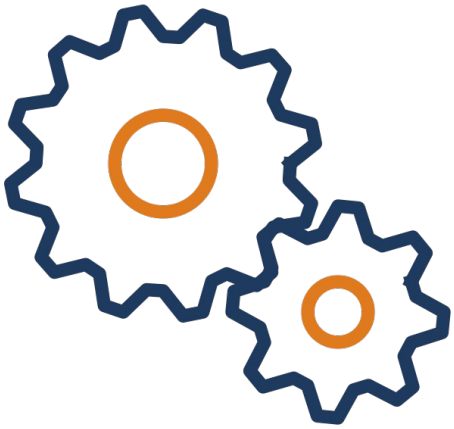
Lesson D3 Review Questions

Output Speed of Gear Trains



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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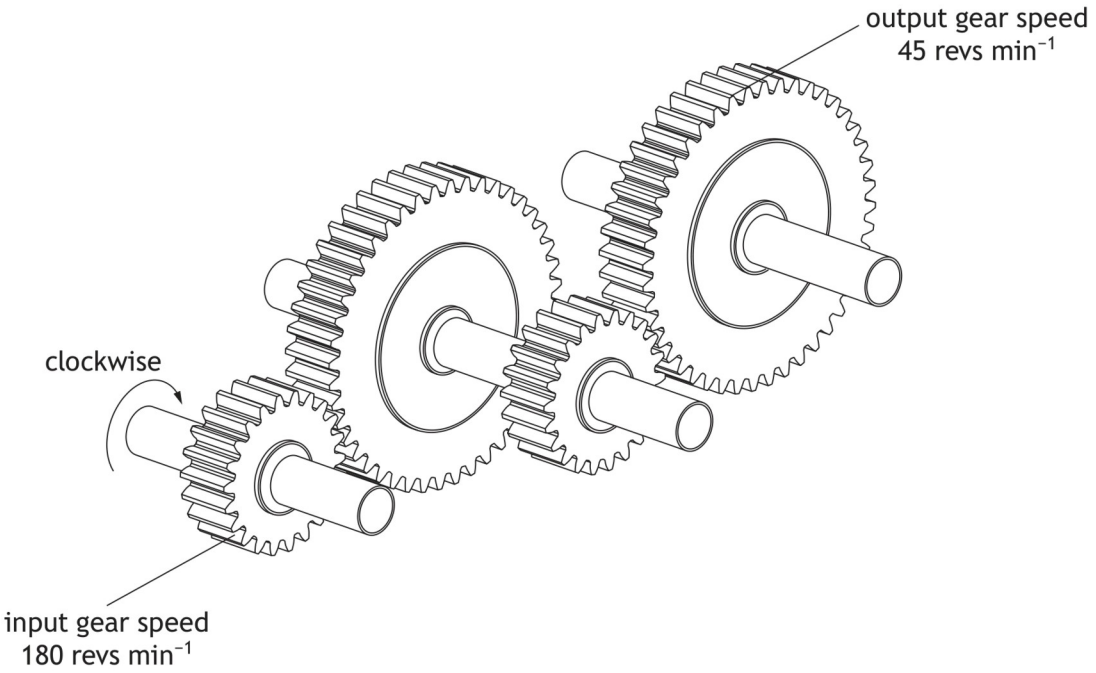
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Questions

2025 Section 1 Question 4

1. A gear train is shown.



(a) State the name of this type of gear train. **1**

The input gear rotates clockwise.

(b) State the direction of rotation of the output gear. **1**

(c) Calculate the velocity ratio of the gear train. **2**

Show answer ›

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2. Part of the gear mechanism used to control the gate movement has a velocity ratio of 14:1 and an input speed of 870 revs min^{-1}.

