

This material has been freely shared by past OMO committees for use by OAME Chapters in the preparation of students for participation in the annual OMO competition.

We would like to thank the following chapters for their contributions:

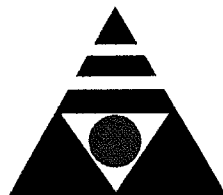
MAC²

PRMA

SAME

TE² Y² MS

Y⁴ MA



PROVINCIAL COMPETITIONS





Ontario Mathematics Olympics

Scorborough Campus
University of Toronto

Saturday June 1, 1996

EVENT #1



Using the worksheet attached, cover the grid with six pentominoes so that the sum of the numbers under each pentomino piece is 20.

Record your answer by colour coding the appropriate squares below.

6	9	5	3	2	1
1	2	4	5	4	4
7	3	1	7	3	1
2	9	1	2	6	7
5	3	8	1	5	3



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EVENT #2



How many phone numbers can be made under the following conditions? (The first digit cannot be 0 or 1 because you will get the operator or long distance.)

- a) The first two digits are 3 followed by 6.
- b) The third digit is even.
- c) The fourth digit is greater than 5.
- d) The fifth and seventh digits are odd.
- e) The sixth digit is 2.



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EVENT #3

Individual Competition



1.

Express as a mixed number :

$$\sqrt{0.64} - \sqrt[3]{-0.008} + \sqrt[4]{\frac{4}{20.25}} + \sqrt[5]{\left(16 \div \frac{1}{2}\right)}$$



2.

If the population of a country doubles every 20 years, and in 1900 the population was 2.1×10^4 , find the projected population in the year 2000. Express your answer in scientific notation.





3.

Find the most probable total when two regular octahedral dice are rolled.



4.

Evaluate if $u = 4$ and $v = 5$:

$$\frac{(2v)^2}{3u^2} \times \frac{3(u-2)^2 + 6v}{u + (u-2)^2}$$

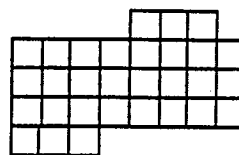
Express your answer as a mixed or improper fraction





5.

If the grid paper shown is folded without overlap to produce a solid figure, how many cubic units will be in the volume of the figure?



6.

How many axes of symmetry does a regular hexagon have?

7.

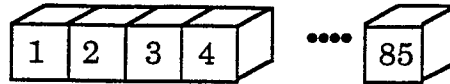
In how many different ways can three students be seated in a row of five desks?





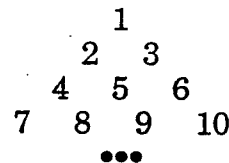
8.

Eighty-five unit cubes are placed in a line such that they are joined face to face. Find the number of square units in the surface area of the resulting solid.



9.

Suppose the numbers 1, 2, 3, ... are written in a pyramid as shown. In what row does the number 100 first appear?



10.

A radio announcer stated that the odds of rain are 2 to 5. What is the probability of rain?





11.

The price of an item is reduced by 20%. Find what percent the discounted price must be increased to bring it back to the original price?



12.

On a certain store shelf, carton A is older than carton D, carton E is older than carton C, carton B is older than carton A, and carton C is older than carton B. Find the newest carton of the five.

13.

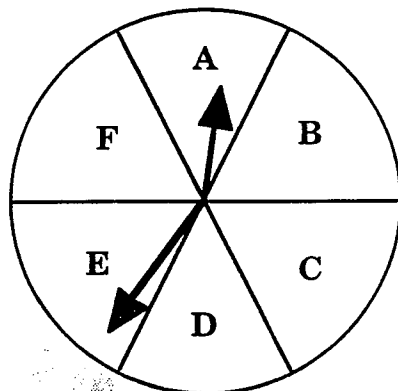
Jill owes Greg \$30, Greg owes Bob \$10, and Bob owes Jill \$20. Which of the following actions would settle all the debts?

- a) Bob and Jill each pay Greg \$10.
- b) Jill pays Greg \$30, and Bob pays Jill \$20
- c) Bob pays Greg \$20
- d) Bob pays Jill \$20, and Greg pays Bob \$10
- e) Jill pays Greg \$20 and Bob \$10



14.

