



MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

MATHEMATICAL REASONING

Solved Examples And Exercises

1. Consider the following sentence. Is it a statement?: Washington D.C. is in America.



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2. Consider the following sentence: Two plus three is five. Is it a statement?



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3. Consider the following sentence: The sun is a star. Is it a statement?



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4. Consider the following sentence: Moon revolves around the Earth. Is it a statement?



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5. Consider the following sentence: Every square is a rectangle. Is it a statement?



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6. Consider the following sentence: Three plus four is 6. Is it a statement?



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7. Consider the following sentence: Every rectangle is a square. Is it a statement?



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8. Consider the following sentence: the earth is a star. Is it a statement?



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9. Consider the following sentence: New Delhi is in Nepal. Is it a statement?



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10. Consider the following sentence: Give me a glass of water. Is it a statement?



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11. Consider the following sentence: Bring some fruits from the fruit shop. Is it a statement?



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12. Consider the following sentence: Please do me a favor. Is it a statement?



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13. Consider the following sentence: Switch on the light. Is it a statement?



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14. Consider the following sentence: Do your homework. Is it a statement?



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15. Consider the following sentence: Where is your pen? Is it a statement?



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16. Consider the following sentence: How are you? Is it a statement?



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17. Consider the following sentence: Is every set finite? Is it a statement?



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18. Consider the following sentence: Where are you going? Is it a statement?



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19. Consider the following sentence: Have you ever seen Taj Mahal? Is it a statement?



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20. Consider the following sentence: May God bless You! Is it a statement?



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21. Consider the following sentence: May you live long! Is it a statement?



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22. Is the following sentences are statements or propositions? Justify your answer: the set of prime integers is infinite.



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23. Is the following sentence statement or proposition? Justify your answer: The moon is made of green cheese.



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24. Is the following sentences statement or proposition? Justify your answer: Who are you?



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25. Is the following sentence statement or proposition? Justify your answer: Paris is in England



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26. Is the following sentence statement or proposition? Justify your answer: May God bless you!



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27. Is the following sentence statement or proposition? Justify your answer: The number x is a positive integer.



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28. Is the following is a statement (or proposition)? $x + 2 = 9$.



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29. Is the following a statement (or proposition)? 6 has three prime factors



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30. Is the following a statement (or proposition)? $x^2 + 5x + 6 = 0$



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31. Check whether the following sentence is a statement. Give reasons for your answer: 18 is less than 16.



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32. Consider the following sentence: The sun is a star. Is it a statement?



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33. Check whether the following sentence is a statement. Give reasons for your answer:
There is no rain without clouds.



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34. Check whether the following sentence is a statement. Give reasons for your answer: Every set is a finite set.



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35. Check whether the following sentence is a statement. Give reasons for your answer: Mathematics is fun.



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36. Check whether the following sentences is a statement. Give reasons for your answer: How far is Chennai from here?



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37. Find out that the following sentence is a statement or not. Justify your answer: Listen Me , Ravi!



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38. Find out that that the following sentence is a statement or not. Justify your answer: Two non-empty sets have always a non-empty intersection.



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39. Find out that the following sentence is a statement or which are not. Justify your answer: the cat pussy is black.



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40. Find out which of the following sentences are statements and which are not. Justify your answer: all triangles have three sides



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41. Find out that the following sentence is a statement or not. Justify your answer:

$x^2 + 5|x| + 6 = 0$ has no real roots.



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42. Find out whether following sentence is a statement or not. Justify your answer: Is the earth round?



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43. Find out whether the following sentence is a statement or not. Justify your answer: the real number x is less than 2.



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44. Find out whether the following sentence is a statement or not. Justify your answer:
Mathematics is difficult.



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45. Find out whether the following sentence is a statement or not. Justify your answer: The product of (-1) and 8 is 8 .



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46. Check whether the following sentence is a statement. Give reasons for your answer: Every set is a finite set.



