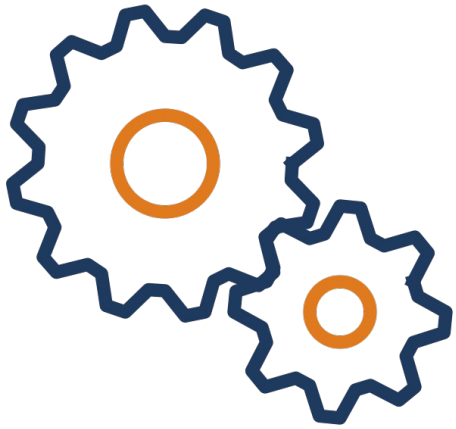
Lesson D4 Review Questions

Compound Gear Trains: Working Backwards



Answer every question in your jotter. Show your working. Tap a question below to go to it. Tap **Show answer** under a question to mark it.

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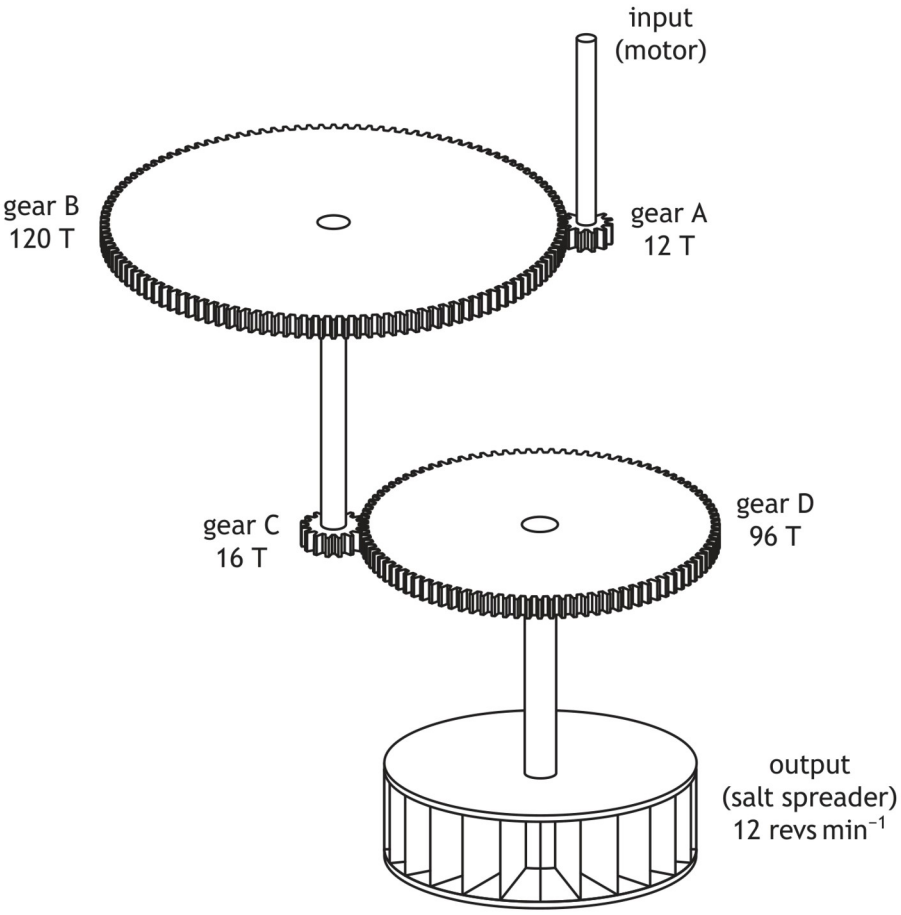
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Questions