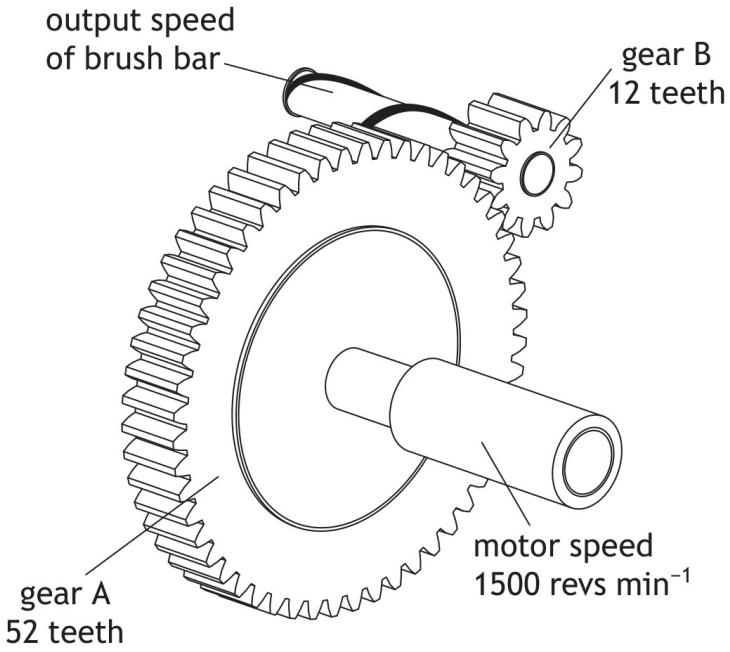
Calculate the output speed of this part of the gear mechanism.

Show answer ›

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3. The carpet cleaner has a brush bar to help collect dirt.

A possible drive system to operate the brush bar is shown below.



(a) Calculate the output speed of the brush bar.

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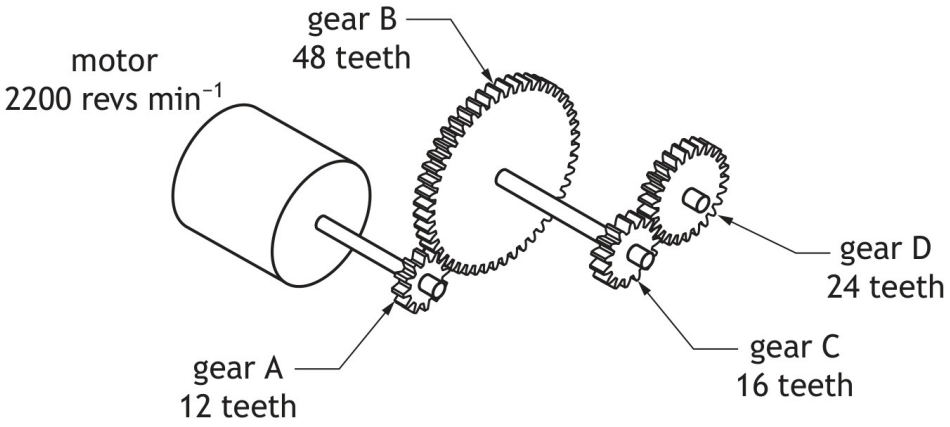
During testing it was found that the brush bar did not rotate in the same direction as the motor.

(b) Describe a modification to the drive system that would cause the brush bar to rotate in the same direction as the motor. **1**

Show answer ›

2019 Section 2 Question 14 (b)

4. Part of the conveyor belt mechanism is shown below.

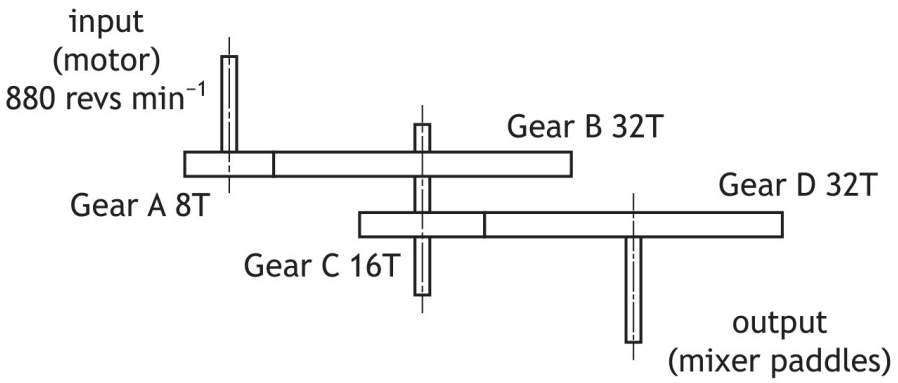


Calculate the output speed of gear D.

