

Design a Star Finder (Prototype)

Technology and the Skilled Trades Grades 9 and 10

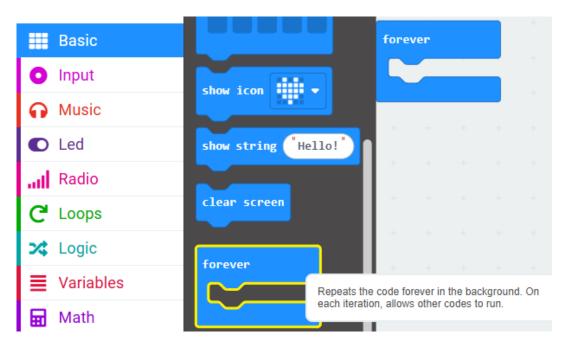
Coding Guide

Use these instructions to code your Micro:bit to be able to detect pitch and roll (rotation up and down, as well as side to side), and identify when it's pointing at the North Star's location. Before starting, go to makecode.microbit.org and log in or make an account. This will allow you to go back to your work and re-download it later if needed. Then, create a new file.

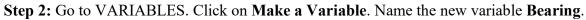
Everything written in ALL CAPITALS are the block categories in the menu. Everything written in **bold** is the name of a specific block. If you want a picture of the entire code without step-by-step instructions, please go to the last page.

Coding Instructions:

Step 1: Go to BASIC and add a **Forever Loop** block. If there is already one in your work area, then leave it and delete any other blocks you may have started with.

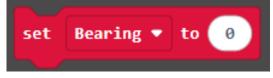






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	D Input		
6	Music		
	D Led		
	New variable	nomo:	•
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2	Bearing		
6			Ok
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Step 3: You should have a block that says: 'Set Bearing to 0'. This is your Set Index block

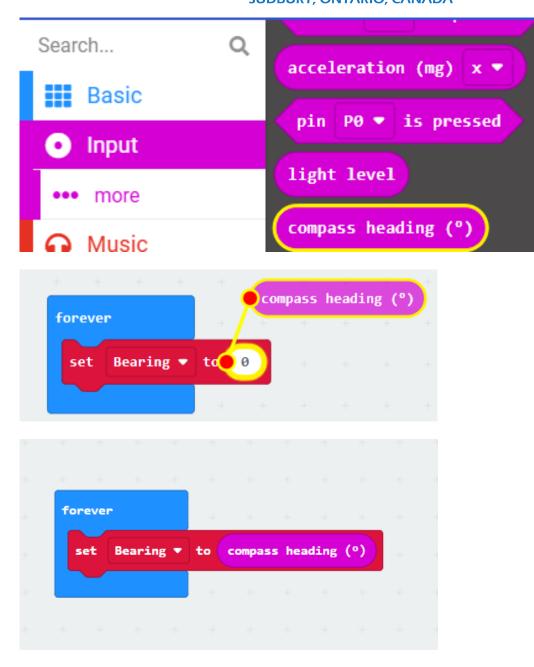


Step 4: Add Set "Bearing" to 0 to your Forever block



Step 5: Go to INPUT. Add a Compass Heading block inside your red block, in place of the 0.

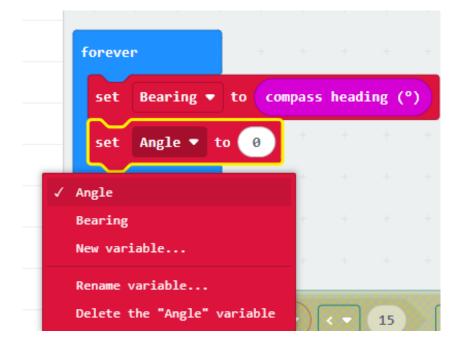




Step 5: Go to VARIABLES. Add another Set Index to 0 block.

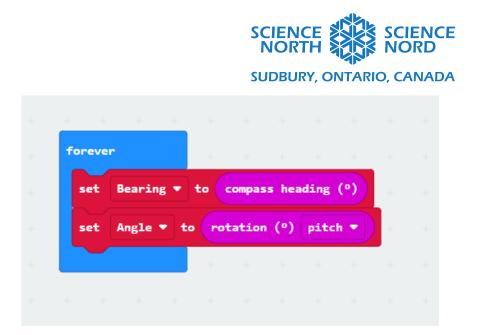
Step 6: Click the drop down and click 'new variable'. Name it 'Angle'. Be sure that the drop down on your second red block now says Angle.



