



MATHS

NCERT - NCERT Maths(Telugu)

PROOFS IN MATHEMATICS

Example

1. Restate the following statements with appropriate conditions, so that they become true statements.

For every real number x , $3x > x$



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2. Restate the following statements with appropriate conditions, so that they become true statements.

For any x , $x^3 \geq 0$.



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3. Restate the following statements with appropriate conditions, so that they become true statements.

If you divide a number by two, you will always get half of that number.



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4. Restate the following statements with appropriate conditions, so that they become true statements.

The angle subtended by a chord of a circle at a point on the circle is 90°

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5. Restate the following statements with appropriate conditions, so that they become true statements.

If a quadrilateral has all its sides equal, then it is a square.

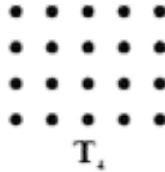
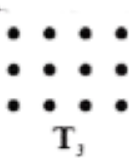
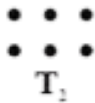
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6. The following geometric arrays suggest a sequence of numbers.

(a) Find the next three terms .

(b) Find the 100^{th} term .

(c) Find the n^{th} term .



The dots here arranged in such a way that they form a rectangle.

Here $T_1 = 2$, $T_2 = 6$, $T_3 = 12$, $T_4 = 20$ and so on. Can you guess

what T_5 is? What about T_6 ? What about T_n ?

Make a conjecture about T_n .

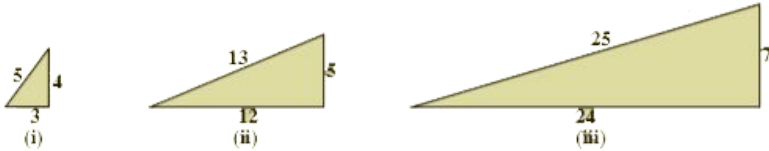
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Try This

1. Which of the following metal can be extracted by smelting

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2. Envid by the popularity of Pythagoras his disciple claimed a different relation between the sides of right angle triangles. By observing this what do you notice?



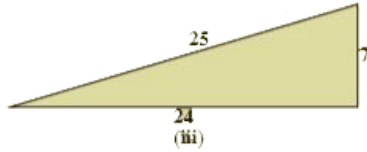
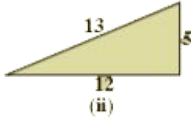
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3. Which of the above statements can be tested by giving a counter example ?

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4. Envid by the popularity of Pythagoras his disciple claimed a different relation between the sides of right angle triangles. By

observing this what do you notice?



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5. By giving a counter example, show that the following statement is false. If n is an odd integer, then n is prime.

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6. Envid by the popularity of Pythagoras his younger brother claimed a different relation between the sides of right angle triangles.



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Do This

1. Make 5 more sentences and check whether they are statements or not. Give reasons

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2. Make 2 more sentences and check whether they are statements or not? Give reasons.

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3. Make 5 more sentences and check whether they are statements or not. Give reasons



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Exercise 15 1

1. State whether the following sentences are always true, always false or ambiguous. Justify your answer

There are 27 days in a month.



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2. State whether the following sentences are always true, always false or ambiguous. Justify your answer

There are 27 days in a month.



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3. State whether the following sentences are always true, always false or ambiguous. Justify your answer

The temperature in Hyderabad is $2^{\circ}C$.



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4. State whether the following sentences are always true, always false or ambiguous. Justify your answer

The earth is the only planet where life exist.



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5. State whether the following sentences are always true, always false or ambiguous. Justify your answer

Dogs can fly.



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6. State whether the following sentences are always true, always false or ambiguous. Justify your answer

February has only 28 days.

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7. State whether the following statements are true or false. Give reasons for your answers.

The sum of the interior angles of a quadrilateral is 350°

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8. State whether the following statements are true or false. Give reasons for your answers.

For any real number x , $x^2 \geq 0$.



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9. State whether the following statements are true or false. Give reasons for your answers.

A rhombus is a parallelogram .



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10. State whether the following statements are true or false. Give reasons for your answers.

The sum of two even number is even .



