MONSTER CARS

You have a toy car. Determine its speed, and use that data to determine other valuable information of the car. Gather your data using the established race course. Each mark is 3 feet apart as shown in the diagram below.

PART ONE: Finding the Rate of the Car

Examples of Calculations

1. Place Car #1 on the starting line and time how long it takes to reach the first mark. Repeat this process for the second mark. Write the data as an ordered pair (t, d).

1st Mark (1.2 , 3) 2nd Mark (2.1 , 6)

2. Calculate the rate of the car twice, once with your first data point, then again with the other. If the two rates differ dramatically, feel free to time your car again.

Rate: 2.5 ft/sec (1st mark) Rate: 2.89 ft/sec (2nd mark) $m = \frac{6-3}{2.1-1.2} = \frac{3}{.9}$ $m = 3.\overline{3}$

3. Write an equation to represent the relationship of the car's distance, d, to time, t. $d = 3.\overline{3}t$

4. Use your equation to predict how far the car will go in 10 sec. Then test your result.

Prediction: (10 , 33.3) Actual Distance: 50 ft

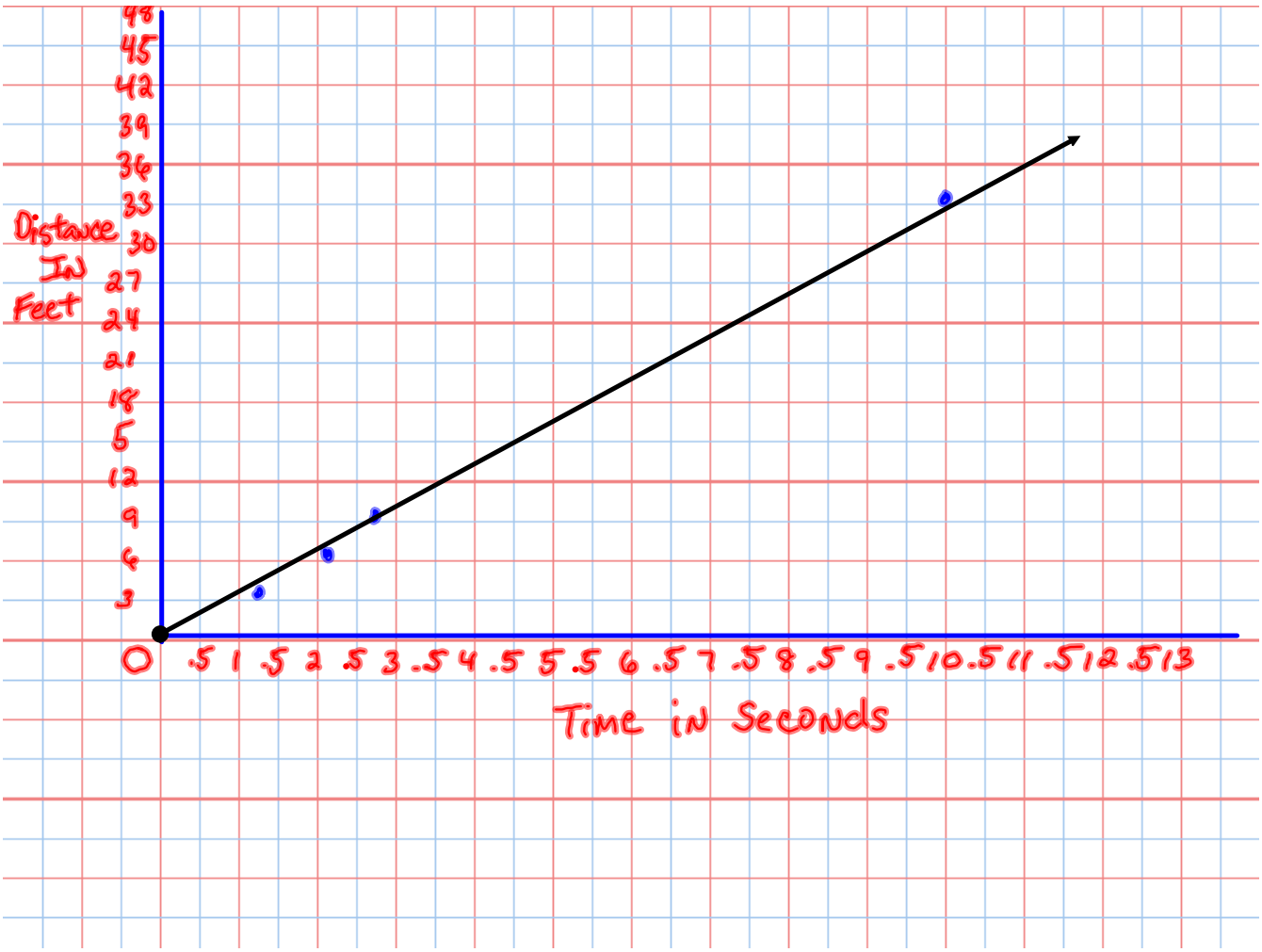
$d = 3.\overline{3}(10) = 33.3$ ft

5. Use your equation to predict how long it would take to get to the third mark. Test your result.

Prediction: (2.7 , 9) Actual Time: 2.4 sec

