

PYTHAGORAS QUEST



Handelskammaren  
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## Distriktsfinal

**Part 1 Time 60 min, 7 questions**

**Total number of points 21 (3 p/question)**

**No calculators allowed!**

**NB! Write down your answers on separate sheets of paper and write your team's name on each sheet.**

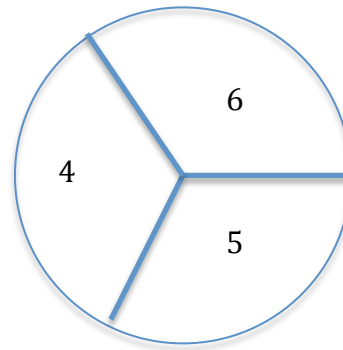
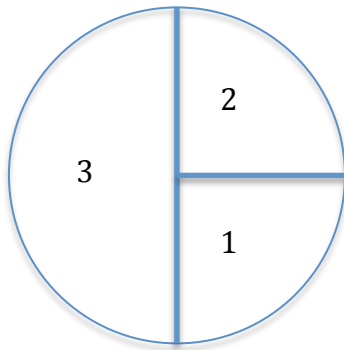
**Complete worked solutions are required for this part. If you only give an answer, no points will be given.**

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### 1. Wheel of fortune

Two wheels can rotate about their centres. A nail just at the edge of each wheel shows which number you get.

What is the probability that the sum of numbers from the two wheels is even?



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### 2. At the Market

Before money was invented, you had to exchange goods. At one particular market you can buy rice, flour, sugar and coffee. (Note that this is not a market where you can negotiate the price for you goods – prices are fixed.)

2 kg of flour gets you 1 kg of sugar.

2 kg of rice gets you 5 kg of flour.

3 kg of sugar gets you 2 kg of coffee.  
How much rice can you get for 1 kg of coffee?

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**3. You've got balls!**

You are to play a game with coloured balls in a large bag. There are 9 blue, 8 red, and 7 yellow balls. You cannot see the balls in the bag. The aim of the game is to pick as many balls from the bag such that there is at least 5 balls of the same colour for at least two of the colours left in the bag.

The game is over when you take out a ball that breaks the rule and that ball does not count.

- a) What is the most number of balls that you can take out before the game is over?
  - b) What is the least number of balls you can take out before the game is over?
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**4. Many Triangles**

A triangle has a perimeter of 27 cm.

All sides have different whole number value.

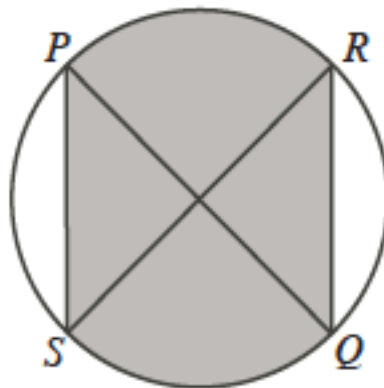
What is the maximum number of triangles you can make?

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**5. Shady circle**

In the figure below, diameters PQ and RS are both 12 cm in length.

Calculate exactly the area of the shaded area if PQ and RS are perpendicular to each other.



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**6. Take a hike!**

Elias & Mattias are going to go on a hike in the mountains and have lots of heavy equipment to share between them. We know that Mattias without his share of equipment weighs less than Elias does with his share of the equipment, but we also know that Mattias with his share of the equipment weighs twice as much as Elias does without his share of the equipment.

Who weighs the most? The equipment or Elias?

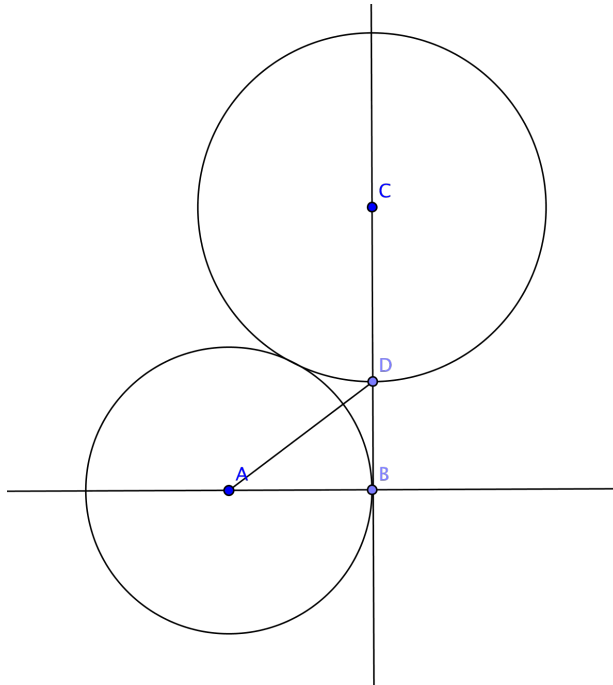


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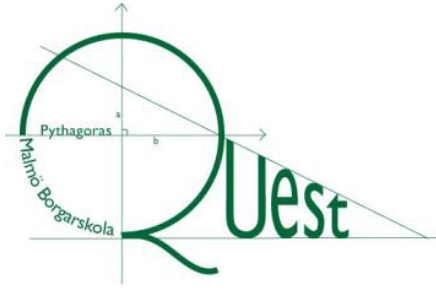
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**7. Going round in circles**

Two circles are at a tangent to each other. The small circle has a centre at A and the larger one has a centre at C. The smaller of the two circles has a radius of 8 units. A tangent to the smaller circle goes through the points, B, D and C. Length AD is 10 units. Calculate the radius of the larger circle. (see figure below)







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### Distriktsfinal

**Part 2 Time 30 min, 6 questions**

**Max points 12 (2 p/question)**

**No calculators allowed!**

**Only correct answers are needed for this part. Use a separate sheet and write your team name on the sheet.**

#### Part 2

#### 1. Arithmetic draughts

In an arithmetic series, you get the next number by always adding the same number onto the previous number in the series. For example 1, 4, 7, 10 is an arithmetic series. In the checkerboard below, all the rows and columns make up arithmetic series. Find x.