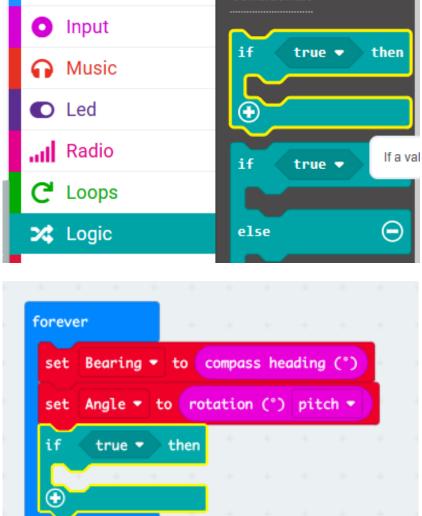


Step 7: Go to INPUT and then click 'more' from the menu. Add a **Rotation (°) Pitch** block in your second red block, again in place of the 0. Be sure the drop down says pitch.

magnetic force (μT) x 🔻
rotation (°) pitch 💌
running time (ms)
running time (micros)
compass heading (°)
) + + + +
•rotation (°) pitch •

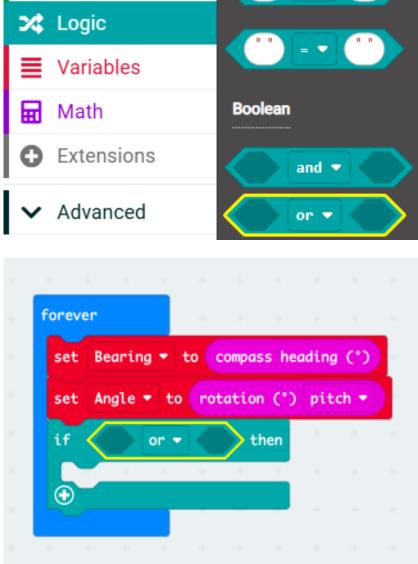


Step 8: Go to LOGIC and select **If True Then** block and add it below the red blocks, still within the **Forever Loop**.





Step 9: Go to LOGIC. Add a _____ or ____ block and put it in place of the 'true' spot on your If True Then block.



Step 10: Go to LOGIC and add a 0<0 block and put it in the place of the first empty hexagon of the _____ or ____ block.

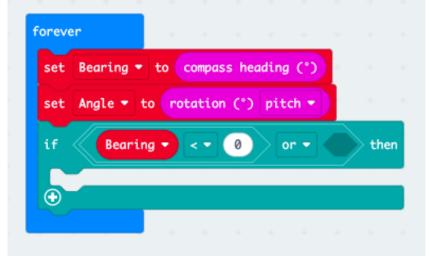




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🔹 to 🤇	compas	s he	ading) (°)	
to ro	tatior	ı (°)	pit	ch 🝷	
< •		or 🝷		t	hen
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Double check the order of the turquoise blocks to the picture above.

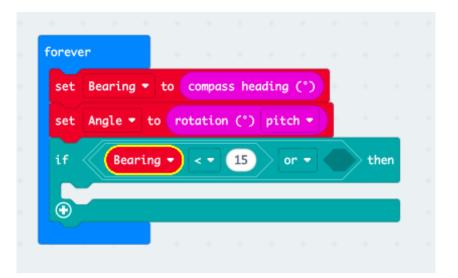
Step 11: Go to VARIABLES and add a Bearing block to replace the first 0.



Step 12: Change the symbol in the middle to < (less than symbol).

Step 13: Change the second 0 to 15.





Step 14: Go to LOGIC and add another **0<0** block to the second blank hexagon.

oreve	er										
set	Bearing	g 🔹 t	:0 0	compas	ss hea	ading	(°)	r.			
set	Angle •	• to	rot	atior	n (°)	pito	:h 🔻				
if	Bea	aring	Ð	< •	15		r -	(0	 0	> the
\odot											

Step 15: Go to VARIABLES and add a Bearing block in place of the first 0.

Step 16: Change the symbol in the middle of your **0<0** block to a > (greater than symbol).

Step 17: Change the second 0 to 345.



