**QUESTION BANK**

**DEPARTMENT OF MATHEMATICS**

**COURSE :B.Sc – NAUTICAL SCIENCE**

**SUBJECT : NAUTICAL MATHEMATICS – I**

**COURSE CODE: UCMT1O1**

**SEMESTER: I**

**Unit-1 ALGEBRA**

**Part-A**

1. Define error.
2. Define Absolute error.
3. Define relative error.
4. Define percentage error.
5. Find 101x99 using appropriate identity.
6. Find 1003x997 using appropriate identity.
7. Find 99 x 82 using appropriate identity.
8. Find 1000 x 32 using appropriate identity.
9. Find 103x107 using appropriate identity.
10. Find 96x104 using appropriate identity.
11. Find 106x94 using appropriate identity.
12. Find 1032 using prime factorization method.
13. Find 96x98 using appropriate identity.
14. Find 9973 using prime factorization method.
15. Define discriminant.
16. Solve 7X-3=4.
17. Solve 13X-2=3X-4.
18. Solve 5t+10=35
19. Solve -10+3y = 87
20. Solve 7z+25= 2z-30
21. Solve -68+8t = 4-4t
22. Solve 10x = 3x+21
23. Simplify
24. Simplify
25. Simplify

**Part B**

1. Solve by using factorization method & formulae method,
2. Solve by using factorization method & formulae method,
3. Solve by using factorization method & formulae method,
4. Solve by using factorization method & formulae method,
5. Solve by using factorization method & formulae method,
6. Solve by using factorization method & formulae method,
7. Solve
8. Solve
9. Solve
10. Solve
11. Solve
12. Solve
13. Solve
14. Solve
15. Solve

**Part – C**

1. Expand the following.
2. Simplify: (ii) .

3. Simplify (ii) .

4.(i) Three consecutive integers are such that when they are taken in increasing order and multiplied by 2,3 and 4 respectively they add up to 74. Find the numbers.

(ii) The ages of Rahul and Haroon are in the ratio 5:7. Four years later the sum of their ages will be 56 years .what are their present ages?

5. (i)One of the two digits of a two digit number is three times the other digit. If you interchange the digit of this two digit number and add the resulting number to the original number, you get 88. What is the original number?

(i) 2 audio cassettes and 3 video cassettes cost 425 and 3 audio cassettes and 2 video cassettes cost 350. What are the prices of an audio cassette and of a video cassette?

6. (i) Alex measured the field the nearest meter and got a width of 6 m and a length of 8 m. Find the error and error percentage.

(ii)Thermometer measures the nearest two degrees. The temperature was measured as 380C. Find the error and error percentage.

7. (i) Solve (ii) Solve

8. Solve 2x + 3y = 46, 3x + 5y = 74 by Cross multiplication method and elimination method.

9. Solve 9x -4y = 2000 and 7x – 3y =2000 by elimination method and graphical method.

10. Solve using substitution method and graphical method.

**Unit-2 GRAPHS**

 **Part- A**

1. Define Labels.
2. Define Axes.
3. Define Origin.
4. Define Abscissa.
5. Define Ordinate.
6. Define Scale.
7. Define Graph.
8. Define Curve.
9. Define slope of a tangent.
10. Find the slope and cut point to the y-axes for the straight line .
11. Fine abscissa and ordinate or (2,-3).
12. Find abscissa and ordinate or (7,1).
13. Draw y2=4ax
14. Draw y2=-4ax
15. Draw x2=4ay
16. Draw x2=-4ay
17. Draw y =
18. Draw y = log x
19. Draw y =
20. Draw y = mx+c
21. Draw y = x3
22. Find the quadrants in which the following points lie:
	1. ( 2, -5) b. ( -8, -9)

