool*
- *If I was paying for me and my sister how much would it cost?*

Demonstrate how this can be done by splitting the price into dollars and cents and doubling them separately



Ask:

- *It costs \$3.90 for a drink at our local café*
- *If I was paying for both me and my sister how much would it cost?*

Again work through the splitting process together.

This time the cents part comes to 180 cents so students may need help converting it to \$1.80 and adding it to the \$6.

The exercises in the first column of *Practice Sheet 1* (11 – 15) ask students to apply this method to prices. In the second column they are asked for the cost of 4, which requires doubling a second time.

The cards prepared from the shopping catalogues can be used for further practice. For example, first ask students how much it would cost for two of each item, then follow up with costs for 4 or 8 of each.



Doubling Up

Practice Sheet 1

Use doubling in your head or diagrams to work out these costs:

	Cost for 1	Cost for 2	Cost for 4
1.	\$5		
2.	\$9		
3.	\$11		
4.	\$15		
5.	\$67		

A business wants to buy two of each of these appliances. Double each of the prices



6. Electric Fan
\$98



7. Coffee Machine \$234



8. LCDTV only \$517!!

9. Air conditioning for your home
or office.



Just \$2,900



10. Family sized
refrigerator now only
\$709

Use doubling in your head or diagrams to work out these costs:

	Cost for 1	Cost for 2	Cost for 4
11.	50c		
12.	75c		
13.	\$3.20		
14.	\$4.45		
15.	\$7.50		



