MATHEMATICS- *ALGEBRA*

1. The average of scores in three subjects is 33. If the average of scores in two subjects is 16. What is the score of the third subject.

A) 32
B) 57
C) 66
D) 67

2. Ally multiplied all rational numbers from -2 to 2 and he got A. John multiplied all real numbers from -1 to 3 and he got B. What statement is true?

A) A= B
B) A> B
C) A < B
D) It is not possible to decide

3. If $\frac{a-2b}{a+2b} = -3$, calculate the value of $\frac{a}{b}$

A) 1/6
B) -1/6
C) ¼
D) -1

4. Let x, y and z be distinct real numbers. Which one of the following statement is true?

A) $(x - z)^2$ y is always positive
B) $(x - z)^2$ y^2 is not negative
C) (x - z) y is negative
D) $(x - y)^2$ z is not negative

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5. **If x, y, z are chosen from the three numbers, -3, 1/2 and 2, what is the largest possible value of the expression $(x/y)z^2$?**

   A) -3/8
   B) 16
   C) 24
   D) 36

6. **The length of one side of a square is 4 more than the length of one side of a regular pentagon. If the perimeters of the pentagon and the square are equal, how long is each side of the pentagon?**

   A) 6
   B) 12
   C) 14
   D) 16

7. **Senya can address a pile of envelopes in 4 hours and Jane can address same pile of envelopes in 6 hours, how many minutes will it take Senya and Jane working together to address all the envelopes?**

   A) 80
   B) 100
   C) 144
   D) 164

8. **What is the minimum value of $|5 - x|$?**

   A) 0
   B) 1
   C) -5
   D) no minimum

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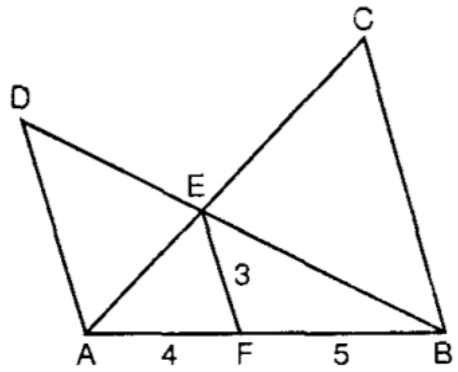
9. **Trees are to be planted inside a circular tree orchard so that there are 5 trees per square meter. The circumference of the tree orchard is 30 meters. If trees are available only in allotments of packages of 6, how many allotments will the caretaker need to purchase?**

A) 59
B) 17
C) 30
D) 24

10. **An operation defined for all x, y such that x∆y = x – y – 5. Find the value of x ∆ x.**

GEOMETRY

11. **In the given figure ADB and ACB are two triangles the line segments $AD \parallel EF \parallel BC$ AF=4 , FB=5 , EF=3 . Find the value of $\frac{1}{AD}+\frac{1}{BC}$ =?**



A) 1/2
B) 1/3
C) 1/4
D) 1/5

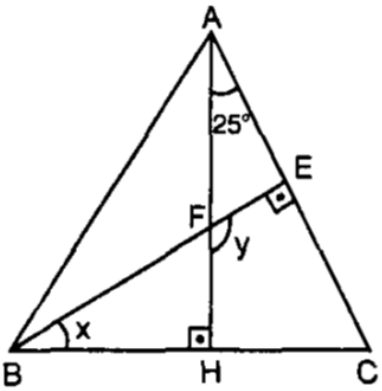
12. **How many triangles are there with side lengths whole numbers and with a perimeter of 9 cm.**

A) 2
B) 3
C) 4
D) 5

13. **PQRS is a parallelogram. X,Y,Z ,T are points on sides PQ , QR, RS,SP such that PX=SZ. If the area of the parallelogram PQRS is 20 cm^2. Find the area of the quadrilateral XYZT.**

A) 6
B) 8
C) 9
D) 10

14. **ABC is a triangle [AH] ⊥ [BC] and [BE] ⊥ [AC] .. What is the value of x+y ?**



