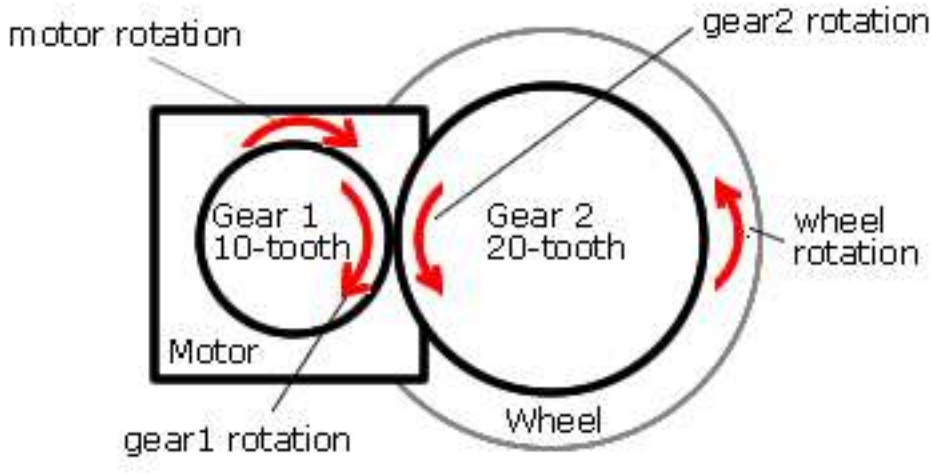
In our previous lab sessions, we have used gears for reversing the direction and changing the speed of rotation of the wheel. Consider the gear configuration below:



In the image above, there are 2 gears: 10-tooth and 20-tooth. Gear 1 is connected to a motor, and Gear 2 is connected to a wheel. Assume the motor is spinning clockwise at 100 rpm (revolutions per minute). How many times does the wheel rotate in a minute and in which direction (clockwise or counterclockwise)?

Answer:

i. For each revolution of the motor, Gear 1 (10-tooth) will rotate once in the same direction as the motor (i.e., clockwise in this case).

ii. In each revolution, Gear 1 will touch 10 of the teeth in Gear 2 (each tooth in Gear 1 will interlock with a tooth in Gear 2 and force Gear 2 to turn). Thus, Gear 2 will turn half a rotation in the opposite direction (i.e., counterclockwise in this case). In other words, the *gear ratio* for these two gears is ~~1 : 2~~ (read "~~one to two~~"), meaning that for one revolution of Gear 2 (the first gear in the ratio), Gear 1 will complete two rotations. This can also be stated as saying that for one rotation of Gear 1, Gear 2 will complete $1/2$ a rotation.

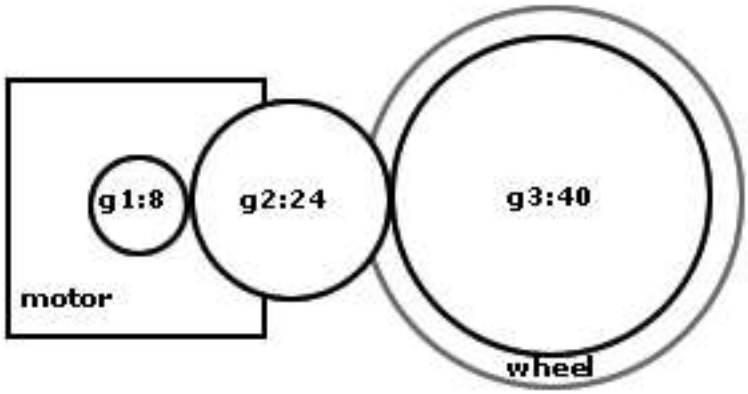
"two to one"

2 : 1

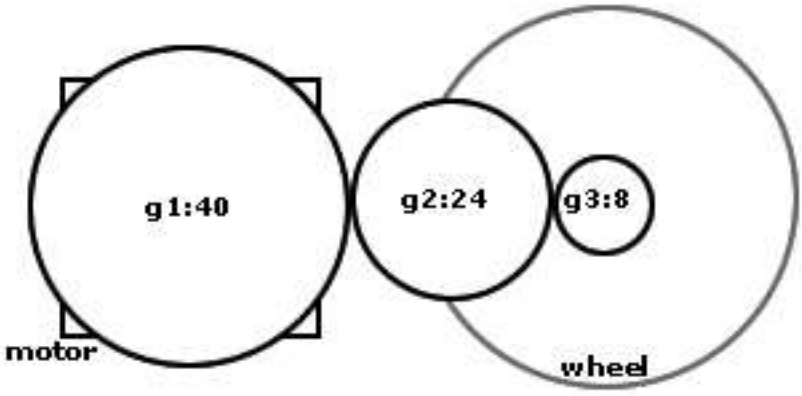
iii. Since Gear 2 is attached to the wheel, the wheel will also turn $1/2$ a rotation for each rotation of the motor, counterclockwise in this case.

iv. The motor spins 100 revolutions per minute. How many revolutions does the wheel rotate in a minute? We can find the answer by multiplying the number of revolutions the motor completes in a minute by the wheel revolution rate that we found above (i.e., $1/2$). Therefore the answer is : $1/2 * 100 = 50$ revolutions, counterclockwise.

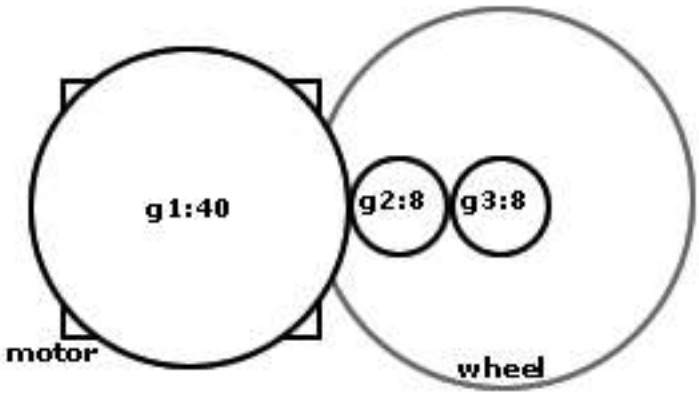
For each configurations below, determine how many times each gear rotates in a minute and in which direction (clockwise or counterclockwise). Assume that the motor is spinning clockwise at 200 rpm.



Answer:



Answer:



Answer: