

Gears Rule	Grade 3 and 4
Gears Rule Coding Guide	

To start, you will need a png image (no background) of a gear. We've included an image as a downloadable resource or you can access an image using this link: <https://bit.ly/3ljNeL9>

A completed version of this project can also be viewed on scratch here: <https://scratch.mit.edu/projects/438665696/>

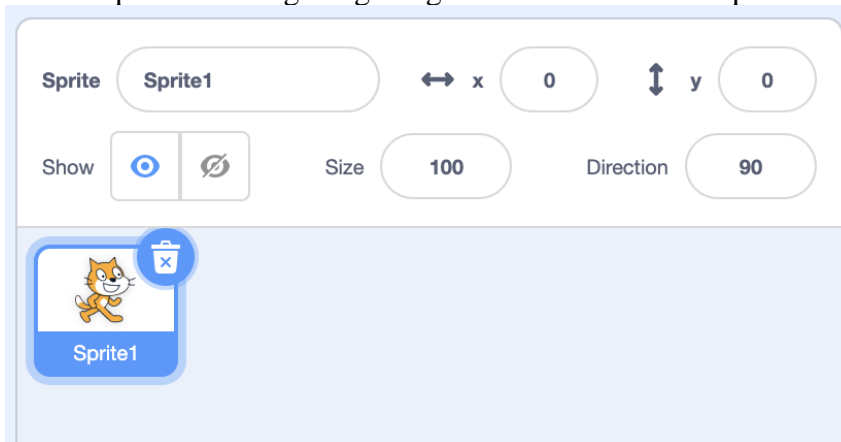
This lesson has three challenges for the students to attempt, which requires them to use their gear coding rules to accurately portray the movement of gears. We'll look at the code for each of the three challenges, which are:

1. Code two gears that are the same size
2. Code three or more gears
3. Code two or more gears that are different sizes

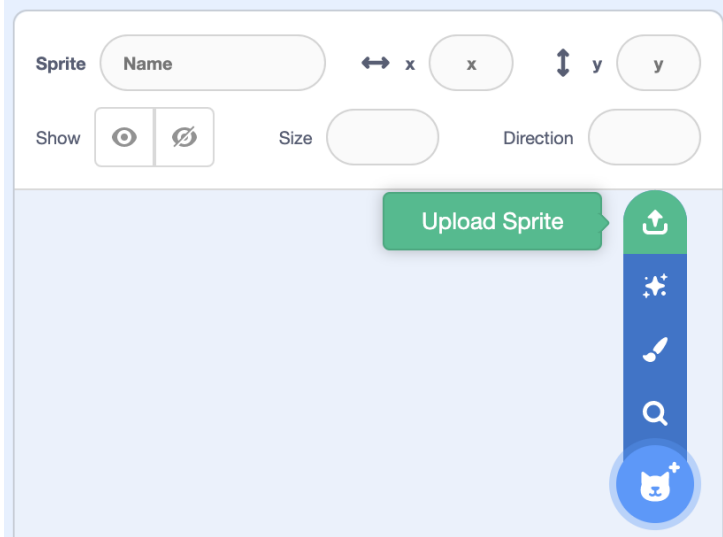
Bonus: Create a gear train that incorporates as many different features as you can

Challenge One: Code Two Gears

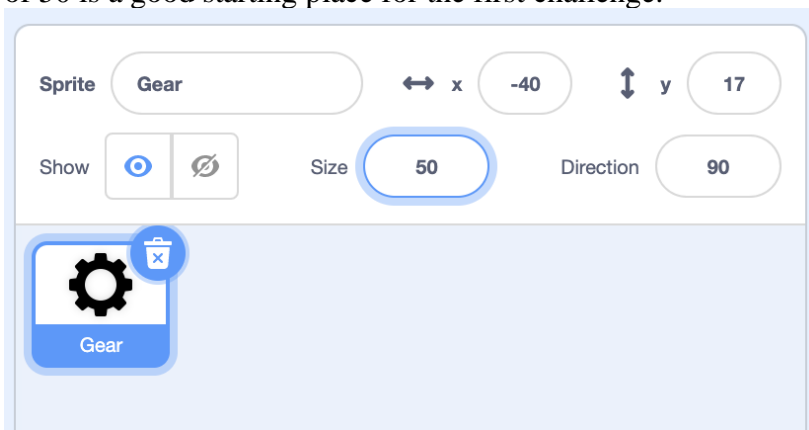
To start, you'll need to delete the current sprite and add the png image of the gear. Removing the sprite is as simple as clicking the garbage can icon on the Cat sprite.