A) 100
B) 125
C) 135
D) 140

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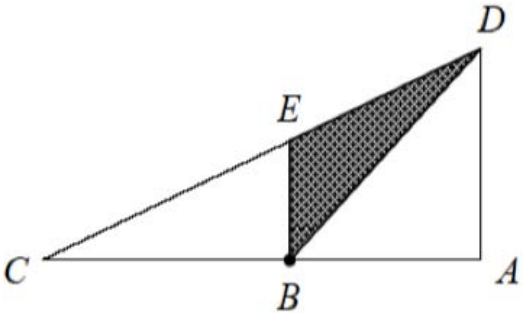
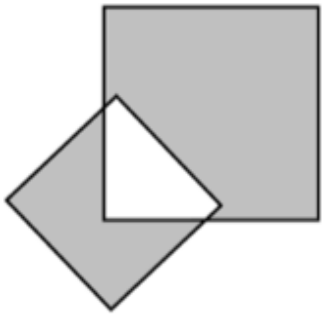
15. **The triangle ACD is right, The area of shaded region is 12 cm^2 , as shown in the figure below . AD =6 , AB=BC , DE=EC . Find the length of AC.**



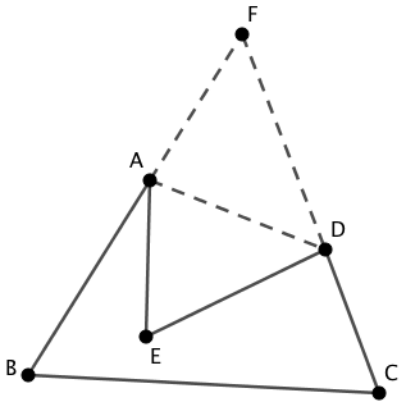
A) 16
B) 17
C) 18
D) 19

16. **In the figure , 1/4 of the larger square is <u>not shaded</u> and 2/7 of the smaller square is <u>not shaded</u>. What is the ratio of the shaded area of the larger square to the shaded area of the smaller square ?**



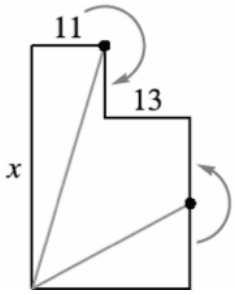
A) 6/5
B) 7/6
C) 8/7
D) 9/8

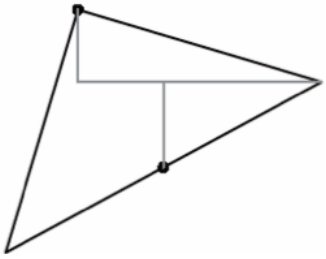
17. **A piece of paper in the shape of an equilateral triangle has one corner folded over, as shown. The angle <BAE=50^0 What is ∠CDE?**



A) 65^0
B) 70^0
C) 75^0
D) 80^0

18. **The left-hand figure shows a shape consisting of two rectangles. The lengths of two sides are marked 11 and 13. The shape is cut into three parts and the parts rearranged into a triangle, as shown in the right-hand figure.**





What is the length marked x

A) 36
B) 37
C) 38
D) 39

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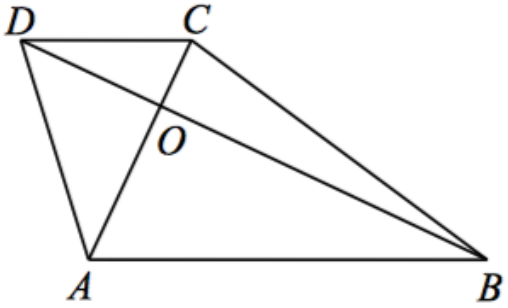
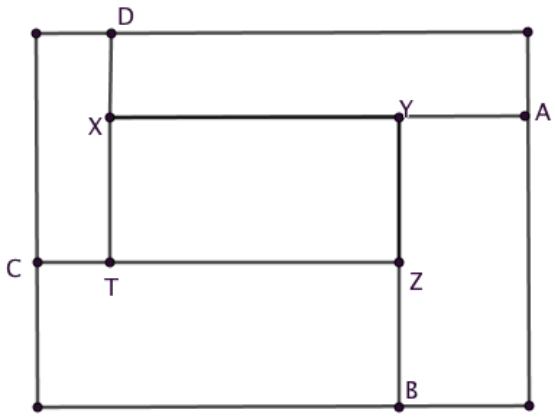
19. **In the given quadrilateral BD is perpendicular to AC and DC is parallel to AB. Given that $AO=a$, $BO=b$, $CO=c$, $DO=d$ and $DC=4$, $AB=9$. Find the value of $ac+bd$?**