Show answer ›

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5. A food processing company uses an industrial mixing machine to combine pastry ingredients. A compound gear train which forms part of the mixing machine is shown below.



(a) (i) Calculate the output speed of the mixer paddles.

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(ii) Calculate the velocity ratio of the compound gear train.

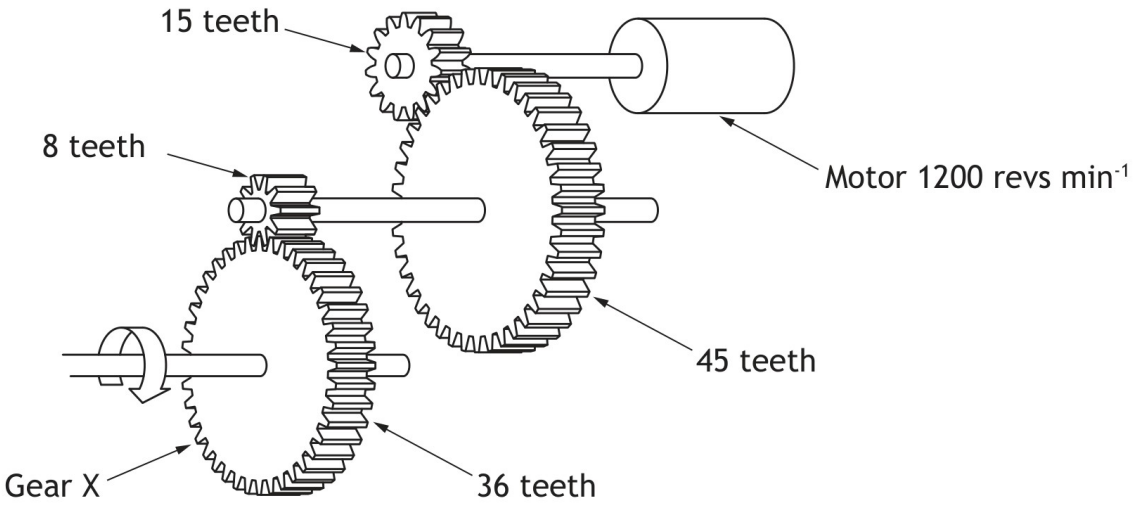
(b) During testing it was found that the mixing paddles were rotating too slowly.

Describe one change that could be made to Gear B in order to increase the speed of the mixing paddles. **1**

Show answer ›

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6. Motors A and B are each connected to a drive system for the laser cutting machine, as shown in the diagram below.



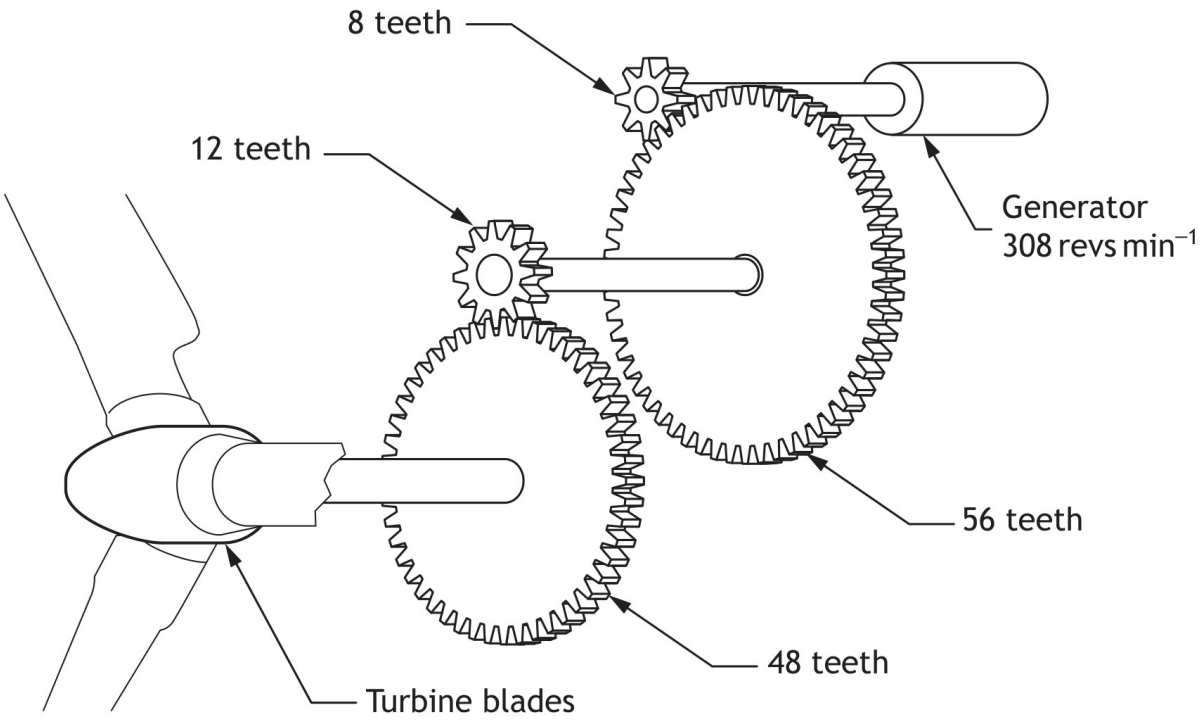
(i) State the name of this type of drive system. **1**