-											
ng 🔹 to	compas	s hea	ading	(°)	1						
• to (otation	(°)	pitc	h 🔻							
aring 🝷		15	<u> </u>			Beari	ng 🝷	>	3	45	\gg th
		• to rotation	• to rotation (°)	 to rotation (°) pitc 	ng • to compass heading (°) • to rotation (°) pitch • earing • < • 15 or •	 to rotation (°) pitch • 	 to rotation (°) pitch ▼ 	 to rotation (°) pitch • 	 to rotation (°) pitch 	 to rotation (°) pitch 	<pre>• to rotation (°) pitch •</pre>

Step 18: Go to BASIC. Add a Show LEDS block and use the LED buttons to make an 'N'.

orever												
set Beari	ng 🝷 to 🌔	compa	ss he	ading	(°)							
set Angle	• to ro	otatio	י (°)	pit	ch 🔻							
if Be	earing 🔹	< •	15		or 🔻	Beari	ng 🔻) > •	3	45	> th	en
show leds										/		

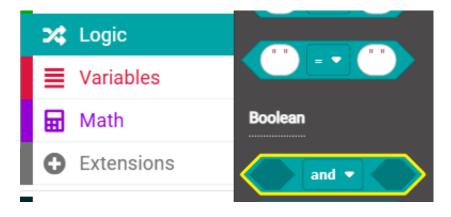
Step 19: Go to LOGIC and add another If True Then block, this time inside the other one (just under the Show LEDS block).



SUDBURY, ONTARIO, CANADA

prever						1							
set Beari	ng 🕶 to	compas	s heo	ading	(°)								
set Angle	• to (otation	(°)	pitc	h 🕶								
if B	earing 🝷	< •	15		r - <		Bearin	g 🔹	> •	34	5	> ther	n
show led	s												
if tr	ue 🔹 th	ien											
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\odot													

Step 20: Go to LOGIC and add a _____ and ____ block in place of the 'true' spot.





orever														
set Beari	ng 🔹 to	compas	s he	ading	(°)	e.								
set Angle	• • to ro	tation	(°)	pitc	h 🔻									
if B	earing 🔹	< 🕶	15		r -		Beari	ng 🔻) > •	3	45	> th	en	
show led	s													
if 🤇	and 🗸		the	n -										
\odot														

Step 21: Go to LOGIC and add a _____ block and put it in the first blank hexagon of your _____ and ____ block.



SUDBURY, ONTARIO, CANADA

set Bearing ♥ set Angle ♥ to				5						
if Bearing		15	_		Beari	.ng 🔻) > •	34	45	≥ ti
show leds										
	-									
if 🖉 🖉	• 0	and		the	n					

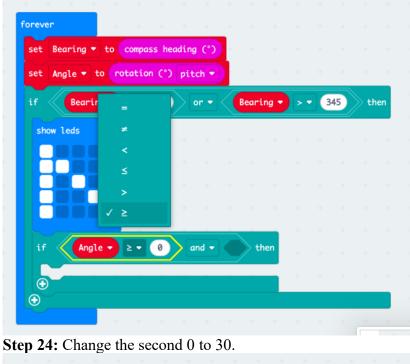
Step 22: Go to VARIABLES and add an Angle block in place of the first 0.

set B	learing 🝷 to	compa	iss he	ading) (°)	Ľ							
set A	ngle 🔹 to	rotatio	n (°)	pit	ch 🔻								
if 《	Bearing 👻	< -	15		or 🔻		Beari	ng 🝷	> -	3	45	> th	er
show	leds												
Н		- 4											
		1											
if	Angle •) < •	0) a	nd 👻		tł	ien					
0													



Change the first 0 to 30.

Step 23: Make sure the symbol in the middle is $a \ge ($ greater than or equal to).



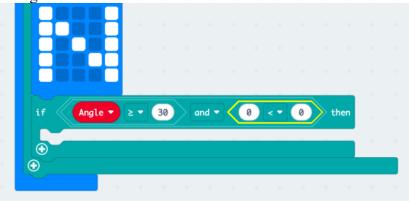
set	Bearing 🝷 t	o compas	ss hea	ading	(°)							
set	Angle 🕶 to	rotation	י (°)	pit	ch 🔻							
if	Bearing		15	>	or 🔻	Beari	ng 🔻	> -	34	45	> th	en
sh	ow leds											
		- a.										
		1.1										
		1.1										
if	Angle		30		nd 🗢	+	hen					
	Aligic		50									
\odot												

Step 25: Make sure the _____ and ____ block says 'and' in the middle, not 'or'.



SUDBURY, ONTARIO, CANADA

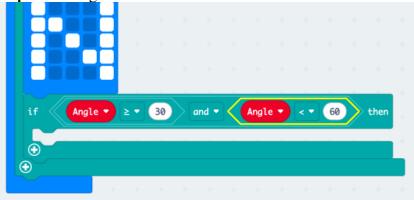
Step 26: Go to LOGIC and get another _____ block and put it in the place of the second empty hexagon.



