Robofest® 2017 Game RoboHit Problem Solving Challenge for World Championship
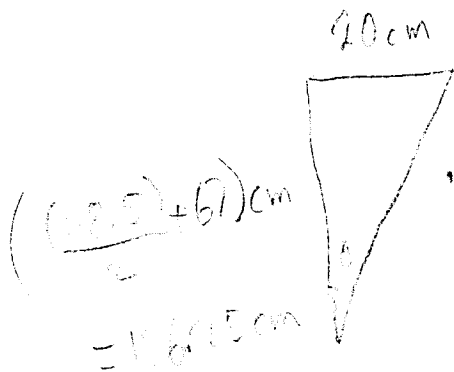
Division: Junior / Senior   Team Name: Robats

Team School / Organization Name: Hoctor High School   Team Number: 2383-1

Unknown Task #2: Fence is NOT centered

- Describe how your team solves the unknown task #2 as mathematical as possible for a special "problem solving" award.
- Teams may use the computer to calculate numbers. However, cell phone cannot be used.
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40cm

$\left(\dfrac{(\dots)^2+61)}{cm}\right)$

$=136.25cm$

$\theta = \tan^{-1}\left(\dfrac{20}{136.25}\right) = 9^o$

90° turn calibration = 167.1°

$1^o = \dfrac{167.1}{10} = 16.71^o$

pencil = 15 cm

2.32cm if robot rotates 9°, end of pencil
10cm   moves 2.32cm back, so
      the robot needs to move 2.38cm
tan 9° × 15 $\frac{cm}{}$ = 2.38cm   forward before turn

↳ 1cm calibration = 20.9
20.9(2.38) = 49.742

add this in after regular hit setup

So to compensate for moved fence, robot should move forward 49.742, do a spinturn right (back on right wheel, forward on left) 16.71°, hit ball, spinturn left (back on left wheel, forward on right) 16.71, then move back 49.742° and continue the program.

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Division: Junior / ⟨Senior⟩   Team Name: __CRASII__

