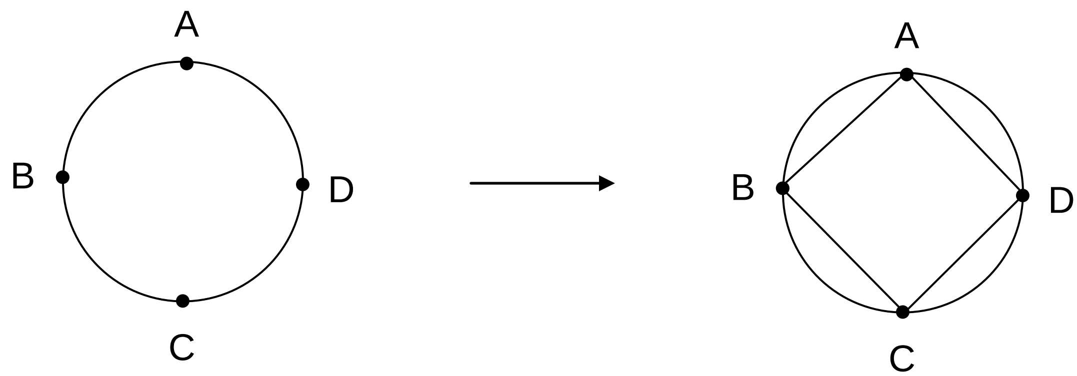
section 3.5

Definitions:

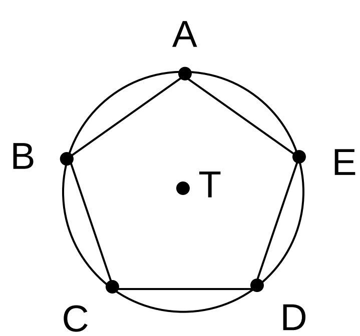


Connect the points in consecutive order with segments.

The square is inscribed in the circle.

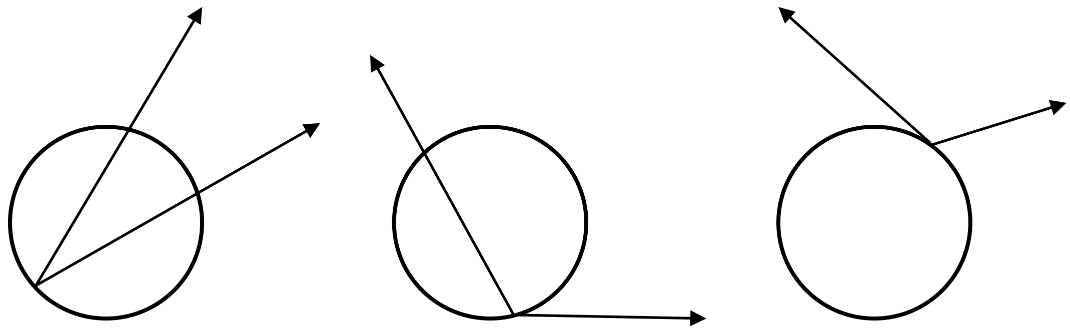
An inscribed polygon is a polygon whose vertices are points of a circle.

“in” means “in” and “scribed” means “written”



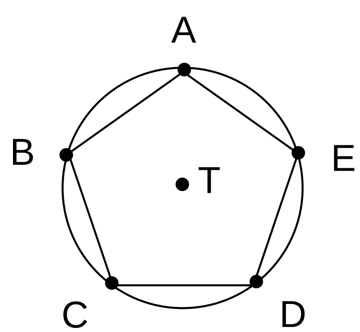
The sides of the inscribed polygon form inscribed angles.

An <u>inscribed angle</u> is an angle whose vertex is on a circle and whose sides contain another point of the circle.



inscribed angle | <u>not</u> inscribed angle | <u>not</u> inscribed angle

Look at the inscribed pentagon again:



Pentagon ABCDE is <u>inscribed</u> in circle T.

