



# PYTHAGORAS QUEST

## Distriktsfinal



Handelskammaren  
I sydsvenska företags intresse

**Part 1.** Time: **60 min – 7 frågor** Max points: **21 points** (3p/question).

Allowed tools: Paper, pencils and rubbers (no calculator)

**Write each question's solution on separate paper. Write your team name on all sheets!!**

**Full worked solutions are required for Part 1.**

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### 1. The Octagon Problem

A regular octagon ABCDEFGH has area 1.

What is the area of the rectangle ABEF?

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### 2. Biggest is Best

What is the largest whole number which is a divisor of

$$(n + 1)(n + 3)(n + 5)(n + 7)(n + 9)$$

for all positive whole numbers  $n$ ?

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### 3. $abc$

Find out how many positive three-digit numbers  $abc$  exist, such that  $a$  and  $c$  are not 0 and both  $abc$  and  $cba$  are multiples of 4. (the digits do not necessarily have to be different)

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#### 4. Difficult difference

If

$$A = 1 + 2 \cdot 3 + 4 \cdot 5 + \dots + 20 \cdot 21$$

and

$$B = 1 \cdot 2 + 3 \cdot 4 + \dots + 19 \cdot 20 + 21$$

What is  $A - B$ ?

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#### 5. Magic

In a magic square, the sum of all rows, columns and diagonals are all the same. Given the values below, fill in the rest of the square. NB. The numbers are allowed to be negative.

	20	16
42		

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#### 6. Intersecting squares

In a square ABCD of length  $a$  M is the midpoint of side CD. AEFG is a square such that M is the midpoint of AE and F and B are on different sides of AM. BHIJ is a square such that M is the midpoint of BH and I and A lie on different sides of BM. What is the area of the intersection between AEFG and BHIJ?

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## 7.PYTHQ

A good word is made up solely of the letters P, Y, T, H and Q. However, the rule is that P may not be followed by Y, Y may not be followed by T, T may not be followed by H, H may not be followed by Q and Q may not be followed by P. How many good words are there of length five? (NB! Each letter may appear more than once in each word e.g. P P P P P is allowed)

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