2022 Section 2 Question 10 (e)

1. The gear train shown below is used to drive the salt spreading system.



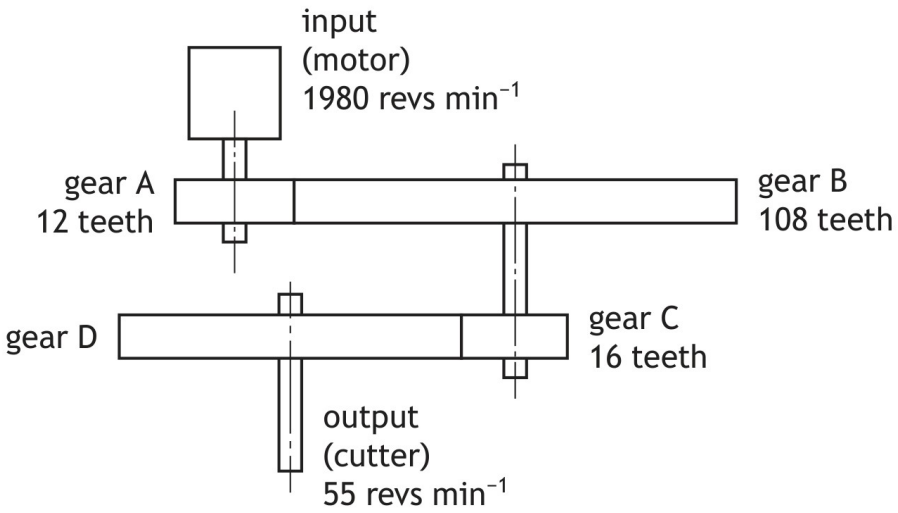
Calculate the **input** speed of the motor.

Show answer ›

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2. Ice is to be broken up by a cutter during the snow making process.

The cutter is driven by a compound gear train as shown below.



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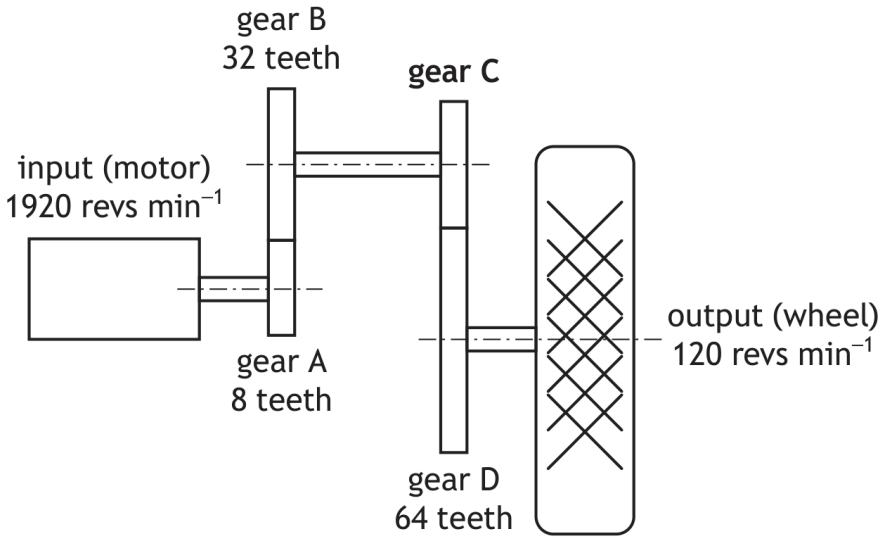
(a) Calculate the number of teeth on gear D in the compound gear train shown.

(b) Describe a modification to the compound gear train that results in gear D rotating in the opposite direction to gear A.

Show answer ›

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3. The drive mechanism used in the movement of the delivery robot is shown.



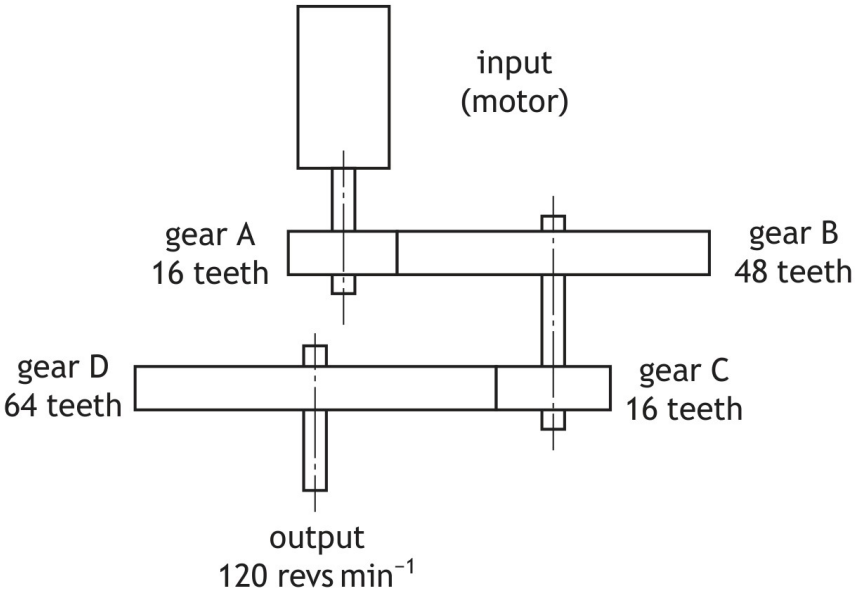
(a) State the name of this drive mechanism.