Team School / Organization Name: __K-USRobot__   Team Number: __1687-3__

Unknown Task #2: Fence is NOT centered

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$L/2 : 20$ pencil : 6.5 cm

$D_1 = 67$

$\frac{1}{2} 4 = 60$

$A = L/2^2 + (D_1 + \frac{1}{2}4)^2 = A^2$

$= 20^2 + 7^2 = A^2$

a $= 400 + 16129 = 16529$

$A^2 = 16529$

$A = \sqrt{16529}$

$A = 128.5 \cdots$

$A = 128.5$

$20 : 127 : 128.5 = 1 : 6.35 : 6.425$

$1 : 63.5 : 64.25 = x : y : pencil$

$1 : 63.5 : 64.25 = x : y : 6.5$

$= 6.5 = 63.5y = 64.25x$

$x = 1.0116 \cdots$

$y = 1.0236 \cdots$

$x = 1$

$y = 1$

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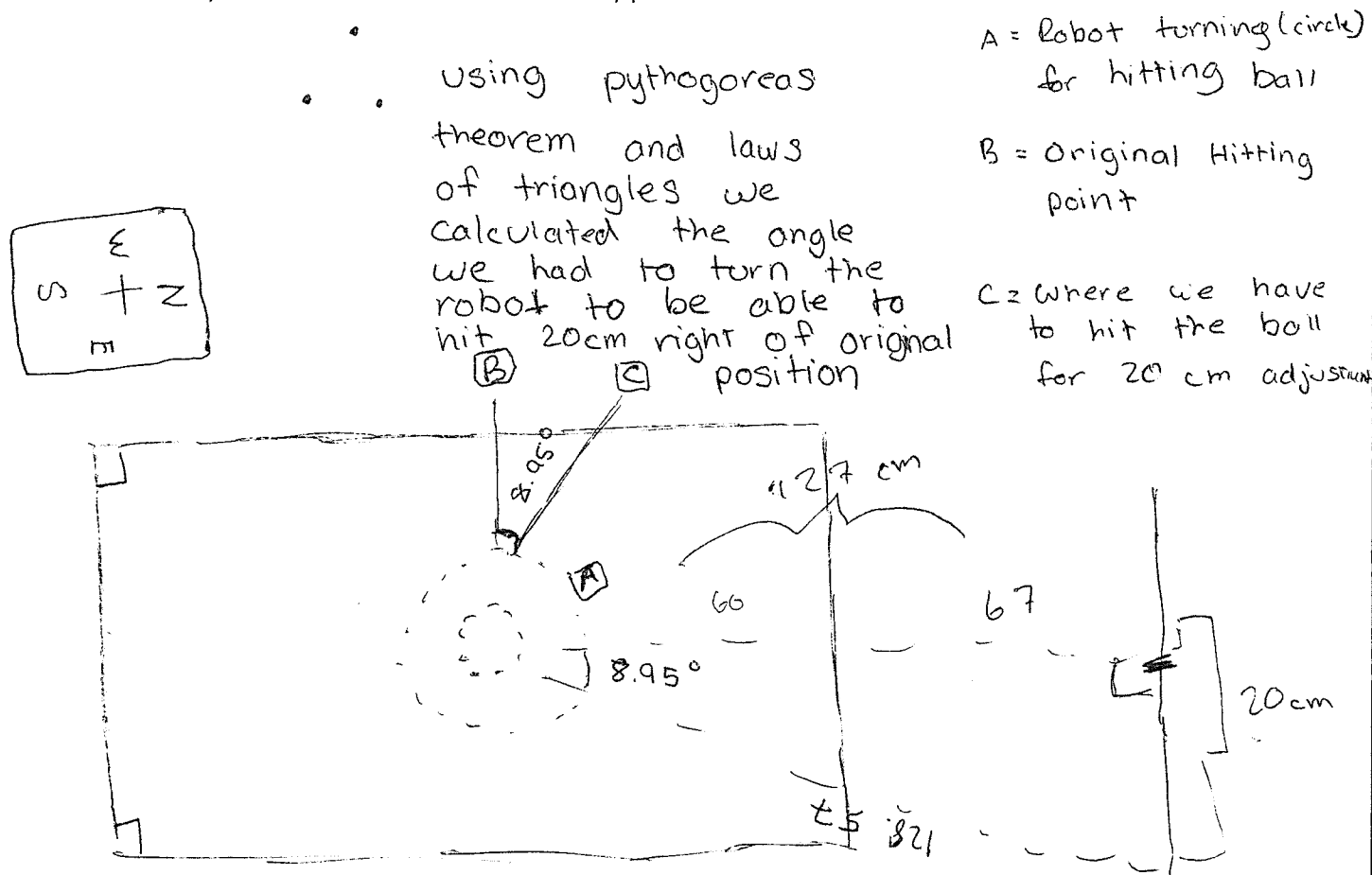Division: Junior / (Senior)   Team Name: __Anything Works__

Team School / Organization Name: __Lego Legion__   Team Number: __2109-34__

Unknown Task #2: Fence is NOT centered

- Describe how your team solves the unknown task #2 as mathematical as possible for a special "problem solving" award.
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using pythogoreas theorem and laws of triangles we calculated the angle we had to turn the robot to be able to hit 20cm right of original position

