



Preparatory Program - AMTI-NMTC Final

Primary Level (Std V-VI)

Worksheet 1- of 17



EXCLUSIVE ★

Success begins with you ...-

Note -

Elegant and novel solution will get extra Credits
Diagrams and explanation should be given wherever necessary.
Rough work should be shown in the answer copy itself.

1. Find the sum (S) of all numbers with 2012 digits and digital sum 2. Find also the digital sum of S.

2. A number 'n' is called a "lonely odd composite" number if

(a) n is an odd composite number and

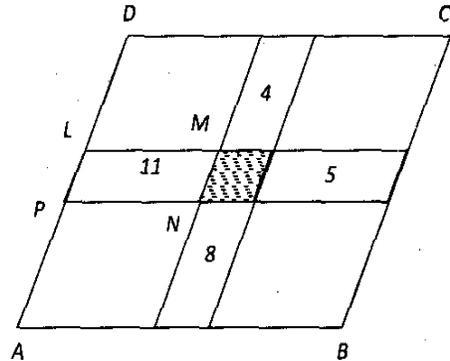
(b) Both (n - 2) and (n + 2) are prime numbers.

{n is odd, hence n - 2, n, n + 2 are three consecutive odd numbers.

Ex. n = 105 Then n - 2 = 103 and n + 2 = 107 Here 103 is an odd composite number 103 and 107 are prime numbers. Therefore 105 is a "lonely odd composite" number}

Find all "lonely odd composite" numbers less than 100. Show that these lonely odd composite numbers are multiples of 3.

3. In the adjoining figure ABCD is a parallelogram of perimeter 21:



It is subdivided into smaller parallelograms by drawing lines parallel to the sides.

The numbers shown are the respective perimeters of the parallelograms in which they are marked.

(For example the perimeter of the parallelogram LMNP is 11). Find the perimeter of the shaded parallelogram.

4. l and b are two numbers of the form $\frac{p}{q}$ where p and q are natural numbers. Further l, b are greater than 2.

and q are natural numbers. Further l, b are greater than 2.

(a) If $l = \frac{2b}{b-2}$ prove that $b = \frac{2l}{l-2}$.

(b) When l takes three values 3, 4 and 8 find the corresponding values of b.

(c) When b takes three values 6, 10, 12 find the corresponding values of l. (d) From (b) and (c) we get 6 sets of values of (l, b).

Taking l, b are the length and breadth of a rectangle, find the perimeter and area of the 6 rectangles. What is your inference?

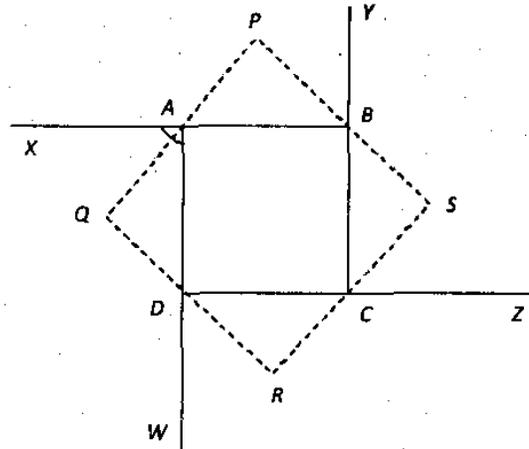
5. a, b, c, d are the units digits of four natural numbers each of which has four digits. The tens digit of these four numbers are the 9 complements of the units digit. The hundreds digits are the 18 complements of the sum of their respective tens and units digits. The thousands digits are the 27 complements of the sum of their respective hundreds, tens and units digits. If $a + b + c + d = 10$, find the sum of these four numbers. {9 complement of a number $4x$ is $9 - x$, 18 complement of a number y is $18 - y$, 27 complement of a number z is $27 - z$ }.

6. A sequence is generated starting with the first term t_1 as a four digit natural number. The second third and fourth terms (t_2, t_3 and t_4) are got by squaring the sum of the digits of the preceding terms. (Ex. $t_1 = 9999$ then
 $t_2 = (9 + 9 + 9 + 9)^2 = 36^2 = 1296$,
 $t_3 = (1 + 2 + 9 + 6)^2 = 324$,
 $t_4 = (3 + 2 + 4)^2 = 81$).

Start with $t_1 = 2012$. Form the sequence and find the sum of the first 2012 terms.

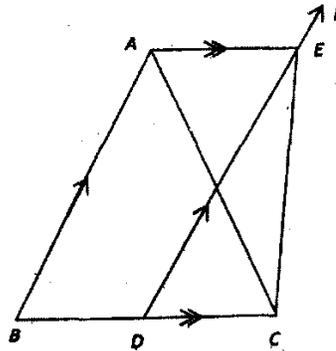
7. Find the two digit numbers that are divisible by the sum of their digits. Give detailed solution with logical arguments.

8. $ABCD$ is a square and the sides are extended as shown in the diagram. The exterior angles are bisected and the bisectors extended to form a quadrilateral $PQRS$. Prove that $PQRS$ is a square.