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11. State whether the following statements are true or false. Give reasons for your answers.

Square number can be written as the sum of two odd numbers .

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12. Restate the following statements with appropriate conditions, so that they become true statements.

Two time a real number is always even.

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13. Restate the following statements with appropriate conditions, so that they become true statements.

For any x , $3x + 1 > 4$.

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14. Restate the following statements with appropriate conditions, so that they become true statements.

For any x , $x^3 \geq 0$.

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15. Restate the following statements with appropriate conditions, so that they become true statements.

In every triangle, a median is also an angle bisector.

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16. Disprove, by finding a suitable counter example, the statement $x^2 > y^2$ for all $x > y$.

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17. State whether the following sentences are always true, always false or ambiguous. Justify your answer

There are 27 days in a month.

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18. State whether the sentence are always true, always false or ambiguous. Justify Your answer: Makarasankranthi falls on Friday.

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19. State whether the following sentences are always true, always false or ambiguous. Justify your answer

The temperature in Hyderabad is $2^{\circ}C$.

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20. State whether the following sentences are always true, always false or ambiguous. Justify your answer

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A rhombus is a parallelogram .



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26. State whether the following statements are true or false. Give reasons for your answers.

The sum of two even number is even .



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27. Restate the statements with appropriate conditions, so that they become true statements: All numbers can be represented in prime factorization.



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28. Restate the following statements with appropriate conditions, so that they become true statements.

Two time a real number is always even.

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29. Restate the following statements with appropriate conditions, so that they become true statements.

For any x , $3x + 1 > 4$.

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31. Restate the following statements with appropriate conditions, so that they become true statements.

In every triangle, a median is also an angle bisector.

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32. Disprove, by finding a suitable counter example, the statement.

$$x^2 > y^2 \text{ for all } x > y$$

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Exercise 15 2

1. Use deductive reasoning to answer the following:

Human beings are mortal. Jeevan is a human being. Based on these two statements, what can you conclude about Jeevan ?



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2. Use deductive reasoning to answer the following:

All Telugu people are Indians. X is an Indian. Can you conclude that

X belongs to Telugu people.



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3. Use deductive reasoning to answer the following:

Martians have red tongues. Gulag is a Martian. Based on these

two statements, what can you conclude about Gulag?



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4. Use deductive reasoning to answer the following:

What is the fallacy in the Raju's reasoning in the cartoon below?



All Presidents are smart.
I am smart.
Therefore, I am a President.

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5. Once again you are given four cards. Each card has a number printed on one side and a letter on the other side. Which are the only two cards you need to turn over to check whether the following rule holds?

"If a card has a consonant on one side, then it has an odd number on the other side."

B

3

U

8

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6. Think of this puzzle What do you need to find a chosen number from this square? Four of the clues below are true but do nothing to help in finding the number. Four of the clues are necessary for finding it.

Here are eight clues to use:

- a. The number is greater than 9.
- b. The number is not a multiple of 10.
- c. The number is a multiple of 7.
- d. The number is odd.
- e. The number is not a multiple of 11.
- f. The number is less than 200.
- g. Its ones digit is larger than its tens digit.
- h. Its tens digit is odd.

What is the number?

Can you sort out the four clues that help and the four clues that do not help in finding it?

First follow the clues and strike off the number which comes out

from it. Like - from the first clue we come to know that the number is not from 1 to 9. (strike off numbers from 1 to 9).

After completing the puzzle, see which clue is important and which is not?

--

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99



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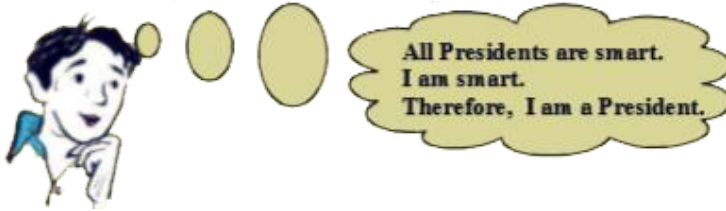
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10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99



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Exercise 15 3

1. Take any three consecutive odd numbers and find their product,
for example

$$1 \times 3 \times 5 = 15, 3 \times 5 \times 7 = 105, 5 \times 7 \times 9 = \dots\dots\dots$$

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2. Take any three consecutive even numbers and add them , say ,

$$2 + 4 + 6 = 12, 4 + 6 + 8 = 18, 6 + 8 + 10 = 24, 8 + 10 + 12 = 30$$

and so on.