Ⓑ Ⓒ

A = Robot turning (circle) for hitting ball

B = Original Hitting point

C = Where we have to hit the ball for 20 cm adjustmn

$Sin(θ)$

$$\frac{2}{20} = 127^2 + 126.57^2$$

Tan^{-1}

$Tan(x) = \dfrac{20}{127}$

$x = Tan^{-1}\left(\dfrac{20}{127}\right)$

$a^2 = b^2 + c^2$

$a^2 = 127^2 + 20^2$

$a^2 = 16129 + 400$

$\sqrt{a^2} = \sqrt{16529}$

$a \approx 128.57$

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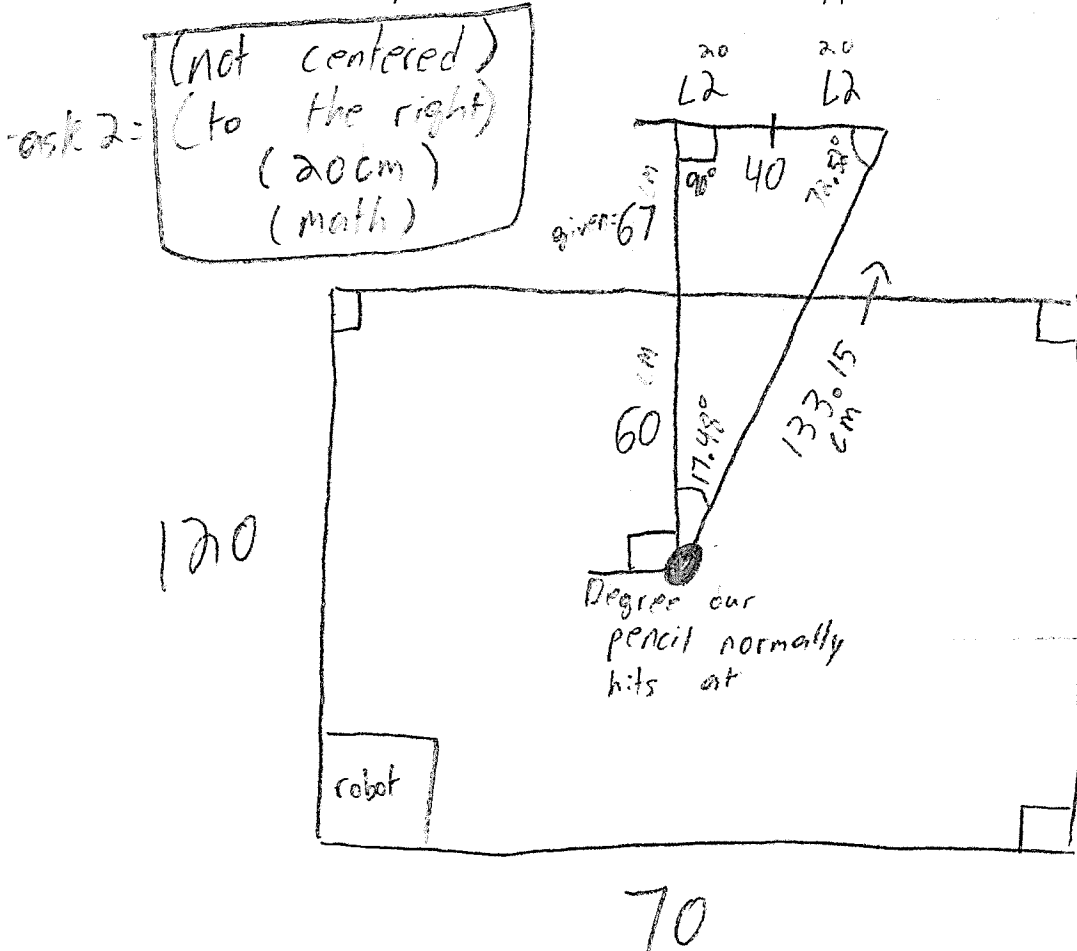
Division: Junior / Senior   Team Name: **GLUE**

Team School / Organization Name: _Lego Legion_   Team Number: _2109-10_

Unknown Task #2: Fence is NOT centered

- Describe how your team solves the unknown task #2 as mathematical as possible for a special "problem solving" award.
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Task 2 = (not centered) (to the right) (20cm) (math)

L2   20   L2   20

90°   40

given 67

60   17.48°

133.15 cm

Degree our pencil normally hits at

120

robot

70

$A^2 + B^2 = C^2$

$(67+60)^2 + 40^2 = C^2$

$127^2 + 40^2$

$16129 + 1600 = \sqrt{17729} = 133.15$

$\sin^{-1}\left(\dfrac{40}{\sqrt{17729}}\right) \approx 17.17.48$

$\cos^{-1}\left(\dfrac{40}{\sqrt{17729}}\right)$

$180 - (90 + 17.45) = 72.5$

Answers ↑ on graph

← In conclusion we have to hit at

= (0-2) rotations ←

$72.52°$ angle

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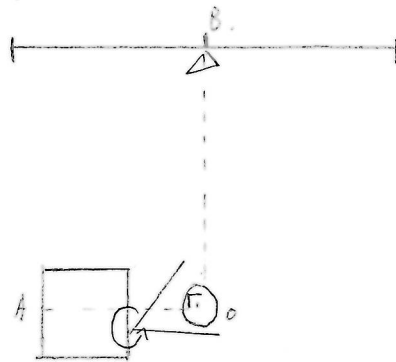Division: Junior /~Senior~/   Team Name: ___PCMS-7___

Team School / Organization Name: __Pui Ching Middle School__ Team Number: __2880-2__
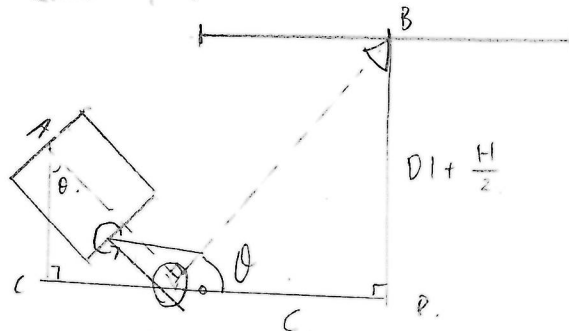
Unknown Task #2: Fence is NOT centered

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In a normal set-up, we have the car and the bottle as shown:

We could notice that $\angle AOB = 90°$, which we have the following.

