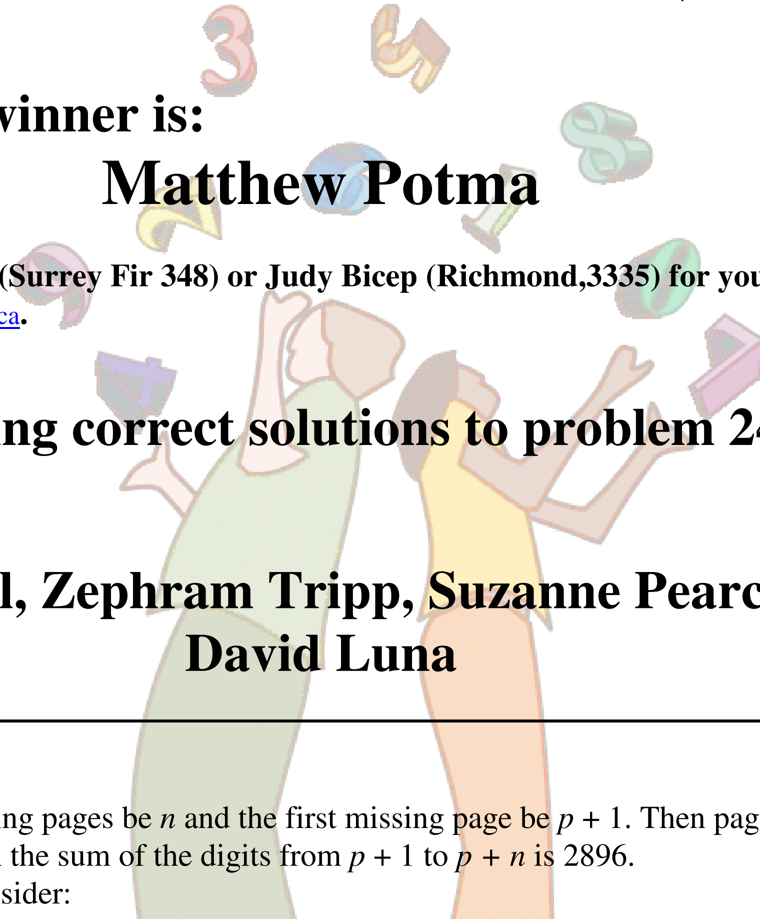
**Kwantlen Polytechnic University**

# Mathematics Problem of the Week (245)



## This week's winner is:

## Matthew Potma

**Contact Lin Hammill (Surrey Fir 348) or Judy Bicep (Richmond,3335) for your prize or email** MathProblem@kpu.ca**.**

## Also submitting correct solutions to problem 245 were:

## Robert Hill, Zephram Tripp, Suzanne Pearce and David Luna

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**Problem 245 solution:**

**Solution**

Let the number of missing pages be $n$ and the first missing page be $p + 1$. Then pages $p + 1$ to $p + n$ are missing. Then the sum of the digits from $p + 1$ to $p + n$ is 2896.

To sum these digits consider:

(p+1) +(p+2) + (p+3) + . . . (p+n-2) + (p+n-1) + (p+n)

(p+3) + (p+n-2)
= (p+1) + (p+n)

(p+2) + (p+n-1) = (p+1) + (p+n)

(p+1) + (p+n)

Notice that $n$ must be even because there are two pages on each leaf of a book. Thus we have $n/2$ pairs, each with sum $(p + 1) + (p + n)$. Also note that he prime factorization of 2896 is $2896 = 2^4 \cdot 181$. Hence:

$$((p+1)+(p+n))\frac{n}{2} = (2p+n+1)\frac{n}{2} = 2896 = 2^4 \cdot 181.$$

Multiplying by 2: $(2p+n+1)n = 2^5 \cdot 181$

Since $n$ must be even and $2p+n+1$ must be odd (since $2p$ and $n$ are even),

$$n = 2^5 = 32 \text{ and } 2p + n + 1 = 181 \text{ so that } p = 74.$$

Thus 32 pages are missing and they are pages 75 to 106.