Circle T is said to be <u>circumscribed</u> about pentagon ABCDE

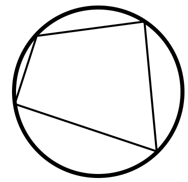
Definition:

A <u>circle circumscribed about a polygon</u> is a circle in which the polygon is inscribed.

“circum” means “around” and “scribed” means “written”

Questions:

1. Do polygons have to be regular to be inscribed in a circle?

No. An example would be 

2. Can all quadrilaterals be inscribed in a circle?

No. A parallelograms or rhombus can't

3. Can all triangles be inscribed in a circle?

Yes. A circle can always be constructed through 3 non-collinear points.

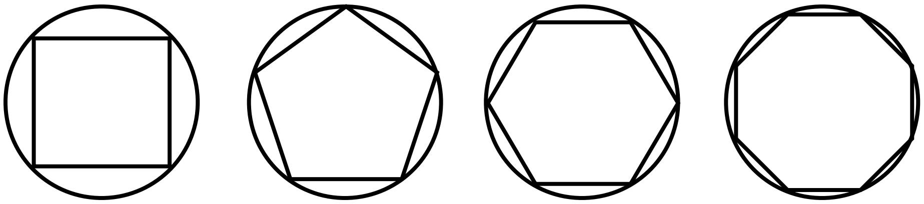
4. Can all regular polygons be inscribed in a circle?

Yes

5. How do the measures of the angles change according to the number of sides of the inscribed polygon?

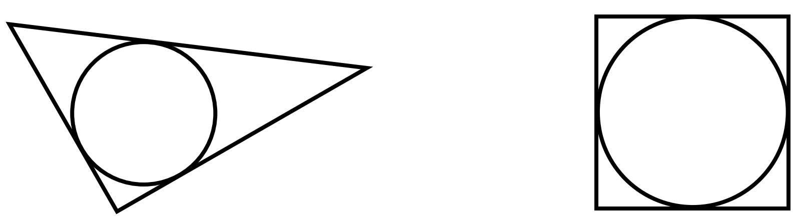
The greater the number of sides, the larger the interior angles.

Look at the inscribed polygons. What happens to the perimeter as the number of sides increases?



Answer: *As the number of sides increases, the perimeter gets closer and closer to the circumference.*

Polygons can also be circumscribed about a circle.



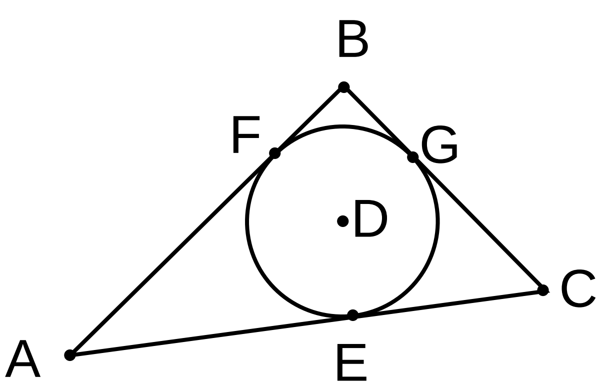
Definitions:

A <u>polygon circumscribed about a circle</u> is a polygon whose sides each intersect the circle in exactly one point.

A <u>tangent line</u> (or <u>tangent</u>) is a line in the plane of a circle that intersects the circle in exactly one point.

The <u>point of tangency</u> is the point at which a tangent line and a circle intersect.

A <u>tangent segment</u> is a segment of a tangent line that contains the point of tangency.



