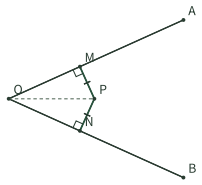
Angle bisectors: the converse and applications

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Worked example 1

P is inside ∠AOB. PM⊥OA, PN⊥OB and PM=PN. Prove that OP bisects ∠AOB.

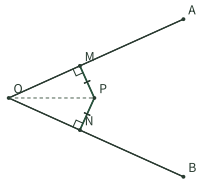


Geometry diagram; not drawn to scale except for construction tasks.

Guided attempt 2

P is inside ∠AOB, PM⊥OA, PN⊥OB and PM=PN. Complete the HL proof without assuming any equal angles at O.

1. The two right angles are at ___ and ___.
2. Hypotenuse ___=___; leg ___=___ is given.
3. △OPM≅△OPN by ___, so ∠___=∠___.
4. Because P is ___, OP is the ___ bisector.



Geometry diagram; not drawn to scale except for construction tasks.

Prerequisite 3

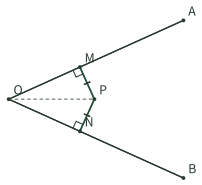
PM⊥OA and M lies on OA. Which side is the hypotenuse of △OPM?

A. OM

B. Any side can be called the hypotenuse.

C. OP

D. PM



Geometry diagram; not drawn to scale except for construction tasks.

Prerequisite 4

Which statement is the converse of “a point on the internal bisector has equal perpendicular distances to the sides”?

A. Every interior point has equal distances to the sides.

B. A point on a side is the angle vertex.

C. Two equal angles always have equal side lengths.

D. An interior point with equal perpendicular distances lies on the internal bisector.

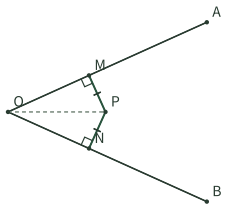
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Independent practice 5

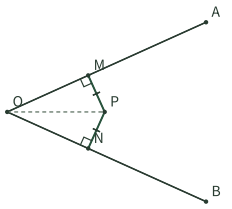
P is inside ∠AOB=86°. PM⊥OA, PN⊥OB and PM=PN=4 cm. Find ∠AOP and give the reason for halving.



Geometry diagram; not drawn to scale except for construction tasks.

Independent practice 6

P is inside ∠AOB. PM⊥OA, PN⊥OB and PM=PN. If ∠MOP=28°, find ∠AOB.



Geometry diagram; not drawn to scale except for construction tasks.

Independent practice 7

Distances to the two intersecting lines containing OA and OB are equal, but P is not stated to be inside ∠AOB. Can we conclude that P lies on this angle’s internal bisector?

A. Yes, because all intersecting lines are perpendicular.

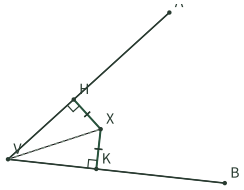
B. No point can have two equal distances.

C. Not necessarily; the interior condition is needed for that conclusion.

D. Yes, with no position condition.

Independent practice 8

X is inside ∠AVB. XH⊥VA, XK⊥VB and XH=XK. Prove that VX is the internal angle bisector.



Geometry diagram; not drawn to scale except for construction tasks.

Exit question 9

P is inside ∠AOB. M lies on OA, N lies on OB and PM=PN. No perpendicular conditions are given. Is this enough to prove that OP is the bisector?

Exit question 10

P is inside the angle and its two perpendicular distances are equal. Which result directly tells us where P lies?

A. Equality of all three angles, without side data.

B. The converse of the angle-bisector property.

C. The forward property, starting by assuming OP bisects the angle.

D. The triangle perimeter formula alone.