

2023-2024 Academic Year Mathematics Final Exam Grade 10

Students are allowed to use a calculator. All answers must be clearly written and labeled with the appropriate units where applicable. Show all work for partial credit. Total score: 100 points.

1. (5 points) A line passes through the points (2, 3) and (4, 7). Find the slope and equation of the line.

Solution: To find the slope m , we use the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Substituting the points (2, 3) and (4, 7), we get $m = \frac{7 - 3}{4 - 2} = \frac{4}{2} = 2$. Using the point-slope form $y - y_1 = m(x - x_1)$ with point (2, 3), we get $y - 3 = 2(x - 2)$. Simplifying, we get $y - 3 = 2x - 4$, so $y = 2x - 1$. The equation of the line is $y = 2x - 1$.

2. (5 points) A rectangle has a perimeter of 24 units. If the length is 2 units more than the width, find the dimensions of the rectangle.

Solution: Let w be the width and l be the length. The perimeter is given by $2l + 2w = 24$. We are also given that $l = w + 2$. Substituting $l = w + 2$ into the perimeter equation, we get $2(w + 2) + 2w = 24$. Simplifying, we get $2w + 4 + 2w = 24$, so $4w + 4 = 24$. Subtracting 4 from both sides, we get $4w = 20$. Dividing by 4, we get $w = 5$. Substituting $w = 5$ into $l = w + 2$, we get $l = 5 + 2 = 7$. The dimensions of the rectangle are 5 units by 7 units.

3. (5 points) A car starts at a speed of 60 mph and accelerates to 100 mph over a distance of 1 mile. Assuming constant acceleration, find the time taken for the car to travel this distance. Express your answer in minutes and seconds, rounded to the nearest second. (Hint: Use the equation $v^2 = u^2 + 2as$.)

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