

# IS 1006 – Discrete Mathematics

## Tutorial 01 – *Introduction to Numbers and Arithmetic*

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### 1. Exercises for Types of Numbers & Number Line.

- i. Show that  $\sqrt{9}$  is a natural number
- ii. Whole Numbers = ..... Numbers + Zero
- iii. Integers - Whole Numbers = .....
- iv. For the set  $\{-1, 0, \frac{1}{2}, 4.3, \sqrt{7}, \pi, -\pi, 1, 7, -18, -\sqrt{2}, \frac{7}{8}, -1.8, 3, 0.\bar{4}\}$  list all of the
  - a) Counting Numbers
  - b) Integers
  - c) Negative Integers
  - d) Rational Numbers
  - e) Real Numbers
  - f) Irrational Numbers
  - g) Even Numbers
  - h) Prime Numbers
- v. Find a real number that is not a rational number.
- vi. Find a whole number that is not a natural number.
- vii. Find a negative integer that is not a rational number.
- viii. Find a number that is both irrational and odd.
- ix. Find a rational number that is not a whole number.
- x. Represent  $x \geq 5, -4 < y \leq 3, -0.5 \geq z > 0.5$  on a number line.

### 2. Calculate the following expressions

- i.  $(100+10)/10$
- ii.  $100+10/10$
- iii.  $((10 \times 12) \div (4 \times 3)) + 34 - 26$
- iv.  $((17 + 3) \times (-28 + 10)) \div 9$
- v.  $7 + (-6 \times 5^2 + 3)$
- vi.  $14 + 6 \div 5 \times 11 - 7 \div 3$
- vii.  $5 + (-6 \times 2)^2 \div 5$
- viii.  $(4^2 - 6 + 5) / (3^2 + 8 - 7 \times 2)$
- ix.  $(7 - \sqrt{9}) \times (4^2 - 3 + 1)$
- X.  $\frac{2^2 + (16 - 3 \times 4)}{(6 + \sqrt{81}) \div (7 - 4)}$

**3. Complete the missing gaps from the following expressions.**

- i. .... x ..... = 225
- ii. .... ÷ ..... = 64
- iii. (..... + .....) / 10 = 200
- iv. (..... x .....) / (..... + 7.....) = 200
- v. (..... ÷ .....) x (6 + ..... ) = 800

**4. Simplify and express the following without absolute value symbols.**

- i.  $|10-8|$
- ii.  $|-3 \times 5|$
- iii.  $-|-5+(-3 \times |-4|)|$
- iv.  $\frac{|-12| \times -|-3|}{(|-6|)^2}$
- v. Order the following number set in ascending order  
 $\{-1, \frac{1}{2}, |-\sqrt{2}|, \pi, 0, 4.3, \sqrt{(3^2 + 4^2)}, -\frac{512}{446}, \frac{|9|}{\sqrt{9}}, \sqrt{7}\}$

**5. List all the Prime Numbers from 0 to 100.**

**6. Find the Highest Common Factor (HCF) of the following.**

- i. 90, 120
- ii. 924, 240
- iii. 576, 648, 936
- iv. A club has 16 girls and 8 boys as members. The president wants to break the club into groups, with each group containing the same combination of girls and boys. The president also wants to make sure that no one is left out. What is the greatest number of groups the president can make?
- v. Nimali is making bead necklaces. She has 90 green beads and 108 blue beads. What is the greatest number of identical necklaces she can make if she wants to use all of these beads?

**7. Find the Least Common Multiple of the following.**

- i. 28, 30
- ii. 648, 936
- iii. 45, 56, 72
- iv. Ben is having a party. He wants to get some hot dogs for the party. When he goes to the store, he finds that sausages come in packages of 32 and buns come in packages of 20. If Ben wants to have the same number of sausages and buns. What is the minimum number of sausages he will have to buy?
- v. Matthew goes hiking every 14 days and swimming every 4 days. He did both kinds of exercise today. How many days from now will he go both hiking and swimming again?

**8. HCF & LCM word problems.**

- i. Maneesha is making emergency-preparedness kits to share with friends. She has 96 bottles of water and 72 cans of food, which she would like to distribute equally among the kits, with nothing left over. What is the greatest number of kits Maneesha can make?
- ii. Sarah's shipping and Ryan's Mail Services both ship packages. Sarah's trucks will only carry loads of 18 packages. In contrast, Ryan's trucks will only carry loads of 11 packages. If both businesses ended up shipping the same number of packages this morning, what is the minimum number of packages each must have shipped?
- iii. A businessman goes to Colombo every 18 days for one day and another businessman every 24 days, also for one day. Today, both men are in Colombo. Within how many days will the two businessmen be in Colombo again at the same time?
- iv. A trader wants to put 12,028 apples and 12,772 oranges into boxes. Each box is to contain an equal number of apples and an equal number of oranges and also the greatest number of each. Find the ideal number of oranges and apples for each box and the number of boxes needed.
- v. The floor of a room that needs to be tiled is 5m long and 3m wide. Determine the ideal size of the tiles and the number of the tiles needed, such that the number of tiles that are placed is minimal and none of them are to be cut. Keep in mind that all tiles are to be the same size.

**9. Derive a relationship between GCD (HCF) and LCM.**

**10. Calculate, giving your answers as fractions or decimals.**

i.  $3^2 + 2^{-1}$

ii.  $10^{-1} + 10^{-2}$

iii.  $5^{-1} + 10^{-2}$

iv.  $(2^{-4})^2 \times 4^2$

v.  $\frac{3^{-2} + 4^{-1}}{2^3 + 6^{-2}}$

vi.  $\sqrt[5]{243}$

vii.  $(12 \times 3)^{\frac{1}{2}}$

viii.  $(13^2 - 12^2)^{-\frac{1}{2}}$

ix.  $4^{\frac{1}{2}} + 16^{-\frac{1}{2}}$

x.  $8^{-\frac{1}{3}} + 9^{-\frac{1}{2}}$

xi.  $3x^2 \times 2x^4$

xii.  $\frac{x^2 - 5x^4 + 3x^2}{x^2}$

xiii.  $\frac{63x^2y^2z^7}{(2x)^4y^2}$

xiv.  $\frac{34m^3n^5 - 51mn^2}{17mn}$

xv.  $\frac{5x^4y^3 + xy^6}{xy^3}$