 23. Solve 5y + 3 = 48.

 24. Solve x2+5x= -6.

 25. Solve y(y-12)+36=0

**Part B**

1. Solve graphically,
2. Solve graphically,
3. Solve graphically,
4. Solve graphically,
5. Solve graphically,
6. Solve graphically,
7. Solve graphically,
8. Solve graphically,
9. Solve graphically,
10. Solve graphically,
11. Solve graphically,
12. Solve graphically,
13. Solve graphically,
14. Solve graphically,
15. Solve graphically,

**Part C**

1. Solve graphically,
2. Solve graphically,
3. Solve graphically,
4. Solve graphically,
5. Solve graphically,
6. Solve graphically,
7. Solve graphically,
8. Solve graphically,
9. Solve graphically, .
10. Solve graphically,

**Unit – III**

**Proportion, Variation and Interpolation**

**PART- A**

1. Define Ratio.
2. Write the ratio if and .
3. A student has 11 note books and 7 text books find the ratio of the note books to that of the text books.
4. Compare the ratio 3:5 and 4:7.
5. If and find.
6. If , find
7. Write the compound ratio of .
8. Define Proportion.
9. Solve
10. Solve 0.4 : 1.4 :: 1.4 : .
11. State that the ratio if is the mean proportion of and
12. Find the third proportional to 4, 9.
13. Find the fourth proportional to 8, 14 and 16.
14. Find the mean proportional between 6, 54.
15. Define direct variation.
16. Define inverse variation.
17. Define joint variation.
18. Write the formula if varies jointly as x and the square of
19. Write the formula for varies inversely proportional to the square root of
20. State that varies directly with and inversely with the square root of z.
21. Define Linear interpolation.
22. Define Linear extrapolation.
23. Write the linear interpolation formula if the data points and be given and there is a unique straight line passes through these points.
24. If varies inversely with and , when , find when
25. Find the value of y at x = 4 given some set of values (2, 4), (6, 7)?

**PART- B**

1. Arrange the following ratios in the descending order .
2. Compare the following ratios 0.2:0.4, 0.3:0.5, 0.8:0.9, 0.6:0.18.
3. Divide Rs.280 in the ratio 3:5 , 2:3 and 1:2.
4. The length and breadth of rectangle are in the ratio 4:7. If the breadth is 77 cm find the length.
5. Solve the following proportions
6. Solve the following , (ii) .
7. If find and .
8. What number must be added to each of the numbers 7,16,43,79 to make the number in proportion.
9. The scale of a map is given as 1:30000000. Two cities are 4 cm apart on the map. Find the actual distance between them.
10. The two places are 4.5 km apart on a map they are 15cm apart. What is the scale of the map?
11. A train is moving at a uniform speed of 75 km/hour. (i) How far will it travel in 20 minutes? (ii) Find the time required to cover a distance of 250 km. (Direct proportions)
12. Suppose varies jointly with and and When and. Find when and . Also find when ,12 ,14 and (Joint proportion)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2 | 5 | 6 |  |  |
|  | 12 |  | 3 | 4 |

1. Complete the table below if
2. Find from the given data

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1.1 | 1.2 | 1.3 |
|  | 0.8912 | -- | 0.9636 |

1. Use the midpoint formula find the value of when from the given data

|  |  |  |  |
| --- | --- | --- | --- |
|  | 4 | 8 | 12 |
|  | -5 | 1 | 3 |

**PART- C**

1. Find and of the following (i) If .

(ii) If .

(iii) If

1. Find the fourth proportional of
2. Find the number such that the mean proportional between them is 14 and third proportional to them is 112.
3. Solve the following (a) Suppose inversely proportional to and when find when. (b) Suppose varies jointly with and and when and. Find when and
4. If is mean proportional between and . (i) Prove that (ii) If then prove that .
5. Using Interpolation formula find form the given data .
6. Find the missing value from the following table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 2 | 4 | 6 | 8 | 10 |
|  | 5.6 | 8.6 | 13.9 | -- | 35.6 |

1. Obtain a root of by inverse interpolation formula given that .
2. If estimate

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1 | 1.1 | 1.2 | 1.3 |
|  | 1.5574 | 1.9648 | 2.5722 | 3.6021 |

