UNIVERSITY OF NEW BRUNSWICK
and
UNIVERSITÉ DE MONCTON

NEW BRUNSWICK MATHEMATICS COMPETITION

May 23, 1997

GRADE 9

PART A

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1. Which of these numbers is the largest?

   (A) 120% of 60 (B) $\frac{3}{7} \times 175$ (C) 19×4 (D) $\frac{1}{\frac{1}{8} - \frac{1}{9}}$ (E) $\sqrt{6000}$

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2. An orchestra has 30 musicians. Twelve of them can play the flute and twelve of them can play the trumpet. Six of them can play both. How many of the musicians can not play either of these instruments?

   (A) 0 (B) 6 (C) 12 (D) 15 (E) None of these

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3. At a party, each person shakes hands with every other person. The total number of handshakes was 66. How many persons are present at the party?

   (A) 6 (B) 11 (C) 12 (D) 18 (E) 33

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4. Of the following, which is the closest estimate of $\sqrt{\frac{1997}{10000}}$?

   (A) .0044 (B) .0141 (C) .0446 (D) .1411 (E) .4469

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5. In the game of baseball, a player's batting average is obtained by dividing the number of hits by the number of times at bat. A player has already had 100 hits in 400 times at bat. If he still has 200 more times at bat until the end of the season, how many more hits does he need in order to end the season with a batting average of 0.300?

   (A) 60 (B) 80 (C) 120 (D) 180 (E) None of these

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6. You throw two ordinary dice (with 6 faces each), one red and one blue. The number shown on the red die is multiplied by 10 and the one shown by the blue die is multiplied by 5. Those two numbers are then added together to obtain your final result. How many distinct results are possible?

   (A) 12 (B) 16 (C) 18 (D) 36 (E) None of these

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7. A city's population increased from 24000 to 25000 during 1993. If the increase in population decreased by 100 in each of the following three years, what was the population of this city at the end of 1996?

   (A) 24700 (B) 27400 (C) 27700 (D) 27900 (E) None of these

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8. The sum of the squares of two integers is 34 and the difference of the squares of those same integers is 16. Find the cube of the smallest of those integers.

   (A) 1 (B) 8 (C) 27 (D) 64 (E) 125

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9. The speed of light is 300000 km/sec and the planet Pluto is located at a distance of 6 billion km from Earth. If a spaceship, traveling at a constant speed in a straight line, goes from Earth to Pluto in 100 hours, at what fraction of the speed of light is this spaceship traveling?

   (A) $\frac{6}{100}$ (B) $\frac{1}{18}$ (C) $\frac{1}{180}$ (D) $\frac{1}{1080}$ (E) None of these

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10. A virus infects your computer. In the computer's memory, each number x from 2 to 9 is replaced by the sum $1 + 2 + \ldots + x$. For example, 2 is replaced by $3(3 = 1 + 2)$ and 5 is replaced by $15(15 = 1+2+3+4+5)$. Everything else works normally. If you enter$1 + 3 + 5$, what result will be shown by the computer?

    (A) 9 (B) 15 (C) 21 (D) 22 (E) 25

PART B

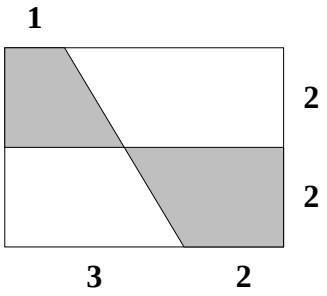
11. If $a * b = a^2 + \frac{1}{b}$, find the value of $3 * 5$.

(A) $\frac{9}{5}$ (B) $\frac{46}{5}$ (C) 15 (D) $\frac{76}{3}$ (E) None of these

12. Three pipes can be used to fill a tank. It is filled in 10 hours using the first pipe, in 12 hours using only the second pipe and in 15 hours using only the third one. A pressure problem cuts the flow capacity of each pipe in half. It is then decided to use the three pipes together. How long will it take to fill the tank?