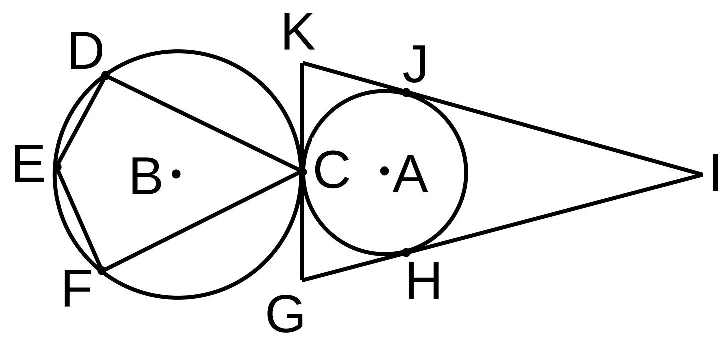
tangent segments:

$\overline{AB}$, $\overline{BC}$, $\overline{AC}$

points of tangency:

F, G, E

Sample Problem:



1. Identify an inscribed polygon.

   quadrilateral CDEF

2. Identify an inscribed circle.

   circle A

3. Identify a circumscribed polygon.

   triangle GIK

4. Identify a circumscribed circle.

   circle B

5. Which segment is tangent to 2 circles?

   $\overline{GK}$

6. How many tangent segments would a circumscribed octagon have with its inscribed circle?

   8

Guidelines for Constructions section 3.6

1. Make sure that your compass pencil and your free pencil are very sharp.

2. Lines and compass marks should look like eyelashes on the paper. These marks represent lines that have no width, so make the representations believable. Make light marks that can be erased if necessary.

3. Be neat. Carefully align your arcs and lines to pass through the correct points. Also, do not use dots for points. The marks of the compass where arcs cross are adequate and neater.

<u>**Construction 2**</u>: Copy a Segment

Given: $\overline{AB}$

1. Draw a line, using the straightedge. Mark any point on this line and label it A′.

2. Open your compass to measure the same length as the given segment, $\overline{AB}$.

3. Without changing the compass, place the point at A′ and mark an arc on the line. Label the point of intersection B′.

Construction 3: Bisect a Segment

Given: $\overline{AB}$

1. Place the point of the compass at each endpoint, making intersecting arcs above and below the line segment.

2. Connect the two intersecting points to form the bisector of $\overline{AB}$. Label the midpoint M.

Chapter 3 Terms:

absolute value
associative
bisector
circumference
circumscribed
commutative
congruent segments
distance
distributive
equivalence relation
identity
inscribed
integers
inverses
irrational numbers
length
measure
midpoint
natural numbers
perimeter
pi
point of tangency
rational numbers
real numbers
reflexive
substitution
symmetric
tangent
transitive
trichotomy
whole numbers

Review the
Properties of Real Numbers

Property	Addition	Multiplication
Commutative	a+b = b+a	ab = ba
Associative	(a+b)+c=a+(b+c)	(ab)c = a(bc)
Distributive		a(b+c) = ab+ac
Identity	a+0 = 0+a = a	a·1 = 1·a = a
Inverse	a+(-a) = 0	a·(1/a) = 1

Equality Properties	
Property	**Meaning**
Addition	If a=b, then a+c = b+c
Multiplication	If a=b, then ac=bc

More Equality Properties	
Reflexive	a=a
Symmetric	If a=b, then b=a
Transitive	If a=b and b=c, then a=c

Look at 2 < 8.

See what happens when you:

