UNIVERSITY OF NEW BRUNSWICK

JUNIOR HIGH SCHOOL MATHEMATICS COMPETITION

May 17, 1991

GRADE 9

PART A

1. Claude has in his hand 15 coins (either pennies, nickels or dimes) worth 79 cents in total. How many dimes does he have?

   (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

2. If I climb a staircase 2 steps at a time, one step is left over. Climbing 3 steps at a time gives 2 steps left over, while climbing 4 at a time gives 3 left over. How many steps are there if there are fewer than 20?

   (A) 11 (B) 13 (C) 15 (D) 17 (E) 19

3. A bicycle wheel has diameter 1 m. If the bicycle travels one kilometer, how many revolutions does the wheel make?

   (A) $\frac{1}{\pi}$ (B) $\frac{100}{\pi}$ (C) $\frac{500}{\pi}$ (D) $\frac{1000}{\pi}$ (E) Not enough information

4. Find the largest number of points of intersection for 10 lines in a plane.

   (A) 22 (B) 30 (C) 36 (D) 45 (E) 55

5. In the high school auditorium the number of rows of seats is double the number of seats in each row. If there are the same number of seats in each row and 1352 seats in total, how many rows are there?

   (A) 12 (B) 26 (C) 37 (D) 52 (E) None of the previous answers

6. A box contains 24 identical cubes. How many cubes can be placed in another box each of whose dimensions is double that of the original box?

   (A) 48 (B) 96 (C) 144 (D) 192 (E) Not enough information

7. If a number is 16% of its own reciprocal, then that number is

   (A) $\frac{1}{50}$ (B) $\frac{4}{25}$ (C) $\frac{2}{5}$ (D) 2 (E) 4

8. Of the whole numbers 1 to 1000 inclusive, how many are multiples of 3 but not multiples of 5?

   (A) 123 (B) 200 (C) 267 (D) 334 (E) None of these

9. If $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$, then solve for x in $\begin{vmatrix} 2x & -4 \\ x & 1 \end{vmatrix} = 18$.

   (A) -1 (B) 2 (C) 3 (D) 4 (E) 6

10. If a * b = ab + a − b, then (7 * p) − (p * 7) equals

    (A) 14p (B) 14 − 2p (C) p + 7 (D) 0 (E) None of these

PART B

11. What is the hundredth term in the sequence 0, 2, 6, 12, 20, 30, 42, ... ?

(A) 9000 (B) 9702 (C) 9900 (D) 10100 (E) 10302

12. In how many years will a 53 year old man be 10 times the age of his son who is now 8 years of age?

(A) 3 (B) 7 (C) 10 (D) 17 (E) None of the previous answers

13. What is the next term in the sequence

$\frac{2}{3}, \quad \frac{4}{9}, \quad \frac{8}{27}, \quad \frac{16}{81}, \quad \frac{32}{243}, \quad \ldots$

(A) $\frac{48}{324}$ (B) $\frac{64}{729}$ (C) $\frac{64}{486}$ (D) $\frac{48}{486}$ (E) None of the previous numbers

14. On an exam with q questions, Marie correctly answered 15 of the first 20 but just $\frac{1}{3}$ of the rest. If her total score was 50%, what was q?

(A) 29 (B) 50 (C) 55 (D) 65 (E) 100

15. A set of 10 numbers has sum 100. Each number of the set is increased by 20, then multiplied by 20 then decreased by 20. What is the sum of the numbers in the new set?

(A) 1200 (B) 2000 (C) 5800 (D) 6000 (E) Not enough information

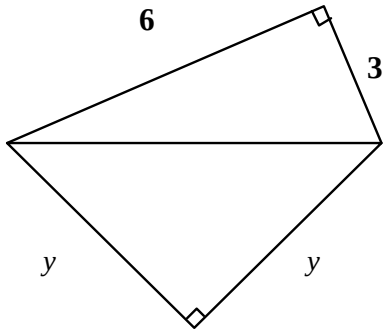
16. The edge of a cube is increased by 50%. The ratio of its new surface area to its old is

(A) 0.50 (B) 1.25 (C) 1.50 (D) 2.00 (E) 2.25

17. The three angles of a triangle are in the ratio 3 : 4 : 5 . What is the middle angle?

(A) 20 deg. (B) 40 deg. (C) 60 deg. (D) 80 deg. (E) 100 deg.

