Challenge 1 **Moving Straight: Close Shave Challenge 10 Points**

In this challenge, you must drive your robot as close as possible to a LEGO mini-fig without knocking the mini-fig over. The mini-fig will be placed at one of three locations, with the specific spot determined by a coin toss.

Using your half of the whiteboard, layout 4, 6” strips of blue tape. The strips must be parallel to each other and 10” apart. Label one of your end lines “0”, the next line “10”, the next line “20” and the last line “30”.

**Rules and Procedure**

**1. Place your robot behind the end line marked “0”.**

**2. Place the mini-fig 10” away on line “10”.**

**3. Design a Mindstorm program that will allow you to come as close as possible to the mini-fig without knocking it over. (1 cm would be a good goal) Label and save the program.**

**4. Design two additional programs. The first one should allow your robot to go from the “0” line to “20”, again trying to provide a “close shave” for your mini-fig. The second should allow your robot to go from the end line to the “30” with the mini-fig.**

**5. Place the mini-fig on the “30” line. Flip two coins. For each “heads” result, move the mini-fig back one line.**

**6. Choose a program from the ones you have prepared, and run it.**

**7. Run your other two programs.**

Challenge 2 **Working with Proportions 12 points**

Determine the following about one of your robot wheels

(1) Diameter \_\_\_\_\_\_\_\_\_\_mm (2) Radius \_\_\_\_\_\_\_\_\_\_ mm

Find the circumference of your wheel.

(Example of Process) (3) Calculate Circumference

Wheel diameter = 6.5 cm for your wheel

C = π d (State formula)

C = 3.14 x 6.5 (Substitute data)

3.14

x6.5 (Show ALL work

1570 neatly)

1884

20.410

C = 20.4 cm (Show answer In equation form)

How far will it travel in one rotation (4)\_\_\_\_\_\_\_ 2 rotations (5)\_\_\_\_\_\_ 4 (6)\_\_\_\_\_\_\_\_

To determine this we can use a proportion. Such as:

If we know that a wheel has a circumference of 20.4 cm, then one full rotation will take your robot 20.4 cm. Using this information you will be able to set up a proportion to help gather additional information.

If we wanted to know how many rotations would be needed to travel 80 mm, we would set up this proportion:

x rotations

80 mm

==

1 rotation

20.4mm mmmmmm

This would be stated as “one rotation is to 20.4 millimeters as x rotations is to 80 mm.”

To solve this, divide 80 by 20.4, getting an answer of 3.9 (rounded to the nearest tenth). Multiply the 3.9 times 1. The answer is 3.9, meaning that one rotation will take you 20.4mm and 3.9 rotations will take you 80mm.

Sometimes the solutions appear a little more difficult, but if set up appropriately the process is the same. The wheel below will travel 40 mm in one rotation.

Divide 15 by 40, getting an answer of .375. Multiply the .375 times 1. The answer is 3.75, meaning that for your robot to travel 15 mm, you should set your rotations to .375 (round to .38)

x rotations

15 mm

==

1 rotation

40 mm

Use what you have learned to solve the following proportions. Neatly, show all of your work and display your circled answer.

x rotations

600 mm

==

1 rotation

40 mm

x rotations

1000 mm

==

1 rotation

40 mm

x rotations

840 mm

==

1 rotation

40 mm

(9)

(8)

(7)

Suppose you want to travel 5 rotations, but do not know how far it will take you. Set up your proportion like this

To solve this, divide 1 into 5, getting an answer of 5. Multiply the 5 times 40. The answer is 200, meaning that 5 rotations will take your robot 200 mm.

8 rotations

x mm

==

1 rotation

40 mm

3.75 r

x mm

==

1 rotation

40 mm

10.5 r

x mm

==

1 rotation

40 mm

5 rotations

x mm

==

1 rotation

40 mm

Try it! Neatly, show all of your work and display your circled answer.

(10)

(11)

(12)

Challenge 3 **Working with Proportions 12 points**

Use blue tape to construct an 8” line perpendicular to the long side of your board and 1’ from the short end of your board. Draw a second 8” line, parallel to, and 16” from, the first line. Continue drawing parallel 8” lines 2 inches from each end until you run out of room .

0 2 4 6 8 10 12 14 16

Begin with your domsbot’s front wheels on one of the outside pieces of tape. Program your bot to travel to the furthest line away and brake on that piece of tape that is 16” away. Next, your bot should go in reverse to the piece of tape that is two inches inside of where you began. You will continue this program until run out of lines. See the diagram below.

End

Begin