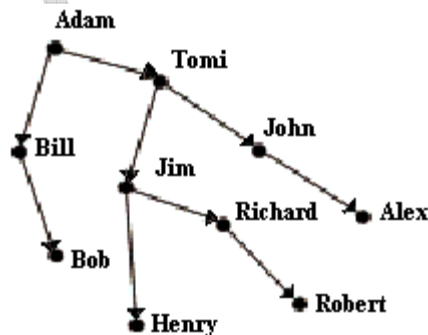


Contest Game
"Math Kangaroo", 2002
Grade 9-10

Part A: Each question is worth 3 points.

1. 2002 is a number that stays the same when read backwards as when read forwards. Which of the following numbers does not have this property?
A. 1991 B. 2323 C. 2112 D. 2222 E. 12021
2. What is the difference between the largest and the smallest three-digit number, each formed by different digits?
A. 889 B. 885 C. 800 D. 100 E. none of these
3. Six kids ate 20 cookies altogether. Andrew ate one cookie, Betty ate two cookies, Carl ate three cookies. Daniella ate more cookies than any of the other kids. What is the smallest possible number of cookies that Daniella ate?
A. 3 B. 4 C. 5 D. 6 E. 7
4. One face of a polyhedron is a pentagon. What is the smallest number of faces the polyhedron can have?
A. 5 B. 6 C. 7 D. 8 E. 10
5. Robert looks at his genealogical tree where only men are indicated. The arrows are directed from fathers to sons. What is the name of the son of the brother of the grandfather of the brother of Robert's father?

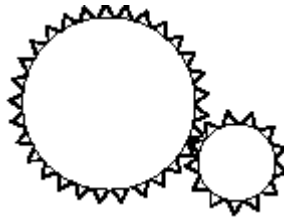


- A. Jim B. Alex C. Tom D. Bob E. another answer
6. In some of the small squares of a 2×9 grid there are coins. Each small square either contains a coin or has a common side with a similar square containing a coin. The number of coins in the grid must then be at least:
A. 5 B. 6 C. 7 D. 8 E. 9
7. In Canada part of the people can speak only English, part of them - only French, and part of them can speak both languages. A survey shows that 85% of the population speak English, 75% of the population speak French. How many per cent of the population can speak both languages?
A. 50 B. 57 C. 25 D. 60 E. 40

8. An integer p is a prime number if $p \geq 2$ and the only divisors of p are 1 and p . Let M be the product of the first 2002 primes. How many 0's are at the end of the number M ?
- A. 0 B. 1 C. 10 D. 20 E. 100

Part B: Each question is worth 4 points

9. In a certain machine you can find gears as shown in the figure. The radius of the larger gear is 3 times the radius of the smaller gear. What will happen with the smaller gear if the larger one is turned around once counter-clockwise?



- A. turn around once clockwise B. turn around three times clockwise
C. turn around three times counter-clockwise D. turn around 9 times clockwise
E. turn around 9 times counter-clockwise.

10. A computer virus is eating disk space. During the first day it eats $1/2$ of the disk space. During the second day it eats $1/3$ of the remaining disk space. The third day it eats $1/4$ of what still remains, and the fourth day it eats $1/5$ of what is left. What fraction of the original disk space remains intact?

- A. $1/5$ B. $1/6$ C. $1/10$ D. $1/12$ E. $1/24$

11. Four children bought a birthday present for their father. One of the children hid the present. Their mother asked them who had hidden the present. The four boys involved made the following statements about the offender:

Alfred: "It was not me!" Benjamin: "It was not me!" Christian: "It was Daniel!"
Daniel: "It was Benjamin!"

It turned out that exactly one of them did not tell the truth. Who was the offender?

- A. Alfred B. Benjamin C. Christian D. Daniel E. This cannot be determined

12. The occupancy percentage of a hotel is 88% for the three summer months and 44% for the rest of the year's months. What is the average occupancy percentage for the whole year?

- A. 132% B. 66% C. 55% D. 44% E. another answer

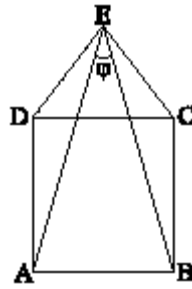
13. Peter and his son, and John and his son went fishing. Peter caught as many fishes as his son did. John caught three times as many fishes as his son did. They caught 35 fishes altogether. The name of Peter's son was Luke. What is the name of John's son?

