

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ calculate the velocity ratio of a simple gear train
- ☐ calculate output speed in revs min^{-1}
- ☐ work out the direction of rotation, including with an idler
- ☐ choose gears to increase or decrease speed

I DO**Key ideas and worked example** Read this first**VR = driven ÷ driver (teeth)**

Velocity ratio = teeth on driven gear ÷ teeth on driver gear = input speed ÷ output speed

- Output speed = input speed ÷ VR
- Speeds in revs min^{-1}

- Meshing gears turn in **opposite** directions. An **idler** gear makes the driver and driven turn the same way and doesn't change the VR.
- A small driver turning a large driven gear **reduces** speed; a large driver turning a small driven gear **increases** it.

A 20-tooth driver gear meshes with a 60-tooth driven gear. The driver turns at $900 \text{ revs min}^{-1}$.

Example Calculate the velocity ratio and the output speed.

Worked answer set out every step like this

$$\text{VR} = \text{driven} \div \text{driver} = 60 \div 20 = 3 \text{ (3 : 1)}$$

$$\text{Output speed} = 900 \div 3$$

$$\text{Output speed} = 300 \text{ revs min}^{-1}$$

WE DO**Guided practice** Follow the steps to help you

From gears of 8, 16, 24 and 40 teeth, build a simple gear train in Yenka with the biggest increase in speed.

1 State which gears you used as the driver and the driven, and calculate the velocity ratio. (2 marks)

Steps

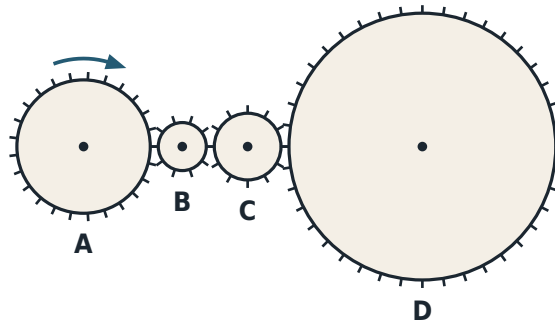
1. To increase speed the driven gear must be smaller than the driver
2. Choose the largest driver and the smallest driven gear
3. $\text{VR} = \text{driven} \div \text{driver}$

YOU DO

On your own Show your working. Check your answers afterwards.

2 Now change your gear train in Yenka to give the biggest decrease in speed. State the gears and calculate the velocity ratio.

3 In the simple gear train shown, A has 50 teeth, B 10 teeth, C 25 teeth and D 100 teeth. A is the driver.

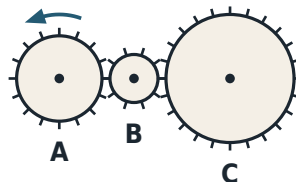


a) Which gear rotates in the same direction as A?

b) Calculate the velocity ratio from A to B, A to C and A to D.

c) A rotates at $500 \text{ revs min}^{-1}$. Calculate the speeds of B, C and D.

4 A has 20 teeth, B 5 teeth and C 30 teeth. A turns anticlockwise at $250 \text{ revs min}^{-1}$.

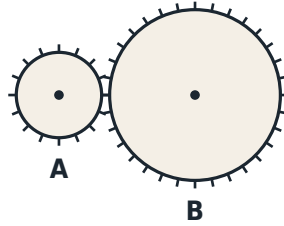


a) Calculate the velocity ratio of the gear system.

b) Calculate the output speed.

c) State the direction of rotation of gear C.

5 Driver gear A has 20 teeth. When shaft A turns 10 times, shaft B turns 5 times.



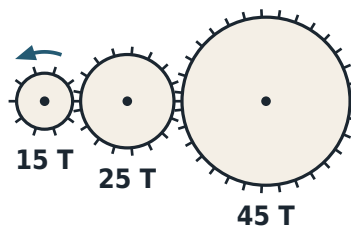
a) How many teeth does gear B have?

b) What is the velocity ratio?

c) Shaft A rotates at 60 revs min^{-1} . At what speed does shaft B rotate?

d) Shaft A rotates anticlockwise. In which direction does shaft B rotate?

6 A 15-tooth driver is turned by a motor at $1800 \text{ revs min}^{-1}$. The 25-tooth gear is an idler and the output gear has 45 teeth.



a) Calculate the velocity ratio.

b) Calculate the speed of the largest gear.

c) The driver turns anticlockwise. In which direction does the output turn?

Check and reflect

Mark your answers with the answer sheet. Which “I can” statement above still needs work? Look back at the notes for that topic on the site.
