Polygons & Transformations Cheatsheet

3.AB PreIB Math

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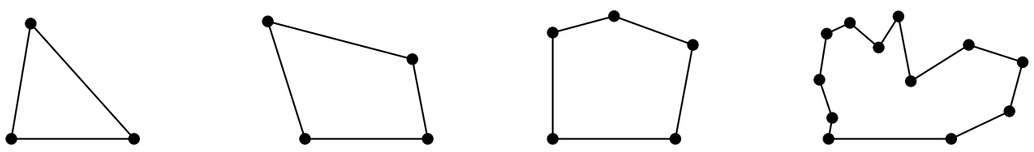
Polygons

Polygon is a closed 2D shape made only of segments. We call the endpoints of those segments, vertices, and the segments themselves, edges.

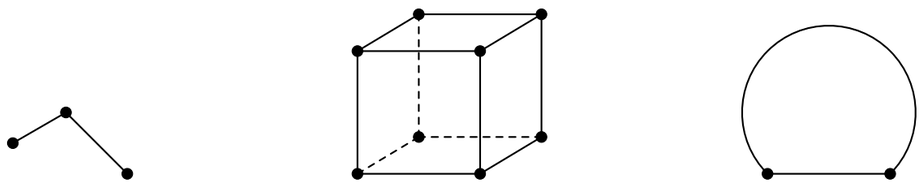
Examples



Triangle — Quadrilateral — Pentagon — Dodecagon

Polygons with n sides are called n-gons.

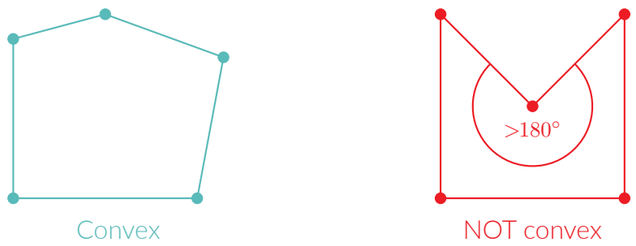
Counterexamples



Not closed — 3D — Not straight

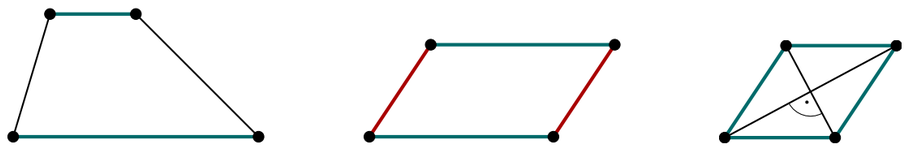
Convex Polygons

A polygon is called convex if it has no internal angle greater than 180°.



Convex — NOT convex

Special types of convex polygons



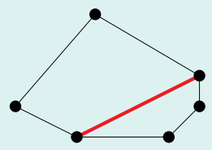
Trapezoid/Trapezium
A convex quadrilateral with at least two parallel sides.

Parallelogram
A convex quadrilateral with two pairs of parallel sides.

Rhombus
An **equilateral** (all sides of the same length) parallelogram.

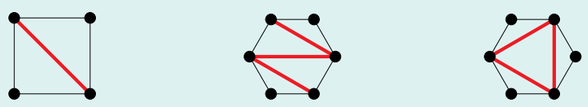
Diagonals & Triangulations

A diagonal in a **convex** polygon is a segment connecting two of its **non-adjacent** vertices.

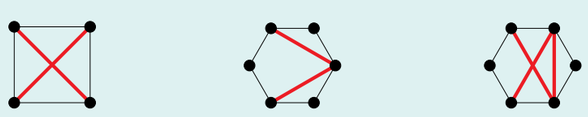


Diagonal in a convex hexagon.

A triangulation of a **convex** polygon is its division into triangles by **non-intersecting** diagonals.



Examples of triangulations.



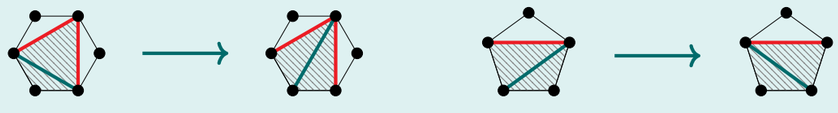
Counterexamples of triangulations.