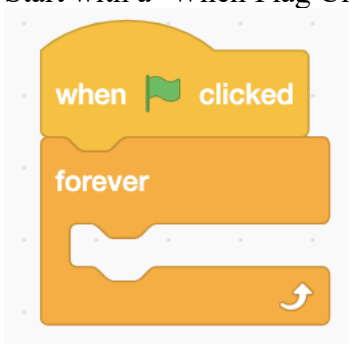
To add the gear, click the icon with the cat and the addition symbol, then use the top most option 'upload sprite'. Choose the image of the gear to add it to your screen.



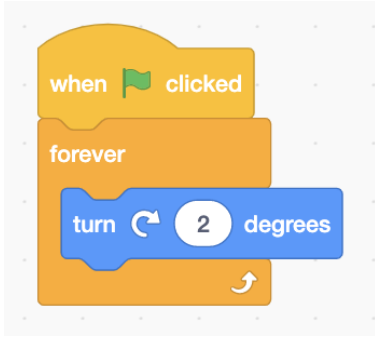
The size of the gear is quite large by default so you can change the size in the appropriate box. A size of 50 is a good starting place for the first challenge.



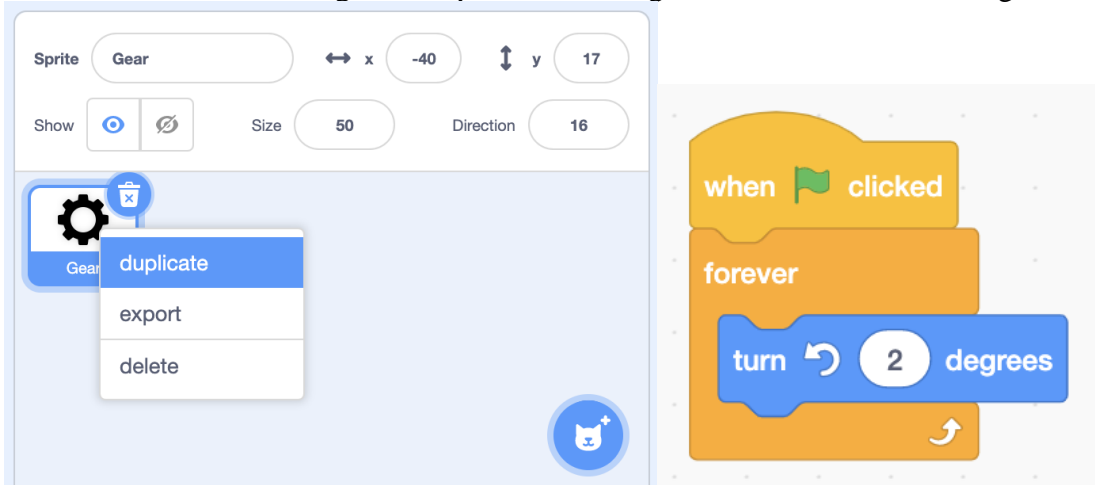
To code the gear, we will take advantage of a forever loop, which will allow the gear to turn forever. Start with a 'When Flag Clicked' block, then add a forever loop underneath it.



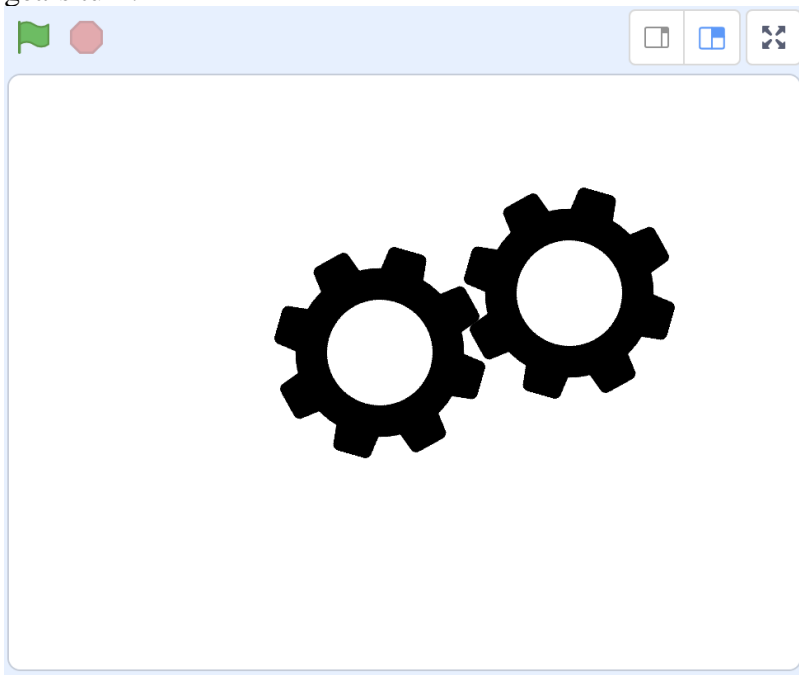
Inside the forever loop we will add a 'Turn' motion block. The number of degrees selected will determine how fast a gear will turn. Turning 2 degrees is a good start because it is easy to double or half when adjusting the speed.



