

ALGEBRA (Q 2 & 3, PAPER 1)

LESSON NO. 8: INEQUALITIES

2007

2 (a) Find the solution set of $4x - 15 < 1$, $x \in \mathbf{N}$.

SOLUTION

$$4x - 15 < 1 \Rightarrow 4x < 1 + 15$$

$$\Rightarrow 4x < 16 \Rightarrow x < 4$$

$$\text{Solution set } x = \{0, 1, 2, 3\}$$

N: Set of natural numbers. These are whole positive numbers. $\mathbf{N} = \{0, 1, 2, 3, \dots\}$

2006

2 (c) (i) Find the smallest natural number k such that

$$2x + 4(x + 3) + 7(2x + 4) < 20(x + k).$$

SOLUTION

$$2x + 4(x + 3) + 7(2x + 4) < 20(x + k) \text{ [Multiply out the brackets.]}$$

$$\Rightarrow 2x + 4x + 12 + 14x + 28 < 20x + 20k \text{ [Bring the } x\text{'s to the right and the numbers to the left.]}$$

$$\Rightarrow 12 + 28 - 20k < 20x - 2x - 4x - 14x$$

$$\Rightarrow 40 - 20k < 0$$

$$\Rightarrow 40 < 20k \Rightarrow 2 < k \Rightarrow k > 2$$

The smallest natural number (whole, positive number) greater than 2 is 3.

$$\therefore k = 3$$

2005

3 (b) (i) Find A , the solution set of $3x - 2 \leq 4$, $x \in \mathbf{Z}$.

(ii) Find B , the solution set of $\frac{1-3x}{2} < 5$, $x \in \mathbf{Z}$.

(iii) List the elements of $A \cap B$.

SOLUTION

3 (b) (i)

$$3x - 2 \leq 4 \Rightarrow 3x \leq 6 \Rightarrow x \leq 2$$

$$\therefore A = \{\dots -3, -2, -1, 0, 1, 2\}$$

Z: Set of integers. These are whole numbers that are positive and negative.

$$\mathbf{Z} = \{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$$

3 (b) (ii)

$$\frac{1-3x}{2} < 5 \Rightarrow 1-3x < 10 \text{ [Multiply both sides by 5.]}$$

$$\Rightarrow -3x < 10 - 1 \text{ [Move the numbers to the right.]}$$

$$\Rightarrow -3x < 9 \text{ [Divide across by } -2\text{. Remember to reverse the inequality.]}$$

$$\Rightarrow x > -3$$

$$\therefore B = \{-2, -1, 0, 1, 2, 3, \dots\}$$

CONT....

3 (b) (iii)

$$A = \{\dots -3, -2, -1, 0, 1, 2\}$$

$$B = \{-2, -1, 0, 1, 2, 3, \dots\}$$

$$\therefore A \cap B = \{-2, -1, 0, 1, 2\}$$

$A \cap B$: A intersection B (The elements common to sets A and B.)

2003

3 (a) Find the solution set of

$$5x - 3 < 12, x \in \mathbf{N}.$$

SOLUTION

$$5x - 3 < 12 \Rightarrow 5x < 12 + 3$$

$$\Rightarrow 5x < 15 \Rightarrow x < 3$$

$$\therefore x = \{0, 1, 2\}$$

\mathbf{N} : Set of natural numbers. These are whole positive numbers.
 $\mathbf{N} = \{0, 1, 2, 3, \dots\}$

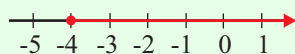
2002

3 (a) Solve the inequality $5x + 1 \geq 4x - 3$, $x \in \mathbf{R}$ and illustrate the solution set on a number line.

SOLUTION

$$5x + 1 \geq 4x - 3 \Rightarrow 5x - 4x \geq -3 - 1$$

$$\Rightarrow x \geq -4$$



\mathbf{R} : Set of real numbers. This set represents all numbers.

2001

2 (a) Find the solution set of $11 - 2n > 3$, $n \in \mathbf{N}$.

SOLUTION

$$11 - 2n > 3 \Rightarrow -2n > 3 - 11$$

$$\Rightarrow -2n > -8 \text{ [Divide both sides by } -2. \text{ Remember to reverse the inequality.]}$$

$$\Rightarrow n < 4$$

$$\therefore n = \{0, 1, 2, 3\}$$

\mathbf{N} : Set of natural numbers. These are whole positive numbers.
 $\mathbf{N} = \{0, 1, 2, 3, \dots\}$

1997

2 (b) Find the solution set E of $9 - 2x \geq 7$, $x \in \mathbf{N}$.

Find the solution set H of $\frac{1}{4}x - \frac{1}{3} \leq \frac{5}{12}$, $x \in \mathbf{N}$.

Write down the elements of $H \setminus E$.

SOLUTION

$$9 - 2x \geq 7 \Rightarrow -2x \geq 7 - 9$$

$$\Rightarrow -2x \geq -2$$

$$\Rightarrow x \leq 1$$

$$\therefore E = \{0, 1\}$$

\mathbf{N} : Set of natural numbers. These are whole positive numbers.
 $\mathbf{N} = \{0, 1, 2, 3, \dots\}$

$$\frac{1}{4}x - \frac{1}{3} \leq \frac{5}{12}$$

$$\Rightarrow 3x - 4 \leq 12$$

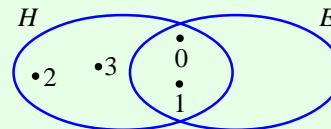
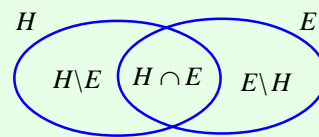
$$\Rightarrow 3x \leq 12 + 4$$

$$\Rightarrow 3x \leq 16$$

$$\Rightarrow x \leq \frac{16}{3}$$

$$\therefore H = \{0, 1, 2, 3\}$$

$H \setminus E$: H less E (The elements in H that are not in E .)



$$\therefore H \setminus E = \{2, 3\}$$