(ii) Calculate the output speed of Gear X. **4**

Show answer ›

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



Calculate the speed of the turbine blade. **4**

Show all working and final unit.

Show answer ›

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Answers

Check your understanding (booklet)

1 input speed × input size = output speed × output size

2 300 × 20 = output speed × 60, so output speed = 6000 ÷ 60 = 100 revs min^{-1}

3 They turn at the same speed, in the same direction.

4 output speed = speed of input ÷ VR = 1000 ÷ 5 = 200 revs min^{-1}

5 A compound gear train.

Answer to question 1

2025 Section 1 Question 4

Marking instructions

Question			Expected response	Max mark	Additional guidance
4.	(a)		Compound (gear)	**1**	
	(b)		Clockwise	**1**	
	(c)		$Velocity\ Ratio = \frac{Speed\ of\ Input}{Speed\ of\ Output}$ $Velocity\ Ratio = \frac{180}{45}$ $Velocity\ Ratio = 4 : 1$	**2**	1 mark for substitution. 1 mark for correct answer from given working. Accept 4. Ignore any units.

‹ Back to question 1

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Answer to question 2

2022 Section 2 Question 14 (b)

Marking instructions

Question	Expected response	Max mark	Additional guidance
14. (b)	$\text{Velocity Ratio} = \frac{\text{Speed of Input}}{\text{Speed of Output}}$	3	
	$14 = \frac{870}{\text{speed of output}}$		1 mark for substitution. Accept 14:1 for VR in substitution.
	$\text{speed of output} = \frac{870}{14}$		1 mark for transposition.
	speed of output = 62.14285		
	speed of output = **62 revs min^{-1} (2 sf)**		1 mark for correct answer from given working with unit. Do not accept RPM.

‹ Back to question 2

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Answer to question 3

Marking instructions

Question			Expected response	Max mark	Additional guidance
14.	(d)		$In_{speed} \times in_{size} = out_{speed} \times out_{size}$ $1500 \times 52 = \text{output speed} \times 12$ $\text{output speed} = \dfrac{1500 \times 52}{12}$ **output speed = 6500 revs min^{-1}** Alternative method $\text{Gear ratio} = \dfrac{Out_{size}}{In_{size}}$ $GR = \dfrac{12}{52}$ $Out_{sp} = 1500 \div \dfrac{12}{52}$ OR $Out_{sp} = 1500 \times \dfrac{52}{12}$ **output speed = 6500 revs min^{-1}**	**3**	1 mark for substitution. 1 mark for transposition. 1 mark for correct answer from given working with unit. Do not accept RPM. 1 mark for gear ratio (any order). 1 mark for correct transposition for given ratio. 1 mark for correct answer with unit from given working.
	(e)		Use an idler (gear). Add a gear between the gear A and gear B.	**1**	Accept use a compound gear.

