6.2 Word-Problems based on Inequalities in One Variable

EXAMPLE - 1

The cost and revenue functions of a product are given by C(x) = 20x + 4000 and R(x) = 60x + 2000 respectively, where x is the number of items produced and sold. How many items must be sold to realise some profit?

Solution:

Hence, the manufacturer must sell more than 50 items to realise some profit.

EXAMPLE - 2

Arohi obtained 70 and 75 marks in first two unit tests. Find the minimum marks she should obtain in the third unit test to have an average of at least 60 marks.

Solution:

Hence, Arohi must obtain a minimum of 35 marks in the third unit test to have an average of at least 60 marks.

EXAMPLE - 3 To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Bhawna's marks in first four examinations are 87, 92, 94 and 95, find the minimum marks that Bhawna must obtain in fifth examination to get grade 'A' in the course. What life skills should she acquire in order to get grade 'A' in the course?

Solution:

Hence, Bhawna must obtain a minimum of 82 marks in the fifth examination to have an average of 90 marks or more.

She needs to be hard-working, self-confident, diligent and dedicated to her work to get grade 'A' in the course.

EXAMPLE - 4

The length of a rectangle is three times the breadth. If the minimum perimeter of the rectangle is 160 cm, then find its breadth.

Solution:

Hence, the minimum breadth of the rectangle is 20 cm.

EXAMPLE - 5

The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side.

Solution:

Hence, the minimum length of the shortest side is 9 cm.

EXAMPLE - 6

A person is not feeling well, so he goes to a doctor. The doctor on examination finds that his temperature varies between 30° C and 35° C. What is the range of temperature in degree Fahrenheit if conversion formula is given by $C = \frac{5}{9}(F - 32)$, where C and F represent temperature in degree Celsius and degree Fahrenheit, respectively. Do you think his temperature is normal? Give reason.

Solution:

Hence, the range of temperature in degree Fahrenheit is between 86°F and 95°F.

No, his body temperature is not normal because the normal body temperature is 98.6°F.

EXAMPLE - 7

A solution is to be kept between 40°C and 45°C. What is the range of temperature in 9 degree Fahrenheit, if the conversion formula is $F = \frac{9}{5}C + 32$?

Solution:

Hence, the range of temperature in degree Fahrenheit is between 104°F and 113°F.

EXAMPLE - 8

In drilling world's deepest hole it was found that the temperature T in degree Celsius, x km below the earth's surface was given by $T = 30 + 25(x - 3)$, $3 \leq x \leq 15$. At what depth will the temperature be between 155° C and 205° C ?

Solution:

Hence, the temperature will be between 155°C and 205°C at a depth ranging from 8 km to 10 km.

EXAMPLE - 9

IQ of a person is given by the formula $IQ = \frac{MA}{CA} \times 100$, where MA is mental age and CA is chronological age. If $80 \leq IQ \leq 140$ for a group of 12-year old children, find the range of their mental age. What do you understand by IQ? How can one increase one's IQ?

Solution:

Hence, the range of mental age is between 9.6 years and 16.8 years.

IQ stands for 'Intelligence Quotient'. It is a score derived from several standardised tests designed to assess intelligence. One can increase one's IQ by reading books.

EXAMPLE - 10

The water acidity in a pool is considered normal when the average pH* reading of three daily measurements is between 7.0 and 7.6. If the first two pH readings are 7.48 and 7.35, find the range of pH value for the third reading that will result in the acidity level being normal.

Solution:

Hence, the range of pH value for the third reading is between 6.17 and 7.97.

HOTS (Higher Order Thinking Skills)

EXAMPLE H - 1

Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11.

Solution:

Hence, the required possible pairs are (5, 7), (7, 9).

EXAMPLE H - 2

Find all pairs of consecutive, even positive integers, both of which are larger than 5 such that their sum is less than 23.

Solution:

Hence, the required possible pairs are (6, 8), (8,10), (10, 12).

EXAMPLE H - 3

A man wants to cut three lengths from a single piece of board of length 91 cm. The second length is to be 3 cm longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest piece if the third piece is to be at least 5 cm longer than the second? These three pieces are to be used as display boards for 'SAVE TIGER' campaign. Would you like to participate in this campaign? Why?

Solution:

Hence, the length of the shortest piece should be greater than or equal to 8 cm, but less than or equal to 22 cm.

Yes. I would like to participate in 'SAVE TIGER' campaign because tigers are an important part of the life cycle and they help in maintaining balance in nature.

EXAMPLE H - 4

A solution of 8% boric acid* is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of 8% solution, how many litres of the 2% solution will have to be added?

Solution:

Hence, the amount of 2% solution to be added should be more than 320 litres but less than 1280 litres.

EXAMPLE H - 5

How many litres of water will have to be added to 1125 litres of the 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?

Solution:

Hence, the amount of water to be added should be more than 562.5 litres but less than 900 litres.

Exercise 6.2

1. A company manufactures audio cassettes. The cost and revenue functions are given by C(x) = 26000 + 30x and R(x) = 43x respectively, where x is the number of cassettes produced and sold in a week. How many cassettes must be sold by the company to realise some profit?
2. The marks obtained by a student of Class XI in first and second terminal examination are 62 and 48, respectively. Find the number of minimum marks he should get in the annual examination to have an average of at least 60 marks.
3. The longest side of a triangle is twice the shortest side and the third side is 2 cm longer than the shortest side. If the perimeter of the triangle is more than 166 cm then find the minimum length of the shortest side.
4. Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.
5. A solution is to be kept between 68° and 77° Fahrenheit. What is the range in temperature in degree Celsius if conversion formula is given by $F = \frac{9C}{5} + 32$, where C and F represent temperature in degree Celsius and degree Fahrenheit, respectively.
6. A solution of 9% acid is to be diluted by adding 3% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of, the 9% solution, how many litres of 3% solution will have to be added?
7. A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

Answers 6.2

1. More than 2000
2. 70 marks
3. 41 cm
4. (11, 13), (13, 15), (15, 17), (17, 19)
5. Between 20°C and 25°C
6. Between 230 litres and 920 litres
7. Between 120 litres and 300 litres