MathTriathlon 2020

14 March 2020

EXAMPLES

1 – MathRelay

The team decides the order in which the (three) members of the team will compete.

Total duration is 45 minutes, **15 minutes for each phase**.

The first player is given a challenge and may solve it in a maximum of 15 minutes.

As soon as he/she **solves** the challenge, the **next** in place team member takes over the next challenge (and is handed the master answer sheet with the first team member's answer on it).

If the first player decides to strategically **pass** for any reason, the next in turn team member takes over the same challenge but with a **-1 point handicap** in case the problem is solved.

In any case, the time not spent in each phase is carried for the benefit of the next in turn team members. Points are awarded as follows:

5 points for a correct answer in phase 1.

Another **5 points** for a correct answer in phase 2.

Challenge 3 is awarded with **8 points**.

Zero points are awarded if a team has given **no answer** in any leg of the Relay provided that **all 15 minutes have elapsed**.

One point is subtracted in case of a **wrong** answer or in case a player **passed** a round.

If a team has successfully **answered all three** challenges then it will earn points according to its order of completion (in **time**): **4** points for the first team, **3** points for the second, **2** for the third and **1** for the fourth.

Example:

A member from all the teams starts with the Challenge:

In Euromath, 50 scientists have registered. Every scientist has brought with him/her two, three or four books. In fact, the number of scientists who brought two books is equal to the ones who brought four books. How many books have travelled to Euromath by all these 50 scientists?

Team 1 cannot solve it. The player realizes it after six minutes. He decides to pass and handles the problem to his teammate who plays second. The second player has a maximum of $9 + 15 = 24$ minutes to solve the problem. She solves it in 5 minutes correctly and the team gains $5 - 1 = 4$ points. She is given the second challenge for which she has 19 minutes to solve:

The function $S(n)$ is defined for positive integers n by $S(n) =$ sum of digits of n. For example, $S(145) = 1 + 4 + 5 = 10$. The sum $S(1) + S(2) + S(3) + \cdots + S(99)$ is equal to which number?

Player two now solves the problem in 14 minutes. She writes her answer on the master answer sheet of her team and handles it to her teammate who plays third. (However, as they will find out at the end of the relay, her answer is wrong so the team will be awarded -1 points.) Player 3 has now 20 minutes to tackle the third challenge:

What is the radius of the inscribed circle in a 3-4-5 triangle?

Player three exhausts all 20 minutes and writes his answer on the master answer sheet. The facilitators check the three answers that Team 1 provided and award: 4 points for challenge 1, minus 1 points for challenge 2 and 8 points for challenge 3 since it is correct. The team did not solve all three problems and therefore does not qualify for the extra points. Had they solved all

three problems correctly, say second in time out of all the teams who had solved all three problems, they would have earned an additional 3 points. Now they earn 11 points in total.

2 – MathBattle

This challenge takes the form of a knock-out tournament at which all teams will have to play a pre-specified game for as many rounds as it takes for them to be defeated.

The teams are initially given the description of the game and its rules for **10 minutes** in order to discuss on the application of a strategy. The goal is for them to identify an optimal strategy (if one exists and to the extent possible) and apply it throughout the flow of the tournament.

At every round of the tournament, **a different member of every team** will have to play the game on behalf of the rest of the team.

Points awarded are 10, 8, 6 and 4 for the first four places of the tournament.

Example of a game for MathBattle:

A game of chess. No, of course not! It will be a fast-paced game (duration of approximately 3 minutes per game). The winning team of the tournament will earn 10 points, etc.

3 – MathSpeed

This challenge is all about precision, mathematical thinking, collaboration, strategy and speed. All teams are seated in a circular arrangement with the facilitators in the middle.

The teams are gradually given a set of **five** mathematical questions that need to be answered correctly in the minimum amount of time possible. All members of the team will have to engage to the solution of the problem and the team needs to write its answer on a piece of paper and put it in one of the "answer balls". The team leader will then have to run and place his team's answer ball in a cylinder. The answer balls will be stacked in a timely order this way, i.e. the first team's answer ball will be at the bottom of the cylinder and so on.

Upon completion of the challenge (predefined given time of **6 minutes per problem**), points are awarded if the answer is **correct** and according to the **order of completion**.

First correct answer: **6** points. Second correct answer: **5** points. Third correct answer: **4** points. Fourth correct answer: **3** points. Fifth correct answer: **2** points. Sixth correct answer: **1** point.

$-\mathbf{1}$ **points** will be awarded for **incorrect** answers.

Zero points are awarded if a team has opted **not** to **answer** a question.

Example (all examples provided above for MathRelay could serve as an example for MathSpeed as well. Actually, the first two are more fitting here!):

Find the maximum value n *such that* 13^n *divides* $500! = 1 \cdot 2 \cdot 3 \cdot 4 \cdot \cdots \cdot 499 \cdot 500$.

A team doesn't know the answer and doesn't wish to guess: They earn zero points. Another team guesses and their guess is wrong: They score minus one point. A third team solves the problem correctly and they are the first to do so: They earn 6 points.

Note: Points are awarded and shown on a screen in real time (to the best extent possible). The winning team of MathTriathlon will be granted a **special prize!!**