Using similar triangles, we could easily notice that $\angle CAO = \angle BOD$, hence by finding $\angle BOD$, we could know how much the car have to turn:

$$\tan \theta = \frac{BD}{OD}$$

$$\tan \theta = \frac{D1 + \frac{H}{2}}{C}$$

$$\theta = \tan^{-1}\left(\frac{2D1 + H}{2C}\right)$$

By plugging in the values ($D1 = 67$, $H = 72$, $C = 20$), we get

$$\theta = \tan^{-1}(5.15).$$

$$\theta = \boxed{79.0113°}$$

P.T.O

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Division: Junior / Senior   Team Name: ~~_____~~ XYZ

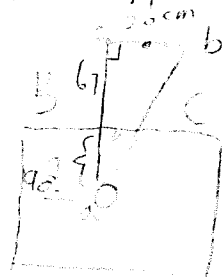Team School / Organization Name: _King's Edgehill School_ Team Number: _2170-5_

Unknown Task #2: Fence is NOT centered

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As we know, the center between Point C is around 10cm of fence

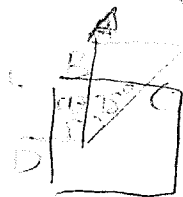A is 20cm, B is around 110cm ±0.5cm

Using the cos law, could know

$$\cos\alpha = \frac{A}{B} = \frac{20cm}{110\pm0.5cm} \approx 78° \pm 0.5° \approx 78 \pm 0.64\%$$

Therefore the angle that our robotic the ball will be 78°

The robotic was 90° between line D & B And the ball will go there

Add the 78° for the robotic to hit, the degree between A and D will decrease 78°   90° - 78° = 12° ± 0.64%

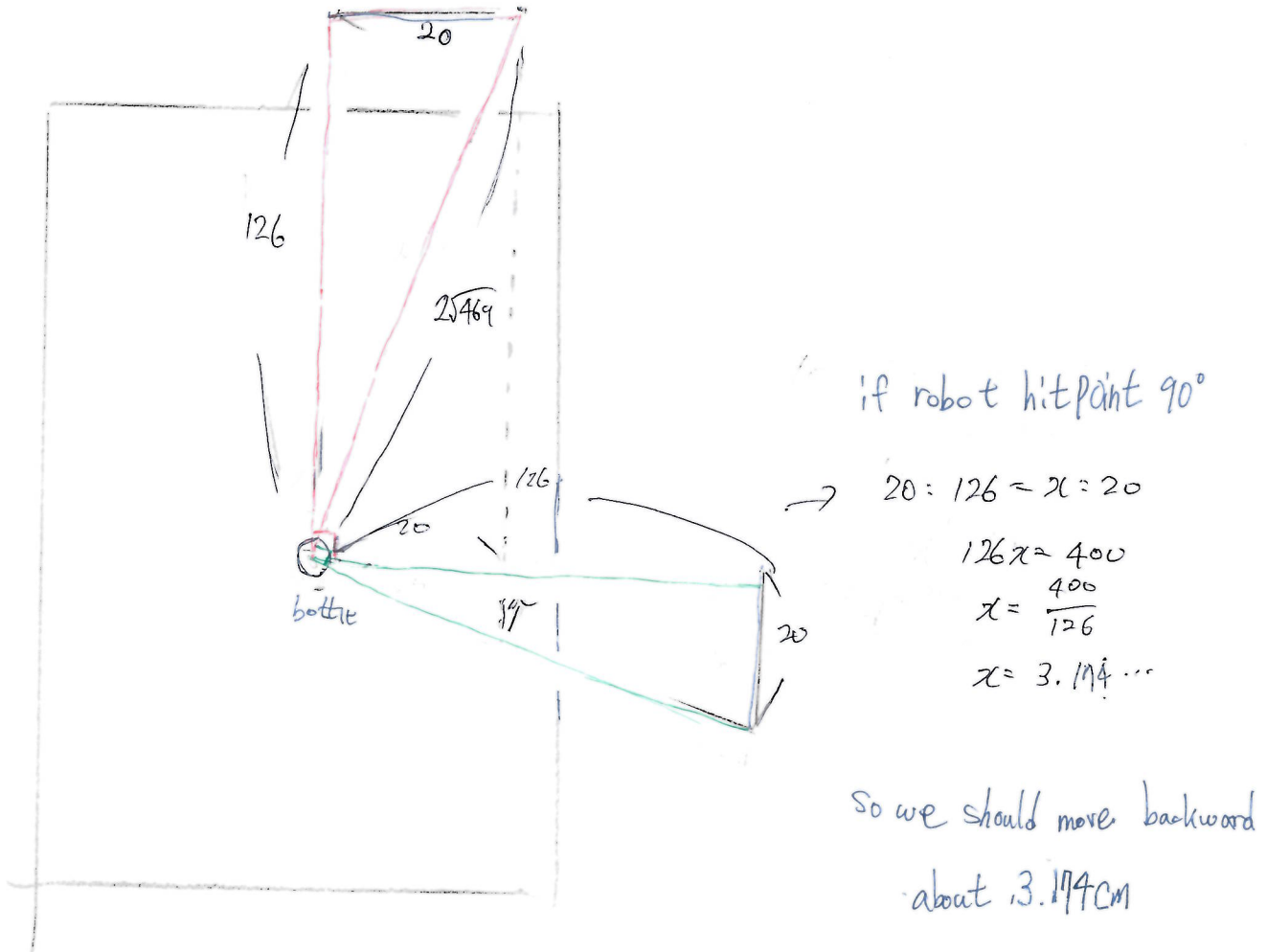The robotic will hit the ball by 12 degree to the line B. Turned on the motor, the left wheel should