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47. Find out whether the following sentence is a statement or not. Justify your answer: Are all circles round?



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48. Find out whether the following sentence is a statement or not. Justify your answer: Every rhombus is a square.



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49. Find out whether the following sentences is a statement or not. Justify your answer: This sentence is a statement.



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50. Find out whether the following sentence is a statement or not. Justify your answer: Go!



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51. Find out whether the following sentence is a statement or not. Justify your answer: There are 35 days in a month.



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52. Find out whether the following sentence is a statement or not. Justify your answer: All real numbers are complex numbers.



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53. Give three examples of a sentence which are not statements. Give reasons for the answer.



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54. Write the negation of the following statement: New Delhi is a city.



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55. Write the negation of the following statement: I went to my class yesterday.



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56. Write the negation of the following statement: $\sqrt{7}$ is rational.



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57. Write the negation of the following statement: $\sqrt{2}$ is not a complex number.



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58. Write the negation of the following statements and check whether the resulting statements are true: The sum of 2 and 5 is 9.



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59. Write the negation of the following statements and check whether the resulting statements are true: Every natural number is greater than 0.



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60. Write the negation of the following statements and check whether the resulting statements are true: Australia is a continent.



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61. Write the negation of the following statement and check whether the a resulting statement is true: There does not exist a quadrilateral which has all its sides equal.



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62. Write the negation of the following statement: All mathematicians are man.



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63. Write the negation of the following statement: Everyone in Germany speaks German.



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64. Write the negation of the following statement: All complex numbers are real numbers.



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65. Write the negation of the following statement: All cats scratch.



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66. Write the negation of the following statement: All primes are odd.



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67. Write the negation of the following statement: all triangles are not equilateral triangles.



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68. Write the negation of the following statement: Every natural number is an integer.



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69. Write the negation of the following statement: Bangalore is the capital of Karnataka.



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70. Write the negation of the following statement: Ravish is honest.



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71. Write the negation of the following statement: The sun is cold.



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72. Write the negation of the following statement: It rained on July 4, 2005.



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73. Write the negation of the following statement: The earth is round.



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74. Write the negation of the following statement: All birds sing:



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75. Write the negation of the following statement: Some even integers are prime.



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76. Write the negation of the following statement: There is a complex number which is not a real number.



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77. Write the negation of the following statement: I will not go to school.



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78. Write the negation of the following statement: Both the diagonals of a rectangle have the same length.



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79. Write the negation of the following statement: All policemen are thieves.



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80. Are the following pairs of statements are negation of each other: The number x is not a rational number.



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81. Are the following pairs of statements are negation of each other: The number x is not a rational number. The number x is an irrational number.



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82. Write the negation of the following statement: p : For every positive real number x , the number $(x - 1)$ is also positive.



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83. Write the negation of the following statement: q : For every real number x , either $x > 1$ or $x < 1$.



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84. Write the negation of the following statement: r : There exists a number x such that \sqrt{x}



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85. Check whether the following pair of statements are negation of each other. Given reasons for your answer: $a + b = b + a$ is true for every real number a and b . There exist

real numbers a and b for which

$$a + b = b + a.$$



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86. Consider the following statement: $\sqrt{2}$ is an irrational number. Is it a simple statement?



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87. Consider the following statement: The set of real numbers is an infinite set. Is it a simple

statement?



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88. Is the following statement a simple statement? $2+5<4$.



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89. Find the component statements of the following compound statement: There is

something wrong with the bulb or with writing.



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90. Find the component statements of the following compound statement: It is raining and it is cold.



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91. Find the component statements of the following compound statement: The sun shines or it rains.



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92. Find the component statements of the following compound statement: The roof is red and the will is white.



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93. Find the component statements of the following compound statement: 0 is a positive number or a negative number.



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94. Find the component of the following compound statement and check whether they are true or not: $\sqrt{2}$ is a rational number or an irrational number.



