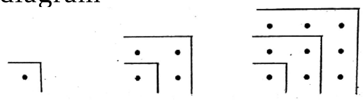
1. Look at the following dot diagram



This pattern continues. The value of 1 + 3 + 5 + ... up to 100 terms is the number of dots shown in the
(A) 100th diagram and the number of dots present in it is 1000
(B) 1000th diagram and the number of dots present in it is 10,000
(C) 100th diagram and the number of dots present in it is 10,000
(D) 1000th diagram and the number of dots present in it is 1000

2. Look at the rows of numbers shown below :

1st row :	$\boxed{1}$	$1 = \frac{1\times 2}{2}$
2nd row :	2 $\boxed{3}$	$3 = \frac{2\times 3}{2}$
3rd row :	4 5 $\boxed{6}$	$6 = \frac{3\times 4}{2}$
4th row :	7 8 9 $\boxed{10}$	$10 = \frac{4\times 5}{2}$ and so on ....

The first number in the 50th row is
(A) 1275 (B) 1224 (C) 1276 (D) 1226

3. In the sequence 1, 22, 333, ... 10101010101010101010, 111111111111111111111, ..., the sum of the digits in the 200th term is
(A) 200 (B) 400 (C) 600 (D) 40000

4. How many two digit numbers greater than 10 are there, which are divisible by 2 and 5 but not by 4 or 25 ?
(A) 3 (B) 12 (C) 5 (D) 2

5. The number of 3 digit even numbers that can be written using the digits 0, 3, 6 without repetition is
(A) 6 (B) 3 (C) 4 (D) 2

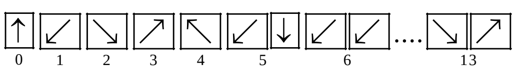
6. In the sequence of numbers 1, 2, 11, 22, 111, 222, ... the sum of the digits in the 999th term is
(A) 999 (B) 1998 (C) 500 (D) 1000

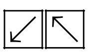
7. When 1000 single digit non-zero numbers are added, the units place is 5. The maximum carry over in this case is
(A) 495 (B) 895 (C) 899 (D) 995

8. You can write the number 1 using 5 and 7 and by addition and subtraction as 5 + 5 + 5 – 7 – 7 = 1 (or) 7 + 7 + 7 – 5 – 5 – 5 – 5 = 1 and so on. But using 3 fives and 2 sevens is the best ways as we are using totally 5 numbers, whereas in the second example, we use 7 numbers. Using the above method, if 1 is written using the digits 2's and 5's only, the minimum number of times 2's and 5's are used is
(A) three 2's and one 5 (B) three 5's and seven 2's
(C) thirteen 2's and five 5's (D) two 2's and one 5

9. 4ab5 is a four digit number divisible by 55 where a, b are unknown digits. Then b – a is
(A) 1 (B) 4 (C) 5 (D) 0

10. In the Fee - Vee land, the numbers are written as follows :



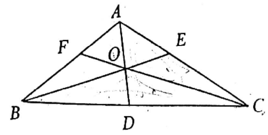
then  represents

(A) 7 (B) 9 (C) 14 (D) 21

11. The sum of the reciprocals of all the divisors of 6 is

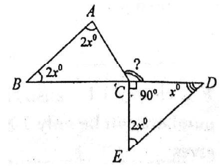
(A) 1 (B) 2 (C) less than 2 (D) greater than 2

12. In the adjoining figure, the number of triangles formed is



(A) 6 (B) 7 (C) 10 (D) 16

13. In the figure shown B, C, D lie on the same line. m$\angle$ECD = 90^0.



m[2$\angle$CDE] = m$\angle$CDE

= m$\angle$BAC

= m$\angle$ABC

The value of m$\angle$ACD is

(A) 120^0 (B) 150^0 (C) 210^0 (D) 240^0

14. If distinct numbers are replaced for distinct letters in the following subtraction,

$$\begin{array}{r} \text{FOUR} \\ -\ \text{ONE} \\ \hline \text{TWO} \\ \hline \end{array}$$

then the values of F and T are given by

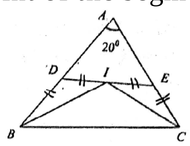
(A) F = 1, T = 9

(B) F = 1, T = 8

(C) F = 1 and T is any single digit other than 1

(D) F and T cannot be determined

15. ΔABC is an isosceles triangle with m$\angle$A = 20^0 and AB = AC. D and E are points on AB and AC such that AD = AE. I is the midpoint of the segment DE.

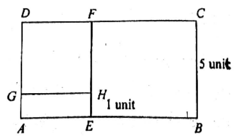


If BD = ID, then the angles of ΔIBC are

(A) 110^0, 35^0, 35^0 (B) 100^0, 40^0, 40^0

(C) 80^0, 50^0, 50^0 (D) 90^0, 45^0, 45^0

16. In the figure given BCFE, DFEA are squares, BC = 5 units, HE = 1 unit, the length and breadth of the rectangle ABCD are



(A) 8 units and 5 units (B) 5 units and 10 units

(C) 5 units and 7 units (D) 9 units and 5 units

17. If !5 = 4 + 6 – 5, !12 = 11 + 13 – 12 and !23 = 22 + 24 – 23, then what is the value of !40 + !41 + !42 + !43 + !44 + ... + !49 + !50 ?

(A) 505 (B) 495 (C) 455 (D) 465

18. The number of pairs of two digit square numbers, the sum or difference of which are also square numbers is

(A) 0 (B) 1 (C) 2 (D) 3

19. $(a-1)^2 + (b-2)^2 + (c-3)^2 + (d-4)^2 = 0$. Then a x b x c x d + 1 is

(A) 0^2 (B) 10^2

(C) 5^2 (D) $1^2 + 2^2 + 3^2 + 4^2 + 1$

20. The adjacent table defines the operation ; e.g. b$*$c = a, d$*$a = a etc.

$*$	a	b	c	d
a	b	c	d	a
b	c	d	a	b
c	d	a	b	c
d	a	b	c	d

If b$*$x = d then (x$*$c)$*$a is

(A) a (B) b (C) c (D) d

AMTI (NMTC) - 2010

GAUSS CONTEST - PRIMARY LEVEL

(Standard - 5/6)

PART - A

Note :

- Only one of the choices A, B, C, D is correct for each question. Shade that alphabet of your choice in the response sheet. (If you have any doubt in the method of answering, seek the guidance of your supervisor).
- For each correct response you get 1 mark; for each incorrect response you lose $\frac{1}{4}$ mark.

1. n; a are natural numbers each greater than 1. If a + a + ... + a = 2010, and there are n terms on the left hand side, then the number of ordered pairs (a, n) is
(A) 7 (B) 8 (C) 14 (D) 16

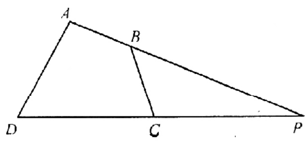
2. X is a seven digit number. Y is an eight digit number 5 more than X. The number of possible values of Y is
(A) 5 (B) 4 (C) 1 (D) 3

3. The sum of the digits of a four digit number is 3. The difference between the biggest and the smallest of these numbers is
(A) 1998 (B) 1989 (C) 1899 (D) 1809

4. ABCD is a quadrilateral AB = AD, BC = CD. $\angle BAD = \angle BDC = 20^0$. The measure of the angles $\angle ABC$, $\angle BCD$ and $\angle CDA$ are respectively.
(A) $100^0, 140^0, 100^0$ (B) $20^0, 140^0, 100^0$
(C) $100^0, 100^0, 20^0$ (D) $140^0, 100^0, 100^0$

5. The digital sum of a certain number is 2010. The minimum possible number of digits is
(A) 223 (B) 224 (C) 2009 (D) 2010

6. In the diagram ABCD is a quadrilateral. $\angle ABC = 150^0$, $\angle DAB = \frac{1}{3}\angle ABC$ and $\angle BCD = 60^0$. Then $\angle ADP$ and $\angle APD$ are respectively

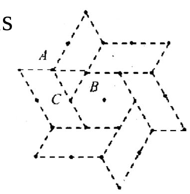


(A) 100^0 and 30^0 (B) 110^0 and 20^0 (C) 80^0 and 40^0 (D) 120^0 and 10^0

7. Given two addition problems
a = 1 + 12 + 123 + ... + 123456789
b = 987654321 + 87654321 + ... + 21 + 1
The digits in the hundredth place of a and b are respectively
(A) 4 and 6 (B) 1 and 6 (C) 4 and 4 (D) 1 and 4

8. The number of numbers with 2010 digits is
(A) $\underbrace{999.......90}_{2009\ times}$ (B) $\underbrace{999.......99}_{2010\ times}$ (C) $\underbrace{900.......00}_{2009\ times}$ (D) $\underbrace{900.......00}_{2010\ times}$

9. In the adjoining rangoli design the distance between any two adjacent dots is 1 unit. In the diagram we find the triangle ABC is equilateral. The number of smallest equilateral triangles thus formed by joining the dots suitably is



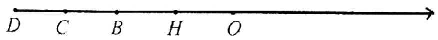
(A) 24 (B) 28 (C) 15 (D) 30

10. The natural numbers are written in the following form

First row	1
Second row	2 3 4
Third row	9 8 7 6 5
Fourth row	10 11 12 13 14 15 16
....	....

