Math SL PROBLEM SET 100

Section FUN

1. (CI) Find the sum of the first 9 prime numbers.

2. (CI) How many pairs of prime numbers have a sum of 100?

3. (CI) Find the sum of the cubes of the first 4 natural numbers.

4. Where does Winnie the Pooh live?

5. (CI) Find the sum of the first ten odd numbers.

6. (CI) A Leyland number is a number of the form $x^y + y^x$ where x and y are integers greater than 1. Show that 100 is a Leyland number. (evaluate this equation for $x = 2$ and $y = 6$)

7. What is a googolplex?

8. (CI) Find at least one way to put in some operations signs (+, −, ×, ÷) to make these digits come to 100. **1 2 3 4 5 6 7 8 9 = 100**

9. (CI) Using the number 4 only four times, create a mathematical statement whose value is 100. How about using the number 8 four times?

10. (CI) A frog is at the bottom of the well which is 100 meters deep. Everyday the frog jumps 5 meters upwards and fall 4 meters down.On which day the frog will reach the top?

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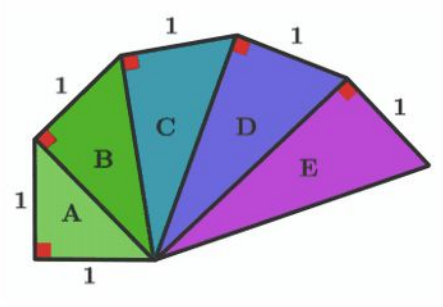
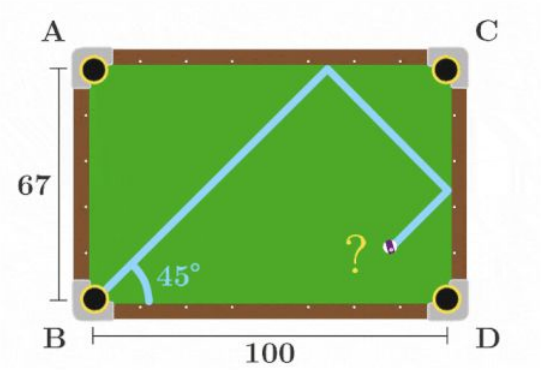
11. (CI) I'm thinking of two positive whole numbers that multiply to 1000, neither of which contain the digit 0. What is the sum of these 2 numbers?

12. (CI) Which triangle has an area of 100^0?



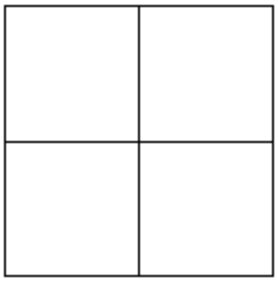
13. (CI) Which pocket will the ball end up in?



14. (CI) Here is a grid of four "boxes". You must choose four **different** digits from 1−9 and put one in each box. For example:

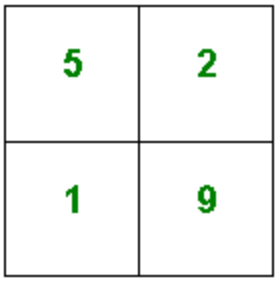
This gives four two-digit numbers:

52 (reading along the 1st row)
19 (reading along the 2nd row)
51 (reading down the left hand column)
29 (reading down the right hand column)
In this case their sum is 151.



Try a few examples of your own.

Your challenge is to find four **different** digits that give four two-digit numbers which add to a total of 100.



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Section A (Skills/Concepts Consolidation)

15. (CI) Find the sum of all multiples of 3 that are less than 100.

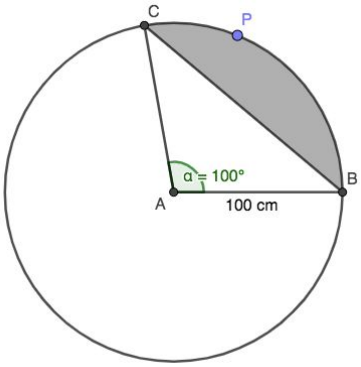
16. (CA) An infinite series, A_n, is given as $A_n = 100 + 1 + \frac{1}{100} + \frac{1}{10000} + \ldots$. A second infinite series, B_n, is given as $B_n = 100 - 1 + \frac{1}{100} - \frac{1}{10000} + \ldots$. Determine $\lim_{n \to \infty} (A_n - B_n)$

17. (CI) For the quadratic equation $C(x) = 100x^2 - 100x + 100$,
    a. Determine the number of zeroes of $C(x)$.
    b. Determine the coordinates of the vertex of C.
    c. Hence or otherwise, write the equation for $y = C^{-1}(x)$.
    d. At what x-coordinate will the slope of $C(x)$ be 100?
    e. (CA) At what value for a will $\int_0^a C(x)dx = 100$?

