

Interlocking Gears

Three gears are connected. One turn of the first wheel turns the second wheel three times. One turn of the second wheel turns the third wheel twice.

- a) Draw a picture of the three gears.
- b) If you turn the first wheel three times, how many times will the third wheel turn?
- c) How many times must you turn the first wheel in order to make the third wheel turn nine times?

Menu Questions

Students may not know where to start in their effort to draw interlocking gears, so it may be useful to introduce this problem with an even simpler example, such as

“Two gears are connected. One turn of the first wheel turns the second wheel two times. Draw a picture of the two gears.”

Even with this, there is likely to be some discussion and difference of opinion about what the two gears would look like relative to each other.

*The Menu options that follow are the same question with three different levels of scaffolding. In one sense, there is more to do for the * option, but that is really only because it contains a larger number of smaller steps. The *** problem asks the solver to come up with more on their own. There is also an additional question which uses four gears, and would be suitable for students who are comfortable with the three-gear *** question.*



- *Three gears are connected. Two turns of the first wheel turn the second wheel nine times. Three turns of the second wheel turn the third wheel five times.*
 - a) *Draw a picture of the three connected wheels.*
 - b) *How many times must you turn the second wheel so that the third wheel turns 30 times?*
 - c) *How many times must you turn the first wheel so that the second wheel turns 18 times?*
 - d) *How many times must you turn the first wheel so that the third wheel turns 30 times?*
 - e) *If you turn the first wheel once, how many times does the third wheel turn?*

- *Three gears are connected so that two turns of the first wheel turn the second wheel nine times and three turns of the second wheel turn the third wheel five times.*
 - a) *Draw a picture of the three connected wheels.*
 - b) *How many times must you turn the second wheel so that the third wheel turns 15 times?*
 - c) *How many times must you turn the first wheel so that the third wheel turns 30 times?*
 - d) *If you turn the first wheel once, how many times does the third wheel turn?*

- *Three gears are connected so that two turns of the first wheel turn the second wheel nine times and three turns of the second wheel turn the third wheel five times.*
 - a) *If you turn the first wheel once, how many times does the third wheel turn?*
 - b) *How many times must you turn the first wheel so that the third wheel turns 30 times?*

- *Four gears are connected so that two turns of the first wheel turn the second wheel three times, two turns of the second wheel turn the third wheel three times, and two turns of the third wheel turn the fourth wheel three times.*
 - a) *How many times must you turn the first wheel so that the third wheel turns 9 times?*

