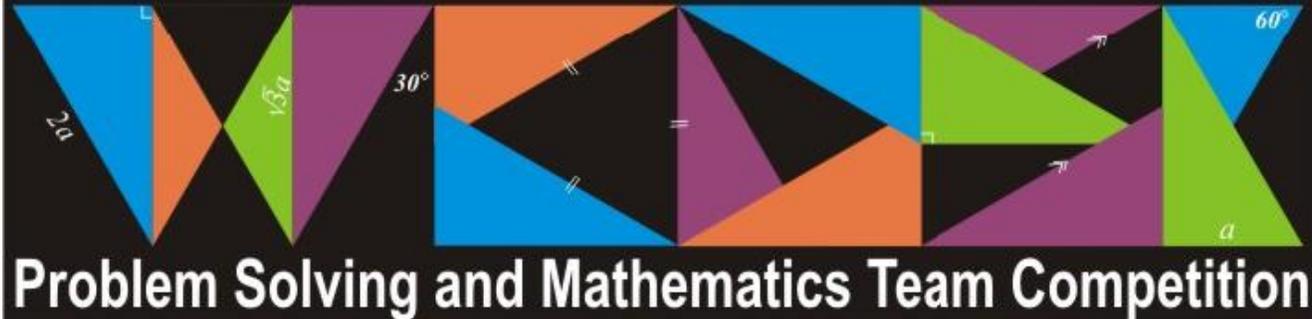


# WATERLOO CATHOLIC DISTRICT SCHOOL BOARD



## Practice Questions

**Problem 1.** On **16.04.2009** Nancy noticed that the sum of the first four digits is equal to the sum of the last four digits. When such an interesting coincidence will happen **THIS YEAR** last time?

Author: *N.M.Netrusova*

**Answer.** 26.12.2009

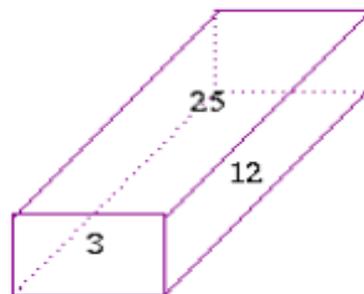
**Problem 2.** A number was multiplied by the sum of its digits that resulted in 2008. Find the original number.

Author: *I.V.Yashchenko*

**Answer.** 251.

**Solution.** The original number is a divisor of the number of 2008. Let's break down 2008 into the prime numbers:  $2008=2 \cdot 2 \cdot 2 \cdot 251$ . Write down all the divisor of 2008: 1, 2, 4, 8, 251, 502, 1004, 2008. If you find the sum of digits of each of them, you will easily notice that the only number 251 satisfies the problem ( $2008=251 \cdot (2+5+1)$ ).

**Problem 3.** The diagram to the right shows a rectangular box. The areas of the faces of the box are 3, 12 and 25 square centimeters. What then is the volume of the box?



Source: *Halton District Junior Contest 2008*

**Answer:**  $30\text{cm}^3$

**Problem 4.** In a letter equation, each letter holds the place value in a four digit number and each digit can be 0 to 9. All the same letters have the same values. For example, if A is 2, B is 3, and D is 5, then ADAB is the number 2523.

Given:  $\text{RARE} - \text{FLEA} = \text{REEL}$

Find the value of R.

Source: *Halton District Junior Contest 2008*

**Answer:** 7

**Problem 5.** You must develop a number sandwich using two 1's, two 2's, two 3's and two 4's. The goal of a number sandwich is to arrange the eight numbers in a line so that:

Between the two 1's, there is one digit.

Between the two 2's, there are two digits.

Between the two 3's, there are three digits.

Between the two 4's, there are four digits.

Source: *Halton District Junior Contest 2008*

Answer: 41312432 or 23421314

**Problem 6.** Composite Functions

An bank in the UK offers the exchange rate £1 = \$1.7 plus an administration fee of £2 for each transaction. A bank in the USA offers the exchange rate \$1 = 1.6 Swiss francs plus an administration fee of \$3 for each transaction.

1. How many Swiss francs will you actually receive if you first exchange £10 into dollars in the UK and then into Swiss francs in the USA?
2. Write as a composite function,  $y(x(t))$  where  $t$  is the amount in £,  $x$  is the amount in \$, and  $y$  is the amount in Swiss francs.

Source: *Centre for Innovation in Mathematics*

Answer: 1. 16.96 Swiss francs

2.  $y \circ x = y(x(t)) = 2.72t - 10.24$

**Problem 7.** Periodic Functions  
Sketch the graph  $f(x) = \begin{cases} x & \text{for } 0 \leq x < 2 \\ 0 & \text{for } 2 \leq x \leq 3 \end{cases}$

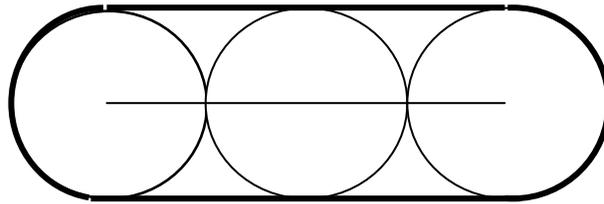
when  $f(x)$  has a period of 3 units, for values of  $x$  between  $-3$  and  $6$ .

Source: *Centre for Innovation in Mathematics Teaching*

Answer:  **Horizontally:** This shape begins at  $-3$  and ends at  $0$ , then repeats twice more from  $0$  to  $3$  and  $3$  to  $6$ .

**Vertically:** The vertical range is from  $0$  to  $2$ .

**Problem 8:** Three circles of radius 1 are drawn so that they just touch each other. Their centers lie in a straight line, as shown. If an elastic band (bold curve) is placed around the circles, what is the area inside the elastic band?



Source: UW Cayley Practice Question

Answer: 11.14 cm<sup>2</sup>

**Problem 9:** What is the next member of the sequence 6 14 30 62 126 254 \_\_\_ ?

Answer: 510

**Problem 10:** Everyone in a room writes down a two-digit number and only two people write the same number. How many people at most could be in the room?

Answer: 91

**Problem 11:** The diagram represents a small sheet of 12 postage stamps, as they are usually sold, all perforated at the edges and all of the same value. (The letters are only there to identify the separate stamps). You need 4 of the stamps in order to post a letter but would like all 4 to be properly joined together at their edges (not at their corners). For example: ABCD, EFGH, JKLM, FGHL would all do, but NOT EFLM.

A	B	C	D
E	F	G	H
J	K	L	M

In how many different ways can you get such a group of 4?  
(Only the number of ways is required, not a listing)

Source: Centre for Innovation in Mathematics Teaching

Answer: 65

**Problem 12:** Each of the shapes given below is to be cut out from the squared-paper and then cut up into separate pieces as shown by the coloured areas inside each shape. For each shape, find how to re-arrange its separate pieces so as to make a square.

NOTE: The shapes for this problem will be sent as a separate file. (GIF Image)

Source: Centre for Innovation in Mathematics Teaching