(b) Calculate the number of teeth on **gear C**.

Show answer ›

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4. The motor and gear train used in the electric bike are shown below.

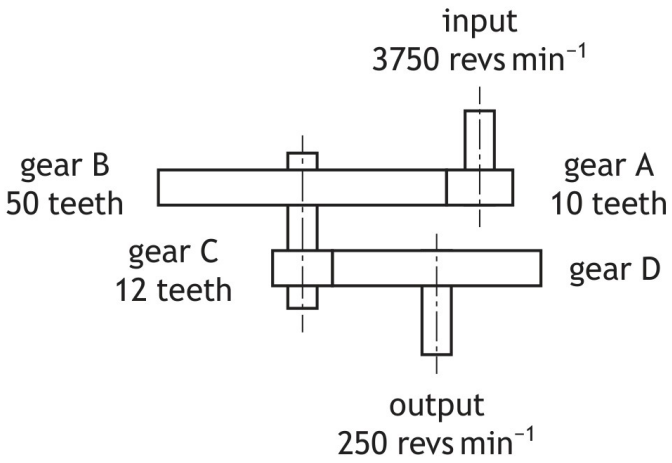


Calculate the rotational speed of the motor.

Show answer ›

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5. Part of a drive mechanism used in the combine harvester is shown.



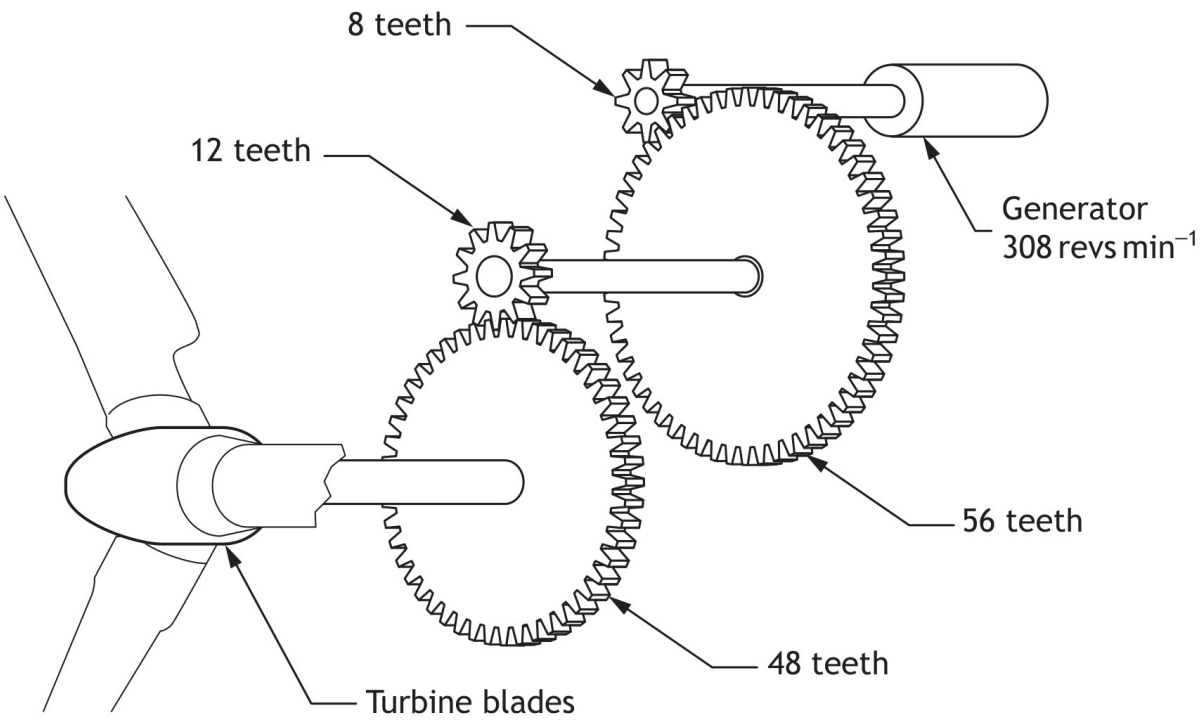
Calculate the number of teeth on gear D.

