INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
DEPARTMENT OF MATHEMATICS AND STATISTICS

Class Test - 1 **MA517M-Basic Programming Laboratory** 18 August 2025

Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a C++ program to compute the lateral surface area, total surface area, and volume of a cylinder given radius and height. $LSA = 2\pi rh, TSA = 2\pi r(r+h), Volume = \pi r^2 h$
2. Write a C++ program to get five integers from the users, calculate the average (float) of these five numbers, and store the output in a file average.txt.

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Answer All Questions $2 \times 1.5 = 3$

1. Write a C++ Program to compute the centroid of the triangle $((x_1+x_2+x_3)/3, (y_1+y_2+y_3)/3)$.
2. Write a C++ program to get the ages and year of five people in a class and save them in a file ageyear.txt

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DEPARTMENT OF MATHEMATICS AND STATISTICS

Class Test - 1 **MA517M-Basic Programming Laboratory** 18 August 2025

Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a C++ program to compute the lateral surface area, total surface area, and volume of a hemisphere given radius. $LSA = 2\pi r^2, TSA = 3\pi r^2, Volume = (2/3)\pi r^3$
2. Write a C++ program to get the ages and year of five people in a class and save them in a file ageyear.txt

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Class Test - 1 **MA517M-Basic Programming Laboratory** 18 August 2025

Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a C++ program to get the three sides of a triangle. The formula to calculate the median of a triangle is $m = (1/2)\sqrt{2a^2 + 2b^2 - c}$. Write a C++ program Compute m
2. Write a C++ program to input the coefficients of a quadratic equation $ax^2 + bx + c = 0$ and calculate the discriminant, saving it in discriminant.txt.

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Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a C++ program to get the three sides of a triangle. The formula to calculate the angle bisection a triangle is $t = \sqrt{ab(1 - c^2/(a+b)^2)}$. Write a C++ program Compute t
2. Write a C++ program to input two angles of a triangle, calculate the third angle, and save it in thirdangle.txt.

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1. Write a `C++` program to input the moment of inertia I_c, mass m, and distance d. Calculate the moment of inertia about a parallel axis using: $I = I_c + md^2$
2. Write a C++ program to input principal amount (P), rate of interest (r), and period (t), calculate simple interest ($Prt/100$), and save it to interest.txt.

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the original length L, temperature change ΔT, and coefficient of linear expansion α. Compute the final length using: $L_f = L(1 + \alpha \Delta T)$
2. Write a C++ program to get three float numbers from the user, calculate their sum and average, and save the result in a file named sumaverage.txt.

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input force F and area A. Compute the stress using: Stress $= \frac{F}{A}$
2. Write a C++ program to input force (F) and displacement (d), calculate work done ($W = Fd$), and save it to workdone.txt.

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Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. A hollow rectangular prism has outer dimensions (length L_o, width W_o, height H_o) and inner dimensions (length L_i, width W_i, height H_i). Write a `C++` program to compute the volume of material used to make the prism:

$$V = (L_o \times W_o \times H_o) - (L_i \times W_i \times H_i)$$

2. Write a C++ program to input three integers, calculate their product and sum, and save it in productsum.txt.

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Class Test - 1 **MA517M-Basic Programming Laboratory** 18 August 2025

Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. A water tank is shaped like a triangular prism. Write a `C++` program to input the base and height of the triangle and the length of the prism. Compute the volume of water the tank can hold:Base Area = (1/2) × base × height, Volume = Base Area × length

2. Write a C++ program to input two sides of a right triangle, calculate the hypotenuse, and save it in hypotenuse.txt.

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Answer All Questions $2 \times 1.5 = 3$

1. A steel pipe is modeled as a hollow cylinder. Write a `C++` program to input the outer radius R, inner radius r, and height h (all in meters). Compute the volume of steel used: $V = \pi h(R^2 - r^2)$

2. Write a C++ program to input mass (m) and velocity (v) of an object, calculate kinetic energy ($E = 1/2mv^2$), and save it to kineticenergy.txt.

