Qualifying Test for Middle School Girls - 12 to 15 years of age

I Instructions

1. The time duration for the below qualifying test is 120 minutes from 10:00 am to 12:00 pm (IST)
2. Answers have to be submitted on the Google form: https://tinyurl.com/agmnc21ans
3. You cannot submit the Google form more than once.
4. No other form of submission will be accepted.
5. Beyond 12:00 pm, the form will be deactivated.
   There is no option to save your answers in a Google form
6. Hence it is suggested that you write your answers on a sheet of paper.
   Submit it together in Google form before 12:00 pm.
7. Wherever there is a field/box to write the answer, write ONLY the INTEGER part of the answer.
   E.g. If the answer is 134 hours or 134 sq cm, write (fill) the answer as: 134 only.
   Do not use any full stop or any other explanation along with the answer.
   Any such content will fetch you a wrong answer because the checking is automated and not manual.
8. For multiple choice questions, use the appropriate option.
9. The participant is not allowed to use any device for calculations or any sort of help from anyone else.
   Any such act will disqualify the application.
10. Preserve your rough calculations. You may be asked to submit it.
    If you are unable to submit it, you may be disqualified.
11. There is no negative marking for incorrect answers.
12. Be honest.
13. Ensure that you have filled respective fields about your personal details correctly in the Google form.

Hope you have read the instructions thoroughly !

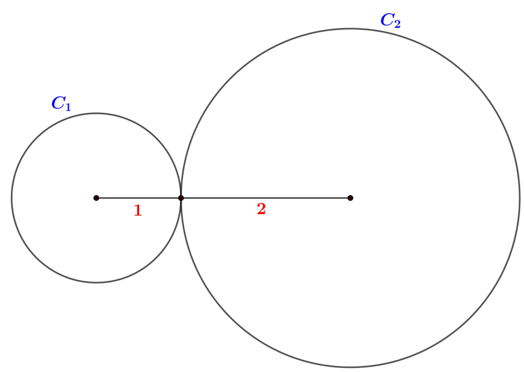
See Problems from next page! ↓

II PROBLEMS

1. When $\underbrace{8888\cdots888}_{2020\ digits}$ is *divided by* $\underbrace{444\cdots44}_{20\ digits}$, we get *a whole number* as *quotient*, the *remainder* is 0.

   The *sum of the digits of the quotient* is ____________.

2. Let *two circles* C_1 and C_2 *on the same plane*, *touch each other externally* having *radius* 1 *unit* and 2 *unit respectively*, as shown.



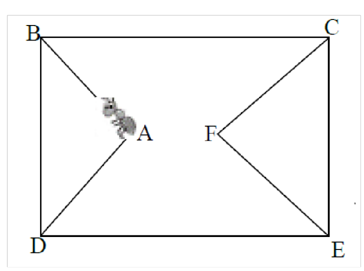
   How many *circles* of *radius* 5 *unit* can be *drawn on the same plane* touching both the circles *internally* or *externally*? _______.

3. Here you observe a *rectangle* $BCED$ with *interior points* A, F.

   There are *eight line segments* $BC, CE, ED, DB, DA, AB, CF$ and EF.

   An *Ant* is placed at A. It should follow only the path along some of the line segments to *reach* F.

   The *Ant* cannot repeat a path (*line segment*) *more than once whether it is forward or backward.*



   How many possible routes are there for the ant to move from A *to* F ? _______.

4. It is noticed that in *a volley ball match* the *jersey numbers (numbers on the shirts)* of all the 12 *players* playing are *different composite numbers*, each < 23.

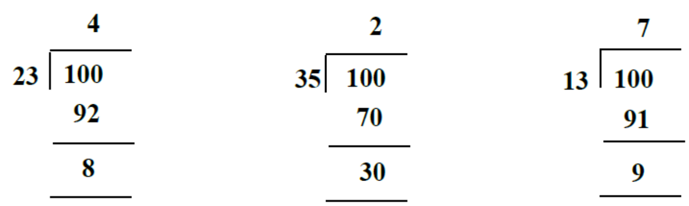
   All the *jersey numbers* of all the 6 *players* of *one of the teams* named CHENNAI CATS are *even numbered.* Their *sum* is *same as the sum of the jersey numbers* of all the 6 *players* of the other *team* BENGALURU BATS.

   Jersey numbers 22 and 20 belong to *one team*, whereas *jersey numbers* 8 and 12 belong to *other team.*

   The *sum* of *larger* 3 *jersey numbers* of BENGALURU BATS is _______.