10. Using Interpolation formula find the value of f(3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | 0 | 1 | 2 | 5 |
| f(x) | 2 | 3 | 12 | 147 |

**UNIT IV – GEOMETRY**

**PART-A**

1. Define Equilateral Triangle.

2. Define Isosceles Triangle.

3. Define Scalene Triangle.

4. What is meant by acute angled triangle?

5. When is a triangle said to be right angled triangle?

6. Define obtuse angled triangle.

7. State Angle sum property of a triangle.

8. What is called reflex angle?

9. What is the important property of exterior angle with respect to Triangle?

10. Define: Transversal

11. State any two properties of Transversal.

12. What do you mean by congruent triangles?

13. When are triangles called similar?

14. Mention the difference between similar triangles and congruent triangle.

15. For which criteria congruence is not applicable? Why?

16. State Pythagoras theorem.

17. In a right angled triangle, If two sides are 3 cm and 4 cm respectively, what is the hypotenuse?

18. What do you mean by quadrilateral?

19. State properties of parallelogram.

20. Define arc.

21. Define Sector.

22. Define Chord of a circle.

23. Define Segment of a circle.

24. What is the circumcentre of triangle?

25. Define Centre of a triangle.

**PART-B**

1. Define Triangle and classify it based on sides and angles.

2. a) of the three angles of a triangle, one is twice the smallest and another is thrice the smallest.

 Find the angles.

 b) If the angles of a triangle are in the ratio 2:3:4 what are the angles?

3. Construct Trapezium for two parallel lines and mention the following angles.

 a) Interior angles b) Exterior angles c) Corresponding angles

 d) Alternate Interior angles e) Vertically opposite angles

 f) Interior angles on the same side.

4. State all the properties of Transversal.

5. Find the values of ‘x’ and ‘y’ from the given figure:

6. In the given figure, the lines XY and MN intersect at O.

IF and a:b = 2:3, find c.

7. In the given figure, If AB CD, EF CD and =1260 then find, and

8. If PQ PS , PQ SR, and 650 then find the values of x and y.

9. Find the value of x and y in the following figure.



10. AB and CD bisect each other at O. Prove that

 AC = BD.

11. a) The hypotenuse of a right triangle is 3 less than twice the length of the shorter leg. Find the length of the hypotenuse if the longer leg is 12 centimetres.

b) The foot of an extension ladder is 15 feet from the wall. The ladder is 7 feet less than three times longer than the height that it reaches on the wall. What is the length of the ladder?

12. a) The foot of a ladder is placed 6 feet from a wall. If the top of the ladder rests 8 feet up on the wall, how long is the ladder?

 b) Scott wants to swim across a river that is 400 meters wide. He begins swimming perpendicular to the shore he started from but ends up 100 meters down river from where he started because of the current. How far did he actually swim from his starting point?

13. a) Donna's TV screen is 20 inches long. If the diagonal measures 25 inches, how long is the width of Donna's TV?

b) An isosceles triangle has congruent sides of 20 cm. The base is 10 cm. Find the height of the triangle.

14. a) Tanya runs diagonally across a rectangular field that has a length of 40 yards and a width of 30 yards. What is the length of the diagonal, in yards, that Tanya runs?

b) A suitcase measures 24 inches long and 18 inches high. What is the diagonal length of the suitcase to the nearest tenth of a foot?

15. If the radius of a circle is 21 cm and the angle of sector is 900 then what is the arc length of the circle? Also find the area of the sector.

**PART-C**

1. State and Prove Angle Sum Property of Triangle.

2. Prove that the exterior of a triangle is equal to the sum of its interior opposite

 angles.

3. Write elaborately the conditions for triangle to be congruent.

4. Prove that the angles subtended by a chord in the same segment of a circle

 are equal.

5. Prove that the angles subtended by a chord at the centre of the circle is twice

 the angle subtended at the circumference

6. Prove that the angle subtended at the circumference by a diameter is right

 angle.