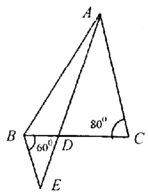
The number 2010 is in the
(A) 45th row as the 72nd number from the right.
(B) 44th row as the 73nd number from the right.
(C) 45th row as the 16th number from the left.
(D) 44th row as the 17th number from the left.

11. The number of ways of labeling the ray using the points shown in the figure is



(A) 6 (B) 4 (C) 1 (D) 10

12. ABC is a triangle in which $\angle BAC = 60^0$, $\angle ACB = 80^0$, ADE is the angle bisector of $\angle BAC$. Then the triangle BDE is



(A) Isosceles (B) Equilateral (C) Right angled (D) Scalene

13. The digits of a three digit number are 3, 7 and x in that order and $37x = 3^3 + 7^3 + x^3$. The value of x is
(A) 1 or 2 (B) 0 or 2 (C) 1 or 2 (D) 0;1 or 2

14. In the sequence 1, 4, 3, 6, 5, 8, 7, 10, ... we have $t_{2n-1} = 2n-1$ and $t_{2n} = t_{2n-1} + 3$ [(ie) evey odd term is that odd number and the next even term is 3 more than the previous odd term]. If $t_m = 2010$, then m is equal to
(A) 1005 (B) 1004 (C) 2008 (D) 2010

15. The largest of the four numbers given below is
(A) $3.\overline{1416}$ (B) $3.1\overline{416}$ (C) $3.14\overline{16}$ (D) 3.1416

PART - B

Note :

- Write the correct answer in the space provided in the response sheet.
- For each correct response you get 1 mark; for each incorrect response you lose $\frac{1}{2}$ mark.

16. The percentage of the square numbers among the numbers between 9 and 100 is ______.
17. In a sequence, the first term $t_1 = 6$, $t_2 = a + 3$, $t_3 = 42\ t_{n+3}\ 3t_{n+2} - 2t_{n+1}$ for n = 1, 2, ...; then every term of the sequence is a multiple of _________.
18. a234 is a four digit number which is divisible by 18 then a is _______.
19. a, b, c are squares of three consecutive integers and (b—a) = 87 then c is _______.
20. In the sum of 1 + 11 + 111 + ... + 111111111 the digit that does not occur is ______.
21. After simplification the denominator of the fraction $\frac{57}{10}\times\frac{58}{9}\times\frac{59}{8}\times\frac{60}{7}\times\frac{61}{6}\times\frac{62}{5}\times\frac{63}{4}\times\frac{64}{3}$ is ______.
22. In the adjoining figure the value of x + y — z is _______.
23. The number of ways in which 100 can be written as the sum of two prime numbers is _____.
24. The number of natural numbers (a, b) satisfying the relation 7 + a + b = 10 is ____.
25. A boy divided a certain number by 75 instead of by 72 and got both quotient and remainder to be 72. What should be the quotient and remainder if it is divided by 72 ______.

GAUSS CONTEST - PRIMARY LEVEL

(Standard - 5/6)

PART - A

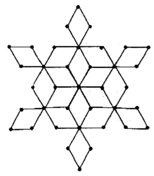
Note :

- Only one of the choices A, B, C, D is correct for each question. Shade that alphabet of your choice in the response sheet. (If you have any doubt in the method of answering, seek the guidance of your supervisor).
- For each correct response you get 1 mark; for each incorrect response you lose $\frac{1}{4}$ mark.

1. Given a sequence of two digit numbers grouped in brackets as follows :
(10), (11, 20), (12, 21, 30), (13, 23, 31, 40) ... (89, 98), (99).
The digital sum of the numbers in the bracket having maximum numbers is
(A) 9 (B) 10 (C) 9 or 10 (D) 18

2. Using the digits 2 and 7, and addition or subtraction operations only, the number 2010 is written. The maximum number of 7 that can be used, so that the total numbers used is a minimum is
(A) 284 (B) 286 (C) 288 (D) 290

3. In the adjoining rangoli design each of the four sided figures is a rhombus and the distance between any two dots is 1 unit. The total area of the design is

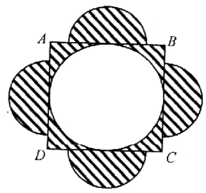


(A) $36\sqrt{3}$ (B) $9\sqrt{3}$ (C) $24\sqrt{3}$ (D) $18\sqrt{3}$

4. In the addition problem shown, different letters represent different digits. If the carry over from adding the units digit is 2, then (A + I) cannot be
(A) 2 (B) 4 (C) 7 (D) 9

5. The percentage of natural numbers form 10 to 99 both inclusive which are the product of consecutive natural numbers is
(A) $9\frac{7}{9}$ (B) $7\frac{7}{9}$ (C) 10 (D) 9

6. In the adjoining figure, ABCD is a square of side 4 units. Semicircles are drawn outside the squares with diameter 2 units as shown. The area of the shaded portion in square units is



(A) 8 (B) 16 (C) $16 - 2\pi$ (D) $8 - \pi$

7. $n = 1 + 11 + 111 + ... + 1111111111$. The digital sum of n is
(A) 39 (B) 38 (C) 37 (D) 36

8. If A + B = C, B + C = D, D + A = E then A + B + C is
(A) E (B) D + E (C) E – D (D) B – D + C

9. A three digit number $ab7 = a^3 + b^3 + 7^3$. Then a is
(A) 6 (B) 4 (C) 7 (D) 8

10. Among the participants of this screening test, some of them together got the correct answers for all the problems, not all of them got more than 8 problems correct. The maximum and minimum number of problems solved by the three together are
(A) 25, 25 (B) 24, 26 (C) 25, 27 (D) 25, 28

11. $\frac{1}{a}+\frac{1}{b}=\frac{1}{13}$ where a, b are natural numbers.

(1) a = b = 26 (2) a = 13, b = 13 x 14 (3) a = 14, b = 13 x 14.

Of these statements the correct statements are

(A) (1) and (2) (B) (1) and (3) (C) (2) and (3) (D) (1) (2) and (3)

12. $a^3 + b^3 = p_1 \times p_2$, $a^3 - b^3 = p_3$, where p_1, p_2, p_3 are prime numbers, a > b, $2 \leq a, b < 5$.

The following statements are also given :

(1) $p_1 + p_2 + p_3$ is a prime number. (2) $p_3 - (p_1 + p_2)$ is a prime number. (3) $p_1 \sim p_2$ is a prime number. Then the values of a and b are respectively.

(A) (3, 4) (B) (4, 3) (C) (3, 2) (D) (2, 3)

13. p is a prime number greater than 3. When p^2 is divided by 12 the remainder is

(A) always an odd number greater than 2.

(B) always 1.

(C) 1 or 11.

(D) always an even number.

14. The regular polygons have the number of sides in the ratio 3 : 2 and the interior angles in the ratio 10 : 9 in that order. The number of sides of the polygons are respectively

(A) 6 and 4 (B) 9 and 6 (C) 12 and 8 (D) 15 and 10

15. a is a real number such that $a^3 + 4a - 8 = 0$. Then the value of $a^7 + 64a^2$ is

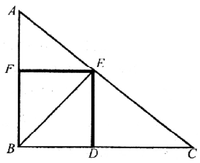
(A) 128 (B) 164 (C) 256 (D) 180

PART - B

Note :

- Write the correct answer in the space provided in the response sheet.
- For each correct response you get 1 mark; for each incorrect response you lose ½ mark.

16. ABC is a right angled triangle with $B = 90^0$. BDEF is a square. BE is perpendicular to AC. The measure of $\angle$DEC is ______.



17. p is prime number and $p = a^2 - 1$. The number of divisors of a + p is _______.

18. a = 1 + 3 + 5 + 7 + ... + 2009

b = 2 + 4 + 6 + 8 + ... + 2010 then the value of $(a - b)^2$ is _______.

19. $1\frac{1}{2}+2\frac{2}{3}+3\frac{3}{4}+.....n\frac{n}{n+1}$, on complete simplification has the denominator ______.

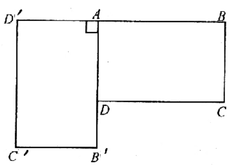
20. The biggest value of $\frac{10a}{10+a}(a \in N)$ is never greater than ______.

21. From a point within an equilateral triangle perpendiculars are drawn to the three sides and are 5, 7 and 9 cms in length. The perimeter of the triangle is _______ cm.

22. The number of terms in the expansion $(a + b + c)^3$ is ________.

23. The value of x satisfying the equation $\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{1+\cfrac{1}{x}}}}=\frac{3}{4}$ is ________.

24. ABCD is a reatangle rotated clockwise about A by 90^0 as shown. The rotation takes B to B', C to C', D to D'. AB = 6 cm, BC' = 10 cm. The breadth of the rectangle ABCD is ______.



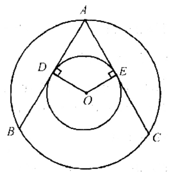
25. AB is a line segment 2000 cm long. The following design of semicircles is drawn on AB, with AP = 5 cm and repeating the designs. The area enclosed by the semicircular designs from A to B is ________.

