Bicycle Gearing: Gear Inches, Development and Speed

Gear ratio, gear inches, development (metres per crank turn), gain ratio and road speed at a cadence for a bicycle chainring, cog and wheel size.

Method: Bicycle gearing measures (gear inches, development, gain ratio)

Input parameters

Unit system: SI

Parameter	Value	Unit
Chainring teeth	50.000	
Rear cog teeth	15.000	
Wheel diameter with tyre	672.00	mm
Crank length	172.50	mm
Cadence	90.000	rpm

Calculated results

Parameter	Value	Unit
Gear ratio	3.3333	
Gear inches	88.189	
Development per crank turn	7.0372	m
Gain ratio	6.4928	
Speed at the cadence	38.001	km/h

Notes for this case

• The gear ratio is chainring over cog teeth. Gear inches (wheel diameter in inches × ratio) is the traditional measure, equal to the wheel size of a penny-farthing with the same gearing; development is the distance travelled per pedal turn. The gain ratio (wheel radius over crank length × ratio) also counts crank length. Speed is development × cadence. A 700C road wheel with a 25 mm tyre is about 672 mm in diameter.

Formula and method

$$i = \frac{z_c}{z_s}, \quad GI = D_{in}\, i, \quad s = \pi D i, \quad v = s n$$

Variables

z_c	Chainring teeth	-
z_s	Rear cog teeth	-
D	Wheel diameter with tyre	m
l_c	Crank length	m
n	Cadence	rad/s
i	Gear ratio	-
GI	Gear inches	-
s	Development per crank turn	m
G	Gain ratio	-
v	Speed at the cadence	m/s

Method and standards

Bicycle gearing.

Assumptions and limits

- No chain or tyre slip.

References

Bicycle gearing measures (gear inches, development, gain ratio)

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/automotive/transmission/bicycle-gear-inches-development

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.