7. Construct a perpendicular to a line segment of 10 cm from a given point .

8. Construct a tangent to a circle of 6 cm.

9. Construct perpendicular bisector to a line segment of 12 cm.

10. Draw a triangle of sides 8 cm, 6 cm and 5 cm respectively. Find circumcenter.

**UNIT V - TRIGONOMETRY**

**PART-A**

1. What is meant by one degree ( 10)?

2. Describe the measurement of angle in degrees, minutes and seconds of arc.

3. Define radian.

4. Mention the relationship between degree and radian.

5. Define sine and cosec ratio of the side of right angled triangle.

6. Define cosine and secant ratio of the side of right angled triangle.

7. Define tangent and cotangent ratio of the side of right angled triangle.

8. Tabulate the value of sin for the degrees of 0, 30, 45, 60 and 90.

9. Tabulate the value of cos for the degrees of 0, 30, 45, 60 and 90.

10. Tabulate the value of tan for the degrees of 0, 30, 45, 60 and 90.

11. Tabulate the value of csc for the degrees of 0, 30, 45, 60 and 90.

12. Tabulate the value of sec for the degrees of 0, 30, 45, 60 and 90.

13. Tabulate the value of cot for the degrees of 0, 30, 45, 60 and 90.

14. State the period of function of sin , cos and tan .

15. Convert 150o into radians.

16. Convert into degrees

17. Convert radians into degrees.

18. Find the degree measure corresponding to .

19. Determine the quadrant in which the following degrees lie.

 (i) 380o (ii) 1100o

20. If (2,3) is a point on the terminal side of , find sin and cos.

21. Simplify: tan 735o.

22. Evaluate : cos 9800.

23. Find sin 24600.

24. Find cot (-2460)o.

25. What is the value of sec(-1305)o.

**PART-B**

1. Simplify:

2. Without using the table, prove that sin 780o sin 480o + cos 120o cos 60o = ½.

3. Find the value of cos 450 cos 60o – sin 45osin60o.

4. Determine cot 60o.tan 30o +sec245o sin900.

5. Prove that

6. If x = a cos + b sin and y = a sin - bcos show that x2+y2  = a2 + b2.

7. Show that sin2A.tan A + cos2A.cotA +2sinA.cosA = tan A + cot A.

8. Prove that sin4A – cos4A = 1-2cos2A.

9. Prove that + = 2sec2A.

10. Write compound angles of A+B and A-B for sine, cos and tan ratios.

11. Find the values of

 (i) cos 15o (ii) cos 105o (iii) sin75o

12. If A, B are acute angles, sin A = 3/5 ; cos B = 12/13 find Cos(A+B).

13. Show that sin(A+B)sin(A-B) = sin2A – sin2B

14. Show that cos (A+B)cos(A-B) = cos2A – sin2B.

15. a) Find sin 45o + sin 300 and compare with sin 75o.

 b) Find cos 45o + cos 300 and compare with cos 75o.

**PART-C**

1. Find the value of tan230o +2sin60o+tan45o-tan600+cos230o.

2. If cos = and tan > 0 show that .

3. Show that 3(sinx-cosx)4 + 6 (sinx+cosx)2+4(sin6x+cos6x)=13.

4. If tan A + sec A = x, show that 2tanA = x – 1/x and 2 sec A = x + 1/x .

 Hence show that Sin A = x2-1/ x2+1.

5. If tan A + sin A = p, tan A – sin A = q and p > q then show that

 p2 - q2 =4.

6. Prove that ( 1+ tan A +secA)(1+cot A – cosec A) = 2.

7. If A + B = 450 , show that ( 1 + tan A) ( 1+ tan B) = 2 and hence deduce the value of tan 22 .

8. . If A + B = 450 , show that (cot A - 1) ( cot B - 1) = 2 and hence deduce the value of cot 22 .

9. Prove that + + = 0,

10. If sinA = 1/3, sin B = 1/4 find sin(A+B) and sin (A-B) .