A) 16
B) 14
C) 12
D) 10

20. **XYZT is a rectangular house. A fence extends XY to A with YA=60 m. A fence extends YZ to B with ZB=70 m. A fence extends ZT to C with TC=40 m. A fence extends TX to D with XD=50 m. Fences through A and C parallel to XZ and fences through B and C parallel to XY are built, enclosing a rectangular plot with four rectangular gardens around the house. The sum of the perimeters of four gardens is 2018 m. What is the perimeter , in m, of the house**



NUMBER THEORY

21. **William produces a sequence of positive integers by following three rules. He starts with a positive integer, then applies the appropriate rule to the result, and continues in this fashion.**

Rule 1: If the integer is less than 10, multiply it by 9.
Rule 2: If the integer is even and greater than 9, divide it by 2.
Rule 3: If the integer is odd and greater than 9, subtract 5 from it.

A sample sequence: 23,18,9,81,76,... Find the 20th term of the sequence that begins 98,49,...

A) 6
B) 11
C) 22
D) 27

22. $2(1-\frac{1}{2})+3(1-\frac{1}{3})+4(1-\frac{1}{4})+\ldots+10(1-\frac{1}{10})=$

A) 45
B) 50
C) 55
D) 60

23. **There are many two-digit multiples of 7, but only two of the multiples have a digit sum of 10. What is the sum of these two multiples of 7 ?**

A) 227
B) 198
C) 143
D) 119

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24. **Let $\boxed{N}$ mean the number of whole number divisors of N. For example, $\boxed{3}=2$ because 3 has two divisors, 1 and 3. What is the value of $\boxed{\boxed{11}\times\boxed{20}}$.**

A) 4
B) 5
C) 6
D) 12

25. There are positive integers that have these properties:

- the sum of the squares of their digits is 50, and
- each digit is larger than the one to its left.

The product of the digits of the largest integer with both properties is

A) 36
B) 45
C) 60
D) 72

26. The number 5005 can be written as a product of a pair of positive two-digit numbers. What is the maximum sum of the pair of numbers?

A) 142
B) 146
C) 228
D) 288

27. d is a natural number. When we divide d by 12, 15 and 18, the remainder is 6 in each case. Which is the following number can be d?

A) 180
B) 366
C) 534
D) 1256

28. A man has a rectangular field whose sides are 75m and 120m long respectively. He wants to put trees around the field so that the distance between each tree is the same. What is the least number of trees that the man needs?

A) 26
B) 24
C) 20
D) 15

29. **If A , B and C are different digits, What is the largest possible 3-digits sum for**

$$\begin{array}{r} A\ A\ A \\ B\ A \\ +\quad A \\ \hline \end{array}$$

A) AAB
B) ABC
C) BBA
D) BBC

30. **Find the sum of the digits in the answer to**

$$\underbrace{9999\ldots99}_{\text{99 nines}} \times \underbrace{4444\ldots44}_{\text{99 fours}}$$

Where a string of 99 nines is multiplied by a string of 99 fours.