18. Determine y from the following figure (in which two 90 degree angles are indicated).

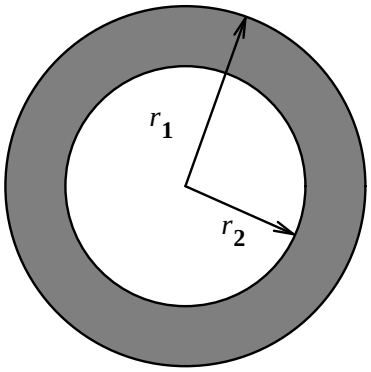


(A) $3/\sqrt{5}$ (B) $3\sqrt{2}$ (C) $3\sqrt{2.5}$ (D) 4.5 (E) Not enough information given

19. I have 6 different books, 3 with red covers and 3 with blue covers. In how many different ways can I arrange these books on a shelf so that no two books of the same colour are next to each other?

(A) 6 (B) 24 (C) 36 (D) 72 (E) 120

20. The shaded and unshaded areas in these concentric circles are equal. What is the ratio $\frac{r_1}{r_2}$ of the larger to the smaller radius?



(A) $\frac{\pi}{1}$ (B) $\frac{\pi}{2}$ (C) $\frac{\sqrt{2}}{1}$ (D) $\frac{4}{\pi^2}$ (E) $\frac{\sqrt{2}-1}{1}$

PART C

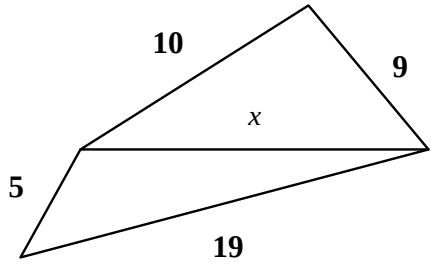
21. Three workers are named X, Y and Z. Suppose that together X and Y can do a job in 4 hours, X and Z can do it in 6 hours and X, Y and Z can do the job in 3 hours. How many hours will Y alone need to do the job?

(A) 6 hrs. (B) 8 hrs. (C) 10 hrs. (D) 12 hrs. (E) None of the previous answers

22. The average of the first 100,000 odd positive integers is

(A) 100,000 (B) 1,000,000 (C) 10,000,000 (D) 100,000,000 (E) 1,000,000,000

23. The distance x is known to be one of the following answers. Which is it?



(A) 9 (B) 10 (C) 14 (D) 15 (E) 20

24. What is the units digit in $(2127)^{753}$?

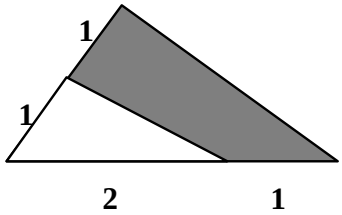
(A) 1 (B) 3 (C) 5 (D) 7 (E) 9

25. Find the value of this product of 98 numbers:

$$\left(1-\frac{2}{3}\right)\left(1-\frac{2}{4}\right)\left(1-\frac{2}{5}\right)\ldots\left(1-\frac{2}{98}\right)\left(1-\frac{2}{99}\right)\left(1-\frac{2}{100}\right).$$

(A) $\frac{1}{10}$ (B) $\frac{98}{100}$ (C) $\frac{1}{6}$ (D) $\frac{1}{582120}$ (E) $\frac{1}{4950}$

26. What fraction of the area of the large triangle is shaded?



(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $\frac{3}{5}$ (D) $\frac{2}{3}$ (E) Not enough information