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to compute the total surface area of a closed cylinder with radius r and height h: $A = 2\pi rh + 2\pi r^2$

2. Write a C++ program to input mass and acceleration of an object, calculate the force ($F = ma$), and save it in Force.txt.

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Answer All Questions $2 \times 1.5 = 3$

1. A spherical water tank leaks, reducing its radius over time. Write a `C++` program to input initial radius r_1 and final radius r_2. Calculate the change in volume: $\Delta V = (4/3)\pi(r_1^3 - r_2^3)$
2. Write a C++ program to get two points in a straight line (x_1, y_1) and (x_2, y_2) from the user, compute its slope, and save it in slope.txt.

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Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r and height h of a cone and calculate the angle θ between the slant height and the base, where:$\theta = \arctan(h/r)$ (in degrees)
2. Write a C++ program to get three inputs from the user: slope (m), intercept (b), and a value x. Compute the value of y using the formula $y = mx + b$. Save the output in yvalue.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input an angle θ in degrees and calculate $\tan 2\theta$ using the identity: $\tan 2\theta = 2\tan\theta/(1 - \tan^2\theta)$
2. Write a C++ program to get three angles from a 4-sided polygon (sum should be 360°). Calculate the fourth angle of the polygon and save it as fourthangle.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input angles α and β in degrees and compute the value of $\cos(\alpha - \beta)$ using the identity: $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

2. Write a C++ program to get four angles from a pentagon (sum should be 540°). Calculate the fifth angle of the pentagon and save it as fifthangle.txt

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Class Test - 1 **MA517M-Basic Programming Laboratory** 18 August 2025

Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a circle and the length l of a tangent from an external point. Calculate the distance d from the external point to the center of the circle using the formula: $d = \sqrt{l^2 + r^2}$

2. Write a C++ program to get the angle θ from the user, save the value of $\sin(2\theta)$ and $2\sin(\theta)\cos(theta)$ in the file trignom.txt

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Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a circle and the length c of a chord. Calculate the perpendicular distance p from the center of the circle to the chord using: $p = \sqrt{r^2 - \left(\frac{c}{2}\right)^2}$

2. Write a C++ program to get two angles (α, β) from the user, compute $\sin(\alpha+\beta)$ and $\sin\alpha\cos\beta + \cos\alpha\sin\beta$ and save it in a file sinformula.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input two secants lengths a and b drawn from an external point to a circle. Use the secant length theorem: $a \times (a + x) = b \times (b + y)$ where x and y are the segments inside the circle. Assume $x = y$, compute x

2. Write a C++ program to get two angles (α, β) from the user, compute $\tan(\alpha + \beta)$ and $(\tan\alpha + \tan\beta)/(1 - \tan\alpha\tan\beta)$ and save it in a file sinformula.txt

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Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a circle and the length of a chord c. Calculate the area A of the segment formed by the chord using the formula:

$$A = r^2 \cos^{-1}\left(\frac{r-h}{r}\right) - (r-h)\sqrt{2rh - h^2}$$

   where $h = r - p$ is the height of the segment and p is the perpendicular distance from the center to the chord (compute p first).

2. Write a C++ program to get the two sides of the triangle b and c and the angle α from the user, calculate the third side using the formula $a^2 = b^2 + c^2 - 2bc\cos\alpha$ and save it in a file triangle.txt

