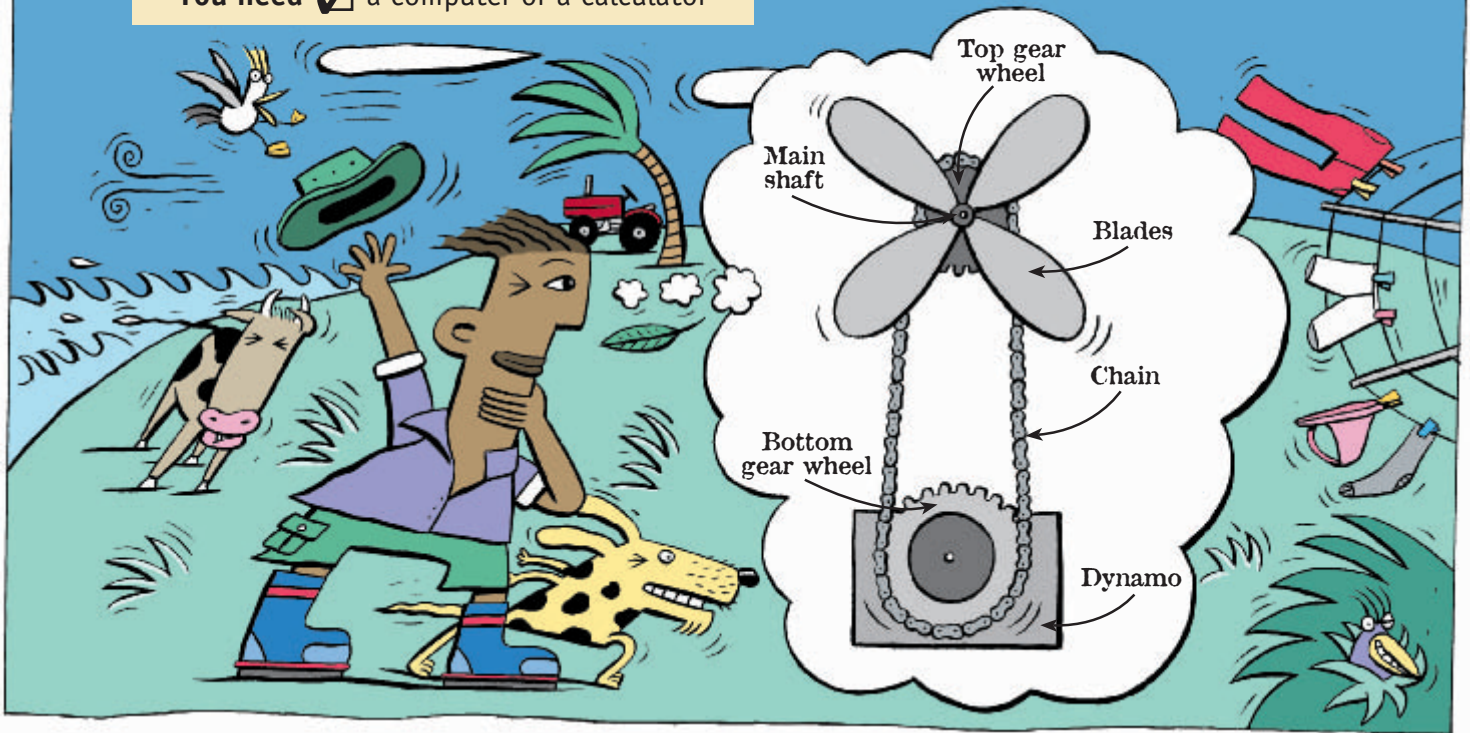


The Right Gear

You need a computer or a calculator

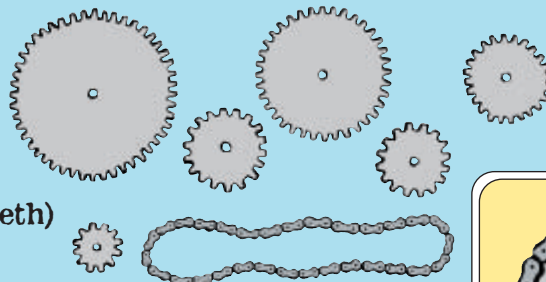


Activity

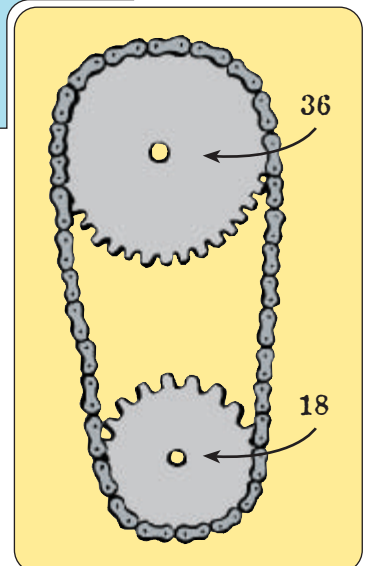
Farmer Fred is making a small wind-powered generator using a dynamo and other bits and pieces, mostly from an old bike.

Gearing

- 2 large gear wheels (36 and 48 teeth)
- 4 small gear wheels (12, 16, 18, and 24 teeth)
- Chain.



- If he uses the 36-tooth wheel on top and the 18-tooth wheel on the bottom, how many times will the bottom wheel turn for every turn of the top one?
 - If he swaps the position of the two wheels, what difference will this make?
 - For the dynamo to spin fastest, should the big wheel or the small wheel be attached to the main shaft?
 - What combination of Fred's six gear wheels will make the dynamo turn fastest? Slowest?



2. Fred decides to try the 48-tooth wheel on top and the 12-tooth wheel below. If the wind turns the blades 20 times a minute, how many times will the dynamo turn?
3. Copy and complete this table, showing what happens as the wind speed changes and Fred tries different wheels:

Wind (turns of blades)	Large wheel (teeth)	Small wheel (teeth)	Dynamo (turns)
20	48	16	60
30	36	12	
26		18	52
	36	24	72
21	48		63



4. The instructions on the dynamo say that, for best performance, it should turn at a rate of 55 to 65 times per minute. If the wind is turning the blades 21 times per minute, what combinations of Fred's gear wheels will achieve this?

If possible, organise the information in a spreadsheet like this, using formulae to do the calculations for you:

	A	B	C	D
1	Blades turn 21 times per minute			
2		36	48	
3	12	63		
4	16			
5	18			
6	24			
7				

Challenge

Fred finds that the blades of his windmill usually turn at a rate of 25–45 times per minute.

He attaches a cluster of 3 gear wheels to the dynamo (like those on the rear hub of a bike) and invents a way of getting the chain to shift from one to another as the wind changes speed.

Which combination of gear wheels (1 large and 3 small) should he use to get the best performance out of the dynamo?

