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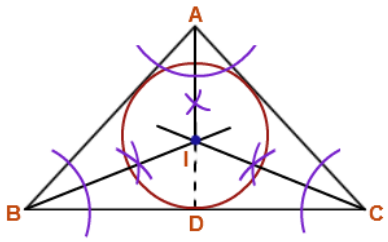
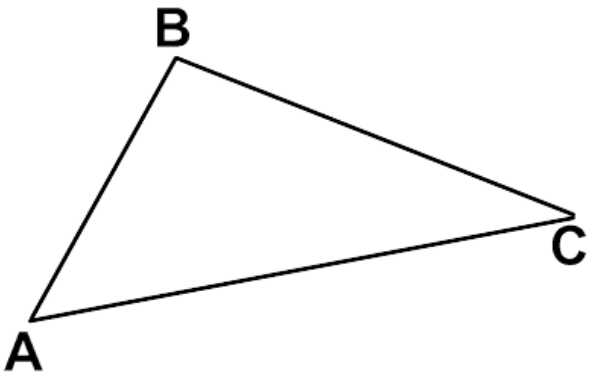
Chapter 3: Constructions
Topic 3: Incenter & Incircle

Recall: An _____ is a line segment with one endpoint on any vertex of a triangle that extends to the opposite side of the triangle and **bisects the angle**. Since there are three vertices in every triangle, there are _____ angle bisectors of a triangle. The point of concurrency of the angle bisectors of a triangle is known as the _____ of a triangle. To construct the incenter of a given triangle construct the angle bisector on _____ vertices. The incenter will always be located _____ a given triangle. The point of concurrency (the incenter) is the center of the circle that is inscribed within a given triangle. This circle is called the _____.

Construction #6: Incenter & Incircle



Using a compass and a straightedge, construct the incenter and incircle of ΔABC.



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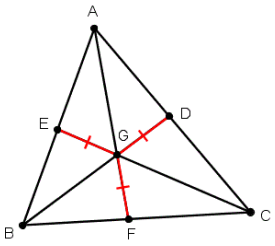
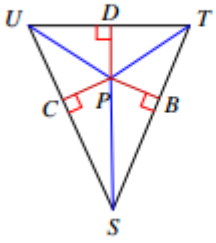
The Incenter:

- The incenter is formed by connecting the three angle bisectors
- The three angle bisectors of a triangle are concurrent at a point equidistant from the ***sides*** of a triangle. These are the radii of the incircle

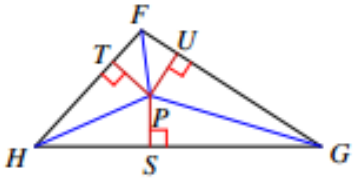


Directions: Using the above information, complete the following questions. Don't forget justifications.

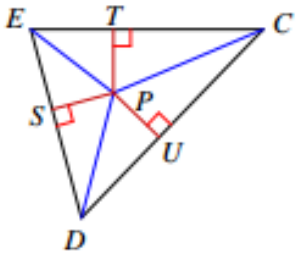
1) The incenter of ΔTUS is located at point P. If CP = 4x + 9 and PB = 6x – 11, find the value of x and the length of CP and PD. Justify all calculations.



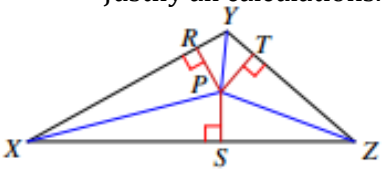
2) Point P is the incenter of ΔFGH. If m<TFP = 3x + 15, and m<UFP = 5x – 13, find the value of x. Justify all calculations.



3) The incenter of ΔCDE is point P. If m<SDP = 7x + 5 and m<UDP = 9x – 5, find the value of x and m<SDP. Justify all calculations.



4) P is the incenter of ΔXYZ. If m<SZP = 7x + 7, and m<SZT = 16x + 4, find the value of x and m<SZT. Justify all calculations.



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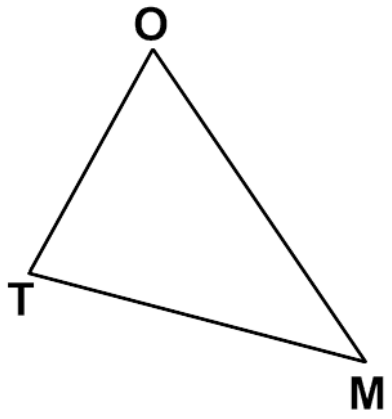
Chapter 3: Constructions
Topic 3 Homework: Incenter & Incircle

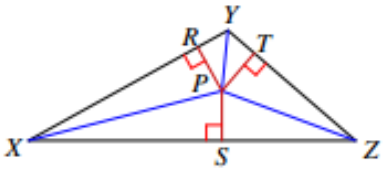
1) Construct the incenter of ΔTOM.