PART - A

Note :

- Only one of the choices A, B, C, D is correct for each question. Shade that alphabet of your choice in the response sheet. (If you have any doubt in the method of answering, seek the guidance of your supervisor).
- For each correct response you get 1 mark; for each incorrect response you lose $\frac{1}{4}$ mark.

1. The number which, when subtracted from the terms of ratio a : b makes it equal to c : d is
   (A) $\frac{ab - cd}{ab + cd}$ (B) $\frac{bc - ad}{c + d}$ (C) $\frac{ab + cd}{c + d}$ (D) $\frac{ab - cd}{b - c}$
2. In a Kilometer race Ram beats Shyam by 25 meters or 5 seconds. The time taken by Ram to complete the race is
   (A) 1 minute (B) 5 minutes and 30 seconds
   (C) 3 minutes and 15 seconds (D) 4 minutes and 10 seconds
3. Through D, the mid-point of the side BC of a triangle ABC, a straight line is drawn to meet AC at E and AB produced at F so that AE = AF. Then the ratio BF : CE is
   (A) 1 : 2 (B) 2 : 1 (C) 1 : 3 (D) None of these
4. In the bigger of two concentric circles two chords AB and AC are drawn to touch the smaller circle at D at E. Then BC is equal to



   (A) 3DE (B) 4DE (C) 2DE (D) $\frac{3}{2}$ DE
5. The number of solutions of the equation $x^{\log_{10}x} = 100x$ is
   (A) 0 (B) 1 (C) 2 (D) 3
6. The internal bisector AE of the angle A of triangle ABC is
   (A) not greater than the median through A for all triangles.
   (B) not greater than the median through A for only acute angled triangles.
   (C) Not greater than the median through A for only obtuse angled triangles.
   (D) not less than the median through A for all triangles.
7. In the adjoining diagram ABC is an equilateral triangle and BCDE is a square. The side of the equilateral triangle is 2010. The radius of the circle is
   (A) 2010 (B) 4020 (C) 6030 (D) 8040
8. Given a and b are integers the expression $(a^2 + a + 2011)(2b + 1)$ is
   (A) Odd for exactly 2010 values of a.b.
   (B) Odd for all values of a, b.
   (C) Even for exactly one value of a and two values of b.
   (D) Odd for exactly for one value of a and one value of b.
9. A sequence of real numbers x_n is defined recursively as follows. x_0, x_1 are arbitrary positive real numbers and $x_{n+2} = \frac{1 + x_{n+1}}{x_n}$ n = 0, 1, 2, ... Then the value of x_{2011} is
   (A) 1 (B) x_0 (C) x_1 (D) x_2
10. If xy = 6 and $x^2y + y^2x + x + y = 63$, the value of $x^2 + y^2$ is
    (A) 81 (B) 18 (C) 2010 (D) 78

11. If p is the perpendicular drawn from the vertex of a regular tetrahedron to the opposite face and if each edge is equal to 2 units, then p is

(A) $8\sqrt{3}$ (B) $\frac{8\sqrt{3}}{2}$ (C) $\frac{8\sqrt{3}}{5}$ (D) $\frac{8\sqrt{3}}{3}$

12. The ramainder when the polynomial $x + x^3 + x^9 + x^{27} + x^{81} + x^{243}$ is divided by $x^2 - 1$.

(A) 6x (B) 2x (C) 3x (D) 1

13. Consider the sequence 4, 4, 8, 2, 0, 2, 2, 4, 6, 0, ... where the n^{th} term is the units place of the sum of the previous two terms for $n \geq 3$. If S_n is the sum to n terms of this sequence, then the smallest 'n' for which Sn > 2010 is

(A) 253 (B) 502 (C) 503 (D) 504

14. P is a point inside an equilateral triangle of side 2010 units. The sum of the lengths of the perpendiculars drawn from P to the sides is equal to

(A) 2010 (B) $2010\sqrt{3}$ (C) $1005\sqrt{3}$ (D) $\frac{2010}{\sqrt{3}}$

15. The equation $\log_{2x}\left(\frac{2}{x}\right)(\log_2 x)^2 + (\log_2 x)^4 = 1$ has

(A) A root less than 1. (B) Has only one root greater than 1
(C) Two irrational roots. (D) No real roots.

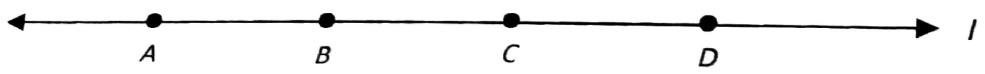
PART - B

Note :

- Write the correct answer in the space provided in the response sheet.
- For each correct response you get 1 mark; for each incorrect response you lose $\frac{1}{2}$ mark.

16. The value of $\sqrt[3]{20+14\sqrt{2}} + \sqrt[3]{20-14\sqrt{2}}$ is _______.
17. If a, b are positive and a + b = 1 the minimum value of $a^4 + b^4$ is _____.
18. The whole surface area of rectangular block is 1332 cm^2. The length, breadth and height are in the ratio 6 : 5 : 4. The sum of the length, breadth and height is ____ centimeters.
19. If |x| + x + y = 10, x + |y| – y = 12 then x + y = _______.
20. Two parallel sides of a trepezoid are 3 and 9, the non parallel sides are 4 and 6. A line parallel to the bases (parallel sides) divides the trapezoid in to two trapezoids of equal perimeters. The ratio in which each of the non-parallel sides is divided is _____.
21. Triangle ABC has AB = 17, AC = 25 and the altitude to BC has length 15. The sum of the possible values of BC is _______.
22. $\frac{5}{6} = \frac{a_2}{2!} + \frac{a_3}{3!} + \frac{a_4}{4!} + \frac{a_5}{5!} + \frac{a_6}{6!}$, where $0 \leq a_i < i$, i = 1, 2, 3, 4, 5, 6. Then $a_2 + a_3 + a_4 + a_5 + a_6$ is _____.
23. A circle is circumscribed about a triangle with sides 30, 34, 16. It divides the circle into 4 regions with the non triangular regions being A, B, C; C being the largest. Then the value of (C – A – B) is _______.
24. If a number n is divisible by 8 and 30, then the smallest number of divisors that n has is ______.
25. Both the roots of the quadratic equation $x^2 - 12x + K = 0$ are prime numbers. The sum of all such values of K is _______.
26. In a convex polygon of 16 sides the maximum number of angles which can all be equal to 10^0 is _______.
27. If an arc of circle 1 subtending 60^0 at the centre, has double the length as the arc subtending 75^0 at the centre in circle 2, then $\frac{area\ of\ circle\ 1}{area\ of\ circle\ 2}$ is ________.
28. A two digit number is equal to the sum of the product of its digits and the sum of its digits. Then the units place of the number is _______.
29. Let f(x) be a polynomial of degree 1. If f(10) – f(5) = 15, then f(20) – f(5) equals ____.
30. The number of perfect square divisors of the number 12! is _______.

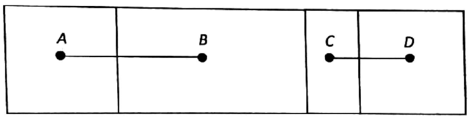
1. When a number n is divided by 10,000, the quotient is 1 and the remainder is 2011. The quotient and remainder when n is divided by 2011 are respectively.
   (A) 4, 1936 (B) 5, 1956 (C) 4, 0 (D) 5, 0
2. Baskar is older than Prakash by one year minus one day. Baskar was born on January 1, 2005. The date of birth of Prakash is
   (A) January 2, 2006 (B) December 31st, 2005
   (C) December 31st 2004 (D) January 2nd 2004
3. The points A, B, C and D are marked on a line *l* as shown in the figure.



AC = 12 cm, BD = 17 cm, AD = 22 cm. Then $\left(\frac{AB}{CD}\right)$ is equal to

(A) $\frac{5}{7}$ (B) $\frac{1}{2}$ (C) 2 (D) $\frac{7}{5}$

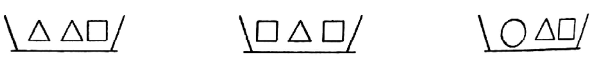
4. The sum of all four digit numbers formed by using all the four digits of the number 2011 (including this number) is
   (A) 10877 (B) 12666 (C) 10888 (D) 12888
5. a, b, c are three natural numbers such that $a < b < c$ and $a + b + c = 6$. The value of c is
   (A) 1 (B) 2 (C) 3 (D) 1 or 2 or 3
6. A boy calculates the sum of the digits seen on a digital clock. (For eg., when the clock shows 20:20 then he sum is 4). The biggest digital sum that can be seen on a 24 hour clock is
   (A) 21 (B) 22 (C) 23 (D) 24
7. A thin rectangular strip of paper is 2011 cms long. It is divided into four rectangular strips of different sizes as in the figure.