Is there any pattern can you guess in these sums? What can you conjecture about them?

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3. Go back to Pascal's triangle .

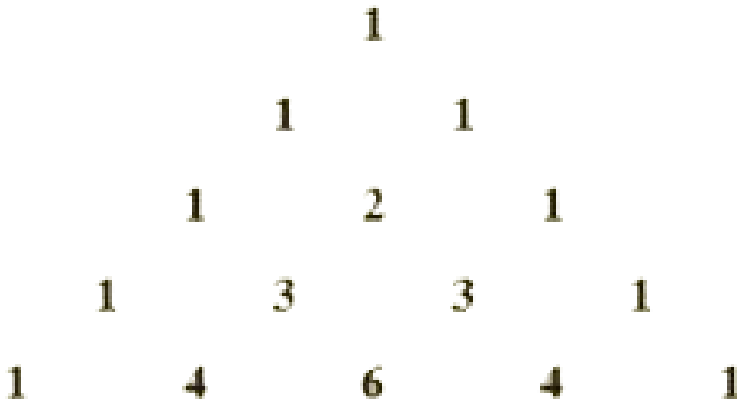
$$\text{Line } -1 : 1 = 11^0$$

Line -2 : $11 = 11^1$

Line-3 : $121 = 11^2$

Make a conjecture about Line-4 and Line-5 .

Does your conjecture hold ? Does your conjecture hold for Line -6 too ?



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4. Look at the following pattern. i) $28 = 2^2 \times 7^1$, Total number of factors $(2 + 1)(1 + 1) = 3 \times 2 = 6$ 28 is divisible by 6 factors i.e., 1,2,4,7,14,28.

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5. Look at the following pattern:

$$1^2 = 1$$

$$11^2 = 121$$

$$111^2 = 12321$$

$$1111^2 = 1234321$$

$$11111^2 = 123454321$$

Make a conjecture about about each of the following :

$$111111^2 = \dots\dots\dots .$$

$$1111111^2 = \dots\dots\dots .$$

Check if your conjecture is true .

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6. In a polynomial $p(x) = x^2 + x + 41$ put different value of x and find $p(x)$. Can you conclude after putting different value of x that

$p(x)$ is prime for all. Is x an element of N ? Put $x=41$ in $p(x)$. Now what do you find ?

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7. Take any three consecutive odd numbers and find their product, for example

$$1 \times 3 \times 5 = 15, 3 \times 5 \times 7 = 105, 5 \times 7 \times 9 = \dots\dots\dots$$

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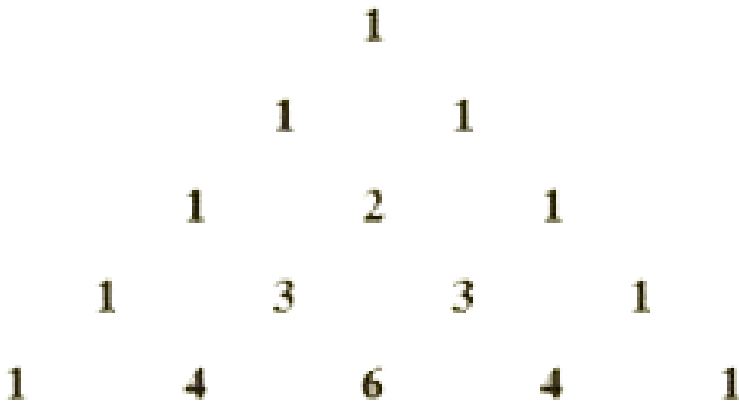
Line -1 : $1 = 11^0$

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Make a conjecture about Line-4 and Line-5 .