Step 27: Go to VARIABLES and add an Angle block into the spot of the first 0.

Step 28: Make sure the symbol in the middle is $a \leq (less than or equal to)$.

Step 29: Change the second 0 to 60.



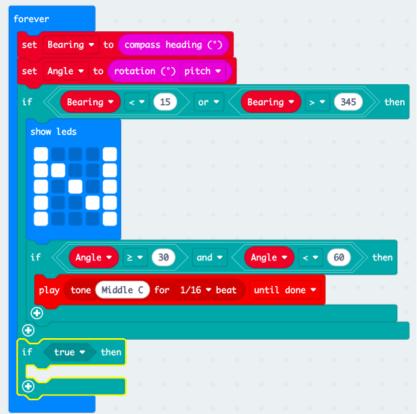
Step 30: Go to MUSIC and add a **Play Tone Middle C for 1 Beat Until Done** block and add it inside the empty **If True Then** block

Step 31: Change the tone (Middle C') to whatever you like, and change '1 beat' to '1/16 beat'.



Set	Bearing 🝷 t	o compa	ss he	ading	C	Ľ						
set	Angle 🝷 to	rotatio	n (°)	pit	ch 🝷							
if	Bearing		15		or 🔻		Beari	ng 🔹	> -	34	45	th
sh	ow leds											
		- A.										
		1.1										
		1.1										
if	Angle	2 -	30	a	nd 🔻		Angle	D	< •	60	$\left \right\rangle$	then
	olay tone Mi	iddle C	for	1/16	▼ be	at	unti	l dor	ne 🔻			

Step 32: Go to LOGIC and add another If True Then block under the others (but still inside the Forever Loop).





Step 33: Go to LOGIC and add a _____ and ____ block and put it in place of the 'true'.

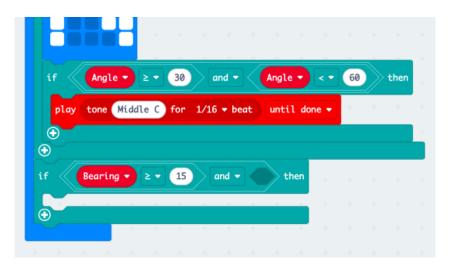
Step 34: Go to LOGIC and add a **0<0** block and put it in place of the first empty hexagon.

Step 35: Go to VARIABLES and add a Bearing block in place of the first 0.

Step 36: Change the symbol to \geq (greater than or equal to).

Step 37: Change the second 0 to 15.

Step 38: Make sure the _____ and ____ block says 'and', not 'or'.



Step 39: Go to LOGIC and add another **0<0** block in place of the second empty hexagon.

Step 40: Go to VARIABLES and add a Bearing block in place of the first 0.

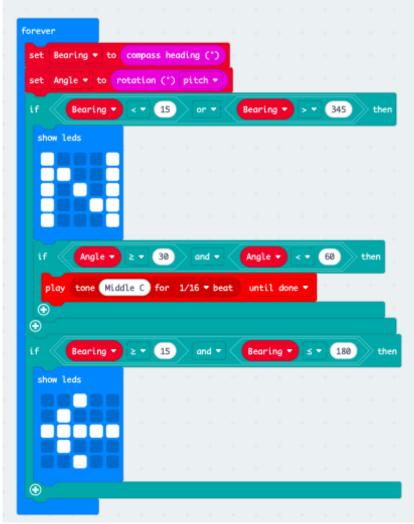
Step 41: Make sure the symbol in the middle is $a \le (less than or equal to).$

Step 42: Change the second 0 to 180.



Show L	cus												
		Н											
		Н											
if 《			-									1	
44 77			≥ ▼	30) a	ind 🔻		Angle	3 🔻 📘	< 🔻	60	$) \rightarrow$	then
	Angle				<u> </u>		$^{\prime} \sim$	-		<u> </u>		<u>//_</u>	
play	tone								l dor	ne 🔻	а. С	/	
										ne 🔻	2		
play (*)	tone	Middl	Le C	for	1/16	► be	at	unti	l dor			180	
play 🕣		Middl			1/16		at		l dor		•	180	t t
play (*)	tone	Middl	Le C	for	1/16	► be	at	unti	l dor		- (1	180) tł

Step 43: Go to BASIC and add a **Show LEDS** block inside the **If True Then** block and use the LED buttons to make an arrow pointing left.



https://schools.sciencenorth.ca/ Science North is an agency of the Government of Ontario and a registered charity #10796 2979 RR0001.



