Maximum time: 25 *minutes*

KEM2 - Maths Olympiad for Std 7^{th} & 8^{th} together @ *ABIMS*

Try on your own ! Don't use calculators ! Think and Answer !

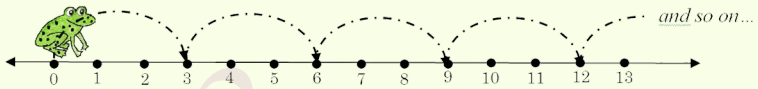
Name:_____ Standard:_____

I Answer the following questions accordingly !

1. *Assume* that the *frog* is initially placed on a *number line* at *zero*

   facing the *side* of *positive integers* and *jumping* in equal leaps of *a natural number*.

   See the sample figure ↓ where frog could jump in equal leaps of 3′s.



   A frog lands on two three digit numbers both having middle digits as 2 and many more numbers.

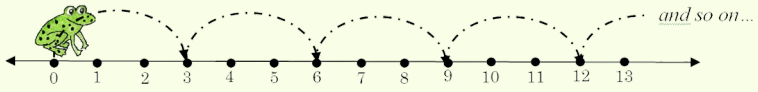
   Which of the following can never be a leap number for the *jumping frog*?

   A. 11 B. 9 C. 7 D. 5

2. *Assume* that the *frog* is initially placed on a *number line* at *zero*

   facing the *side* of *positive integers* and *jumping* in equal leaps of *a natural number*.

   See the sample figure ↓ where frog could jump in equal leaps of 3′s.



   A *frog* lands on $1247, 5633, 11051$ and *many more*.

   What is the possible longest leap number for the *jumping frog*? _____.

3. What is the *HCF* of $1736, 3875$ and 15872 ? _____.

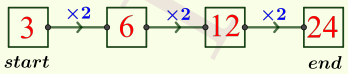
4. Here is a *Number Trip - Game*, The *rules* are as *follows*:
   - The *trip* should be made from 2 to 2024.
   - You can *travel by adding* 2 or *multiplying* 11 or *multiplying* 5 only.
   - No other operation or choice of numbers is allowed!

   What is the smallest number of steps required for the *number trip* $2 \to 2024$? _____.

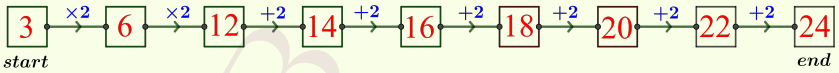
5. Here is a *Number Trip - Game*, The *rules* are as *follows*:
   - The *trip* is from 3 to 24.
   - You can *travel by adding* 2 or *multiplying* 2 only.
   - No other operation or choice of numbers is allowed!

   There are *many possible routes* in total from $3 \to 24$, of which two are shown below $\downarrow$

   Route 1

   Route 2

   There is a number trip from $3 \to 24$ that has exactly two even numbers; rest all odd numbers.

   What will be the *sum* of all the numbers in this trip from $3 \to 24$? _____.

Maximum time: 80 *minutes*

Frog Jumping Theory, Number Trip Game, Cows & Bulls, Basic Counting

KEM2 - Maths Olympiad for Std 7,8 together @ *ABIMS*

Try on your own ! Don't use calculators ! Think and Answer !

Name:_____ Standard:_____

I Answer the following questions accordingly !

1. A frog lands on numbers $135, 432$ and many more.

   Let m be the smallest possible number of $3-$ digit landing numbers of the frog.

   Let n be the largest possible number of $3-$ digit landing numbers of the frog.

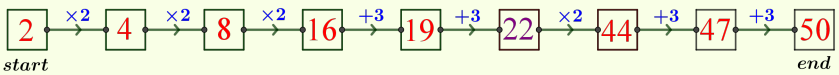
   Then, the value of $m + n$ is _____.

2. Here is a *Number Trip - Game*, The *rules* are as *follows*:

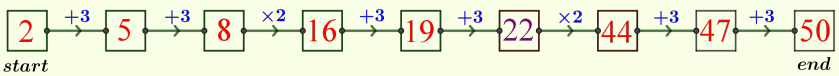
   - The required trip is from 2 to 50.
     You should reach 50 and not allowed to cross it!
   - You can *travel by adding* 3 or *multiplying* 2 only.
   - No other operation or choice of numbers is allowed!
   - 22 must be one of the station numbers, during this trip.

   There are *many possible routes* in total from $2 \to 50$ via 22, of which two are shown below ↓

   Route 1

   Route 2

   How many such trips are there from $2 \to 50$ via 22? _____.

3. Here are the first 5 trials of a Cows & Bulls game played between Player A and Player B.

   Here the number thought by Player A, was a 5-digit code.

