# High School Mathematics Competition 2007

## First Round, Basic Level

**1.** A shopkeeper sold a shirt to a customer with a 20 % profit and a pair of trousers with a 20 % loss. The customer paid the same price for both items. Did the shopkeeper get a profit or a loss from the transaction?

**2.** Without using a calculator, place the numbers $2^{1000}$, $3^{750}$ and $5^{500}$ in the correct order of magnitude.

**3.** The length of each side of a 12-gon is $s$ and end every second of its angles is $60°$ while the other angles are $240°$. Determine the area of the polygon.

**4.** The Prime Minister $R$ and eight other ministers $A$, $B$, ..., $H$ participate in a government meeting. Some of the ministers talk to each other, some do not. The following table, where 1 denotes being on speaking terms and 0 not being on speaking terms, shows which ministers talk to each other and which do not:

|   | R | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|---|
| R | – | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| A | 0 | – | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| B | 0 | 1 | – | 0 | 0 | 0 | 1 | 1 | 0 |
| C | 1 | 1 | 0 | – | 1 | 0 | 1 | 0 | 1 |
| D | 0 | 1 | 0 | 1 | – | 0 | 1 | 0 | 0 |
| E | 0 | 1 | 0 | 0 | 0 | – | 0 | 0 | 1 |
| F | 1 | 1 | 1 | 1 | 1 | 0 | – | 0 | 0 |
| G | 0 | 1 | 1 | 0 | 0 | 0 | 0 | – | 0 |
| H | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | – |

In the meeting, the Prime Minister told a rumor, which then passed from one minister to another (naturally, only through those who were on speaking terms with each other). The last one to hear the rumor was minister $D$. Who was the fourth minister who heard the rumor? Justify your answer!

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