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10. Look at the following pattern. i) $28 = 2^2 \times 7^1$, Total number of factors $(2 + 1)(1 + 1) = 3 \times 2 = 6$ 28 is divisible by 6 factors i.e., 1,2,4,7,14,28.

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11. Look at the following pattern. ii) $30 = 2^1 \times 3^1 \times 5^1$, Total number of factors $(1 + 1)(1 + 1)(1 + 1) = 2 \times 2 \times 2 = 8$ 30 is divisible by 8 factors i.e., 1,2,3,5,6,10,15 and 30 Find the pattern.
[Hint: product of every prime base exponent + 1]

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12. Look at the following pattern:

$$1^2 = 1$$

$$11^2 = 121$$

$$111^2 = 12321$$

$$1111^2 = 1234321$$

$$11111^2 = 123454321$$

Make a conjecture about about each of the following :

$$111111^2 = \dots\dots\dots .$$

$$1111111^2 = \dots\dots\dots .$$

Check if your conjecture is true .

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13. List five axioms (postulates) used in text book.

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14. In a polynomial $p(x) = x^2 + x + 41$ put different value of x and find $p(x)$. Can you conclude after putting different value of x that $p(x)$ is prime for all. Is x an element of \mathbb{N} ? Put $x=41$ in $p(x)$.
Now what do you find ?



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Exercise 15 4

1. State which of the following are mathematical statements and which are not? Give reason.

She has blue rays



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2. State which of the following are mathematical statements and which are not? Give reason.

$$x + 7 = 18$$



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3. State which of the following are mathematical statements and which are not? Give reason.

Today is not Sunday .

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4. State which of the following are mathematical statements and which are not? Give reason.

For each counting number x , $x + 0 = x$

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5. State which of the following are mathematical statements and which are not? Give reason.

What time is it ?

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6. Find counter examples to disprove the following statements:

Every rectangle is a square.



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7. Find counter examples to disprove the following statements:

For any integers x and y , $\sqrt{x^2 + y^2} = x + y$



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8. Examine why they work ?

Choose a number. Double it. Add nine. Add your original number.

Divide by three. Add four. Subtract your original number. Your

result is seven.



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9. Write down any three-digit number (for example, 425). Examine why they work ?

Make a six-digit number by repeating these digits in the same order (425425). Your new number is divisible by 7, 11, and 13.

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16. Find counter examples to disprove the following statements:

For any integers x and y , $\sqrt{x^2 + y^2} = x + y$

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17. Find counter examples to disprove the statements: If n is a whole number, then $2n^2 + 11$ is a prime.

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18. Find counter examples to disprove the statements: Two triangle are congruent if all their corresponding angles are equal.

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19. Find counter examples to disprove the statements: A quadrilateral with all sides are equal in a square.

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20. Prove that the sum of two odd numbers is even.



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21. Prove that the product of two even numbers is an even numbers.

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22. Prove that if x is odd, then x^2 is also odd

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23. Examine why they work ?

Choose a number. Double it. Add nine. Add your original number. Divide by three. Add four. Subtract your original number. Your result is seven.

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24. Write down any three-digit number (for example, 425). Examine why they work ?

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Examples

1. what is prime number.give few examples

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2. “Product of two odd integers is even”. Consider 3 and 5 as the odd integers. Their product is 15, which is not even.



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3. Among the sentences there are some like “ Humans are meant to rule the earth” or “Ramu is a good driver.”



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4. Consider some of the other sentences like. The earth has one Moon. Bhaskara has written the book “Leelavathi”. Think about how would you verify these to consider as statements?



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5. Restate the following statements with appropriate conditions, so that they become true statements.

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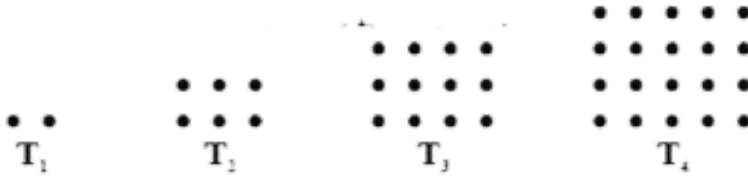
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10. The following geometric arrays suggest a sequence of numbers.

(a) Find the next three terms .