Step 44: Go to LOGIC and add another **If True Then** block underneath the previous one, but still in the **Forever Loop**.

forever			_	_								
set Bearing -	to com	pass h	eadin	ig (°)								
set Angle 👻 t	o rotat	ion (*)) pi	tch 👻								
if Bearin		15		or 🕶		Beari	ng 🕶	>		45) th	en
show leds												
	8											
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					1	_						ċ
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if Angl		. <u> </u>			1	-			_	2/		
	Middle (6 - be	at	unti	1 dor	ie -	1			
play tone (6 - be	at	unti	1 dor	ie -	1			
play tone	Middle (for	1/1					ie -				
play tone (Middle (1/1	6 - be and -			l dor ing •	ia -	•	180)))	her
play tone	Middle (for	1/1					ie -	•	180	>.	her
play tone The second s	Middle (for	1/1					ia - ≥	- (180	>•	her
play tone The second s	Middle (for	1/1					ie -	- (189	>•	her
play tone The second s	Middle (for	1/1							189	>•	her
play tone The second s	Middle (for	1/1					s -		189)))))))	her
play tone The second s	Middle (for	1/1					10 -		180		her
play tone	Middle (for	1/1					10 -		180		her

Step 45: Go to LOGIC and add a _____ and ____ block in place of the 'true' spot.

Step 46: Go to LOGIC and add a 0<0 block in the first empty hexagon.

Step 47: Go to VARIABLES and put a Bearing block in place of the first 0.

Step 48: Change the symbol in the middle to \geq (greater than or equal to).

Step 49: Change the second 0 to 179.



Step 50: Make sure the _____ block says 'and', not 'or'.

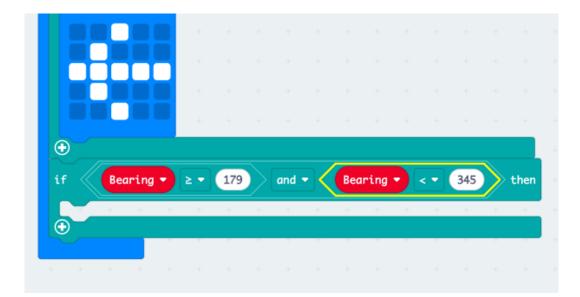
if Bearing	▶ ≥ ▼	15	2	and 🔻		Bear	ing 🕶	4	•	180	∑ t	hen
show leds	+	+	+	+	+	+	+	+	+	+	+	-
	-											
	- +											
	+	+	+	+	+	+	+	-+	+	+	+	-
0												
if Bearing	• ≥ •	179		and •			then					
	+ +		+	+	+	+	-					
	+ +		-	-	+	-						

Step 51: Go to LOGIC and add a 0<0 block in place of the second empty hexagon.

Step 52: Go to VARIABLES and add a Bearing block in place of the first 0.

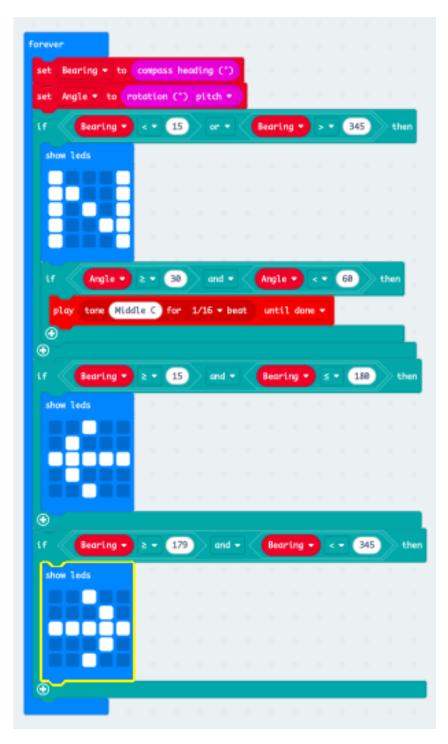
Step 53: Make sure the symbol in the middle is $a \leq (less than or equal to)$.

Step 54: Change the second 0 to 345.





Step 55: Go to BASIC and add a **Show LEDS** block inside the empty **If True Then** block. Use the LED buttons to make an arrow pointing right.



This is the completed code. Now all there is to do is connect your Micro:bit, download the code to it, and test it out!