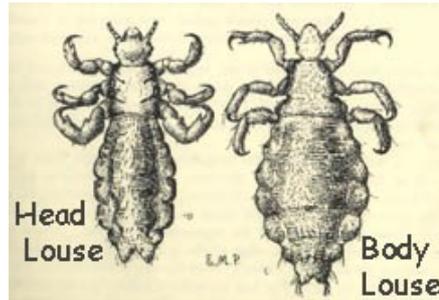# Captain's contest for the Science Fight 4

Captains are invited to the stage. Chairpersons give out the sheets with five problems and read the tasks aloud. The winner is determined by the maximum number of correct answers. In case of a tie, an extra Problem 6 is offered. The sheets with answers and names of Captains are then submitted to the Scoring Commission for archiving.

1. A DNA analysis of body louse (*Pediculus humanus corporis)* indicated that it diverged from head louse (*P. h. capitis)* ca. 70,000 years ago. It allowed dating a major development in the human society for which no archaeological evidence existed. What development was it?

Answer: clothing.

2. You have 100 kg of fresh mushrooms with 99% water content. The mushrooms are dried and the water content is reduced to 98%. What is the total mass of the dried mushrooms?

Answer: 50 kg.

3. Name the closest star to the Earth.

Answer: the Sun.

4. Name the only species of birds that have full binocular vision.

Answer: Owls.

5. Name the physical constant that American experimental physicist Robert Andrews Millikan first measured by suspending oil droplets between two electrodes.
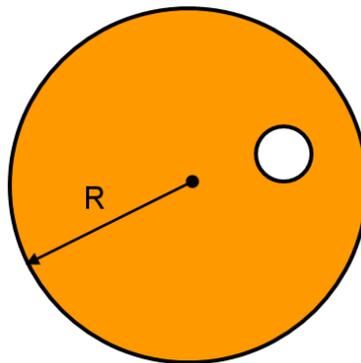
Answer: Elementary charge.

To break the tie between two or more captains in case of equal results, an extra Problem 6 is offered and the captain with the closest result in Problem 6 is declared winner.

6. Extra problem in case of a tie between two or three captains: Pour an exact amount of 100 mL of water into a beaker using no equipment.

Captain's contest for the Semi-Finals

Captains are invited to the stage. Chairpersons give out the sheets with five problems and read the tasks aloud. The winner is determined by the maximum number of correct answers. In case of a tie, an extra Problem 6 is offered. The sheets with answers and names of Captains are then submitted to the Scoring Commission for archiving.

1. Evaluate the height of the tallest among two other Captains. One point is credited to the answer with the least variance between the guess and true value.

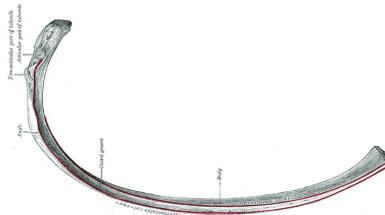2. A copper disk has a round hole. How does the diameter and shape of the hole change as the disk is heated?

Answer: The diameter of the hole is increased yet it remains circular.

3. Name the heaviest living animal.

Answer: Blue whale.

4. Name the number of pairs of ribs in a healthy human.

Answer: 12.

5. Name the physical constant that Danish astronomer Ole Rømer first measured by studying the apparent motion of Jupiter's moon Io.

Answer: Speed of light.

To break the tie between two or more captains in case of equal results, an extra Problem 6 is offered and the captain with the closest result in Problem 6 is declared winner.
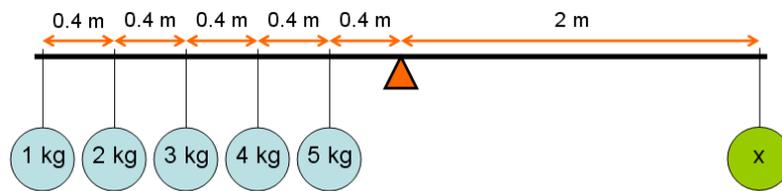
6. Extra problem in case of a tie between two or three captains: Pour an exact mass of 150 g of crystalline salt using no equipment.

Captain's contest for the Finals

Captains are invited to the stage. Chairperson gives out the sheets with five problems and reads the tasks aloud (and shows on the screen). The winner is determined by the maximum number of correct answers. In case of a tie, an extra Problem 6 is offered. The sheets with answers and names of Captains are then submitted to the Scoring Commission for archiving.
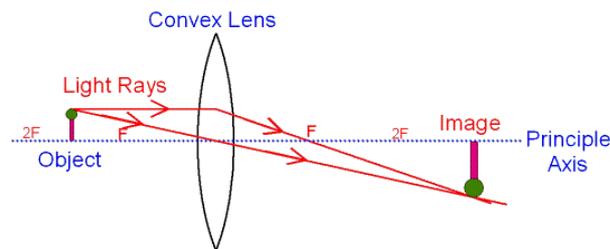
1. Make a paper airplane from an A4 sheet that flies as far as possible. Only one public launch is allowed to determine the winning airplane and credit one point.

2. A seesaw is in equilibrium. It has five masses of 1, 2, 3, 4, and 5 kg attached to its left-hand side at the distances of 2 m, 1.6 m, 1.2 m, 0.8 m, and 0.4 m from the pivot, respectively. An unknown mass is attached to the right-hand side at a distance of 2 m. Find this mass.

Answer: 7 kg.

3. A convex lens is used to form a sharp, inverted image of a burning candle. How would the image on the screen change if the top half of the lens is covered with an opaque black paint?

Answer: image brightness would decrease yet image would stay the same.

4. What is greater, $\sqrt{3} - \sqrt{2}$ or $\sqrt{7} - \sqrt{5}$?

Answer: $\sqrt{7} - \sqrt{5}$

5. Name the important physical value that Ancient Greek mathematician Eratosthenes of Cyrene first measured by comparing Sun elevation at noon in Alexandria and in Syene.

Answer: Circumference of the Earth.

To break the tie between two or more captains in case of equal results, an extra Problem 6 is offered and the captain with the closest result in Problem 6 is declared winner.

6. Extra problem in case of a tie between two or three captains: Cut a piece of thread with an exact length of 1 m using no equipment.