18. (CI) The value of $\sin(50°) = W$. Determine:
    a. (i) the value of $\sin(100°)$ in terms of W
       (ii) the value of $\cos(100°)$ in terms of W.
    b. the solution to the equation $\sin(x) - W = 0$ on the domain of $0 \leq x \leq 100\pi$.

19. (CA) Let $\log_c 100 = K$ and let $\log_c 200 = L$ and let $\log_c 300 = M$.
    a. Show that $\log_c 500 = \log_c 5 + 2\log_c 10$.
    b. $\log_c 500$ can also be written as $A\log_c B + D\log_c 2$. Find the values of A, B, and D.
    c. Find a simplified expression in terms of K, L, and/or M for:
       i. $\log_c (1{,}800{,}000{,}000)$
       ii. $\log_c \sqrt[3]{\frac{2}{3}}$.

20. (CA) Given that AB = 100 cm and that $\angle BAC = 100°$ as shown on the diagram, determine:
    a. the area and perimeter of the shaded region.
    b. how far from point C would you have to move (to get to point P) so that the shaded area has decreased by 1%.



21. (CA) Two adjacent sides of a triangle are $\sqrt[4]{100}$ and $\sqrt{100}$ and its area is $\sqrt[3]{100}$. Find the measure of the smallest angle in this triangle.

22. (CI) Determine the value(s) for K such that the parabola $f(x) = 100x^2 + 300x + 100$ and the line $g(x) = 100x - 100K$ have no solutions.

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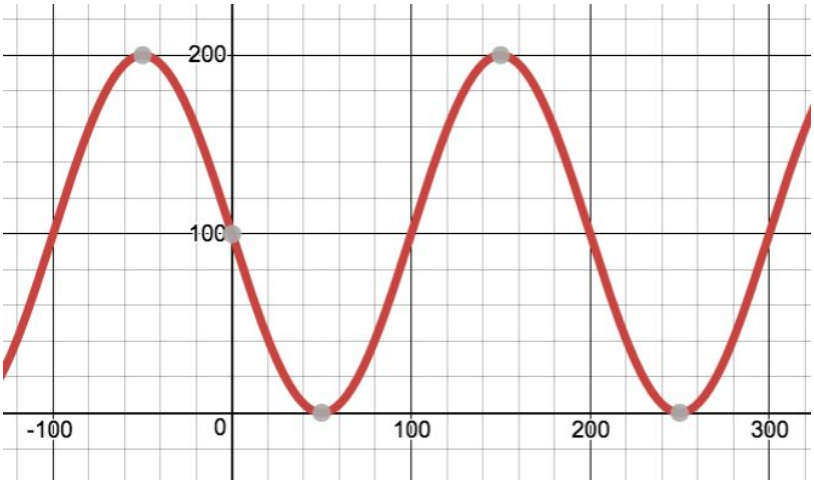
23. (CI) A graph of a sinusoidal function in the form of $f(x) = A \sin(Bx) + C$ is given. Determine:



a. the values of A, B and C.
b. the equation of a cosine function that matches this function.
c. the equation of the derivative of $f(x)$.
d. The equation of a line that is normal to $f(x)$ at the point where $x = 100$.
e. The value of $\int_{-100}^{100} f(x)dx$.
f. The value of P such that $\int_{0}^{P} f(x)dx = 100$.

24. (CI) Given the rational function $h(x) = \frac{500x + 300}{100x - 200}$,

a. Determine the equation(s) of the asymptotes of h(x)
b. Determine the x- and y-intercept(s) if possible.
c. Sketch $h(x)$.
d. Find the equation of $h^{-1}(x)$
e. Determine the equation of $\frac{dh}{dx}$.
f. Show that $h(x) = \frac{1300}{100x - 200} + 5$ and hence find $\int h(x)dx$.