

Are you ready to start ME25?
Self-Assessment Test

1. (a) Simplify each expression. Write answers without negative exponents.
 - (i) $(2^3)^2 \cdot 2^{-4}$
 - (ii) $\frac{3^5 \cdot 3^{-2}}{3^0}$
 - (iii) $\left(\frac{x^4 y^{-2}}{x^{-1} y^3}\right)^2$
- (b) A line passes through the points $A(2, -1)$ and $B(-4, 5)$.
 - (i) Find the slope of AB .
 - (ii) Write the equation of line AB in the form $y = mx + b$.
 - (iii) Write the equation of the line parallel to AB passing through $C(3, 2)$.
 - (iv) Write the equation of the line perpendicular to AB passing through A .
2. (a) Sam wants to compare two savings options for \$5 000.
 - (i) Option A: 3% simple interest per year for 4 years. Find the total interest earned.
 - (ii) Option B: 2.8% per year, compounded annually for 4 years. Find the future value.
 - (iii) Which option gives more money? By how much?
3. (a) A right triangle has legs of length 7 cm and 24 cm.
 - (i) Find the length of the hypotenuse.
 - (ii) Find all three primary trigonometric ratios for the smallest angle.
 - (iii) Find the measure of the smallest angle, to the nearest degree.
- (b) Solve each triangle. Round side lengths to one decimal place and angles to the nearest degree.
 - (i) Right triangle: $\angle A = 38^\circ$, hypotenuse = 14 cm. Find the two legs.
 - (ii) Acute triangle: $a = 9$, $b = 12$, $\angle A = 43^\circ$. Find $\angle B$ using the sine law.
 - (iii) Acute triangle: $a = 7$, $b = 10$, $c = 8$. Find $\angle C$ using the cosine law.
- (c) A rectangular prism has dimensions 5 cm $\times$ 3 cm $\times$ 8 cm.
 - (i) Find the total surface area.
 - (ii) Find the volume.
 - (iii) If all three dimensions are doubled, by what factor does the volume change? Explain.
- (d) A cone has a base radius of 5 cm and a height of 12 cm. A cylinder has the same base radius and the same height.
 - (i) Find the volume of the cone.
 - (ii) Find the volume of the cylinder.
 - (iii) Verify that the volume of the cone is one-third the volume of the cylinder.

4. (a) For the parabola $y = 2(x - 3)^2 - 8$:
 - (i) State the vertex, axis of symmetry, direction of opening, and y -intercept.
 - (ii) Find the zeros (if any exist). Show your work.
 - (iii) Sketch the parabola on a clearly labelled set of axes.
- (b) Solve $x^2 + 4x - 1 = 0$.
- (c) A ball is launched upward from a height of 2 m with its height modelled by $h = -4.9t^2 + 14.7t + 2$, where h is in metres and t is in seconds.
 - (i) Find the maximum height and the time at which it occurs.
 - (ii) At what time does the ball hit the ground? Round to two decimal places.
5. (a) The vertices of a triangle are $P(2, 5)$, $Q(-4, 1)$, and $R(4, -3)$.
 - (i) Find the length of each side of the triangle.
 - (ii) Find the coordinates of the midpoint of each side.
 - (iii) Determine whether PQR is a right triangle.
- (b) (i) Write the equation of the circle centred at the origin that passes through $A(5, -12)$.
 (ii) A circle has equation $x^2 + y^2 = 49$. Determine whether the point $B(3, 7)$ lies inside, on, or outside the circle.
- (c) The line segment JK has endpoints $J(1, 7)$ and $K(9, 3)$.
 - (i) Find the equation of the right bisector (perpendicular bisector) of JK .
 - (ii) Find the distance from the point $L(4, -1)$ to the line containing JK .
- (d) A quadrilateral has vertices $A(0, 0)$, $B(6, 0)$, $C(8, 4)$, and $D(2, 4)$. Using analytic geometry, verify that $ABCD$ is a parallelogram.