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95. Find the component statement of the following and check whether they are true or not: All integer are positive or negative.



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96. Find the component statement of the following and check whether they are true or not: 24 is a multiple of 2,4, and 8.



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97. Find the component statement of the following and check whether they are true or not: all primes are either even or odd.



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98. For each of the following statements, determine whether an inclusive OR or exclusive OR is used. Give reasons for your answer: Sun rises or Moon sets. All integers are positive or negative.



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99. For each of the following statements, determine whether an inclusive OR or exclusive OR is used. Give reasons for your answer: Two lines intersected at a point or are parallel. The school is closed if it is a holiday or a Sunday.



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100. Write the component statement of the following compound statements and check whether the compound statement is true or false: A line is straight and extends indefinitely in both directions. All living things have two legs and two eyes.



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101. Write the component statements of the following compound statements and check

whether the compound statement is true or false: 125 is a multiple of 7 or 8. Mumbai is the capital of Gujrat or Maharashtra.



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102. Write the component statements of the following compound statements and check whether the compound statement is true or false: $\sqrt{2}$ The school is closed, if there is a holiday or Sunday.



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103. Write the negation of the following compound statement: All the students completed their homework and the teacher is present.



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104. Write the negation of the following compound statement: All rational numbers are real and all real numbers are complex.



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105. Write the negation of the following compound statement: Square of an integer is positive or negative.



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106. Write the negation of the following compound statement: The sand heats up quickly in the sun and does not cool down fast at night.



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107. Find the component statements of the following compound statement: The sky is blue and the grass is green.



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108. Find the component statements of the following compound statement: The earth is round or the sun is cold.



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109. Find the component statements of the following compound statement: All rational numbers are real and all real numbers are complex.



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110. Find the component statements of the following compound statement: 25 is a multiple of 5 and 8.



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111. For each of the following statements, determine whether an inclusive OR or exclusive OR is used. Give reasons for your answer: Students can take Hindi or Sanskrit as their third language. To enter a country, you need a passport or a voter registration card.



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112. For each of the following statements, determine whether an inclusive OR or exclusive OR is used. Give reasons for your answer: A lady gives birth to a baby boy or a baby girl. To apply for a driving license, you should have a ration card or a passport.



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113. Write the component statements of the following compound statements and check

whether the compound statement is true or false: (i) Square of an integer is positive or negative (ii) $x = 2$ and $x = 3$ are the roots of the equation $3x^2 - x - 10 = 0$ (iii) The sand heats up quickly in the sun and does not cool down fast at night.



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114. Write the component statements of the following compound statements and check whether the compound statement is true or

false: (i) To enter into a public library children need an identity card from the school or a letter from the school authorities. (ii) All rational numbers are real and all real numbers are not complex.



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115. Determine whether the following compound statements are true or false:

(i) Delhi is in India and $2+2=4$ (ii) Delhi is in India and $2+2=5$



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116. Determine whether the following compound statements are true or false: (i) Delhi is in England and $2+2=4$ (ii) Delhi is in England and $2+2=5$



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117. Identify the quantifier in each of the following statements: (i) For every real number x , $x + 4$ is greater than x . (ii) There exists a

real number which is twice of itself. (iii) There exists a (living) person who is 200 years old.

(iv) For every $x \in \mathbb{N}$, $x + 1 > x$.



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118. Write the negation of the following statements: (i) For all positive integer x , we have $x + 2 > 8$. (ii) Every living person is not 150 years old.



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119. Write the negation of the following statements: (i) All students live in the dormitories (ii) Some students are 25 (years) or older.



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120. Write the negation of each of the following statements: (i) For every real number x , $x + 0 = x = 0 + x$ (ii) For every real number, x , x is less than $x + 1$



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121. Write the negation of each of the following statements: (i) There exists a capital for every state in India. (ii) There exists a number which is equal to its square.