A, B, C, D are the centres of the rectangles (1), (2), (3) and (4) respectively. Then (AB + CD) is equal to

(A) $\frac{2011}{3}cms$ (B) $\frac{2011}{2}cms$ (C) $\frac{2011}{4}cms$ (D) $\frac{2(2011)}{3}cms$

8. Three trays have been arranged according to their weights in increasing order as follows :

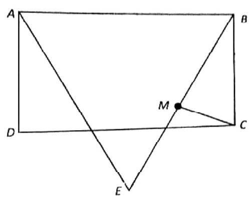


(1) (2) (3)

Where the symbols = = = = = = are the three digits of numbers showing each of the weights. The position of the tray = = = = lies

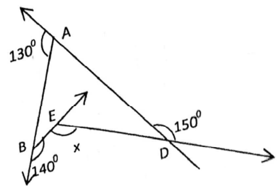
(A) between (1) and (2) (B) between (2) and (3)
(C) before tray (1) (D) after tray (3)

9. ABCD is a rectangle in which AB = 20 cm, BC = 10 cm. An equilateral triangle ABE is drawn here and M is the midpoint of BE. Then ∠CMB is equal to



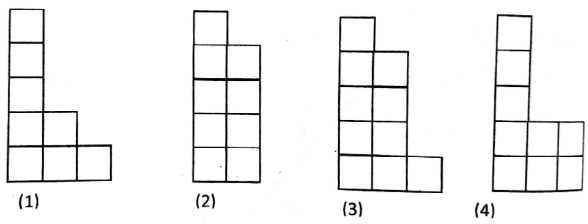
(A) 70^0 (B) 75^0 (C) 65^0 (D) 90^0

10. In the adjoining figure the value of x is



(A) 110^0 (B) 130^0 (C) 120^0 (D) 125^0

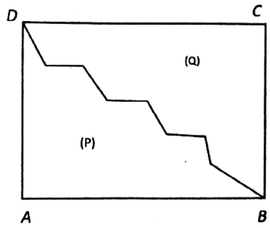
11. In the figure below pieces of squared sheets are shown. Each small square is 1 square unit.



Two of them can be joined together without overlapping to form a rectangle. The area of this rectangle in square units is

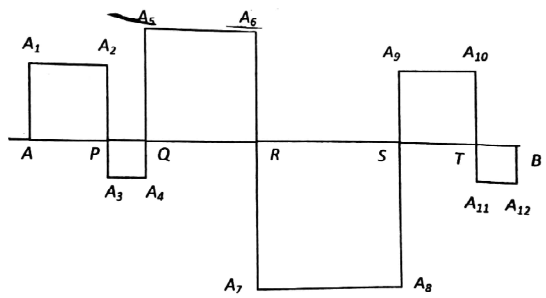
(A) 18 (B) 19 (C) 16 (D) 17

12. ABCD is a rectangle and is divided into two regions P and Q by the broken Zig Zag line as shown. Then



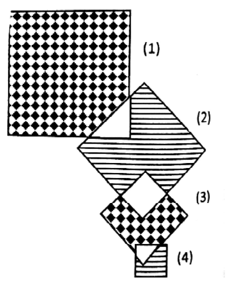
(A) The perimeter of the region P is greater than the perimeter of the region Q.
(B) Area of region P is equal to the area of the region Q.
(C) Perimeter of region P is equal to the perimeter of region Q.
(D) Area of the region P is greater than the area of the region Q.

13. AB is a line segment 2011 cm long. Squares are drawn as in the diagram. The length of the broken line segment $AA_1A_2A_3A_4A_5A_6A–A_8A_9A_{10}A_{11}A_{12}B$ is



(A) 2011 (B) 4022 (C) 6033 (D) 8044

14. In the adjoining figure there are four squares (1) with side 11 cm, (2) with side 9 cm (3) with side 7 cm and (4) with side 5 cm, (The area of the total dotted region) – (area of the lined region) is equal to (in cm^2)



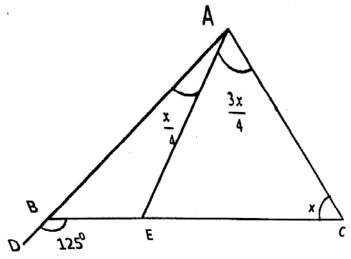
(A) 56 (B) 64 (C) 78 (D) 89

15. The four quarters of the circle (or quadrants) of radius 1 cm, are rearranged to form the adjacent shape. The area of the second figure (in cm^2) is

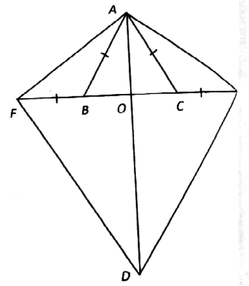
(A) 2 (B) 3 (C) 1 (D) 4

PART - B

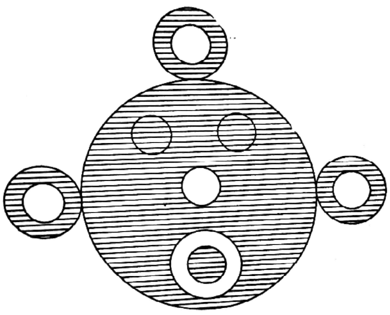
1. In the adjoining figure the value of x is _______.



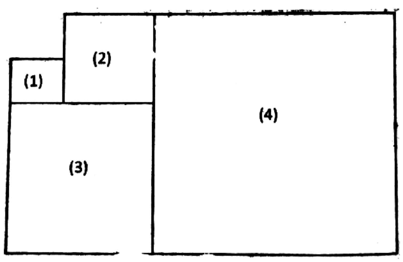
2. The maximum number of points of intersection of a circle and a triangle is m. The maximum number of points of intersection of two triangles is n. Then the value of (m + n) is _______.
3. n is a two digit number. P(n) is the product of the digits of n and S(n) is the sum of the digits of n. If n = p(n) + S(n) then the units digit of n is ________.
4. The number of two digit positive integers which have atleast one 6 as a digit is ______.
5. The sum of the digits of a two digit number is subtracted from the number. The units digit of the result is 6. The number of two digit numbers having this property is _____.
6. In the adjoining figure ABC and DEF are equilateral triangles AB = BF = BC = CE = AC. AD and EF cut at O and are perpendicular to each other. The number of right angled triangles formed in the figure is _______.



7. In the figure, the radius of each of the smallest circle is $\frac{1}{12}$ of the radius of the biggest circle. The radius of each of the middle sized circles is three times the radius of the smallest circle. The area of the shaded portion is ______ times the area of the biggest circle.



8. In the figure (1), (2), (3) and (4) are squares. The perimeter of the squares (1) and (2) are respectively 20 and 24 units. The area of the entire figure is ________.



9. The difference between the biggest and the smallest three digit numbers each of which has different digits is ________.
10. The degree measure of an angle whose complement is 25 % of its supplement is ______.

PART - A

1. a, b where a > b are natural numbers each less than 10 such that $(a^2 - b^2)$ is a prime number. The number of such pairs (a, b) is

(A) 5 (B) 6 (C) 7 (D) 8

2. The number of three digit numbers that are divisible by 2 but not divisible by 4 is

(A) 200 (B) 225 (C) 250 (D) 450

3. A, B, C are single digits. In this multiplication B could be

$$\begin{array}{r} AB\times \\ 7 \\ \hline BCA \end{array}$$

(A) 7 (B) 1 (C) 2 (D) 4

4. The base of a triangle is twice as long as a side of a square. Their areas are equal. Then the ratio of the altitude of the triangle to this base to the side of the square is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) 1 (D) 2

5. Two sequences S_1 and S_2 are as under :

$$S_1 : \frac{2}{1}, \frac{4}{3}, \frac{6}{5}, ...$$
$$S_2 : \frac{1}{2}, \frac{3}{4}, \frac{5}{6}, ...$$

The n^{th} term of S_1 is S_1 : $\frac{2n}{2n-1}$ and the nth term of S_2 is $\frac{2n-1}{2n}$. The value of the difference between the 2012^{th} terms of S_1 and S_2 is

(A) $\frac{4023}{2012\times 2011}$ (B) $\frac{8047}{4024\times 4023}$ (C) $\frac{4023}{4024\times 4023}$ (D) $\frac{8047}{2012\times 2011}$

6. The least number which when divided by 25, 40 and 60 leaves a remainder 7 in each case is

(A) 607 (B) 1007 (C) 807 (D) 507

7. The integers greater than 1 are arranged in 5 columns as follows.

	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)
Row 1 →		2	3	4	5
Row 2 ←	9	8	7	6	
Row 3 →		10	11	12	13
Row 4 ←	17	16	15	14	
⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮

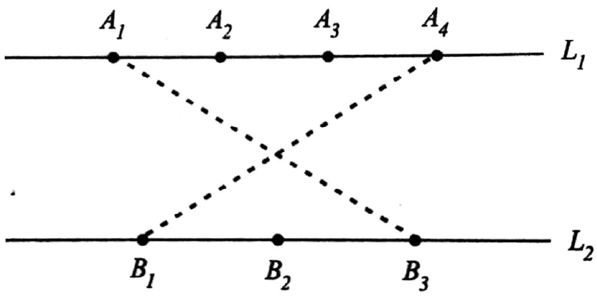
In the odd numbered rows, the integers appear in the last 4 columns are increasing form left to right. In the even numbered rows, the integers appear in the first four columns are increasing from right to left. In which column will the number 2012 appears ?

(A) fourth (B) second (C) first (D) fifth

8. Akash, Bharath, Christe, Daniel and Eashwar are friends. The interesting fact is that all of them were born in the same year, but on different days, different dates and different months. If Akash were born on February 19, then Daniel could have been born on

(A) March 30 (B) August 20 (C) December 25 (D) April 16

9. In the adjoining figure points A_1, A_2, A_3, A_4 are located on the line L_1 and B_1, B_2, B_3 are located on the line L_2. Each one of the points on L_1 is connected to each one of the point of L_2. (Example A_1 to B_3 and A_4 to B_1 as in the figure). The line segments are not extended. No line segment passes through the point of intersection of any two lines segments. The number of points of inter section of all these line segments is (Exclusive of A_1, A_2, A_3, A_4 and B_1, B_2, B_3).



