

PYTHAGORAS QUEST

Riksfinal



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

Allowed tools: Paper, pencil and rubber (no calculator).

Write your solutions on separate pieces of paper. Write your team name on each sheet of paper.

Please show full working for your answers to Part 1.

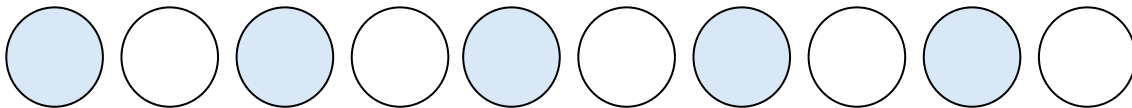
1. Divisible

You pick a three digit number at random.

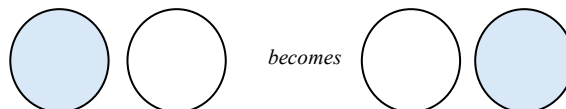
What is the probability that the number is divisible by 3 or 5? Simply your answer.

2. Blue disc, white disc...

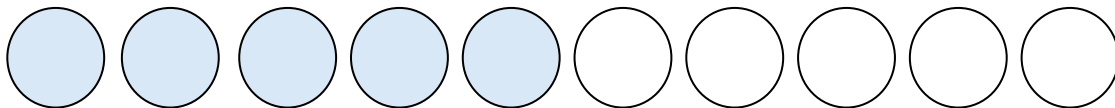
You have five blue discs and five white discs which are arranged in a line as shown.



The only move allowed is to interchange two neighbouring discs:



- a) We want to get all the blue discs to the left-hand side and all the white discs to the right-hand side. What is the least number of moves needed?



- b) What would be the least number of moves needed if we instead had fifty blue and fifty white discs arranged alternately starting with a blue on the left?
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3. PIN-code 2017

Christian has to swap his old four-digit bank code. His old code was **2 0 1 7**.

What are there more of: codes that have *at least* one of these digits or codes that do not have any of these digits? Motivate your answer

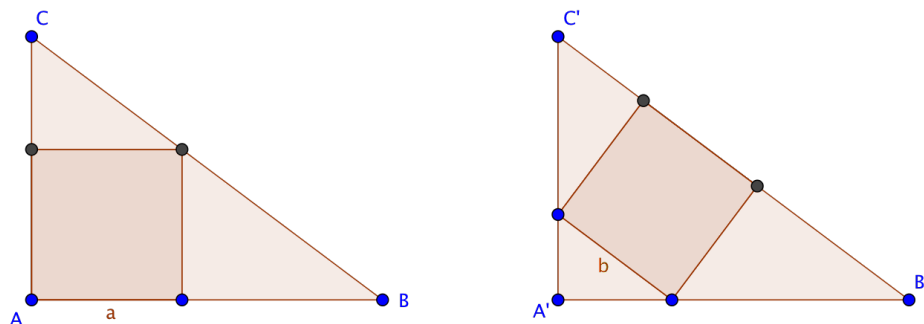
4. Pocket Money

Every week Simon pays for a movie ticket and a soda out of some of his allowance. Last week, Simon's allowance was x kr. The cost of his movie ticket was 50% of the difference between x and the cost of his soda, while the cost of his soda was 20% of the difference between x and the cost of his movie ticket. What fraction of x did Simon pay for his movie ticket and soda?

5. Triangle Drama

In the figure below, triangles ABC and $A'B'C'$ are identical with sides 3, 4 and 5. In triangle ABC , a square is inscribed of side a such that one corner is at A . In triangle $A'B'C'$, a square is inscribed of side b such that one side lies on the hypotenuse according to the figure.

What is b/a ?

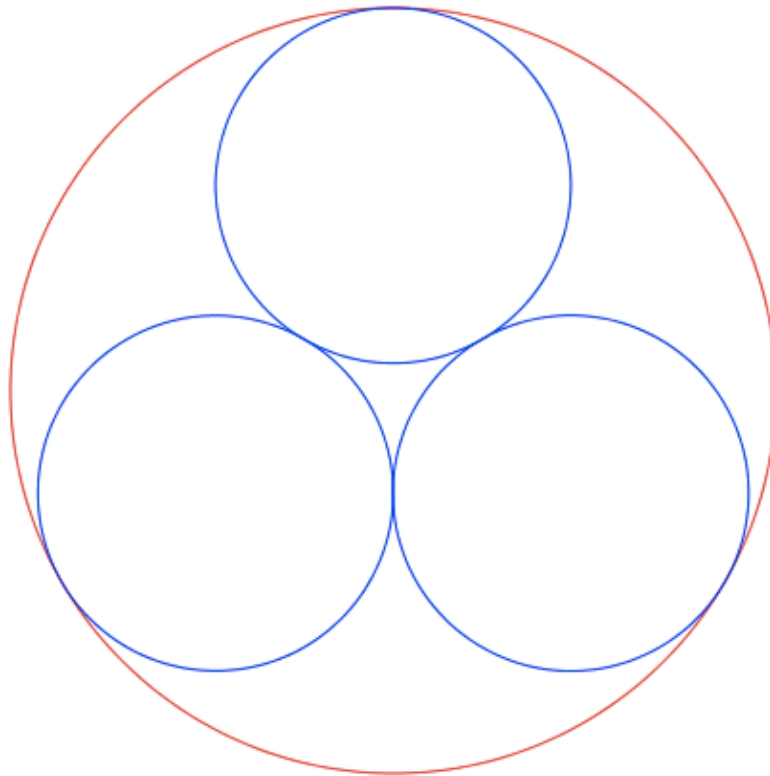


6. *Sangaku*

Sangakus are Japanese math problems or theorems that can be found in shrines or temples as offerings. Here is one example:

Three circles of radius r are inscribed in a circle of radius 4.

Find r .



7. The Square

Inside the square ABCD there is a point P such that $AP = 1$, $BP = 2$ & $CP = 3$.

Find the length DP.