Winners
 are not people who
 never fail,
 but people who
 never
 quit

1. Pustak Keeda of standard six bought a book. On the first day he read one fifth of the number of pages of the book plus 12 pages. On the second day he read one fourth of the remaining pages plus 15 pages and on the third day he read one third of the remaining pages plus 20 pages. The fourth day which is the final day he read the remaining 60 pages of the book and completed reading. Find the total number of pages in the book and the number of pages read on each day.
2. In the adjoining figure $\triangle ABC$ $\angle A$ is equal to an angle of an equilateral triangle.



DEF is parallel to AB and AE parallel to BC

$\angle CEF = 170^\circ$ and $\angle ACE = \angle B + 10^\circ$. Find the angles of the triangle ABC and $\angle CAE$

3. $p = 1 + 2^1 + 2^2 + 2^3 + \dots + 2^n$ where p is a prime number and n is a natural number. Find all such prime numbers $p < 100$ and the corresponding natural number n . For each (p, n) find $N = p \times 2^n$ and find the sum of all divisors of N .

4. The sequence 8,24,48,80,120, ---- consists of positive multiples of 8, each of which is one less than a perfect square. Find the 2011th term. Divide it by 2012 and find the quotient.

5. Each letter of the following words is a positive integer. The letters have the same value wherever they occur. The numerical values given for each word is the product of the corresponding numbers of the letters appearing in the word.

BILL =35, BLAB = 225, BLANK = 270, SLANG = 2574

Find the value of SINKING.

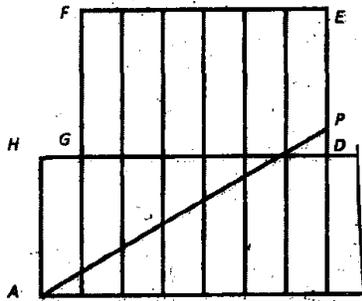
[Ex: If $P=12$, $U=2$, $T=5$ then PUT = 120].

6. (a) The length of the sides of a triangle are three consecutive odd numbers. The shortest side is 20%

of the perimeter. What percentage of the perimeter is the largest side?

(b) The sides of the triangle are three consecutive even numbers and the biggest side is $44\frac{4}{9}\%$ of the perimeter. What percentage of the perimeter is the shortest side?

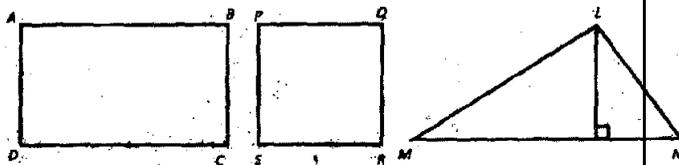
7. In the figure all the 14 rectangles are equal in size. The dimensions of each rectangle are 2 unit x 5 units. P is a point on ED .



AP divides the octagon $ABCDEFGH$ into two equal parts. Find the length of AP (Hint: Area of a triangle

$$= \frac{1}{2} \text{ base} \times \text{height}).$$

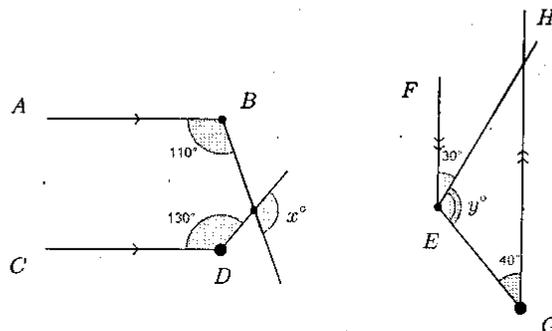
8.



In rectangle $ABCD$, the length is twice the breadth. In the square each side is equal to one unit more than the breadth of the rectangle. In the triangle LMN , the altitude is one unit less than the breadth of the rectangle. Area of the rectangle is 18 square units. The sum of the areas of the rectangle and the square is equal to the area of the triangle. What is the base of the triangle and the areas of the square and the triangle.



11. Consider the sequence $\frac{3}{5}, \frac{6}{7}, 1, 1\frac{1}{11}, \dots$. The 2016 th term of this sequence is $\frac{p}{q}$ where p, q are integers having no common factors, the value of $q - p$ is _____
12. The number of 3 digit numbers that contain 7 as at least one of the digits is _____
13. Mahadevan conducted a problem solving session for a group of 18 primary class students. Seeing the graded performance, he distributed packets of biscuits to all the students. The first student got 1 packet plus $\frac{9}{19}$ of 1 packet.
The second student got 2 packets plus $\frac{9}{19}$ of 2 packets.
The third student got 3 packets plus $\frac{9}{19}$ of 3 packets and so on.
The total number of packets of biscuits distributed by Mahadevan is _____
14. Using the digits of the number 2016, two digit numbers of different digits are formed. The sum of all these numbers is _____
15. The least multiple of 7, that leaves a remainder 4 when divided by 6, 9, 15 and 18 is _____
16. The number of revolutions that a wheel of diameter $\frac{7}{11}$ meter will make in going 8 kilometers on a level road is _____
17. The radius of a circle is increased so that its circumference increases by 5%. The area of the circle will increase (in %) by _____
18. The sum of seven numbers is 235. The average of the first three is 23 and that of the last three is 42. The fourth number is _____
19. The number of $\frac{1}{6}$ that are in $116\frac{2}{3}$ is _____
20. In the figure below, AB is parallel to CD and EF is parallel to GH . The value of $x^\circ - y^\circ$ is _____



If you're chasing a dream, don't waste a moment. Every second of practice makes a difference.