move to the front, and right one move back

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Division: Junior / (Senior)　　　　Team Name: Heros never die

Team School / Organization Name: R&G Robot　　　　Team Number: 2559-2

Unknown Task #2: Fence is NOT centered

- Describe how your team solves the unknown task #2 as mathematical as possible for a special "problem solving" award.
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if robot hitpoint 90°

$20 : 126 = x : 20$

$126x = 400$

$x = \dfrac{400}{126}$

$x = 3.174\cdots$

So we should move backward about 3.174cm

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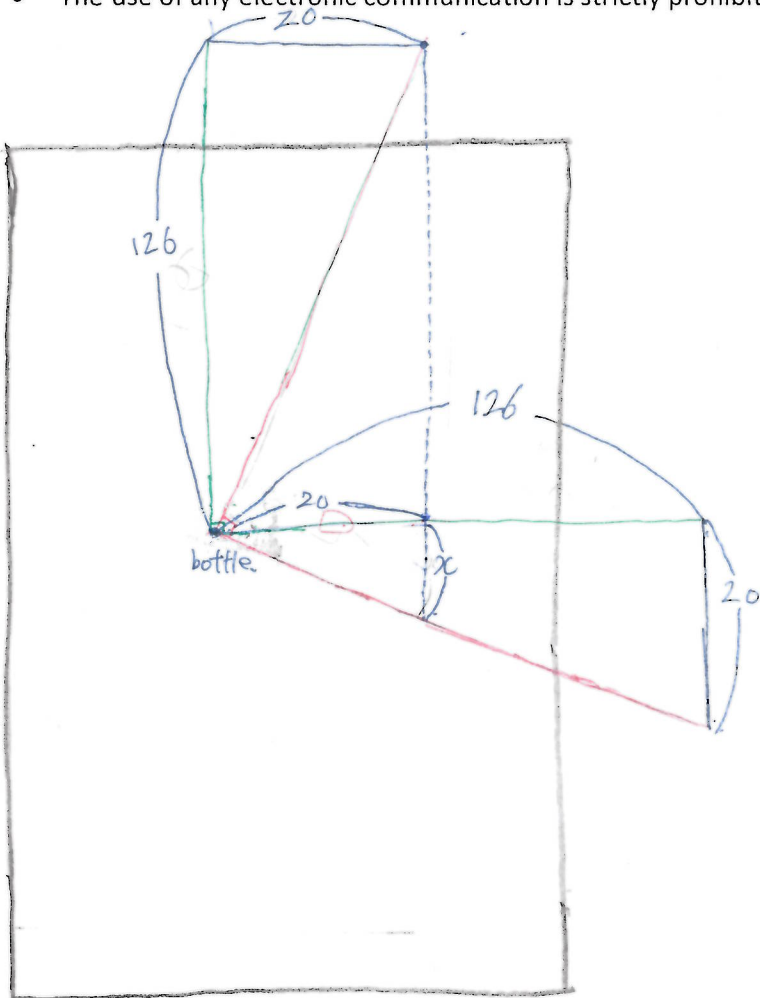
Division: Junior / Senior   Team Name: ___unique___

Team School / Organization Name: ___R&G Robot___   Team Number: ___2559-1___

Unknown Task #2: Fence is NOT centered

- Describe how your team solves the unknown task #2 as mathematical as possible for a special "problem solving" award.
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- The use of any electronic communication is strictly prohibited.

if robot hit point is 90°

$$20 : 126 = x : 20$$

$$126x = 400$$

$$x = \frac{400}{126}$$

$$\therefore x = 3.17$$

so we should move backward about 3.17cm.