

PYTHAGORAS **QUEST**



**Handelskammaren**  
I sydsvenska företags intresse

## FINAL

**Part 1: 6 questions**      **Allowed time: 60 min**

**Max : 18 (3p/question)**

**No tools required, only a pencil!**

**NB: Please use a separate page for each question. Don't forget to write your team name at the top of each page.**

**Complete solutions are required for this part.**

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### Table placement

Four couples (one woman and one man in each pair) are to eat dinner at a round table. They are not allowed to sit next to a person of the same sex neither are they allowed to sit next to their own partner. Call the guests A, a, B, b, C, c, D, d where the capital letter stands for the female in the pairing.

How many different ways are there of seating the guests round the table? Two arrangements are considered the same if each person has the same neighbor to the left and to the right in each arrangement.

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### Found you out!



You have eight coins. Seven of the coins have the same value and therefore weigh the same, but one of the coins is a fake and weighs less than the others. Describe how to find the false coin in two weighings using a set of scales like the ones in the image.

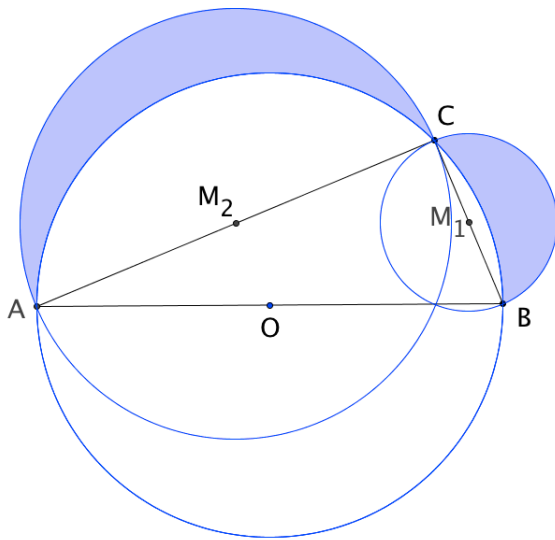
(image source: <http://pixabay.com/en/justice-law-measurement-silhouette-149209/> )

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### Apples

Three brothers are to share 87 apples. Adam takes his apples first. Björn takes one more apple than Adam, then the same amount again. Christoffer has twice as many as Björn and Adam have together. How many apples do the brothers have each?

### Shadowy circles



Triangle ABC is a right-angled triangle. O is the centre of the circle with diameter AB.  $M_1$  and  $M_2$  are the mid points of BC and AC respectively.  $M_1$  and  $M_2$  are also the centres of the circles of diameter BC and AC respectively. What is the value of the shaded area, if the area of triangle ABC is 5?

### Lar's World of Geometry

In *Geometryland*, childrens' toys are made of a combination of the following:

They may be one of three shapes (cube, sphere or tetrahedron)

They may be made out of four materials (plastic, wood, rubber or china)

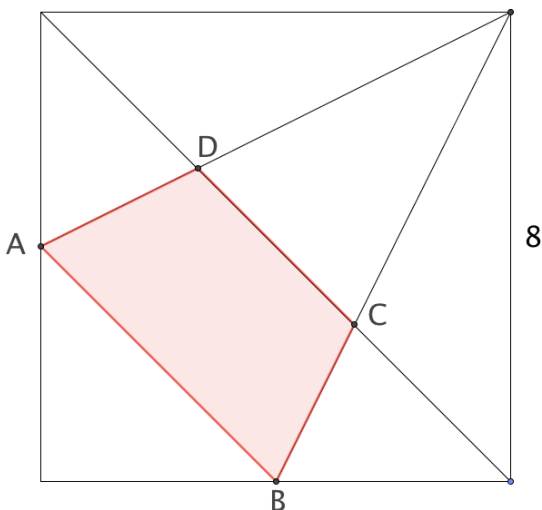
They are one of five sizes (XL, L, M, S eller XS)

They may be one of six colours (white, black, yellow, green, red or blue)

Every child has exactly one toy of each combination (e.g. a white, plastic, XL cube)

- How many different toys does each child have?
- How many toys differ in *two ways* from a black, XL, plastic cube?

### A Squash and a squeeze



The square in the image has sides of length 8. What is the area of the quadrilateral ABCD if A and B are the mid points of the sides of the square?