(b) Find the 100^{th} term .

(c) Find the n^{th} term .



The dots here arranged in such a way that they form a rectangle.

Here $T_1 = 2$, $T_2 = 6$, $T_3 = 12$, $T_4 = 20$ and so on. Can you guess what T_5 is ? What about T_6 ? What about T_n ?

Make a conjecture about T_n .

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11. what is a prime number ? is 1 a prime number ?

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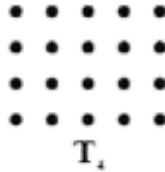
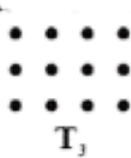
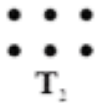
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Make a conjecture about T_n .

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Square number can be written as the sum of two odd numbers .

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12. Restate the statements with appropriate conditions, so that they become true statements: All numbers can be represented in prime factorization.

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13. Restate the following statements with appropriate conditions, so that they become true statements.

Two time a real number is always even.

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14. Restate the following statements with appropriate conditions, so that they become true statements.

For any x , $3x + 1 > 4$.

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15. Restate the following statements with appropriate conditions, so that they become true statements.

For any x , $x^3 \geq 0$.

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16. Restate the following statements with appropriate conditions, so that they become true statements.

In every triangle, a median is also an angle bisector.

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17. Disprove, by finding a suitable counter example, the statement.

$$x^2 > y^2 \text{ for all } x > y$$

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Exercise 15 2

1. Use deductive reasoning to answer the following:

Human beings are mortal. Jeevan is a human being. Based on

these two statements, what can you conclude about Jeevan ?

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2. Use deductive reasoning to answer the following:

All Telugu people are Indians. X is an Indian. Can you conclude that X belongs to Telugu people.

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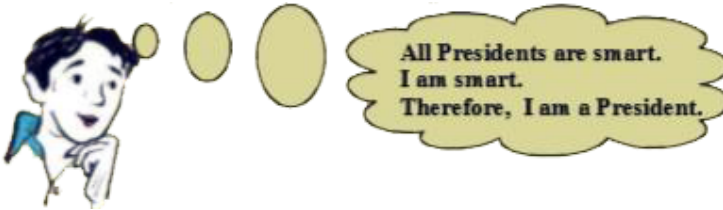
3. Use deductive reasoning to answer the following:

Martians have red tongues. Gulag is a Martian. Based on these two statements, what can you conclude about Gulag?

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4. Use deductive reasoning to answer the following:

What is the fallacy in the Raju's reasoning in the cartoon below?



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5. Once again you are given four cards. Each card has a number printed on one side and a letter on the other side. Which are the only two cards you need to turn over to check whether the following rule holds?

"If a card has a consonant on one side, then it has an odd number on the other side."

B

3

U

8



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6. Think of this puzzle What do you need to find a chosen number from this square? Four of the clues below are true but do nothing to help in finding the number. Four of the clues are necessary for finding it.

Here are eight clues to use:

- a. The number is greater than 9.
- b. The number is not a multiple of 10.
- c. The number is a multiple of 7.
- d. The number is odd.
- e. The number is not a multiple of 11.
- f. The number is less than 200.
- g. Its ones digit is larger than its tens digit.
- h. Its tens digit is odd.

What is the number?

Can you sort out the four clues that help and the four clues that

do not help in finding it?

First follow the clues and strike off the number which comes out from it. Like - from the first clue we come to know that the number is not from 1 to 9. (strike off numbers from 1 to 9).

After completing the puzzle, see which clue is important and which is not?

--

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99



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Exercise 15 3

1. Take any three consecutive odd numbers and find their product,
for _____ example

$$1 \times 3 \times 5 = 15, 3 \times 5 \times 7 = 105, 5 \times 7 \times 9 = \dots\dots\dots$$

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2. Take any three consecutive even numbers and add them , say ,

$$2 + 4 + 6 = 12, 4 + 6 + 8 = 18, 6 + 8 + 10 = 24, 8 + 10 + 12 = 30$$

and so on.

Is there any pattern can you guess in these sums? What can you
conjecture about them?