$9 = 3.\overline{3}(T)$
$T = 2.7$ sec

6. Graph your data points from numbers 1, 4, & 5. Draw a line through these data points. Show the slope of the line. How does this relate to your answer in number 2? What does the y-intercept of the graph represent?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Time in Seconds

STUDENT HANDOUT

MONSTER CARS

PART TWO: Finding the Starting Point of the Car.

7. Place Car #2 somewhere between the starting line and the first mark. Time how long it takes the car to get to the first mark. Then place the car at the same starting point and time how long it takes to reach the third mark. Write the data as an ordered pair (t, d).

1st Mark (1.25 , 36) 3rd Mark (3.81 , 108)

$m = \frac{108-36}{3.81-1.25} = 28.13$

8. Calculate the rate of the car. Then start the car at the starting line and test your prediction.

Prediction Rate: 28.1 in/sec Actual Rate: 25 in/sec

$\frac{72''}{2.88\ sec} = 25\ in/sec$

9. Describe how to calculate rate when the starting point is not the starting line, given two data points.

use slope formula to find the rate over a known interval

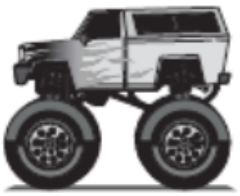
10. Write a formula to represent your explanation above. $m = \frac{y_2 - y_1}{x_2 - x_1}$