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122. Write the negation of the following statement: for every $x \in \mathbb{N}$, $x + 3 < 10$



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123. Negate the following statement: All the students completed their homework.



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124. Negate the following statement: There exists a number which is equal to its square.



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125. Rewrite the following statement with if then in five different ways conveying the same meaning: If a natural number is odd, then its square is also odd.



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126. Write each of the following statements in the form if-then (i) You get job implies that your credentials are good. (ii) You can access the website only if you pay a subscription fee.





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127. Write each of the following statements in the form if-then (i) The banana trees will bloom if it stays warm for a month (ii) A quadrilateral is a parallelogram if its diagonals bisect each other. (iii) To get A^+ in the class, it is necessary that you do all the exercises of the book.



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128. Write the contrapositive of the following statements: (i) If a number is divisible by 9, then it is divisible by 3. (ii) If you are born in India, then you are a citizen of India (iii) If a triangle is equilateral it is isosceles.



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129. Write the contrapositive of the following statements: (i) If x is prime number then x is odd (ii) If two lines are parallel then they do not

intersect in the same plane. (iii) x is even number implies that x is divisible by 4.



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130. Write the contrapositive of the following statements: (i) Something is cold implies that it has low temperature (ii) You cannot comprehend geometry if you do not know how to reason deductively.



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131. Write the converse of the following statements: (i) If a number is even then n^2 is even (ii) If you do all the exercises in the book, you get an A grade in the class.



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132. Write the converse of the following statements: (i) If two integers a and b are such that $a > b$ then $a - b$ is always a positive integer.



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133. Write the component statements of each of the following statements. Also, check whether the statements are true or not. (i) If a triangle ABC is equilateral then it is isosceles. (ii) If a and b are integers, then ab is a rational number.



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134. Given below are two pairs of statements. Combine these two statements using if and only if: p : if a rectangle is a square, then all its four sides are equal. q : if all the four sides of a rectangle are equal, then the rectangle is a square



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135. Given below are two pairs of statements. Combine these two statements using if and

only if: p : if the sum of the digits of a number is divisible by 3, then the number is divisible by 3. q : if a number is divisible by 3, then the sum of its digits is divisible by 3.



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136. Write the following statements in the form if p then q : You can access the website only if you pay a subscription fee.



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137. Write each of the following statements in the form if p then q : There is traffic jam whenever it rains.



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138. Write the following statements in the form if p then q : It is necessary to have a passport to log on to the server.



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139. Write each of the following statements in the form if p then q : It is necessary to be rich in order to be happy.



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140. Write each of the following statements in the form if p then q : The game is canceled only if it is raining.



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141. Write the following statement in the form

if p then q : It rains only if it is cold.



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142. Write the following statement in the form

if p then q : Whenever it rains it is cold.



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143. Write the following statements in the form if p then q : It never rains when it is cold.



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144. State the converse and contrapositive of the following statement: If it is hot outside, then you feel thirsty.



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145. State the converse and contrapositive of the following statement: I go to a beach whenever it is a sunny day.



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146. State the converse and contrapositive of the following statement: A positive integer is prime only if it has no divisor other than 1 and itself.



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147. State the converse and contrapositive of the following statement: If you live in Delhi, then you have winter clothes.



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148. State the converse and contrapositive of the following statement: If a quadrilateral is a parallelogram then its diagonals bisect each other.



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149. Rewrite the following statements in the form p if only if q : if you watch television then your mind is free and if your mind is free, then you watch television.



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150. Rewrite the following statement in the form p if only if q : q : if a quadrilateral is equiangular, then it is a rectangle and if a

quadrilateral is a rectangle, then it is equiangular.



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151. Rewrite the following statement in the form p if only if q : r : For you to get an A grade, it is necessary and sufficient that you do all the homework you regularly.



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152. Rewrite the following statement in the form p if only if q : If a tumbler is half empty, then it is half full and if a tumbler is half full, then it is half empty.