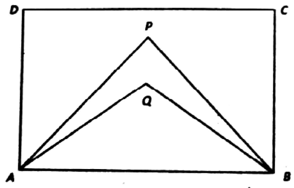
(A) 15 (B) 16 (C) 17 (D) 18

10. A box contains 100 balls of different colours: 28 Red, 17 Blue, 21 Green, 10 white, 12 Yellow and 12 Black. The smallest number of balls drawn from the box so that at least 15 balls are of the same colour is

(A) 73 (B) 77 (C) 81 (D) 85

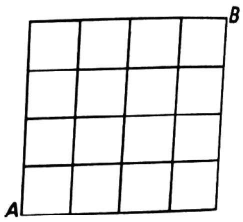
PART - B

1. ABCD is a rectangle, AP, AQ divide $\angle DAB$ in to three equal parts and BP and BQ divide $\angle CBA$ into three equal parts. If $k(\angle APB) = (\angle AQB)$ then the value of k is ______.



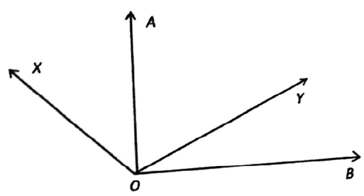
2. Here is a sequence of composite numbers having only one prime factor, written in ascending order 4, 8, 9, 16, 25, 27, 32, ... The 15^{th} number of this sequence is ____.

3. An insect crawls from A to B along a square lamina which is divided by lines as shown into 16 equal squares. The insect always travels diagonally from one corner of a square to the other corner. While going it never visits the same corner of any square. If one diagonal of a smallest square is taken as 1 unit, the maximum length of the path travelled by the insect is ________.



4. A says : "I am a 6-digit number and all my middle digits are made of zeros." B says to A : "I am your successor. My digit in the tens place is the same as your starting digit." The value of the whole number A is ______.

5. In the figure $\angle XOY = \angle AOB = 90^0$. The measure of $\angle XOB = 126^0$. The measure of $\angle AOY$ is _____.

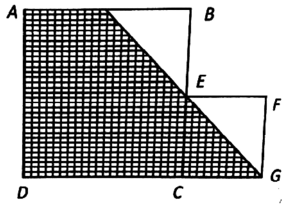


6. 6 men can do a work in 1 year and 2 months. Then 3 men can do the work in _____ months.

7. The first term of a sequence of fraction is $\frac{3}{1}$ and the n^th term t_n of the sequence is equal to $\frac{sum\ of\ the\ numerator\ and\ denominator\ of\ t_{n-1}}{Difference\ of\ the\ numerator\ and\ denominator\ of\ t_{n-1}}$. (Ex. : If $t_1 = \frac{a}{b}$ and $t_2 = \frac{a+b}{a-b}$.)

The sum of this sequence to 2012 terms is ______.

8. In the figure ABCD and CEFG are squares of sides 6 cm and 2 cm respectively. The area of the shaded portion (in cm^2) is ______.



9. Master Ramanujan of Sixth standard was drawing squares of sides 1 cm, 2 cm, 3 cm and so on. After doing this for sometime he added the areas of the squares he made. He got the sum of the areas as 1015 cm^2. The number of squares Ramanujan had drawn is ____.

10. The tens digit of a four digit number is an even prime. The number is divisible by 5. The other digits are all prime numbers and all the digits are distinct. The sum of all such four digit numbers is _____.

PART - A

1. Consider the numbers 2, 3, 4, 5. Form two digit numbers of different digits using these numbers. How many of them are odd ?

   (A) 4 (B) 5 (C) 6 (D) 7

2. A is the sum of all een three digit numbers in which all the three digits are equal. B is the sum of all odd three digit numbers in which all the digits are equal. The value of $\frac{B}{A}$ is

   (A) $\frac{5}{4}$ (B) $\frac{4}{3}$ (C) $\frac{6}{5}$ (D) $\frac{7}{6}$

3. 21 rose plants, 42 sunflower plants and 56 dalia plants have to be planted in rows such that each row contains the same number of plants of one variety only. The minimum number of rows in which the above plants may be planted is

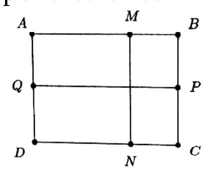
   (A) 3 (B) 15 (C) 17 (D) 21

4. The length and breadth of a square are increased by 30% and 20% respectively. The area of the rectangle so formed exceeds the area of the square by

   (A) 25 % (B) 50 % (C) 60 % (D) 56 %

5. ABCD is a rectangular play ground in which AB = 40 m and BC = 30 m. The Physical director of the school gave punishment to two students Samrud and Saket. Samrud has to start from A and go round the play ground along ABCDA twice.

   Saket has to start from A go along AM, MN, NC, CP, PQ and to A two times. MN is perpendicular to CD and PQ perpendicular to DA. Then



   (A) Samrud covers more distance than Saket
   (B) Saket covers more distance than Samrud
   (C) Samrud and Saket cover equal distances
   (D) Saket coveres exactly twice the distance Samrud covers

6. B has 5 Rupees more than C. A has 14 Rupees more than B. Which transaction makes equal money to all the three.

   (A) A gives 6 Rs. to B and B gives 3 Rs. to C
   (B) A gives 3 Rs. to B and C receives 6 Rs. from A
   (C) A gives 2 Rs. to C and B gives 5 Rs. to C
   (D) A gives 8 Rs. to C and B receives 3 Rs. from A

7. A natural number a is multiplied by 11 and 33 is added to it. It is divided by 9 and the remainder is zero. The smallest such natural number is

   (A) 15 (B) 3 (C) 6 (D) 1

8. n is a natural number such that (n + 1) (n + 2) (n + 3) = 201320132013. Then

   (A) n is a two digit number (B) n is a three digit number
   (C) No such n exists (D) n is a three digits number ending with 3

9. What fraction of the rectangle is shaded ?

   (A) $\frac{1}{2}$ (B) $\frac{17}{30}$ (C) $\frac{5}{8}$ (D) $\frac{8}{15}$

10. The first and the third digit of a five digit number d6d41 are the same. If the number is divisible by 9, the sum of its digits is

    (A) 18 (B) 36 (C) 25 (D) 27

PART - B

11. Good Shephered high school has 1584 students. $\frac{4}{9}$ of the students are girls. The number of boys more than the girls in the school is _______.

12. There is a lengthy rope. Ram cuts one third of the rope. From the remaining Rahim cuts one fifth. The total length of the rope both cut is 861 metres. The length of the original uncut rope is _______.

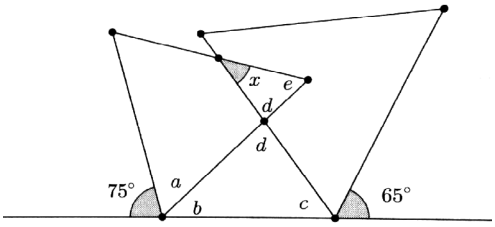
13. Square papers of black and white are arranged as shown :

■ ■ □ □ ■ □ ■ ■ □ □ ■ □ ■ ■ □ ....

There are totally 80 squares. The number of white squares is _______.

14. A company promised Govind Rs. 21,000 and a gift for working 2 years. But Govind left the job in 16 months and got Rs. 12,500 and the gift as compensation. The gift is worth of Rs. _______.

15. Two equilateral triangles overlap as in the figure. The value of the angle x is ______.



16. x and y are the digits of a two digit number xy. x is greater than y by 3. When this two digit number is divided by the sum of its digits the quotient is 7 and the remainder is 3. The sum of the digits of the two digit number is ________.

17. If the square roots of the natural numbers 1 to 200 are written down, the number of whole numbers among them is _______.

18. Two ants start at A and walk at the same speed, one along the square and the other along the rectangle. The minimum distance (in cm) any one must cover before they meet again is _______.

19. When 26 is divided by a positive integer N, the remainder is 2. The sum of all possible values of N is ______.

20. If $\left(1+\frac{1}{2}\right)\left(1+\frac{1}{4}\right)\left(1+\frac{1}{6}\right)\left(1+\frac{1}{8}\right)\left(1+\frac{1}{10}\right)\times\left(1-\frac{1}{3}\right)\left(1-\frac{1}{5}\right)\left(1-\frac{1}{7}\right)\left(1-\frac{1}{9}\right)=1+\frac{1}{n}$ then the value of n is ____.