2) Construct an equilateral triangle to DE.

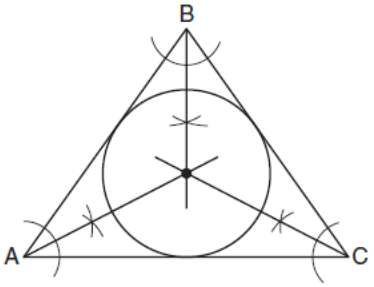
____ 3) P is the incenter of ΔXYZ. If m<RYP = 2x + 20, and m<TYP = x + 40, what is the m<RYT?

(1) 20 (2) 40
(3) 60 (4) 120



____ 4) Which geometric principle is used in the construction shown below?

(1) The intersection of the angle bisectors of a triangle is the center of the inscribed circle.
(2) The intersection of the angle bisectors of a triangle is the center of the circumscribed circle.
(3) The intersection of the perpendicular bisectors of the sides of a triangle is the center of the inscribed circle.
(4) The intersection of the perpendicular bisectors of the sides of a triangle is the center of the circumscribed circle.

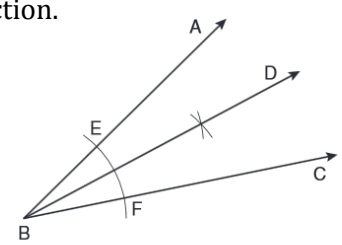


____ 5) The incenter of ΔABC is located at point G. If EG = 3x + 14 and DG = 5x – 8, what is the length of GF?

(1) 5 (2) 11
(3) 22 (4) 47

____ 6) A straight edge and compass were used to create the following construction. Which statement is false?

(1) $m < ABD = m < DBC$
(2) $\frac{1}{2}(m < ABC) = m < ABD$
(3) $2(m < DBC) = m < ABC$
(4) $2(m < ABC) = m < CBD$



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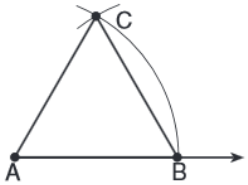
____ 7) The diagram shows the construction of an equilateral triangle. Which statement(s) justifies this construction?



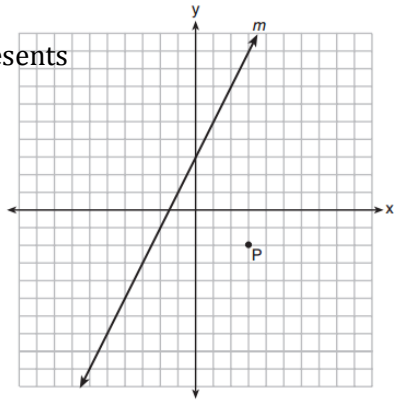
(1) $< A + < B + < C = 180$
(2) $< A = < B = < C$
(3) $AB = BC = AC$
(4) $AB + BC > AC$

Review Section!!

____ 8) What is the slope of a line perpendicular to the line whose equation is $3x - 7y + 14 = 0$?

(1) $\frac{3}{7}$ (2) $-\frac{7}{3}$
(3) 3 (4) $-\frac{1}{3}$

____ 9) Line m and point P are shown in the graph. Which equation represents the line passing through P and parallel to line m?

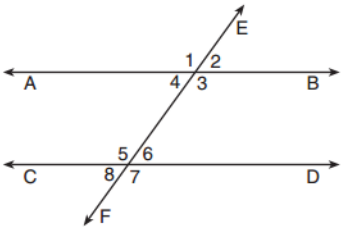


(1) $y - 3 = 2(x + 2)$
(2) $y + 2 = 2(x - 3)$
(3) $y - 3 = -\frac{1}{2}(x + 2)$
(4) $y + 2 = -\frac{1}{2}(x - 3)$

____ 10) In ΔABC, m<A = 3x + 1, m<B = 4x – 17, and m<C = 5x – 20. Which type of triangle is ΔABC?

(1) right (2) scalene
(3) isosceles (4) equilateral

____ 11) Transversal EF intersects AB and CD as shown. Which statement could always be used to prove AB // CD?



(1) $< 2 \cong < 4$ (2) < 3 and < 6 are supplementary
(3) $< 7 \cong < 8$ (4) < 1 and < 5 are supplementary

____ 12) AD is a perpendicular bisector of triangle ABC. If BD = 5x-10, DC = 3x+8, and $\angle ADB = 8y + 4$, find the value of x and y.

Sketch & Label Justify Work