The total number of different triangulations of a convex n-gon is

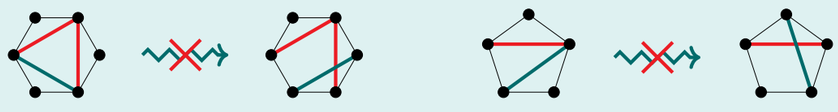
$$\frac{n \cdot (n+1) \cdot \ldots \cdot (2n-4)}{(n-2)!},$$

which you **of course don't have to remember**. Interestingly enough, every triangulation can be transformed into any other by a series of flips.

A flip is a swap of one diagonal for the other in a chosen quadrilateral so that the **result is again a triangulation**.



Examples of flips.



Counterexamples of flips.

A block containing an enumerated list

Vivamus congue volutpat elit non semper. Praesent molestie nec erat ac interdum. In quis suscipit erat. **Phasellus mauris felis, molestie ac pharetra quis**, tempus nec ante. Donec finibus ante vel purus mollis fermentum.

1. **Morbi mauris purus**, egestas at vehicula et, convallis accumsan orci. Orci varius natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus.
2. **Cras vehicula blandit urna ut maximus**. Aliquam blandit nec massa ac sollicitudin. Curabitur cursus, metus nec imperdiet bibendum, velit lectus faucibus dolor, quis gravida metus mauris gravida turpis.
3. **Vestibulum et massa diam**. Phasellus fermentum augue non nulla accumsan, non rhoncus lectus condimentum.

Fusce aliquam magna velit

Et rutrum ex euismod vel. Pellentesque ultricies, velit in fermentum vestibulum, lectus nisi pretium nibh, sit amet aliquam lectus augue vel velit. Suspendisse rhoncus massa porttitor augue feugiat molestie. Sed molestie ut orci nec malesuada. Sed ultricies feugiat est fringilla posuere.

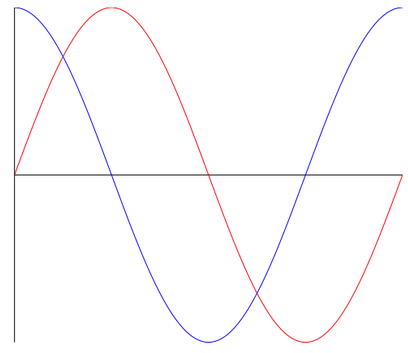


Figure 9. Another figure caption.

Nam cursus consequat egestas

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- **Sed consequat** id ante vel efficitur. Praesent congue massa sed est scelerisque, elementum mollis augue iaculis.
  - In sed est finibus, vulputate nunc gravida, pulvinar lorem. In maximus nunc dolor, sed auctor eros porttitor quis.
  - Fusce ornare dignissim nisi. Nam sit amet risus vel lacus tempor tincidunt eu a arcu.
  - Donec rhoncus vestibulum erat, quis aliquam leo gravida egestas.
- **Pellentesque facilisis dolor in leo** bibendum congue. Maecenas congue finibus justo, vitae eleifend urna facilisis at.

A highlighted block containing some math

A different kind of highlighted block.

$$\int_{-\infty}^{\infty} e^{-x^2}\,dx = \sqrt{\pi}$$

Interdum et malesuada fames $\{1, 4, 9, \ldots\}$ ac ante ipsum primis in faucibus. Cras eleifend dolor eu nulla suscipit suscipit. Sed lobortis non felis id vulputate.

A heading inside a block

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Another heading inside a block

Sed augue erat, scelerisque a purus ultricies, placerat porttitor neque. Donec $P(y \mid x)$ fermentum consectetur $\nabla_x P(y \mid x)$ sapien sagittis egestas. Duis eget leo euismod nunc viverra imperdiet nec id justo.

References (opcional)

[1] Claude E. Shannon.
A mathematical theory of communication.
Bell System Technical Journal, 27(3):379–423, 1948.