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3. Go back to Pascal's triangle .

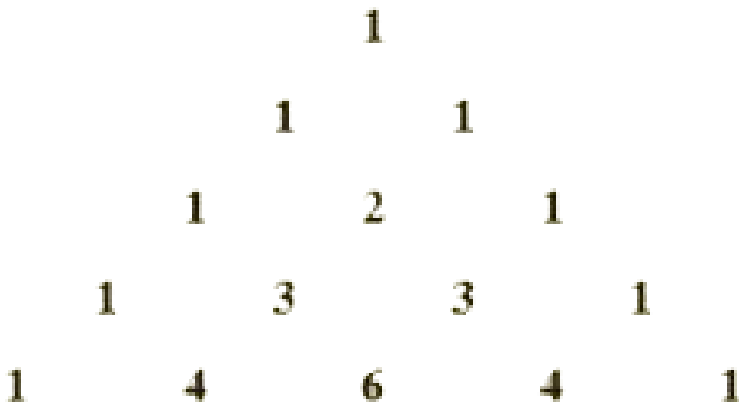
Line -1 : $1 = 11^0$

Line -2 : $11 = 11^1$

Line-3 : $121 = 11^2$

Make a conjecture about Line-4 and Line-5 .

Does your conjecture hold ? Does your conjecture hold for Line -6 too ?



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4. Look at the following pattern. i) $28 = 2^2 \times 7^1$, Total number of factors $(2 + 1)(1 + 1) = 3 \times 2 = 6$ 28 is divisible by 6 factors i.e., 1,2,4,7,14,28.

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5. Look at the following pattern. ii) $30 = 2^1 \times 3^1 \times 5^1$, Total number of factors $(1 + 1)(1 + 1)(1 + 1) = 2 \times 2 \times 2 = 8$ 30 is divisible by 8 factors i.e., 1,2,3,5,6,10,15 and 30 Find the pattern.

[Hint: product of every prime base exponent + 1]

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6. Look at the following pattern:

$$1^2 = 1$$

$$11^2 = 121$$

$$111^2 = 12321$$

$$1111^2 = 1234321$$

$$11111^2 = 123454321$$

Make a conjecture about about each of the following :

$$111111^2 = \dots\dots\dots .$$

$$1111111^2 = \dots\dots\dots .$$

Check if your conjecture is true .

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7. List five axioms (postulates) used in text book.

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8. In a polynomial $p(x) = x^2 + x + 41$ put different value of x and find $p(x)$. Can you conclude after putting different value of x that

$p(x)$ is prime for all. Is x an element of N ? Put $x=41$ in $p(x)$. Now what do you find ?

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Exercise 15 4

1. State which of the following are mathematical statements and which are not? Give reason.

She has blue rays

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2. State which of the following are mathematical statements and which are not? Give reason.

$$x + 7 = 18$$

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3. State which of the following are mathematical statements and which are not? Give reason.

Today is not Sunday .

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4. State which of the following are mathematical statements and which are not? Give reason.

For each counting number x , $x + 0 = x$

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5. State which of the following are mathematical statements and which are not? Give reason.

What time is it ?

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6. Find counter examples to disprove the following statements:

Every rectangle is a square.

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7. Find counter examples to disprove the following statements:

For any integers x and y , $\sqrt{x^2 + y^2} = x + y$

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8. Find counter examples to disprove the statements: If n is a whole number, then $2n^2 + 11$ is a prime.



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9. Find counter examples to disprove the statements: Two triangle are congruent if all their corresponding angles are equal.

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10. Find counter examples to disprove the statements: A quadrilateral with all sides are equal in a square.

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11. Prove that the sum of two odd numbers is even.

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12. Prove that the product of two even numbers is an even numbers.

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13. Prove that if x is odd, then x^2 is also odd

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14. Examine why they work ?

Choose a number. Double it. Add nine. Add your original number. Divide by three. Add four. Subtract your original number. Your result is seven.

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15. Write down any three-digit number (for example, 425). Examine why they work ?

Make a six-digit number by repeating these digits in the same order (425425). Your new number is divisible by 7, 11, and 13.



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