Show answer ›

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2015 Section 2 Question 10 (c)

6. A pupil's model of the wind turbine's compound gear train is shown in the diagram below.



Describe an advantage of using a compound gear train over a simple gear train. **1**

Show answer ›

2023 Section 2 Question 14 (f)

7. A large reduction in speed is required for a feed roller to slowly move the plastic sleeve and paper through the laminator.

Explain why a compound gear train is more suitable than a simple gear train to create this large reduction in speed in the laminator. **2**

Show answer ›

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Answers

Check your understanding (booklet)

1 input speed × 20 = 50 × 60, so input speed = 3000 ÷ 20 = 150 revs min^{-1}

2 400 × 15 = 100 × teeth, so teeth = 6000 ÷ 100 = 60

3 It uses smaller gears (cause), so it fits inside a small space (effect).

4 The opposite way (an odd number of meshes).

5 Add an idler gear between two meshing gears.

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Answer to question 1

2022 Section 2 Question 10 (e)

Marking instructions

Question			Expected response	Max mark	Additional guidance
10.	(e)		$Input_{speed}$ x in_{size} = $output_{speed}$ x out_{size}	4	
			$12 \times 96 = \text{output speed} \times 16$		1 mark for substitution.
			$\text{output speed} = \frac{1152}{16}$		
			output speed = 72 (revs min^{-1})		1 mark for correct answer from given working (unit not required).
			$12 \times \text{input speed} = 72 \times 120$		1 mark for substitution.
			$\text{input speed} = \frac{8640}{12}$		
			Input speed = **720 revs min^{-1} (2 sf)**		1 mark for correct answer from given working with unit. Allow FTE. Do not accept RPM.
			OR		
			$\frac{\text{output speed}}{\text{input speed}} = \frac{A}{B} \times \frac{C}{D}$		1 mark for first ratio (could be inverted).
			$\frac{12}{\text{input speed}} = \frac{12}{120} \times \frac{16}{96}$		1 mark for second ratio (same order as first ratio). Accept simplified ratios.
			$\text{input speed} = \frac{12}{\left(\frac{12}{120} \times \frac{16}{96}\right)}$		
			$\text{input speed} = \frac{12}{\left(\frac{1}{60}\right)}$		1 mark for transposition (12 × 60 if ratios inverted).
			input speed = **720 revs min^{-1} (2 sf)**		1 mark for correct answer from given working with unit.

‹ Back to question 1

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Answer to question 2

2021 Section 2 Question 14 (d), (e)

Marking instructions

Question			Expected response	Max mark	Additional guidance
14.	(d)		1980 x 12 = output speed x 108 $\text{output speed} = \frac{23760}{108}$ Output speed = 220 revs min^{-1} 220 x 16 = 55 x gear D $\text{gear D} = \frac{3520}{55}$ gear D = 64 (teeth) **OR** $VR = \frac{1980}{55}$ VR = 36 : 1 $36 = \frac{108}{12} \times \frac{D}{16}$ $D = \frac{36 \times 16}{9}$ Size of D = 64 (teeth)	4	1 mark for substitution. 1 mark for correct answer from given working (unit not required). 1 mark for substitution. 1 mark for correct answer from given working (ignore any units). 1 mark for calculating VR. 1 mark for substitution. 1 mark for transposition. 1 mark for correct answer from given working (ignore any units).
	(e)		Insert a (idler) gear between gears: A and B **OR** C and D	2	Must be a description response. 1 mark for using an additional gear. 1 mark for position of additional gear.