‹ Back to question 3

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Answer to question 4

2019 Section 2 Question 14 (b)

Marking instructions

Question			Expected response	Max mark	Additional guidance
14.	(b)		2200×12 = Output speed x 48	4	1 mark for substitution.
			$\text{Output speed} = \frac{26400}{48}$		
			Output speed = 550 (revs min^{-1})		1 mark for correct answer from given working (unit not required).
			550×16 = Output speed x 24		1 mark for substitution Allow FTE.
			$\text{Output speed} = \frac{8800}{24}$		
			Output speed = 366·7		
			Output speed = 370 revs min^{-1} (2 sf)		1 mark for correct answer from given working with unit. Do not accept RPM.
			OR		
			$\frac{output\ speed}{input\ speed} = \frac{A}{B} x \frac{C}{D}$		
			$\frac{\text{output speed}}{2200} = \frac{12}{48} \times \frac{16}{24}$		1 mark for first ratio. 1 mark for second ratio.
			$\text{output speed} = \frac{12}{48} \times \frac{16}{24}$ x 2200		
			$\text{Output speed} = \frac{1}{6} \times 2200$		1 mark for transposition (2200/6 if ratios inverted).
			Output speed = 366·7		
			Output speed = 370 revs min^{-1} (2 sf)		1 mark for answer from working with unit.

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Answer to question 5

2018 Section 2 Question 15 (a)(i), (a)(ii), (b)

Marking instructions

Question			Expected response	Max mark	Additional guidance
15.	(a)	(i)	Teeth A x Speed A = Teeth B x Speed B 8 × 880 = 32x B $\frac{8 \times 880}{32} = Speed\ B$ B = 220 revs min^{-1} Teeth C x Speed C = Teeth D x Speed D 16 × 220 = 32 × D $\frac{16 \times 220}{32} = Speed\ D$ D = **110 revs min^{-1}** OR $\frac{\text{input speed}}{\text{output speed}} = \frac{A}{B} x \frac{C}{D}$ $output\ speed = \frac{8}{32} x \frac{16}{32} x\ 880$ output speed = **110 revs min^{-1}**	**4**	1 mark for substitution 1 mark for answer from working (units not required) 1 mark for substitution (allow FTE) 1 mark for answer from working with unit Do not accept RPM 1 mark for first ratio 1 mark for second ratio 1 mark for substitution. (880/8 if ratios inverted) 1 mark for answer from working with unit
		(ii)	VR : $\frac{\text{input speed}}{\text{output speed}}$ VR = $\frac{880}{110}$ VR = 8:1 or 8	**2**	1 mark for substitution (allow FTE from 15(a)(i)) 1 mark for answer from working (ignore units)
	(b)		Reduce/remove a number of teeth Make the gear smaller	**1**	1 mark for descriptive response

‹ Back to question 5

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Answer to question 6

2017 Specimen Section 2 Question 13 (b)(i), (b)(ii)

Marking instructions

Question			Expected response	Max mark	Additional guidance
13	b	i	Compound gear	1	
13	b	ii	*First pair of gears* 15 x 1200 = 45 x Output speed (1 mark for substitution) Output speed = 400 revs min^{-1} (1 mark for answer from candidate's working) *Second pair of gears* 400 x 8 = 40 x Output speed (1 mark for substitution) Output speed = 89 revs min^{-1} (1 mark for answer from candidate's working)	4	Do not accept rpm

Note: the marking instructions print 40 teeth, but the diagram shows 36 teeth. The answer, 89 revs min^{-1}, uses 36 teeth.

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Answer to question 7

2015 Section 2 Question 10 (d)

Marking instructions

Question	Expected Answer(s)	Max Mark	Additional Guidance
(d)	Velocity Ratio = $\frac{12}{48}$ X $\frac{8}{56}$ (1 mark for substitution) Velocity Ratio = $\frac{1}{28}$ Velocity Ratio = 1:28 (1 mark for correct answer from given working) Velocity Ratio = $\frac{\text{Speed of input}}{\text{Speed of output}}$ Input speed = $\frac{1}{28}$ X 308 (1 mark for substitution – allow FTE) Input speed = 11 revs min^{-1} (1 mark for correct answer from candidate's working)	4	Alternative method In_{speed} x in_{size} = out_{speed} x out_{size} In_{speed} x 56 = 308 x 8 - 1 mark In_{speed} = **44** (ignore unit) - 1 mark In_{speed} x 48 = **44** x 12 - 1 mark (allow follow through error) In_{speed} = 11 revs min^{-1} (1 mark for answer from given working with unit) Do not accept rpm.

‹ Back to question 7

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