PART - A

1. In the following sequence 11, 88, 16, 80, 21, 72, –, –, –, – the blanks are two digit numbers. No number in the blank ends with
(A) 1 (B) 4 (C) 6 (D) 7

2. Aruna has a piece of cloth measuring 128 cm by 72 cm. She wants to cut it into square pieces. The greatest possible size of the square that she can cut is
(A) 6 cm by 6 cm (B) 8 cm by 8 cm (C) 9 cm by 9 cm (D) 12 cm by 12 cm

3. When 26 is divided by a positive integer n, the remainder is 2. The sum of all the possible values of n is
(A) 57 (B) 60 (C) 45 (D) 74

4. Samrud, Saket, Slok, Vishwa and Arish have different amounts of money in Rupees, each an odd number which is less than 50. The largest possible sum of these amounts (in Rupees) is
(A) 229 (B) 220 (C) 250 (D) 225

5. Mahadevan used his calculator (which he rarely uses) to multiply a number by 2. But by mistake he multiplied by 20. To obtain the correct result the must
(A) divide by 20 (B) divide by 40 (C) multiply by 10 (D) multiply by 0.1

6. a4273b is a six digit number in which a and b are digits. This number is divisible by 72. Then
(A) $b - 2a = 0$ (B) $a - 2b = 0$ (C) $2a - b = 4$ (D) $a + b = 13$

7. P and Q are natural numbers. If $25 \times P \times 18 = Q \times 15$. The smallest value of P + Q is
(A) 61 (B) 21 (C) 41 (D) 31

8. The thousands digit in the multiplication 111111×111111 is
(A) 1 (B) 2 (C) 3 (D) 4

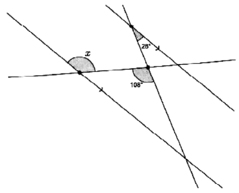
9. The sum of the present ages of 5 brothers is 120 years. How many years ago was the sum of their ages 80 years ?
(A) 6 (B) 7 (C) 8 (D) 9

10. Laxman starts counting backwards from 100 by 7's. He begins 100, 93, 86 .... . Which number will not come in his countdown ?
(A) 65 (B) 30 (C) 23 (D) 15

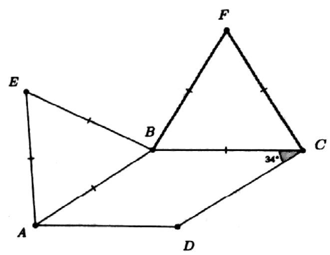
PART - B

11. Jingle has six times as much money as Bingle. Dingle has twice as much money as Bingle. Pingle has six times as much many as Dingle. Pingle has ______ many times as much money as Jingle.

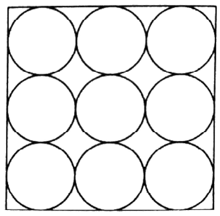
12. In the figure the arrowed lines are parallel. The value of x is _______.



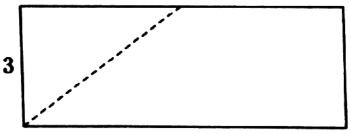
13. In the figure ABCD is a rhombus. BFC and ABE are equilateral triangles. $\angle BCD = 34^0$. Then $\angle EFB$ = _______.



14. In the figure, the area of each circle is 4π square units. The area of the square in the same square units is _______.



15. The maximum number of rectangles with different perimeters and an area of 216 cm^2, if the length and breadth of each rectangle are integer multiples of 3 is _______.
16. If the previous month is July, then the month 21 months from now is _______.
17. The sum of all natural numbers less than 45 which are not divisible by 3 is _____.
18. A rectangle of dimensions 3 cm by 8 cm is cut along the dotted line shown. The cut piece is then joined with the remaining piece to form a right angled triangle. The perimeter of this triangle is ______ cm.



19. Candles A and B are lit together. Candle A lasts 11 hours and candle B lasts 7 hours. After 3 hours the two candles have equal lenghts remaining. The ratio of the original length of candle A to candle B is _______.
20. A, B, C are three toys. A is 50% costlier than C and B is 25% costlier than C. Then A is ______ % costlier than B.

PART - A

1. The price of an item is decreased by 25%. The percentage increase to be done in the new price to get the original price is

(A) 25 % (B) 30 % (C) 43 % (D) $33\frac{1}{2}$ %

2. How many pairs of positive integers are there such that their sum is 528 and their HCF is 33 ?

(A) 4 (B) 6 (C) 8 (D) 12

3. If one–fifth of two–third of three fourth of a number is 43, then the number is

(A) 256 (B) 540 (C) 380 (D) 430

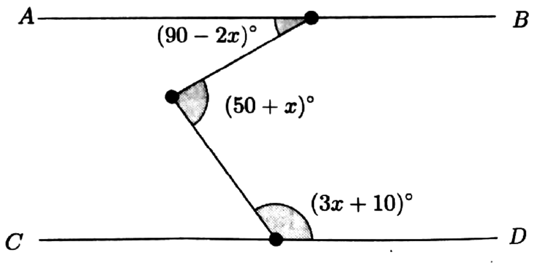
4. The average of 8 numbers is 99. The difference between the two greatest numbers is 18. The average of the remaining 6 numbers is 87. The greater number is

(A) 138 (B) 140 (C) 144 (D) 155

5. In a rectangle, the length is increased by 40% and breadth decreased by 30%. Then the area is

(A) increased by 5% (B) decreased by 2%
(C) decreased by 5% (D) increased by 2%

6. In the adjoining figure, lines AB and CD are parallel. What is the value of x in degrees ?



(A) 25^0 (B) 35^0 (C) 45^0 (D) 55^0

7. Find the least among the fractions $\frac{5}{6},\frac{6}{7},\frac{7}{8}$.

(A) $\frac{5}{6}$ (B) $\frac{6}{7}$ (C) $\frac{7}{8}$ (D) $\frac{6}{7}$ and $\frac{7}{8}$

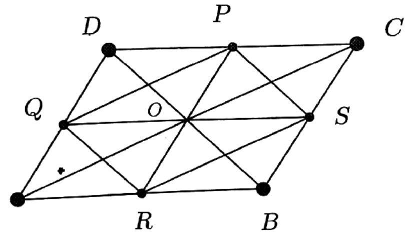
8. By how much is 15% of 23.5 more than 20% of 16.

(A) 0.125 (B) 0.325 (C) 1.5 (D) 0.235

9. How many times does the digit 1 appear when you write numbers 1 to 399 consecutively ?

(A) 180 (B) 175 (C) 178 (D) 179

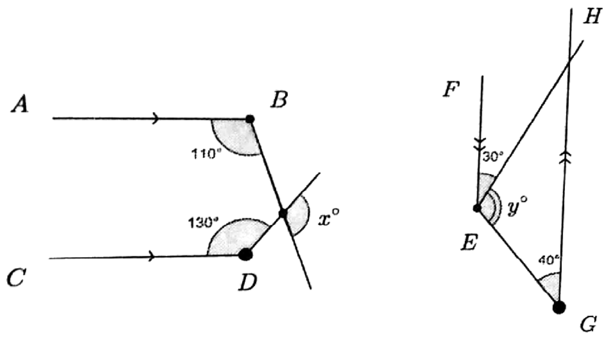
10. The total numbers of parallelogram of different dimensions in the adjoining figures is



(A) 14 (B) 16 (C) 18 (D) More

PART - B

11. Consider the sequence $\frac{3}{5}, \frac{6}{7}, 1, 1\frac{1}{11}, \ldots$ The 2016th 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 bisecuits to all the students.
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 $x^0 - y^0$ is ______.



- - - - - - - - - - - - - -

GAUSS CONTEST - PRIMARY LEVEL
(Standard - V & VI)

Note :

1. Fill in the response sheet with your Name, Class and the institution through which you appear in the specified places.
2. Diagrams are only visual aids; they are NOT drawn to scale.
3. You are free to do rough work on separate sheets.
4. Duration of the test : 2 pm to 4 pm – 2 hours.

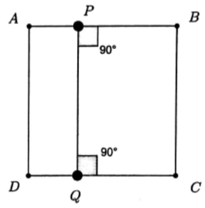
PART - A

Note :

- Only one of the choices A, B, C, D is correct for each question. Shade the alphabet of your choice in the response sheet. If you have any doubt in the method of answering, seek the guidance of the supervisor.
- For each correct response you get 1 mark. For each incorrect response you lose $\frac{1}{2}$ mark.

1. Which one of the following numbers is NOT the sum of two prime numbers ?
(A) 24 (B) 30 (C) 67 (D) 21

2. ABCD is a square and PB = 2AP. The perimeter of the rectangle APQD is 80 cm. The perimeter of ABCD in cms is



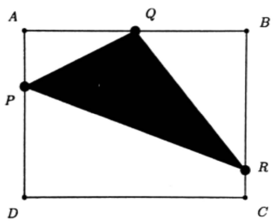
(A) 100 (B) 120 (C) 140 (D) 160

3. Saket added up all the even numbers from 1 to 101. Then, from the total he obtained, he substracted all odd numbers between 0 and 100. The answer he would have obtained is
(A) 0 (B) 20 (C) 30 (D) 50

4. The value of $\dfrac{\frac{1}{2}+\frac{1}{4}+\frac{1}{8}}{2+4+8}$ is

(A) 16 (B) 4 (C) $\frac{1}{4}$ (D) $\frac{1}{16}$

5. ABCD is a rectangle. AB = 8 cm and BC = 6 cm. Q is the midpoint of AB. P, R are on AD and BC respectively such that AP = 2 cm, CR = 1 cm. Area of the shaded triangle is square cms is

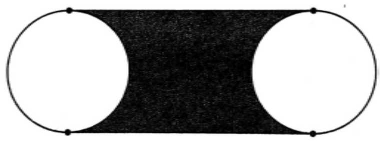


(A) 12 (B) 13 (C) 14 (D) 16

6. The Rishimoolam of a number is defined as follows. Consider the number 234. By multiplying its digits 2, 3 and 4, we obtain 2 x 3 x 4 = 24. Again, multiplying the digits of 24, we get 2 x 4 = 8. We say 8 is the Rishimoolam of the number 234. If 0 is the Rishimoolam, we say the number has no Rishimoolam. Which one of the following has no Rishimoolam ?