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153. Determine the contrapositive of each of the following statements: (i) If Mohan is a poet, then he is poor. (ii) If she works, she will earn money. (iii) It never rains when it is cold.





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154. Determine the contrapositive of each of the following statements: (i) If x is less than zero then x is not positive (ii) If he has courage, then he will win. (iii) It is necessary to be strong in order to be a sailor.



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155. Determine the contrapositive of each of the following statements: (i) Only if he does

not tire will he win I(ii)If x is an integer and x^2 is odd, then x is odd (iii)Only if max studies will he pass the test.



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156. Determine the contrapositive of each of the following statements: (i)If it snows, then they do not drive the car (ii)If ravish skis, then it snowed.



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157. Given below are two statements: p : 80 is a multiple of q : 80 is a multiple of 4. Write the compound statement using connective "AND" and check its validity.



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158. If p and q are two statement given by: p : 25 is multiple of 5. q : 25 is a multiple of 8. Write the compound statement using connective "AND" and check its validity.



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159. Given below are two statements: p : 25 is a multiple of 5. q : 25 is a multiple of 8. Write the compound statement using connective "OR" and check its validity.



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160. Check the validity of the following statement: "Square of an integer is positive or negative"



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161. Check whether the following statement is true or not: If x and y are odd integer, shten xy is an odd integer.



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162. Check whether the following statement is true and false by proving its contrapositive if x, y are integers such that xy is odd then both x and y are odd integers.



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163. Show that the statement: $p: \text{If } x \text{ is a real number such that } x^3 + 4x = 0, \text{ then } x \text{ is } 0$ is true by (i) Direct method (ii). method of contradiction (iii). method of contrapositive.



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164. Show that the following statement is true by the method of contrapositive: $p : \text{If } x \text{ is an}$

integer x^2 is even then x is also even.



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165. Using the words necessary and sufficient rewrite the statement The integer n is odd if and only if n^2 is odd Also check whether the statement is true.



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166. Verify by the method of contradiction that

$\sqrt{7}$ is irrational.



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167. Check the validity of the statement given

below by contradiction method. p : The sum of

an irrational number and a rational number is

irrational.



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168. Evaluate the following limit:

$$\left(\lim \right)_{x \rightarrow 0} \frac{x^2 + 1 - \cos x}{x \sin x}$$



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



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170. Show that the statement For any real numbers a and b , $a^2 = b^2$ implies that $a = b$ is not true by giving a counter example



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171. Check the validity of the following statement: p : 100 is a multiple of 4 and 5.



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172. Check the validity of the following statement: r : 60 is a multiple of 3 or 5.



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173. Check the validity of the following statement: q : 125 is a multiple of 5 and 7.



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174. Check whether the following statement is true or not: p : If x and y are odd integers, then $x + y$ is an even integer.



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175. Check whether the following statement is true or not: p : If x, y are integers such that xy is even then at least one of x and y is an even integer.



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176. Show that the statement: p : If x is a real number such that $x^3 + x = 0$, then x is 0 is true by (i) Direct method



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177. Show that the following statement is true by the method of contrapositive p : if x is an integer and x^2 is odd then x is also odd.



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178. Show that the following statement is true:

The integer n is even if and only if n^2 is even



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179. By giving a counter example, show that the following statement is not true: p : if all the angles of a triangle are equal, then the triangle is an obtuse angled triangle.



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180. Which of the following statements are true and which have are false? In each case give a valid reason for saying so p : Each radius of as circle is a chord of the circle q : The centre of a circle bisects each chord of the circle.



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181. Which of the following statements are true and which have are false? In each case give a valid reason for saying so r : Circle is a

particular case of an ellipse s : If x and y are integers such that $x > y$, then $-x < -y$. $t : \sqrt{11}$ is a rational number.



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Others

1. Determine whether the argument used to check the validity of the following statement is

correct: p : If x^2 is irrational then x is irrational.



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