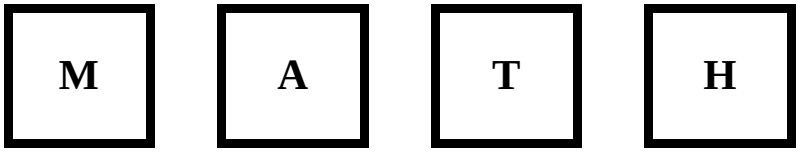
APMOPS: Sample Questions

Q1 There are 4 cards labeled with letters **M**, **A**, **T** and **H** respectively. A single-digit number is written at the back of each card. They are then placed side by side, as shown below, so that a four-digit number is obtained. Peter discovered that regardless of the number written behind the "**A**" card, the difference between the four-digit number and hundred times of the sum of its digits is always 4212.
Find the numbers written behind the cards labeled **M**, **T** and **H** respectively.



Q2 Given that $S = 1+11+111+1111+...+\underbrace{111...1}_{100\ of\ 1's}$

find the sum of the digits of S.

Q3 The diagram shows a 5 by 5 grid comprising 25 squares. Each square is filled with number 1, 2, 3, 4 or 5 in such a way that no row, column or the two main diagonal lines contain the same number more than once. Find the value of m.

	1			
			m	
	2	***3***		
4				
			5	

Q4 The diagram shows a square made up of nine rectangles. Rectangle ***E*** is also a square.
Given that the areas of rectangles ***A***, ***B*** and ***C*** are 7 cm^2, 21 cm^2 and 2 cm^2 respectively,
find the perimeter of the rectangle labeled ***D***.

A		***B***
	E	
C		***D***

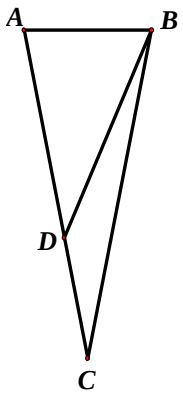
Q5 Given that

$$\left(1+\frac{1}{2}\right)\times\left(1+\frac{1}{2^2}\right)\times\left(1+\frac{1}{2^4}\right)\times\left(1+\frac{1}{2^8}\right)\times\ldots\times\left(1+\frac{1}{2^{2^{2009}}}\right)=2\left(1-\frac{1}{2^{2^n}}\right),$$

find the value of n.

Q6 The diagram shows an isosceles triangle ABC where $AC = BC$ and $\angle BAC = 80°$.

Given that $AB = CD$, find the value of $\angle BDC$.



Solutions to this question by accurate drawing will not be accepted.

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Answers :

Q1 M = 5, T = 1 and H = 2

Q2 415

Q3

5	1	2	3	4
3	4	5	1	2
1	2	3	4	5
4	5	1	2	3
2	3	4	5	1

Q4 $11\frac{2}{3}\ cm^2$

Q5 2010

Q6 $150°$

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