The face of a conventional 12 hour clock is replaced by the face shown where all regions shown are equal. Exactly 5 hours and 15 minutes after the time shown, in which two regions will the hour and minute hand, respectively, be found?



15.

Sam opened his piggy-bank to find only some dimes and quarters in the ratio of 2 dimes to 5 quarters. The total value of the money is between \$3 and \$10. How many possibilities are there for the total amount of money in his bank? What are they?



16.

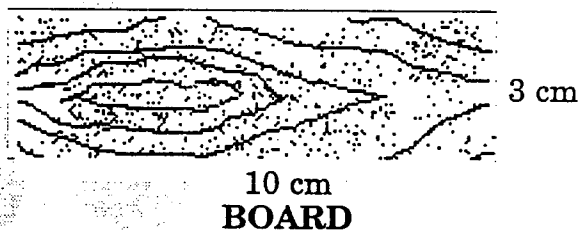
A man walks 3 km east, then 4 km north, then 5 km east.
How far is he from his starting point?



17.

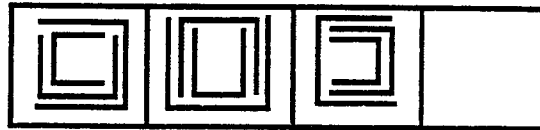
How can you cut the board into two equal pieces to fill the hole completely?

HOLE
15 cm

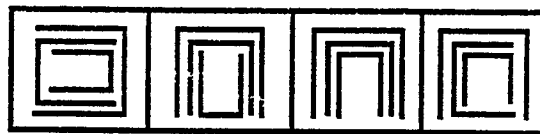


18. Write a numeral with 6 nines whose value is 100. No operation symbols may be used, but a decimal point or fraction bar may be used.

19.



Which of the four figures below should go in the empty box above?



A

B

C

D

20.

One melon and one banana weigh the same as $3 \frac{1}{2}$ pears. Two bananas and three pears weigh the same as 3 melons. How many pears are needed to balance 1 melon?



21.

Four monkeys eat four bags of peanuts in three minutes. How many monkeys will it take to eat 100 bags of peanuts in sixty minutes at this rate?



22.

I am a proper fraction. The sum of my numerator and denominator is one less than a perfect square. Their difference is one more than a perfect square. Their product is one less than a perfect square. What fraction am I?

23.

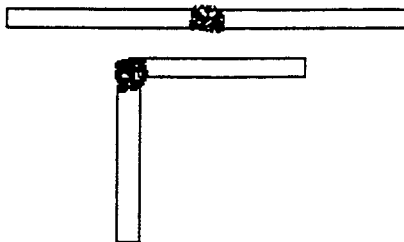
Mrs. White teaches P.E. She had her students space themselves evenly around a circle and then count off. Student number 16 is directly opposite number 47. How many students are in Mrs. White's class?





24.

Two straws are taped at their ends so that they can be pivoted. They may form either 90 or 180 degree angles (no other angles are permitted). There are only two possibilities as shown. How many formations are possible with three straws? What are they?



25.

On what date would the last Sunday of the month fall if the third Saturday of the month was the largest 2 digit prime less than 22?



Ontario Mathematics Olympics

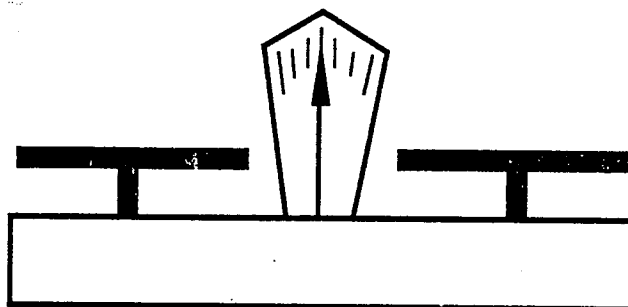
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EVENT #4



A scientific supply house sells gram-weights in integer increments from 1 to 100 grams inclusively. An enterprising physics student would like to find out what is the **least number of weights**, together with a two-pan balance scale, necessary to correctly measure any integral gram-weight from 1 to 100 grams. You may place weights on either or both sides of the pan. Illustrate the balance to get a weight of 47 grams.



Two Pan Balance Scale
Showing a weight of 47 grams

Least number of weights



Scarborough Association for Mathematics Education

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