‹ Back to question 2

Answer to question 3

2026 Section 2 Question 8 (c), (d)

Marking instructions

Question			Expected response	Max mark	Additional guidance
	(c)		Compound gear (train).	1	

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Question			Expected response	Max mark	Additional guidance
8.	(d)		1920 x 8 = output speed x 32	4	**1 mark** for substitution.
			$\text{output speed} = \frac{1920 \times 8}{32}$		
			output speed = 480 (revs min^{-1})		**1 mark** for correct answer from given working (unit not required).
			480 x size of C = 120 x 64		**1 mark** for substitution. Apply FTE.
			$\text{size of C} = \frac{120 \times 64}{480}$		
			C = 16 (teeth) (2 sf)		**1 mark** for correct answer from given working (ignore any units).
			Alternative method		
			$VR = \frac{1920}{120}$		**1 mark** for velocity ratio (does not need to be simplified).
			VR = 16:1		
			$\frac{16}{1} = \frac{32}{8} \times \frac{64}{C}$		**1 mark** for 32:8 ratio (ratios could be inverted).
			$16 = 4 \times \frac{64}{C}$		
			$C = \frac{64}{4}$		**1 mark** for transposition.
			C = 16 (teeth) (2 sf)		**1 mark** for correct answer from given working (ignore any units).

‹ Back to question 3

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Answer to question 4

2024 Section 2 Question 9 (a)

Marking instructions

Question			Expected response	Max mark	Additional guidance
9.	(a)		$120 \times 64 = \text{input speed} \times 16$ $\text{input speed} = \frac{7680}{16}$ $\text{input speed} = 480$ (revs min^{-1}) $480 \times 48 = \text{input speed} \times 16$ $\text{input speed} = \frac{23040}{16}$ $\text{input speed} = 1440$ **1400 revs min^{-1} (2 sf)** **Alternative method** $\frac{\text{speed of output}}{\text{speed of input}} = \frac{A}{B} \times \frac{C}{D}$ $\frac{120}{\text{input speed}} = \frac{16}{48} \times \frac{16}{64}$ $\frac{120}{\text{input speed}} = \frac{1}{12}$ $\text{input speed} = 120 \times \frac{12}{1}$ $\text{input speed} = 1440$ **1400 revs min^{-1} (2 sf)**	4	1 mark for substitution. 1 mark for correct answer from given working (unit not required). 1 mark for substitution. Apply FTE. 1 mark for correct answer from given working with unit. Do not accept 'RPM'. 1 mark for first ratio. 1 mark for second ratio. 1 mark for transposition. 1 mark for correct answer from given working with unit.

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Answer to question 5

2023 Section 2 Question 13 (c)

Marking instructions

Question			Expected response	Max mark	Additional guidance
13.	(c)		3750 × 10 = Output speed × 50	**4**	1 mark for substitution.
			$Output speed = \frac{37500}{50}$		
			Output speed = 750 (revs min^{-1})		1 mark for correct answer from given working (unit not required).
			750 × 12 = 250 × gear *D*		1 mark for substitution. Allow FTE.
			$gear D = \frac{9000}{250}$		
			gear *D* = **36** (teeth)		1 mark for correct answer from working (ignore any units).
			Alternative method		**Alternative method**
			$VR = \frac{3750}{250}$		1 mark for velocity ratio (does not need to be simplified).
			VR = 15:1		
			$\frac{15}{1} = \frac{50}{10} \times \frac{D}{12}$		1 mark 50:10 gear ratio (ratios could be inverted).
			$D = \frac{15 \times 12 \times 10}{50}$		1 mark for transposition.
			gear *D* = **36** (teeth)		1 mark for correct answer from working (ignore any units).

‹ Back to question 5

Answer to question 6

2015 Section 2 Question 10 (c)

Marking instructions

Question			Expected Answer(s)	Max Mark	Additional Guidance
	(c)		Compact size with a large speed changes possible.	**1**	Descriptive response

‹ Back to question 6

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Answer to question 7

2023 Section 2 Question 14 (f)

Marking instructions

Question	Expected response	Max mark	Additional guidance
(f)	A compound gear train will use smaller gears ...which makes it able to fit inside the small space/laminator.	2	1 mark for cause (smaller gears/ train). Do not accept high velocity ratio as a cause or effect. 1 mark for effect (compact space). Accept responses explaining the disadvantage of a simple gear train.

‹ Back to question 7

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