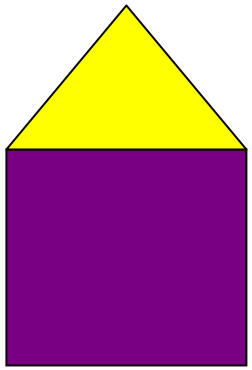
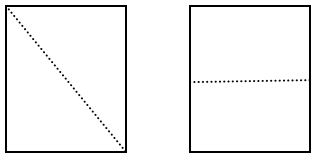
Open Ended Problems that Could be Used to Provide Differentiated Instruction in Mathematics

These problems have been taken from various sources. Where known, I have given the source. In some cases I do not know the source but if you find the source I'd be glad to include it here. If you have any problems to add to this list, please e-mail them to sean.delaney@mie.ie. The language of some of the problems may be challenging for some children and it is assumed that the teacher will spend some time discussing the problem with the class before they begin solving the problem. Some of the terms that will need to be explained before solving the problems are: integers, whole numbers, positive, sum, product, element, expression, represent, consecutive, number sentence, arithmetic, combinations, symbols, area, perimeter, total, elevation, remainder, ratio, region, rectangular,

PROBLEM	SOURCE	STRAND & STRAND UNIT	POSSIBLE SKILLS	SUGGESTED CLASS LEVEL
Find a set of positive integers whose sum is 20 and whose product is as large as possible. Explain why your answer is correct. (Note that there is no restriction on the number of elements in the set, but be sure that you select only positive integers.)	www.math.toronto.edu/barbeau/elemarith.pdf#search=%22Problems%20for%20elementary%teachers%22	Number (Number theory)	Explaining, communicating and expressing, reasoning, applying and problem solving	3rd to 6th
Write a real-life story problem that could be represented by the expression ½ - $^{1}/_{3}$.		Number (fractions)		5th, 6th
How many whole numbers less than 50 can be written as the product of two or more consecutive whole numbers?		Number (Number theory)	Explaining, integrating and connecting	3rd to 6th
David, Mark, Laura and Sarah's ages are 9, 7, 4, and 1. How many different four-digit numbers can you make with these four numbers? What is the smallest? What is the largest?		Number (Place value)		4th to 6th
How many number sentences can you write that equal 10?		Number (algebra, operations)		1st - 6th (Could be adapted for any number)
Using any arithmetic combinations or symbols, how can you use exactly seven 4s to make 100?		Number (operations)		3rd to 6th
I used two identical shapes to make a rectangle. What might they have been?	(Baker and Baker, 1991)	Shape and space		1st - 6th

Show all the rectangular regions you can make using 24 tiles (1-inch or 1-centimetre squares). You need to use all the tiles. Count and keep a record of the area and perimeter of each rectangle and then look for and describe any relationships you notice.	Principles and Standards for School Mathematics (p. 183)	Measures (perimeter and area)	Applying (concepts and strategies) and problem solving	4th to 6th
Rebecca notices boys and dogs running past her at the park. She counts a total of 40 legs running by. How many boys and how many dogs might have run past her? How many answers can you find?	National Council of Teachers of Mathematics website			3rd to 6th
The front elevation of a 3-D shape is shown below. The shape was constructed from two 3-D shapes, one placed on top of the other. List the possible shapes that could have been used. 		Shape and space- 3-D shape	Visualising, explaining, communicating	3rd, 4th

A farmer wants to build a new area for his sheep. The farmer decides that the enclosure must be square or rectangular with an area of 100 square metres. (i) What could be the possible side-lengths of the enclosure? (ii) How many metres of fencing will be needed for each possible design? (iii) Use your copy or some graph paper to draw all the possible rectangular or square designs. (iv) Include a key to tell how much each unit on the grid paper equals. (v) Which fence would you advise the farmer to build? Why?	Adapted from a problem on the NCTM website			5th & 6th
What is the most efficient way you can think of to find the sum of all the numbers from 1 to 100? i.e. 1+2+3+4….+100.		Number		6th
I have 10-cent, 5-cent and 1-cent coins in my money box. If I open the box and take out three coins, how much money could I have? How can you be sure that you have found all the possible amounts?		Number, measures		1st to 6th
Start with two identical rectangular regions – each the same size. Cut each of the two rectangles in half as shown below. Compare one of the smaller rectangles to one of the right triangles; do they have the same area or does one have a larger area than the other? 	Principles and Standards for School Mathematics (p. 190)	Number (fractions)	Reasoning	3rd

Other Interesting Problems				
If you fold a square paper vertically, the new rectangle has a perimeter of 39 inches. What is the area of the original square? What is the perimeter of the original square? What is the area of the resulting rectangle? Make a ratio of areas and perimeters. What do you notice?	http://sln.fi.edu/school/math2/sept.html	Measures (Length) Also Number (fractions)	Applying and problem solving, reasoning, integrating and connecting, communicating and expressing	6th
One night, Papa Chimp felt hungry. He swung into the treehouse kitchen and ate 1/6 of a bunch of bananas. Next morning, Mama Chimp ate up 1/5 of what Papa Chimp had left before heading towards the market. Brother Chimp came home from school that afternoon and ate 1/4 of the remaining bananas. Sister Chimp saw what was left and took 1/3 of it. Finally, Baby Chimp ate 1/2 of the remainder, leaving behind 6 bananas. How many bananas were on the bunch at first.?	http://www.vtaide.com/png/bananas.htm	Number (Fractions)	Explaining, communicating and expressing, applying and problem solving	6th
A rabbit falls into a dry well, thirty metres deep. Since to be at the bottom of a well was not in her original scheme of things, she decides to climb out. When she attempts to do so she finds that after going up three metres (and this is the sad bit) she slips back two. Frustrated, she stops where she is for that day and resumes her efforts the following morning – with the same result. How many days does it take her to get out of the well?	*In Code* by Sarah Flannery. Solution available in book	Measures (Length)	Applying and problem solving	6th