11. Calculate the starting point of the car, then measure the actual starting point.

Calculated: about 5in in front of starting line Measured: 12 in

$36 = 25(1.25) + b$

$b = 4.75$



12. Write an equation to represent the relationship of the car's distance, d, to time, t. $d = 25T + 4.75$

13. Use your equation to predict how far the car will go in 15 sec.

Prediction: (15 , 380'') Actual Distance: 36 ft

about 31.6 ft

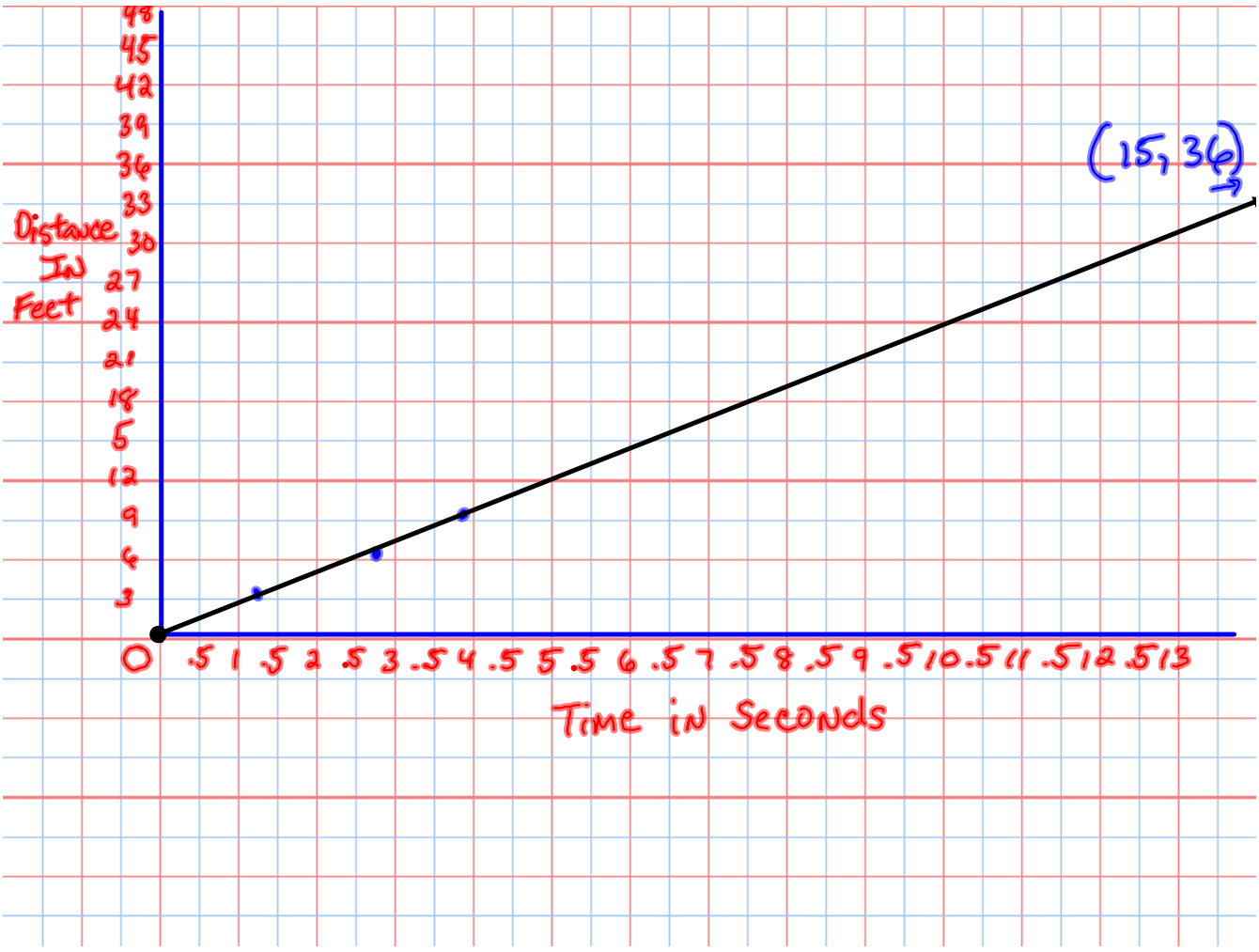
14. Use your equation to predict how long it would take to get to the second mark. Test your result.

Prediction: (2.69 , 72'') Actual Time: 2.78 sec

$72 = 25T + 4.75$

15. Graph your data points from numbers 7, 11, 13, & 14. Draw a line through these data points. Show the slope of the line. How does this relate to your answer in number 8? What does the y-intercept of the graph represent? How does it relate to your answer in number 9?

inches!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PART THREE: Starting Behind the Starting Line

16. Place Car #2 somewhere BEHIND the starting line, but not at any of the established marks. Determine two data points (t, d).

1st Point (2.49 , 36) 2nd Point (4.43 , 108)

17. Calculate the rate of the car.

Rate: 37.1 in/sec

$m = \frac{108-36}{4.43-2.49} = 37.1$

18. Calculate the starting point of the car, then measure the actual starting point.

Calculated: -56.4 Measured: -24"

$y = mx + b$

$108 = 37.1(4.43) + b$ $b = -56.4$"