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COMBINATORICS

31. **At least how many colors are we supposed to use to color edges of a pentagon such that no two adjacent edges have same color?**

A) 5
B) 4
C) 3
D) 2

32. **A family has three people. How many sons may this family have at most?**

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

33. **Chris and Jo put some red and some blue ribbons in a box to play a game. They each pick a ribbon from the box without looking (and without replacing them) by turns. Jo wins if the two ribbons are the same color and Chris wins if the two ribbons are a different color. If Chris starts first, in what turn may Jo win earliest?**

A) 2
B) 3
C) 4
D) 5

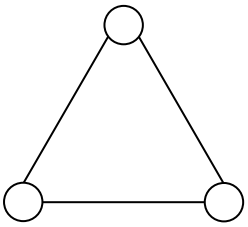
34. **Belle wants to get a sandwich from the deli for lunch. She can pick a roast beef or chicken salad sandwich. The bread choices are sourdough or multi-grain. How many different combinations can Belle pick from?**

A) 3
B) 4
C) 5
D) 6

35. **Jeff is ordering breakfast in a restaurant. He can have fried, or scrambled eggs. On the side, he can choose to have pancakes, potatoes, or hash browns. How many different combinations can Jeff order for breakfast?**

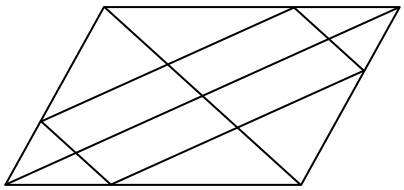
A) 4
B) 5
C) 6
D) 7

36. **Aisha wants to make a triangular necklace like in the figure. She can use at most two different colors to paint the circles. How many distinct necklaces can she make?**



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

37. **In a parallelogram shown in the figure. How many points are the common points for three line segments?**

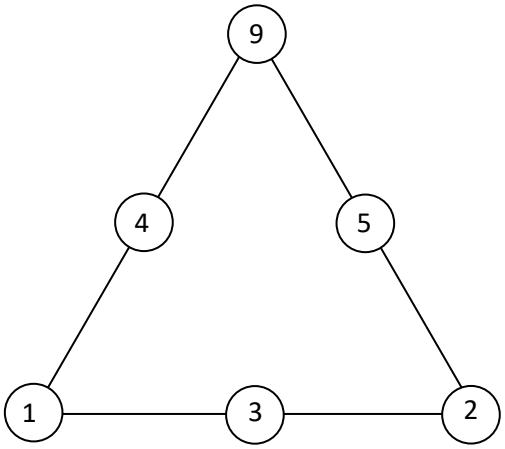


A) 4
B) 5
C) 6
D) 7

38. **All the word that can be formed from the letters A, H, M, T are written down in alphabetical order and numbered from 1,2,3 … etc. Which number in the list is the word MATH?**

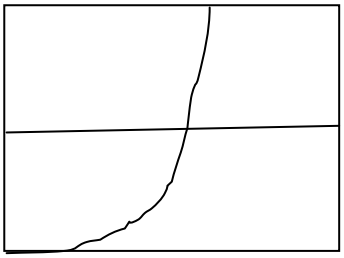
A) 11
B) 12
C) 13
D) 14

39. **Numbers were placed in circles in the figure according to a certain rule. How many possibilities do we have for three numbers in the last row?**



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

40. **Color the four regions in the rectangle in different colors. What is the maximum number of colors? Justify your answer**



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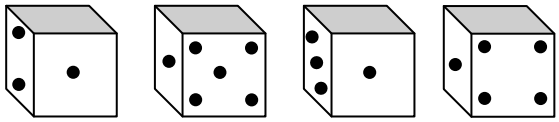
IQ QUESTIONS

41.



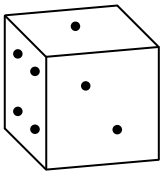
Which of the following are exactly true?

I. 2 is on the opposite face of 3.
II. 6 is on the opposite face of 1.
III. 3 and 5 are sharing an edge.

A) Only I
B) Only II
C) Only III
D) I and II

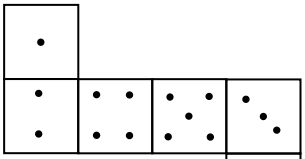
42.

I. 6 is on the opposite face of 1.
II. 5 is on the opposite face of 2.

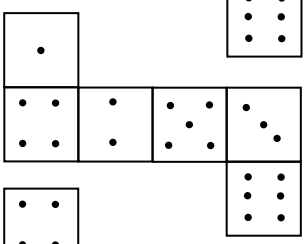


If the dice is opened to two dimension, which of the following will be true?