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Name **Roll No.: MA25M**

Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a circle and the length t of a tangent from an external point. Calculate the length of the chord c formed by two secants from the same external point using:
$$c = 2r \sin\theta, \quad \text{where} \quad \theta = \cos^{-1}\left(\frac{r}{d}\right), \quad d = \sqrt{r^2 + t^2}$$
2. Write a C++ program to get the three sides a, b, c of a triangle, and use Heron's formula to calculate area $s = \sqrt{s(s-a)(s-b)(s-c)}, s = (a+b+c)/2$, save the output in area.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a circle and the distance d from an external point to the center. Calculate the length l of the tangent from that point to the circle using the formula:
$$l = \sqrt{d^2 - r^2}$$
2. Write a C++ program to get four real numbers a, b, c, d and save the output as $a + ib$, $c + id$ and then save their sum $(a + c) + i(b + d)$ and product $(ac - bd) + i(ad + bc)$ in a file complex.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r and the distance d between the centers of two circles. Calculate the length of their common external tangent segment l using the formula:

$$l = \sqrt{d^2 - (r_1 + r_2)^2}$$

2. Write a C++ program to get r, θ and n, save the output of $z^n = r^n(\cos n\theta + \sin n\theta)$ in a file DeMoivre.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a sphere and the length d of a chord through the sphere, then calculate the height h of the corresponding spherical segment:

$$h = r - \sqrt{r^2 - \left(\frac{d}{2}\right)^2}$$

2. The general equation of a circle is given by $x^2 + y^2 + 2gx + 2fy + c = 0$. Then its radius is given by $\sqrt{g^2 + f^2 - c}$. Write a C++ program to get g, f, and c from the user and compute the radius and save it in a file radius.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r of a sphere and the angle θ (in degrees) of a spherical sector, then calculate the volume V of that sector using:

$$V = \frac{2}{3}\pi r^3 \left(\frac{\theta}{360}\right)$$

2. Write a C++ program to get the major axis (a) and minor axis (b) of an ellipse, compute its eccentricity $e = \sqrt{1 - b^2/a^2}$, and save it in a file eccentricity.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the radius r and slant height l of a cone, and calculate its height h using the Pythagorean theorem:

$$h = \sqrt{l^2 - r^2}$$

2. Write a C++ program to get the transverse axis (a) and conjugate axis (b) of a hyperbola from the user, compute its eccentricity $e = \sqrt{1 + b^2/a^2}$, and save it in a file eccentricity.txt

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1. Write a `C++` program to input the semi-major axis a and semi-minor axis b of an ellipse, and calculate its approximate perimeter P using Ramanujan's first approximation:

$$P \approx \pi \left[3(a+b) - \sqrt{(3a+b)(a+3b)}\right]$$

2. Write a C++ program to get the major axis (a) and minor axis (b) of the ellipse from the user, compute its length of latus rectum $2b^2/a$, and save it in a file latusrectum.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input five data values and calculate the variance using the formula:

$$\text{Variance} = \frac{1}{5}\sum_{i=1}^{5}(x_i - \bar{x})^2$$

where $\bar{x}$ is the mean.

2. Write a C++ program to get the transverse axis (a) and conjugate axis (b) of a hyperbola from the user, compute its length of latus rectum $2b^2/a$, and save it in a file latusrectum.txt

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Answer All Questions $2 \times 1.5 = 3$

1. Write a `C++` program to input the probabilities of two independent events $P(A)$ and $P(B)$, then calculate the probability of both events occurring together:

$$P(A \cap B) = P(A) \times P(B)$$

2. Write a C++ program to get five numbers (float) x_1, x_2, x_3, x_4, x_5 and their respective frequency (int) f_1, f_2, f_3, f_4, f_5 from the user, compute the mean for the frequency table $x = (\sum f_i x_i)/(\sum f_i)$ and save it as frequencymean.txt

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1. Write a `C++` program to input the probability of an event $P(E)$, then calculate the probability of the event not occurring:

$$P(E') = 1 - P(E)$$

2. Write a C++ program to get marks (float) from five subjects m_1, m_2, m_3, m_4, m_5 and their respective credits (int) c_1, c_2, c_3, c_4, c_5 from the user, compute the GPA $GPA = (\sum c_i m_i)/(\sum c_i)$ and save the output as GPA.txt

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