To create a second gear, right click on the sprite icon and click duplicate. Since gears go opposite directions when interacting, it is important to change the direction of the new gear.

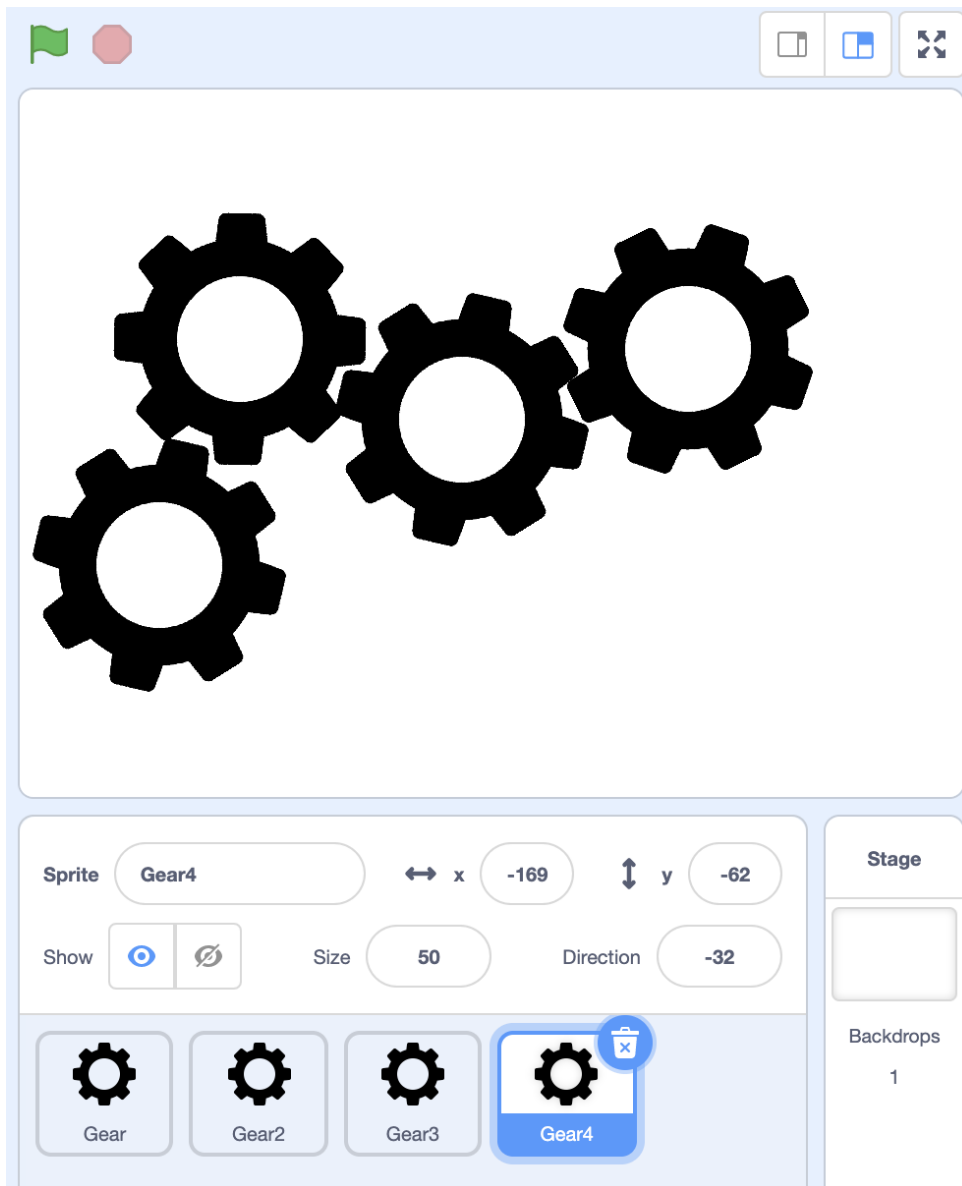


Finally, drag the gear images on screen so they no longer overlap. Click the green flag to make the gears turn.



Challenge Two: Three or More Gears

To add additional gears, duplicate one of the existing gears and position the sprites into place. The important thing is to ensure that the gears are turning in the right direction. The rules that students created in the other part of the lesson will help with this.