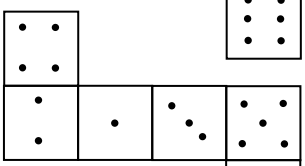
A)



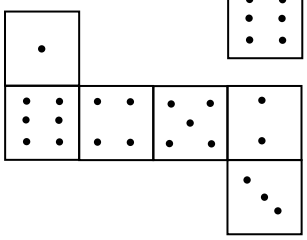
B)



C)



D)



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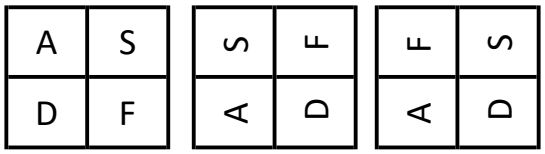
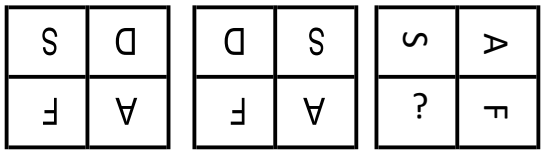
43.

I II III



IV IV VI



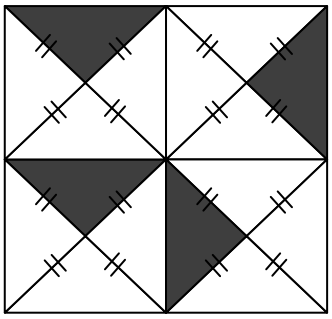
A) 

B) 

C) 

D) 

44. **A square in the figure is divided into four small squares. What is the area of the shaded part in the square if the total area of the unshaded part is 17.28 cm^2?**



A) 5.26
B) 5.76
C) 11.52
D) 23.04

45.

D U ⊔ ∃

U P ∃ ⊂

P E ⊂ U

? ? ? ?

A) E D ⊃ ϥ

B) ∃ ⊂ ∩ P

C) P ∩ D ∃

D) E D ∩ P

46. **A part of secret letter is given below**

ih raed ,
woh era uoy gniod
I epoh uoy era yrev llew.
…

According to the letter, how can the writer put " I will visit you in September 20"

A) 02 rebmetpes no uoy tivis lliw I
B) 02 rebmetpes you no tivis wlli I
C) I lliw tisiv uoy ni rebmetpes 02
D) who gnoid uoy yrev llew

47.

G	E	N	U
E	N	I	N
G	S	U	I
I	E	N	G

How many times the word "GENIUS" can be written in the puzzle?

A) 4
B) 5
C) 6
D) 8

48.

KALEM	=	76567
KULEN		34567
LELAM		31562
MELEM		56547

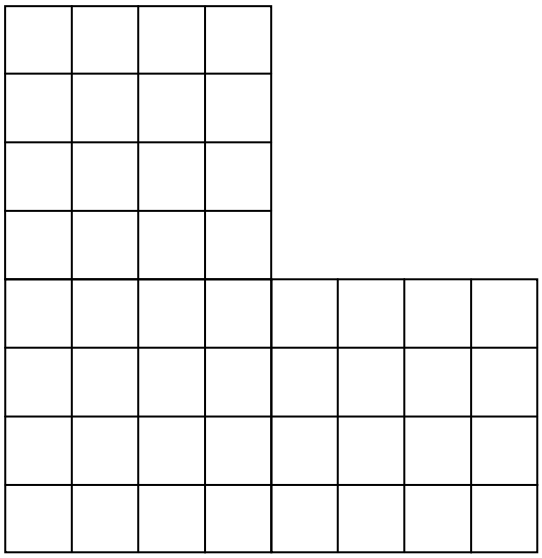
A group of words in a set are matched with a set of numbers. Each letter is represented by a number which of the following is equal to word " MALEK"

A) 74563
B) 76543
C) 56573
D) 36547

49. **31 = 111**
42 = 2222
53 = 33333
26 = ?

A) 222222
B) 666
C) 666666
D) 66

50. **A plane figure is formed by three 4 by 4 units^2 . Divide the figure into 4 same (congruent) using line segments.**



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