Trial No.	Code Guessed by Player B	Hints given by Player A	
		No. of Cows	No. of Bulls
1	36801	0	0
2	43012	0	1
3	75992	0	5
4	56789	1	2
5	97905	0	4

   The 5− digit code thought by player A was _____.

4. The product of the digits of a 4− digit number is 0.

   How many such 4− digit numbers are there? _____.

5. Suppose the leap number of a frog > 1.

   Then , which of the following statements is definitely $FALSE$?

   A. The frog lands on two numbers; one prime and other composite and many more.

   B. The frog lands on two two-digit numbers both ending with digit 9 and many more.

   C. The frog has no three-digit landing number but lands on many numbers.

   D. none of these.

6. Here is a *Number Trip - Game*, The *rules* are as *follows*:

   - The required trip is from a number to 100.
   - You can *travel by adding* 5 or *by subtracting* 5 or *multiplying by* 5 or *dividing by* 5 only.
   - No other operation or choice of numbers is allowed!

   Following the given rules, which one has the smallest number of steps among the following routes?

   A. Number Trip from $1 \to 100$

   B. Number Trip from $3.8 \to 100$

   C. Number Trip from $4.4 \to 100$

   D. Number Trip from $1000 \to 100$

SEE NEXT PAGE!

7. Here are the first 5 trials of a Cows & Bulls game played between Player A and Player B.

   Here the number thought by Player A, was a 3-digit code.

Trial No.	Code Guessed by Player B	Hints given by Player A	
		No. of Cows	No. of Bulls
1	351	0	2
2	678	0	0
3	904	0	0
4	456	0	1
5	123	0	2

   The sum of all possible 3− digit codes thought by player A was _____.

8. A triple of distinct integers need to be selected from the first 10 natural numbers.

   Examples are: $(2,3,9),(5,1,7),(8,6,4), e.t.c$

   How many triples will have their product value to be divisible by 4? _____.

   Note: A triple $(2,3,9)$ is same as $(2,9,3),(3,2,9),(3,9,2),(9,2,3) or (9,3,2)$.

9. A frog lands on numbers $943, 1863, 2783$ and many more numbers. What could be the longest leap of the frog? _____.

10. Here is a *Number Trip - Game*, The *rules* are as *follows*:

    - The required trip is from 20 to 11.
      You should reach 11 and not allowed to cross it!
    - You can *travel by subtracting* 1 or 4 or 7 only.
    - No other operation or choice of numbers is allowed!
    - No landing number (in between) should contain digit 6 or 8 in it.

    How many *possible routes* are there from $20 \to 11$? _____.

SEE NEXT PAGE!

11. Here are the first 6 trials of a Cows & Bulls game played between Player A and Player B.

    Here the number thought by Player A, was a 4-digit code.

Trial No.	Code Guessed by Player B	Hints given by Player A	
		No. of Cows	No. of Bulls
1	4036	0	0
2	5791	1	2
3	2890	0	2
4	1700	0	2
5	8536	0	0
6	7429	0	3

    The 4− digit code thought by player A was _____.

12. The number of factors of 648 is _____.

13. A frog lands on numbers $1260, 2340$ and many more numbers, but doesn't land on 36 and 45.

    What could be the shortest leap of the frog? _____.

14. Here is a *Number Trip - Game*, The *rules* are as *follows*:

    - The required trip is from 2024 to 1.
    - You can *travel by either adding* 1 or *dividing by* 5 only.
    - No other operation or choice of numbers is allowed!
    - All station numbers should be natural numbers!

    What is *the smallest number of steps* required for the number trip from $2024 \to 1$? ___.

SEE NEXT PAGE!

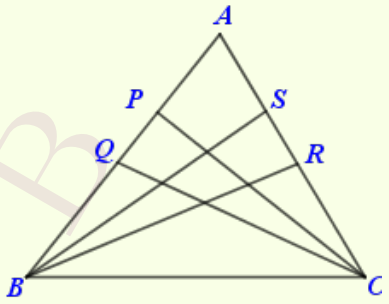
15. Here are the first 5 trials of a Cows & Bulls game played between Player A and Player B.

    Here the number thought by Player A, was a 2-digit code.

Trial No.	Code Guessed by Player B	Hints given by Player A	
		No. of Cows	No. of Bulls
1	27	0	0
2	81	0	1
3	43	0	0
4	95	0	0
5	60	0	1

    The sum of all possible $2-$ digit codes thought by player A was _____.

16. A triangle ABC is dissected into 9 pieces by line segments BS, BR, CP, CQ as shown. P, Q are points on AB; R, S are points on CA , as shown.