Gear 1



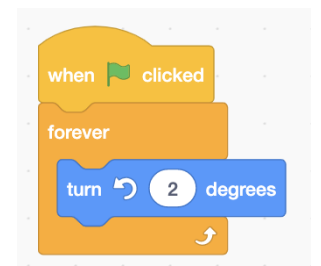
Gear 2



Gear 3



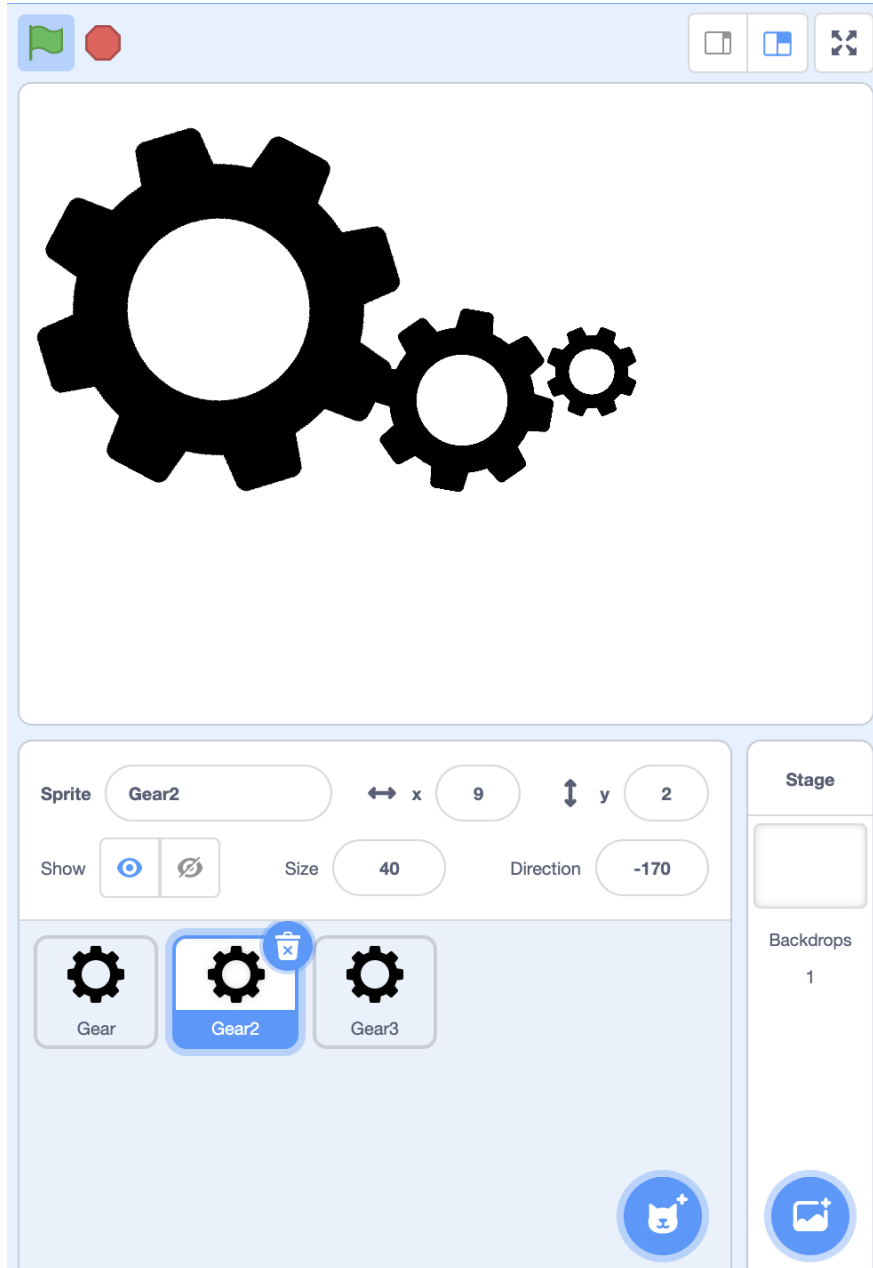
Gear 4



Challenge Three: Gears with different speeds

Note: When an actual gear changes size, the number of teeth that they have also change. We are only simulating different sized gears to show how their speeds change.

To do this challenge, students will have to adjust the sizes. Choosing the middle gear to be a size of 40 means that a smaller gear can be 20 in size while a bigger gear can be 80 in size without taking up too much space. From the rules, we know a bigger gear has to move slower while a smaller gear moves faster. Students can adjust the rotation to replicate this.



Gear 1
 Size: 80
 Rotation: 1



Gear 2
 Size: 40
 Rotation: 2



Gear 3
 Size: 20
 Rotation: 4