19. Write an equation to represent the relationship of the car's distance, d, to time, t. $d = 37.1x - 56.4$

20. Use your equation to predict how far the car will go in 15 sec.

Prediction: (15 , 500.1) 41.7 ft Actual Distance: 48 ft

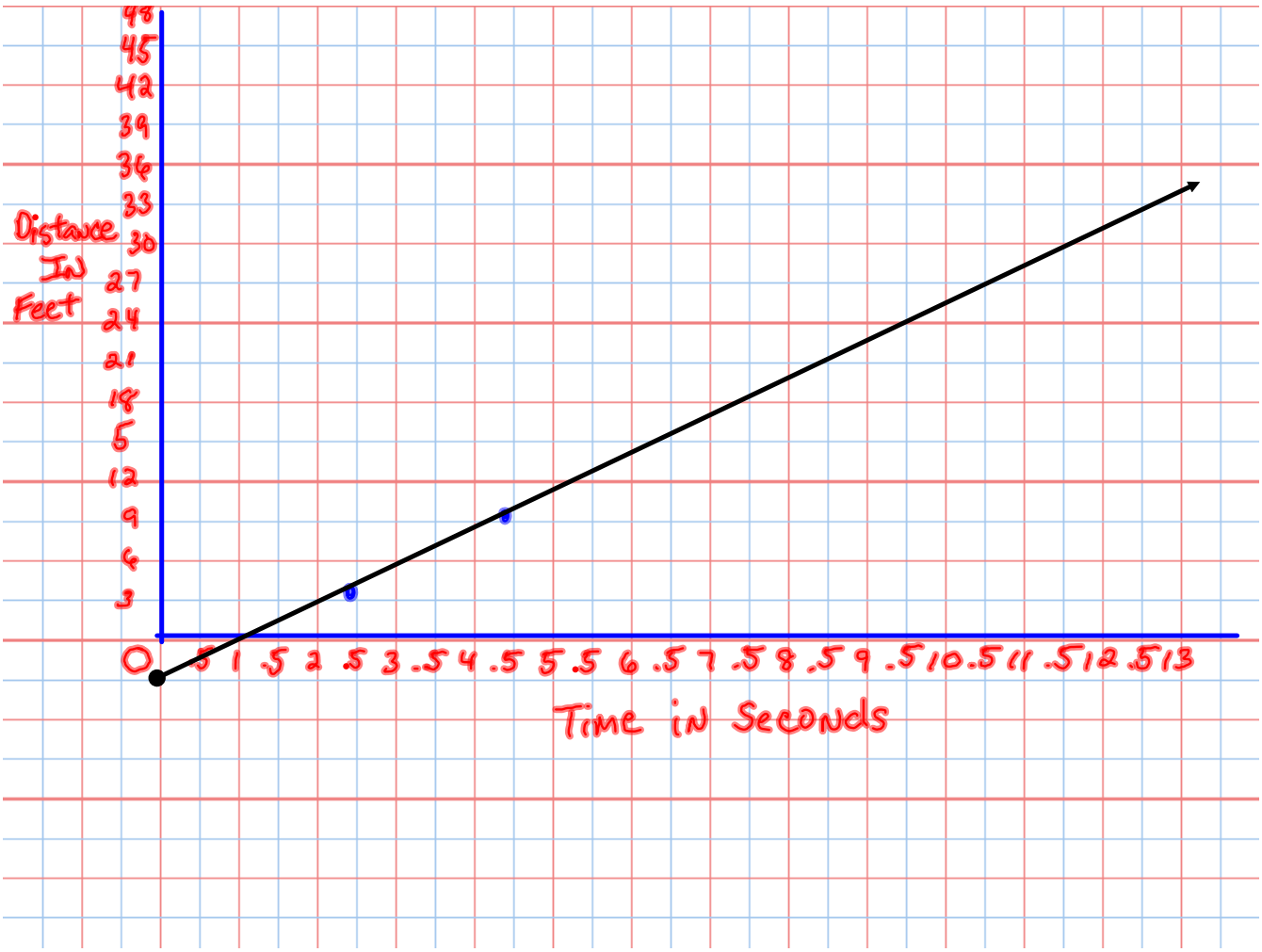
$d = 37.1(15) - 56.4$

21. Use your equation to predict how long it would take to cross the starting line. Then test your result. Where is this point on the graph?

Prediction: (2.16 24) Actual Time: 2.35

$24 = 37.1(T) - 56.4$

22. Graph your data points from numbers 16, 20, & 21. Draw a line through these data points. Show the slope of the line. How does this relate to your answer in number 17? What does the y-intercept of the graph represent? How does it relate to your answer in number 18?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