    How many triangles are realised from the figure? _____.

17. A frog lands on 2025 and many more numbers. If the leap number of the frog is a $3-$ digit number, how many such possible leap numbers are there? _____.

18. Here is a *Number Trip - Game*, The *rules* are as *follows*:

    - The required trip is from 5 to 55.
    - You can *travel by either adding* 2 or *adding* 4 or *adding* 6 only.
    - No other operation or choice of numbers is allowed!
    - All station numbers other than the start station, should be composite numbers!

    How many such possible number trips are there from $5 \to 55$? ___.

19. Here are the first 5 trials of a Cows & Bulls game played between Player A and Player B.

    Here the number thought by Player A, was a 6-digit code.

Trial No.	Code Guessed by Player B	Hints given by Player A	
		No. of Cows	No. of Bulls
1	736412	0	6
2	273641	0	6
3	127364	0	6
4	334477	3	0
5	641273	0	6

    The 6− digit code thought by player A was _____.

20. How many natural numbers are there from 500 to 999 having no two consecutive digits being identical? _____.

    Note: $535,707,848$ qualifies where as $553,889,911$ does not.

COWS and BULLS & BASIC COUNTING & SOCCER SCORE TABLE

ASSIGNMENT - 2

KEM2 - Maths Olympiad for Std 7^{th} and 8^{th} together @ *ABIMS*

Shri Sadagopan Rajesh

Try on your own!

Post your detailed (not just numbers) and neat solution(s) to : kem2022.23@gmail.com (only!)

Mention your Name, Standard INSIDE ANSWER SHEET along with Course code: KEM2, Topic and Assignment number.

Use unruled note, submit a clearer view of answers preferably in a single pdf file using adobe scan app (only one answer file for one assignment)

You may go through the related lecture session(s) before trying this!

Dead Line for submission of this assignment: 13th October, 2024 (SUN)

ARYABHATTA INSTITUTE OF MATHEMATICAL SCIENCES

INDIA

September 2024

MATHS OLYMPIAD - STD 7, 8

ASSIGNMENT - 2

Hope you have studied the live class video before trying this worksheet !

Name:_____ Standard:_____

1 Cows & Bulls

1. Here are the first 6 trials of a Cows & Bulls game played between Player A and Player B.

   Here the number thought by Player A, was a 5-digit code.

Trial No.	Number Guessed by Player B	Hints given by Player A	
		No. of Cows	No. of Bulls
1	12345	1	1
2	67890	0	2
3	32019	0	3
4	98654	0	0
5	12800	0	3
6	24680	0	1

   - A Cow: Right digit in the right position.
   - A Bull: Right digit in the wrong position.
   - Neither a Cow nor a Bull: Wrong digit.

   If the hints given by A were all correct, then find the 5-digit code thought by A. Give reasons.

2. Suppose *Player A* thinks of a 6-digit code and *Player B*$'s$ guess in the first trial was 667667.

   Player A responds by saying: "2 cows and 4 bulls".

   How many possibilities are there for A''s code from these hints? _____. Give reasons.

SEE NEXT PAGE!

2 Basic Counting

3. Let p be the number of 4-digit multiples of 4.

   Let q be the number of 4-digit numbers, whose middle digits form a prime number.

   (Examples are: $20\underline{2}3, 61\underline{7}4, 57\underline{3}9, etc...$). Which is bigger: p or q? Give reasons.

4. How many factors of 6^{100} are not factors of 6^{50} ? Give reasons.

3 Soccer Score Table

5. Certain number of soccer teams played a league basis of tournament.

   Each team played against every other team exactly once.

   Total MP = 156 and Total points = 250. (Win: 3 points; Draw: 2 points each)

   Let the total number of teams played in the tournament be t.

   Let the total number of matches (actually) played in the tournament be p.

   Let the total number of matches resulted in a draw, be d.

   Find the values of t, p and d. Give reasons.

6. Four soccer teams A, B, C and D play 6 matches in total.

   Each team play against each of the other 3 teams exactly once.

Sl.No	Team	M.P.	W	L	D	G.F.	G.A.	Points
1	**A**	3	3			9	6	
2	**B**	3			2	12		
3	**C**	3			2		8	
4	**D**	3			2			
NA	$Total \rightarrow$					35		

   A win match fetches 3 points for the winning team; A drawn match fetches 2 points for each team.

   The score table is filled partially. In the match A v/s B, A scored 4 goals against B.

   In the match A v/s D, D scored 1 goal against A. Complete the soccer score table. Give reasons.

KEEP ENJOYING MATHEMATICS!