(A) 736 (B) 647 (C) 831 (D) 619

7. Two circles touch two parallel lines as shown in the diagram. The radius of each circle is 1 cm. The distance the centres of the circles is 5 cm. The area of the shaded region in square cms is



(A) 5π (B) 10π (C) $10 - \pi$ (D) $10 + \pi$

8. Samrud wrote two consecutive integers, one of which ends in a 5. He multiplied both. He squared the answer. The last two digits of his answer is

(A) 50 (B) 40 (C) 10 (D) 00

9. Vishwa wrote a number on each side of 3 cards. In each card, the numbers written on the sides are different. One side of each card is a prime number and the other sides had 44, 59 and 38 respectively. Given that the sum of the numbers on each card is the same, the difference between the largest and the second largest of the prime numbers on the cards is

(A) 6 (B) 7 (C) 9 (D) 4

10. The number of three digit numbers abc such that a x b x c = 15 is

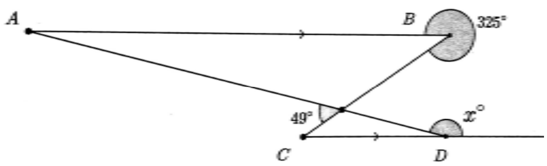
(A) 2 (B) 6 (C) 8 (D) 9

PART - B

Note :

- Write the correct answer in the space provided in the response sheet.
- For each correct response you get 1 mark. For each incorrect response you lose $\frac{1}{4}$ mark.

11. Five chairs cost as much as 12 desks, 7 desks cost as much as 2 tables and 3 tables cost as much as 2 sofas. If the cost of 5 sofas is Rs. 5250, then the cost of a chair (in Rs) is ________.
12. The average age of a class of 20 children is 12.6 years. 5 new children joined with an average age of 12.2 years. The new average of the class (to one decimal place) ______.
13. 13 is a two digit prime and when we reverse its digits, the number 31 obtained is also a prime number. The number of two digit numbers living this property is ________.
14. In a garden there are two plants. One plant is 44 cm tall and the other is 80 cm tall. The first plant grows 3 cm in every 2 months and the second 5 cm is every 6 months. The number of months after which the two plants will have equal height is ________.
15. In 5 days a man walked a total of 85 KM. Every day he walked 4 KM less than the previous day. The number of KM he walked on the last day is ________.
16. In the adjoining figure, AB is parallel to CD. The value of x is ________.



17. In Mahadevans cycle shop for children, there are unicycles, having only one wheel, bicycles, having two wheels and tricycles, having three wheeels. Samrud counts the seats and wheels and finds that there are totally 7 seats and 13 wheels. The number of bicycles is more than tricycles. The number of unicycles in the shop is ________.
18. There is a tree with several branches. Many parrots came to rest on the tree. When 6 parrots sat on each branch of the tree, all the branches were occupied but three parrots were left over. When 9 parrots sat on each branch, all parrots were seated but two branches were empty. If b is the number of branches and p is the number of parrots, the value of b + p is ________.
19. The income of A and B are in the ratio 3:2. Their expenditures are in the ratio 5:3. If each saves Rs. 10,000, then As income is (in Rs.) ________.
20. The radius of a circle is increased so that its circumference is increased by 5%. The area of the circle will increase by _______ %.

1. Find all the three digit numbers formed by 3, 5 and 7 in which no digit is repeated. For example if you do the same for 1, 2, 3 we have 123,231,213 as some of the numbers that you can get. Add all of them and divide the sum by 3 + 5 + 7. Call the number that you get as a. Now find all the three digit numbers that are formed by 2, 6 and 8, again without repetitions. Add all of them and divide the sum by 2 + 6 + 8. Call the number you get as b. Compare a and b to find which is bigger.

2. Ram bought a notebook containing 98 pages, and numbered them from 1 to 196. Krishna tore 35 pages of Ram's notebook and added in 70 numbers he found on the pages. Could Krishna have got 2004 as the sum ?

3. There are 20 cities in a certain country. Every pair of cities is connected by an air route. How many air routes are there ?

4. Ram checks his purse and finds that he can buy an apple and three oranges or two apples for the money he has. I buy, from the same shop, two apples and two oranges for Rs. 16. How much my friend should pay when he buys three apples and two oranges from the same shop ?

5. Let d(n) denote the number of divisors of a positive integer n. For example, d(6) = 4, d(7) = 2, d(12) = 6 as 1, 2, 3, 6 are the divisors of 6; 1, 7 are the divisors of 7; and 1, 2, 3, 4, 6, 12 are the divisors of 12. We note that d(n) = 2 if and only if n is a prime integer. Prepare a table which gives the values of d(n) for n = 1, 2, 3, ..., 20.

   (a) Find d(4), d(49), d(121) and d(37 x 37).

   (b) Find n such that $1 \le n \le 100$ for which d(n) = 3.

   (c) Use the table you have prepared above to find n between 2000 and 2009 such that d(n) is an odd number.

   (d) If d(n) is a very big integer, then n is clearly a bigger integer. Looking in the opposite direction, if n is a very big integer can we say that d(n) is at least half as big ?

   (e) Can you find a big integer K such that for any integer n bigger than K we have $d(n) \ge 3$?

6. Some prime numbers are generated as follows. Startwith a prime number. For example 3. Then consider 2 x 3 + 1. It is 7. It is a prime number. Again multiply by 2 and add 1 to get 2 x 7 + 1 to get 15. Now 15 is not a prime. So find the least prime dividing 15; which is the number 3. The sequence generated so far is 3, 7, 3. If we continue this process we will get the sequence 3, 7, 3, 7, 3, 7, 3, 7, ... The process is given by

   (a) Start with a prime number p_1.

   (b) Multiply p_1 by 2 and add 1 to get $2p_1 + 1$.

   (c) If $2p_1 + 1$ is a prime write $2p_1 + 1 = p_2$.

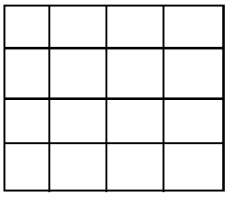
   (d) If $2p_1 + 1$ is not a prime call the smallest prime factor of $2p_1 + 1$ as p_2.

   (e) Multiply p_2 by 2 and add 1 to get $2p_2 + 1$.

   (f) If $2p_2 + 1$ is a prime write $2p_2 + 1 = p_3$.

7. Consider the first five natural numbers 1, 2, 3, 4, 5. This set of five numbers is divided into two sets A and B where A contains two numbers and B contains the other three numbers. One example is A = {2, 4} and B = {1, 3, 5}. How many such pairs A, B of sets are there ?

8. Draw a 4 x 4 square as shown. Fill the 16 squares with the letters a, b, c, d so that each letter appears exactly once in each row and also exactly once in each column. Give at least two different solutions.



9. One can easily see that if a perfect square n^2 is divisible by a prime p then it is also divisible by p^2. For example any square integer that is divisible by 7 is also divisible by 49. Can a number written with 200 zeroes, 200 ones and 200 twos be a perfect square ?

10. The positive integers a and b satisfy 23a = 32b. Can a + b be a prime number ? Justify your answer.

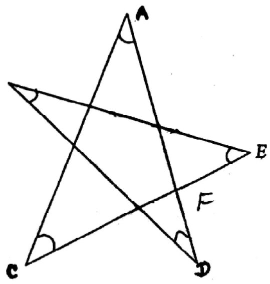
11. Each square in a 2 x 2 table is coloured either black or white. How many different colourings of the table are there ?

12. Explain why an equilateral triangle (a trianle with equal sides) cannot be covered by two smaller equilateral triangles.

13. The side AC of a triangle is of length 2.7 cms., and the side AB has length 0.7 cms. If the length of the side BC is an integer,what is the length of BC ?

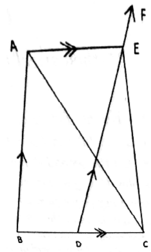
14. It is well known that the diagonals of a parallogram bisect each other. In any triangle the line segment joining a vertex with the midpoint of the opposite side is called a median. If ABC is any triangle prove that the sum of the lengths of the three medians is not greater than the triangle's perimeter.

15. In the adjacent figure we have a start with five vertices A, B, C, D, E. Find the sum of the angles at the vertices A, B, C, D, E of the five pointed star. (You may use the fact that in any triangle the sum of the angles is 180^0).



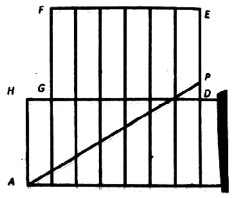
----

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 $\angle A$ is equal to an angle of an equilateral triangle. DEF is parallel to AB and AE parallel to BC. $\angle CEF = 170^0$ and $\angle ACE = \angle B + 10^0$. Find the angles of the triangle and $\angle CAE$.