5			x
			1211
		1013	
23			

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**2. Last digit**

What is that last digit in the number  $7^{207}$ ?

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**3. Beautiful digits**

Calculate

$$\frac{666666 \cdot 666666}{1 + 2 + 3 + 4 + 5 + 6 + 5 + 4 + 3 + 2 + 1}$$

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**4. Questolympics**

Rut, Axel and Tea run a 100 m race (at constant speed).  
When Rut runs against Axel she wins by 20 m.  
When Axel runs against Tea he wins by 10 m.  
What is the result when Ruth runs against Tea?



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**5. Codebreaker**

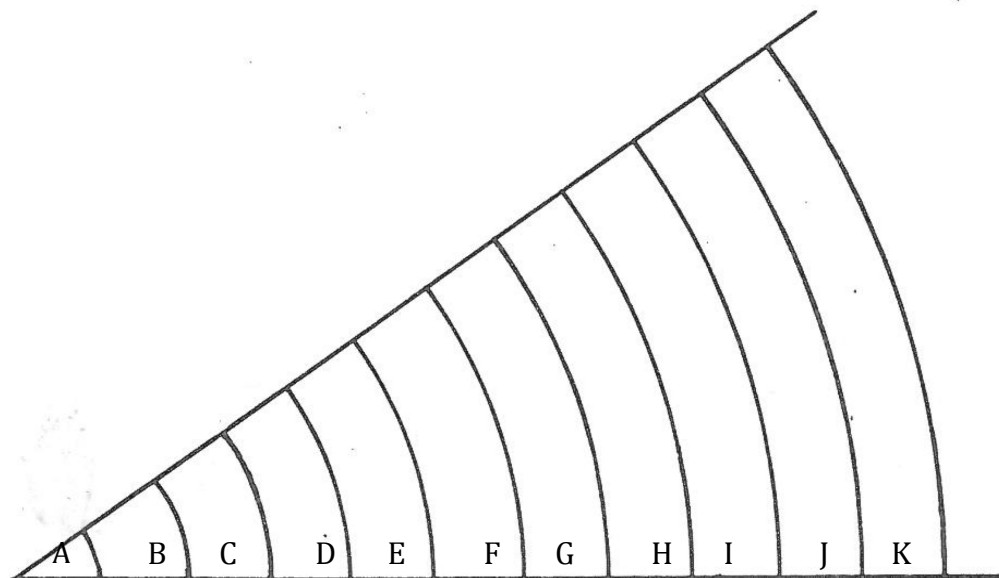
The numbers 1, 2, 3, 4, and 5 are coded into the letters A, B, C, D and E.  
Which numbers correspond to A, B, C, D and E if the following is given?

- $A + E < B$
- $B > D$
- $E + C \cdot D > B^2$

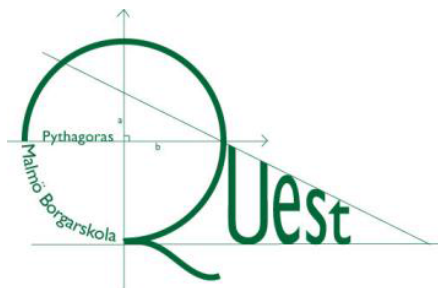
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**6. Ratio**

The 11 areas in the diagram below are labelled A-K. Each curve is a part of a circle. The radii of the circles increase by one unit for each new curve.



Find all the field-pairs (e.g. A-B) where the ratio of areas is 3:1 i.e. the bigger field has an area three times that of the smaller one.



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### Part 3 Max time 20 min

#### Decider question

If two teams have the same points from parts 1 and 2 then this question and its time to be solved, decides the final placement. Only a correct answer is needed.

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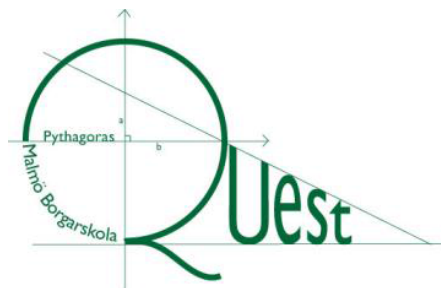
Find the number ABC which has digits A, B and C and which satisfies the identity

$$1998 \cdot ABC = CBA \cdot 8991$$



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KEY:

**Part 1**

1.  $5/12$
2. 1,2 kg
3. a) 14 balls      b) 6 balls
4. 12 triangles
5.  $18\pi + 36$
6. The equipment
7. radius = 9

**Del 2**

1. 911
2. 3
3. 12345654321
4. Rut wins by 28 m.
5. A=1, B=4, C=5, D=3, E=2
6. B:A, E:B, H:C, K:D

**Del 3** 891