



THUNDER BAY HIGH SCHOOL MATHEMATICS COMPETITION

JUNIOR TEAM COMPETITION

Grades 9 and 10

Wednesday, May 10, 2006
1:00pm – 2:30pm

also sponsored by



Instructions:

- You are to work with other competitors from your school in teams of at most three.
- Do not begin until you are instructed to do so.
- Fill in all required information on the front page of your team's answer booklet.
- ***Calculators are not permitted.***
- Rulers, compasses, protractors, rough paper and graph paper are permitted.
- Diagrams are not drawn to scale.
- You must place ***all*** of your answers in the answer booklet.

Scoring:

- This team competition is out of 120 marks.
- There are 12 full solution questions.

Full Solution (120 marks):

- Each question is worth 10 marks.
- Sufficient *work must be shown* to receive full marks.
- Partial credit may be given to incomplete solutions if relevant work is shown.

Full Solution (120 Marks)

Place your solutions to these questions in the answer booklet.

Each question is worth 10 marks.

You must show sufficient work to receive full marks, but if you do not completely answer a question you may still receive partial marks for showing work. So *show your work!*

1. What is the sum of the first twenty positive odd integers subtracted from the sum of the first twenty positive even integers?
2. What is the maximum number of points of intersection of four distinct straight lines? How about six distinct straight lines?
3. If the radius of a circle is increased by one unit, what is the ratio of the new circumference to the new diameter?
4. Mike Montanaro has 10 bags and 44 hamburgers. He wants to put his hamburgers into his bags so that each bag contains a different number of hamburgers. Can he do this?
5. If the statement “All shirts in this store are on sale” is false, which of the following statements are necessarily true and which statements can be false? Explain your answer in each case.
 - (i) All shirts in this store are at non-sale prices.
 - (ii) There is some shirt in this store not on sale.
 - (iii) No shirt in this store is on sale.
 - (iv) Not all shirts in this store are on sale.
6. If M men working M hours a day for each of M days produce M articles, then how many articles (not necessarily an integer) are produced by N men working N hours a day for each of N days?
7. James and Ryan are roommates. They live 756 metres from the math building at their university, where they have their classes. James walks at a pace of 2.0 metres per second and Ryan walks at a pace of 4.5 metres per second. If Ryan leaves for class two minutes after James, who gets to the math building first and how long is it until the other arrives?
8. “How many children have you, and how old are they?” asked the guest. “I have three boys,” said Mr. Harris. “The product of their ages is 72 and the sum of their ages is the street number of my house.” The guest went to look at the entrance, came back and said to Mr. Harris, “The problem is indeterminate.” “Yes, you’re right,” replied Mr. Harris. “Did I mention the two youngest are twins?” How old are the three boys?

9. A wooden cube has edges of length 3 metres. Square holes of side one metre, centered in each face, are cut through the square to the opposite face. The edges of the holes are parallel to the edges of the cube. What is the surface area of the resulting piece of wood?

10. Among grandfather's papers a bill was found that read:

72 turkeys for exactly \$_67.9_

The first and last digits of the number that represented the total price of the turkeys had faded away and are now illegible. What are the two faded digits and what was the price of one turkey, assuming that each turkey is the same price?

11. Sammy's stamp collection consists of three books. Two tenths of his stamps are in the first book, several sevenths in the second book, and there are 303 stamps in the third book. How many stamps does Sammy have?

12. The length of the perimeter of a right angle triangle is 60 metres and the length of the altitude perpendicular to the hypotenuse is 12 metres. What are the lengths of the sides of the triangle?