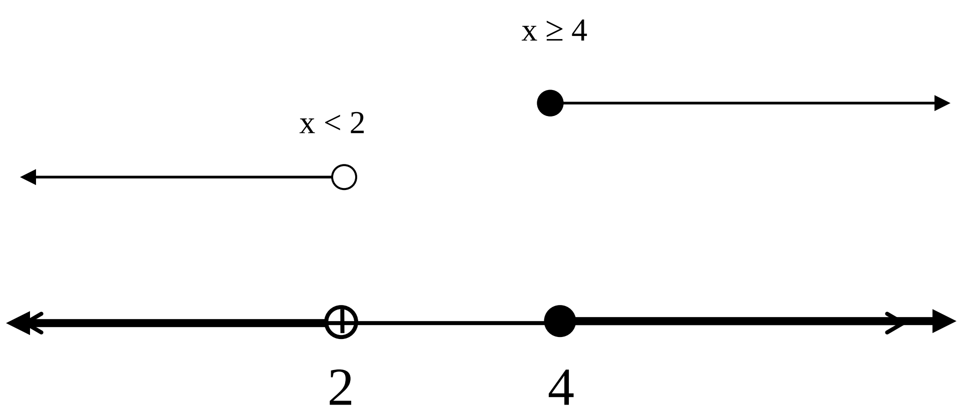
Add 3 to both sides $\Longrightarrow$ inequality preserved
Subtract 5 from both sides $\Longrightarrow$ inequality preserved
Multiply both sides by 4 $\Longrightarrow$ inequality preserved
Multiply both sides by -9 $\Longrightarrow$ inequality reversed
Divide both sides by -2 $\Longrightarrow$ inequality reversed

Inequality Properties

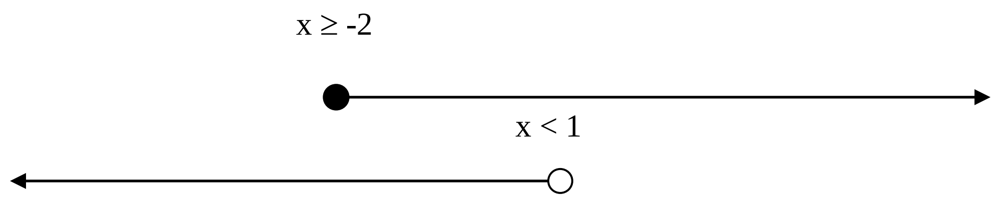
Property	**Meaning**
Addition	If a>b, then a+c > b+c
Multiplication	If a>b and c>0, then ac>bc If a>b and c<0, then ac<bc
Transitive	If a>b and b>c, then a>c

It is often easier to graph inequalities to find solutions:

Example: Graph $x \geq 4$ or $x < 2$.



Example: Graph $x \geq -2$ and $x < 1$.

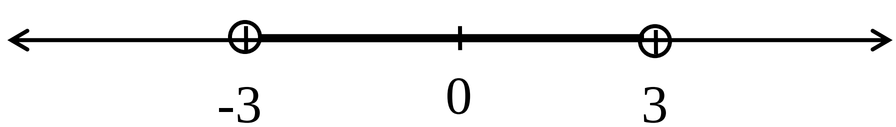


Remember:

"or" means "union"
"and" means "intersection"

Example: Graph $|x| < 3$.

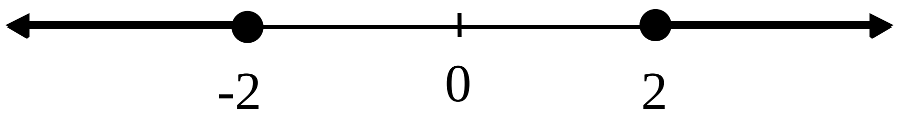
Remember that the absolute value of a number is its distance from zero. This problem says that the distance from zero is less than 3.



This can also be written as $-3 < x < 3$.

Graph $|x| \geq 2$.

This problem says that the distance from zero is greater than or equal to 2.



Questions:

1. Is < reflexive?

    No. 3 < 3 is false.

2. Is ≥ reflexive?

    Yes. 3 ≥ 3 is true (n ≥ n)

3. Is ≠ symmetric?

    Yes. If 3 ≠ 4, then 4 ≠ 3 is true. (If n≠m, then n≠m)

4. Is < transitive?

    Yes. If 2<3 and 3<7, then 2<7 is true.
    (If n<m and m<k, then n<k)

Definition:

A real number a is <u>greater than</u> a real number b (ie. $a>b$) if there is a positive number c so that $a = b + c$.

i.e. If $a > b$, then there is a number we can add to b to make them equal.

Example: $7 > 2$ because $7 = 2 + 5$ and $5 > 0$.