(A) 4 hrs (B) 5 hrs (C) 8 hrs (D) 12 hrs (E) None of these

13. What is the area of the shaded region?



(A) 6 (B) 8 (C) 10 (D) 12 (E) Not enough information

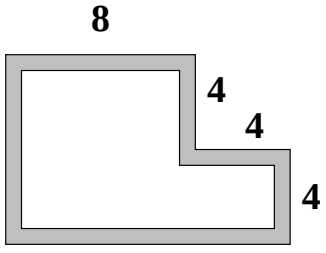
14. A fruit shop sells apples for 5 cents each, oranges for 10 cents each and bananas for 25 cents each. If you spend exactly 55 cents at the shop, how many distinct purchases of exactly two kinds of fruit can you make?

(A) 7 (B) 8 (C) 9 (D) 14 (E) 18

15. How many integers between 1 and 1000 (inclusive) do not contain the digits 8 or 9?

(A) 200 (B) 488 (C) 512 (D) 521 (E) 800

16. If the shaded region has a constant width of 1 unit, what is the difference between the areas of the non-shaded region and the shaded region?



(A) 0 (B) 4 (C) 8 (D) 12 (E) None of these

17. Evaluate the expression $\dfrac{10^{10}-10^{8}}{10^{9}}$.

(A) 9.9 (B) 99 (C) 100 (D) 10^{9} (E) None of these

18. In the expression $\frac{1}{2}@\frac{1}{3}@\frac{1}{6}@\frac{1}{18}$, each @ can be replaced by either a + sign or a − sign. What value given below can not be a result of this expression?

(A) $-\dfrac{1}{18}$ (B) $\dfrac{3}{18}$ (C) $\dfrac{5}{18}$ (D) $\dfrac{7}{18}$ (E) $\dfrac{19}{18}$

19. What is the last digit of the number 2^{1997}?

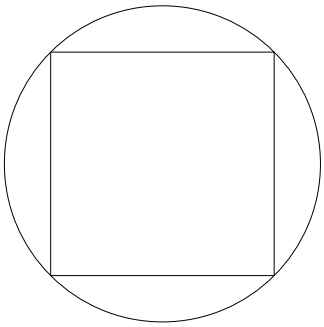
(A) 0 (B) 2 (C) 4 (D) 6 (E) 8

20. A solar panel measuring 105 cm by 24 cm is to be covered with square silicon wafers of varying sizes. Find the minimum number of squares needed to cover the panel exactly without overlapping.

(A) 10 (B) 24 (C) 168 (D) 2520 (E) None of these

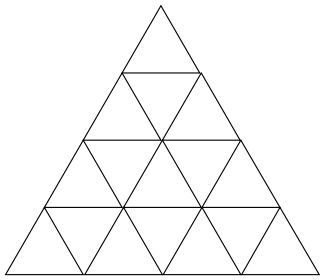
PART C

21. A square is inscribed in a circle of radius 1. What is the sum of the lengths of the square's perimeter and the circle circumference?



(A) $4 + 2\pi\sqrt{2}$ (B) $4 + 2\pi$ (C) $4\sqrt{2} + 2\pi$ (D) $8 + 2\pi$ (E) none of these

22. How many triangles are there in the figure shown at the right?

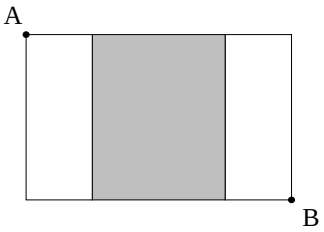


(A) 16 (B) 26 (C) 27 (D) 32 (E) None of these

23. x and $2x$ are both 3 digit integers. If the sum of the digits of x is 19, what is the sum of the digits of $2x$?

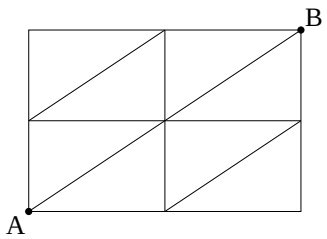
(A) 18 (B) 19 (C) 20 (D) 26 (E) Not enough information

24. Two squares, each of area 36 overlap as shown in the diagram at the right. If the overlapping area is 2/3 of one of the squares, what is the distance between the points A and B?



(A) $6\sqrt{2}$ (B) 10 (C) $6\sqrt{3}$ (D) 12 (E) None of these

25. How many different paths are there from A to B if you are only allowed to move "right", "up" or "right-and-up" at each step?



(A) 6 (B) 11 (C) 13 (D) 14 (E) 15

26. Which of the following numbers is the largest?

(A) 2^{222} (B) 2222 (C) 22^{22} (D) 222^2 (E) $2^{2^{2^2}}$