5. In a *division process*, the *dividend* is 100 and also *Quotient* $<$ *Remainder* $<$ *Divisor* $<$ *Dividend.*

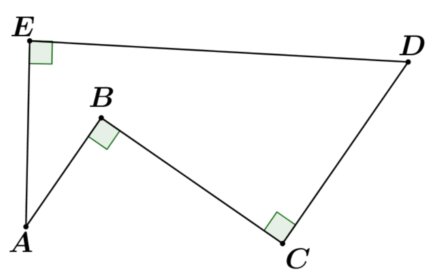
   Here are *few examples*:



   Observe that $4 < 8 < 23 < 100$; $2 < 30 < 35 < 100$; $7 < 9 < 13 < 100$ in the *given examples.*

   How many such divisions are possible with 49 as *dividend* ? _______.

6. In the *figure below*, $\angle B = \angle E = \angle C = 90°$. Also, $AB = 5, BC = 12, CD = 15$ (all in unit) and $AE = BC$. Then $DE =$ _______ *unit.*



   A. $\sqrt{544}$ B. 20 C. $4\sqrt{30}$ D. $\sqrt{444}$

7. The 7-*digit numbers* $74A52B1$ and $326AB4C$ are *both multiples* of 11.

   Which of the following *could be the value* of C ?

   A. 3 B. 5 C. 7 D. none of these

8. The *number* of 3-*digit multiples* of 5 such that no digit in it is *prime*, is _______.

9. The *value* of $\sqrt{51-\sqrt{2600}}-\sqrt{51+\sqrt{2600}}$ is

   A. 10 B. -10 C. $2\sqrt{26}$ D. $10-2\sqrt{26}$

10. If $x=2021, y=2020, z=\dfrac{1}{2020}$, then the *value* of

$$\big(x+y+z\big)^3-\big(x+y-z\big)^3-\big(x-y+z\big)^3-\big(-x+y+z\big)^3-23xyz$$

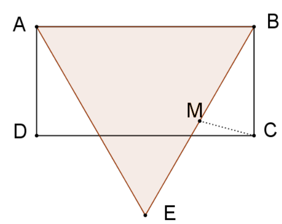
   is *equal* to

   A. 2020 B. 2021 C. $\dfrac{2323}{101}$ D. none of these

11. Let n be the smallest positive integer such that $(n-29)$ and $(3n+50)$ have a *common factor greater than* 1. (Note that $n \neq 29$)

   Then the *number of divisors* of n *including* 1 and n is _______.

12. $ABCD$ is a *rectangle* in which $AB = 20$ *cm*, $BC = 10$ *cm*.



   An equilateral triangle ABE is *drawn* as in the *figure* and M is the *midpoint* of BE.

   Then the $\angle BMC$ is _______ (*in degrees*).

13. The *number of even valued digits* $\{0,2,4,6,8\}$ in the *result* of 222222×333333 is _______.

14. Here you observe *examples* of 9-*digit multiples* of 3 with all digits same except the middle digit:

   111171111, 777717777, 555585555

   Total number of such 9-*digit numbers* including the given examples is _______.

15. The *numbers* M, N are *selected* from the first 20 *natural numbers* and are of different values.

   The smallest possible value of $\dfrac{M \times N}{M-N}$ is _______.

16. There are 3 *bags* namely *Bag A*, *Bag B*, *Bag C*.

    Bag A has 10 *balls* of which 6 are *red* and 4 are *green*.

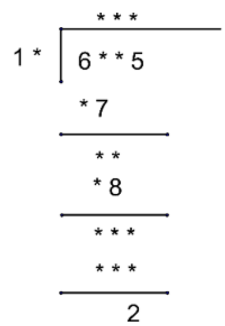
    Bag B has 10 *balls* of which 3 are *red* and 7 are *green*.

    Bag C has 10 *balls* of which 8 are *red* and 2 are *green*.

    Suppose a *TRANSFER* is *defined* as a *ball* (*only one ball*) being *transferred from one bag to another bag* within these 3 *bags*.

    What is the *minimum* (*smallest*) *number of TRANSFER's* required to get *Bag B* having more red balls and less green balls than each of the other two bags? _______.

17. In the following *division fact*, the missing digits are marked by $*$



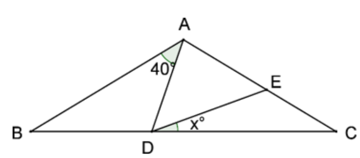
    Then the *quotient of the division process* is _______.

18. $ABCD$ is a *quadrilateral* such that the *perimeters of triangles* ABC, BCD, CDA, DAB are all equal.

    Then the *quadrilateral* must be a

    A. *rhombus.* B. *parallelogram.* C. *rectangle.* D. *none of these.*

19. In $\triangle ABC, AB = AC, \angle BAD = 40^\circ$ and $AD = AE$. Then $\angle CDE =$ _______$^\circ$.



20. There are several *interesting divisions* having the *following property*:

    The dividend, divisor, quotient and remainder all these numbers start with digit 1 *and none of them being* 1.

    The smallest dividend having *this property* is _______.