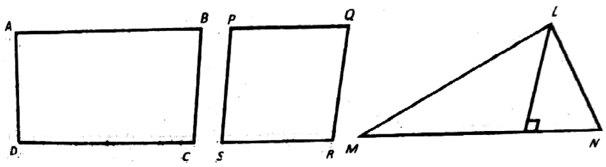


3. $p = 1 + 2^1 + 2^2 + 2^3 + ... + 2^n$ where p is a prime number and n is a natural number. Find all such prime numbers $p < 100$ and the corresponding natural number n. For each (p, n) find $N = p \times 2^n$ and find the sum of all divisors of N.
4. The sequence 8, 24, 48, 80, 120, ... consists of 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.
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 = $\frac{1}{2}$ base x 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.

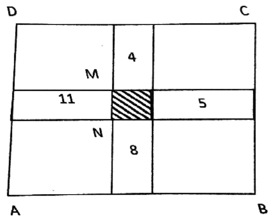


----

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.

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 he parallelograms in which they are marked. (For example the perimeter of the parallelogram ∠MNP is 11). Find the perimeter of the shaded parallelogram.



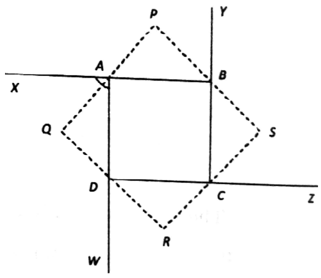
4. *l* and b are two numbers of the form $\frac{p}{q}$ where p and q are natural numbers. Further l, b are greater than 2.

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 complementof a number 4x is 9 – x, 18 complement of a number y is 18 – y, 27 complement of a number z is 27 – x}.

6. A sequence is generated starting with the first term t_1 as a four digit natural number. The second third and fourth terns (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)| = 362 = 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 from a quadrilateral PQRS. Prove that PQRS is a square.



- - - - - - - - - - - - - -

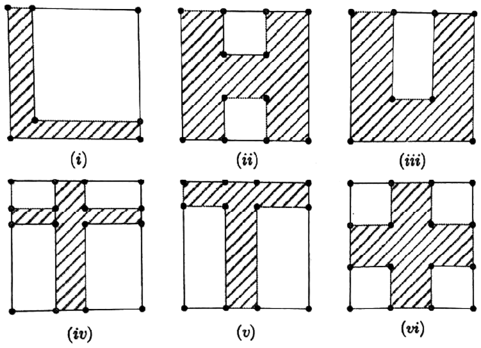
AMTI (NMTC) - 2014

GAUSS CONTEST - FINAL - PRIMARY LEVEL

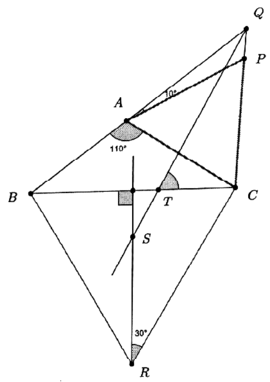
1. There are 4 girls and 2 boys of different ages. The eldest is 10 years old while the youngest is 4 years old. The older of the boys is 4 years older than the youngest of the girls. The oldest of the girls is 4 years older than the youngest of the boys. What is the age of the oldest of the boys ?

2. In the equation A + M + T + I = 10. A, M, T, I are all different natural numbers. A is the least. Calculate the maximum and minimum value of A · M · T · I + A · M · T + A · T · I + M · I · T + M · T · I (where . means multiplication. i.e., A · T · I = A x T x I).

3. The six squares below are identical. The dimensions of the shaded portions are not known. The perimeter of which shaded areas are equal to the perimeter of the square ? Show the calculations clearly and if the perimeter of any shaded area is different from that of the square, state whether it is more or less than the perimeter of the square.



4. ABD is a triangle in which A = 110^0. AB = AC. APC and BRC are equilateral triangles drawn respectively on AC and BC outside the triangle ABC. BA is produced and meets CP produced at Q. The bisectors of ∠Q and ∠R cut at S. Calculate ∠QSR. What can you say about the figure SRCQ ?



5. a) Two numbers are respectively 20% and 50% more than a third number. What percentage is the first of the second ?

   b) Three vessels of sizes 3 litres, 4 litres and 5 liters contain mixture of water and milk in the ratio 2 : 3, 3 : 7 and 4 : 11 respectively. The contents of all the three vessels are poured into a single vessel. What is the ratio of water to milk in the resultant mixture ?

6. It is a well-known fact that Mahatma Gandhi was the man responsible for getting us the freedom. We got independence in 1947. Mahatma was born in 1869. Find the smallest numbers by which

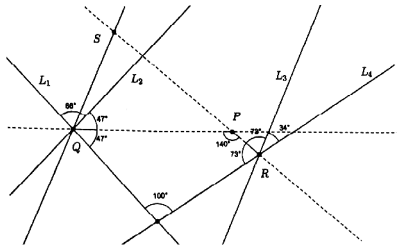
   a) 1869 should be multiplied to get a product which ends in 1947.

   b) 1947 should be multiplied to get a product which ends in 1869.

   (The method you use to obtain the required numbers should also be given).

- - - - - - - - - - - - -

1. A three digit number is divisible by 7 and 8.
   a) How many such numbers are there ?
   b) List out all the numbers.
   c) Find the two numbers whose digit sum is maximum and minimum.
   d) For how many numbers the digit sum is odd ?
2. a is the least number which on being divided by 5, 6, 8, 9 and 12 leaves in each case a remainder 1, but when divided by 13 leaves no remainder. b is the greatest 4–digit number which when divided by 12, 18, 21 and 28 leaves a remainder 3 in each case. Find the value of (b – a).
3. L_1, L_2, L_3, L_4 are straight lines such that L_1, L_2 intersect at Q and L_3, L_4 intersect at R in the same plane as in the diagram. The two dotted lines are the bisectors of the respective angles exterior to 86^0 and 34^0 and they meet at P. If L_1 and L_4 make an angle 100^0, find the measure of $\angle$QPR. What is the angle between the lines L_2 and L_3 ?



4. The two digit number 27 is 3 times the sum of the digits, since (2 + 7) x 3 = 27. Find all two digit numbers each of which is 7 times the sum of its digits.
5. There are a ten digit number a b c d e f g h i j with a = 1 and all the other digits are equal to either 0 or 1. It has the property that a + c + e + g + i = b + d + f + h + j. How many such 10-digit numbers are there ?
6. All the natural numbers from 1 to 12 are written on 6 separate pieces of paper, two numbers on each piece. The sums of the numbers on these six pieces are respectively 4, 6, 13, 14, 20 and 21. Find the pairs of the integers written on each piece of paper.

----

1. (a) i. In how many ways can two identical balls be placed in 3 different boxes so that exactly one box is empty ?

ii. In how many ways can three identical balls be placed in 2 different boxes so that exactly one box is empty ?

iii. In how many ways can four identical balls be placed in 2 different boxes so that exactly one box is empty ?

(b) A positive integer n has five digits. N is the six digit number obtained by adjoining 2 as the leftmost digit of n. M is the six digit number by adjoining 2 at the right must digit of n. If M = 3N, find all the values of n.

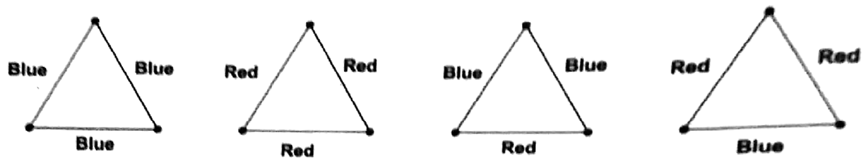
2. (a) 1800 is expressed as $2^a \times 3^b \times 5^c$ and 1620 is expressed as $2^d \times 3^e \times 5^f$, where a, b, c, d, e, f are positive integers. Find the remainder when 2016 is divided by a + b + c + d + e + f.

(b) Three persons A, B, C whose salaries together amount to Rs. 14,400, spend 80%, 85% and 75% of their respective salaries. If their savings are as 8 : 9 : 20, find their individuals salaries.

3. Completely simplifly the fraction $\dfrac{7}{5-\frac{8}{3}} \div \dfrac{3-\dfrac{2}{3-\frac{3}{2}}}{4-\frac{3}{2}} - \dfrac{5}{7}$ of $\left\{\dfrac{1}{1\frac{3}{7}} + \dfrac{6}{5} \, of \, \dfrac{3\frac{1}{3}-2\frac{1}{2}}{\frac{47}{21}-2}\right\}$ By $\dfrac{x}{y}$ of $\dfrac{a}{b}$ we mean $\dfrac{x}{y} \times \dfrac{a}{b}$.

4. p, q, r are prime numbers and r is a single digit number. If pq + r = 1993, find p + q + r.

5. (a) If we have sticks of the same color and same length, we can make one triangle using them. If we have sticks of same length but two different colours, say blue and red, we can make 4 triangles as shown below. How many triangles can be formed using sticks of same length but three different colors, say Red, Blue and Green ?



(b) The diagonals of a quadrilateral divide the quadrilateral into four regions. Draw a pentagon and find the maximum number of regions that can be obtained by drawing line segments connecting any two of its vertices.

- - - - - - - - - - - - -