- A. This situation is impossible. B. John C. Peter
D. Luke E. There is not enough information to find out.

14. In a group of boys and girls, after 15 girls had left the boys that remained were twice as many as the girls. Then, 45 boys left and it turned out that of the remaining there were 5 girls for each boy. How many girls were originally in the group?

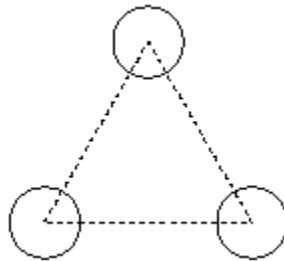
- A. 20 B. 25 C. 35 D. 40 E. 75

15. ABCD is a square and CED is an equilateral triangle. The measure of the angle ϕ is equal to



- A. 15° B. 30° C. 45° D. 60° E. 90°

16. How many circles can touch simultaneously the three circles on the picture?



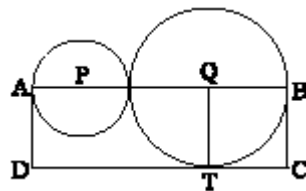
- A. 4 B. 5 C. 6 D. 7 E. 8

Part C: Each question is worth 5 points.

17. Introducing a certain invention we can reduce production expenses by 50%; introducing another invention - by 40%, and introducing a third invention - by 10%. By how many per cent will the production expenses be reduced after introducing all the three inventions at the same time (the inventions are independent)?

- A. 100% B. 73% C. 92% D. 87% E. 67%

18. In the figure, P and Q are the centres of two tangent circles and the line PQ intersects the circles at the points A and B, as shown. The larger circle touches the side CD of the rectangle ABCD at the point T. If the area of ABCD is 15, what is the area of the triangle PQT?



- A. 4 B. $15/4$ C. $\frac{\pi}{2}$ D. 5 E. $2\sqrt{5}$

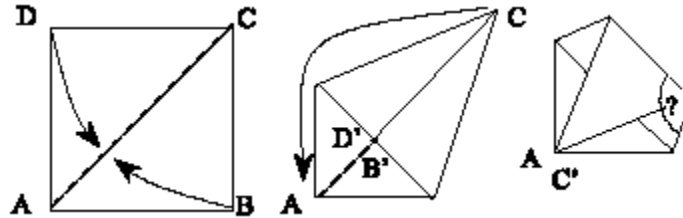
19. How many numbers from 1 to 10^{2002} have the sum of their digits equal to 2?

- A. 2007006 B. 2005003 C. 2003001 D. 2005002 E. none of these

20. Achilles runs to overtake a crawling tortoise that is ahead of him. At the beginning the distance between them equals 990m. The velocity of Achilles is 10 meters per second, and the velocity of the tortoise is equal to 1 meter per 10 seconds. How long does it take for Achilles to overtake the tortoise?

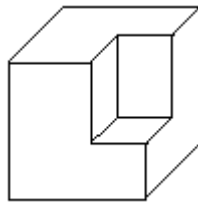
- A. 1 min. 40 sec. B. 990 sec. C. 1 min. 39 sec. D. 1 min. 50 sec.
 E. He will never overtake the tortoise.

21. A pentagon was folded from a paper square. At first, the corners B and D were folded towards the diagonal AC. Then, the figure formed was folded so that point C coincided with point A (as shown in the figure). Find the measure of the angle marked by the question mark.



- A. 104° B. 106.5° C. 108° D. 112.5° E. 114.5°

22. The modern statue on the diagram was made by cutting a rectangular prism out of a stone that originally had the shape of a cube. The volume of the original cube was $512dm^3$. What is the surface area of the statue on the diagram?



- A. $320dm^2$ B. $336dm^2$ C. $384dm^2$ D. $468dm^2$ E. there is not enough information

23. Given are 10 points in the plane and all the lines connecting any two or more of them. Five of the points lie on the same line, and no other lines connect more than two of the points. How many triangles are there whose vertices are three of the given points?

- A. 20 B. 50 C. 70 D. 100 E. 110

24. Consider the number $2002! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot 2002$ (the product of the numbers from 1 to 2002 inclusive). Clearly 2001 divides $2002!$ since $2002! = 2000! \cdot 2001 \cdot 2002$. What is the greatest number k , such that 2001^k divides $2002!$?

- A. 101 B. 71 C. 69 D. 2 E. 1