

GEOMETRY CC - Unit 3
Lesson 5: The Orthocenter of a Triangle
MS.15

HW Answers 3.4

5. In $\triangle MNP$, $m\angle M = 21$, and $m\angle Q = 4$. Find $m\angle S$ and $m\angle R$.

$x = 2x - 21$
 $3x = 21$
 $x = 7$
 $2x = 14$
 $m\angle S = 14$

$m\angle S = 2(-7)$
 $= -14$
 $m\angle R = 12$

6. In $\triangle GHJ$, $m\angle H = 29$, and $m\angle K = 10.8$.

$y = 2x + 10.8$
 $3x = 10.8$
 $x = 3.6$
 $2x = 7.2$

a) Find $\angle C$: 3.6
b) Find $\angle P$: 7.2
c) Find $\angle A$: 8.2
d) Find $\angle Q$: 5.8

7. In $\triangle LMN$, $m\angle P = 7$, and $m\angle Q = 8.1$. Find $m\angle R$ and $m\angle S$.

$k = 7x + 2.1$
 $3x + 2.1$
 $x = 2.7$
 $2x = 5.4$
 $m\angle S = 2.1$

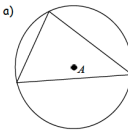
8. In the diagram, $m\angle D = 10$, and $m\angle B = 12.6$.

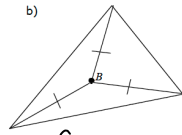
$x + 2x = 10$
 $3x = 10$
 $x = \frac{10}{3}$
 $2x = \frac{20}{3}$
 $12.6 = 2$
 $6 = 2$

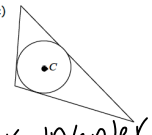
a) Find $\angle D$: 10
b) Find $\angle C$: $\frac{20}{3}$
c) Find $\angle E$: $6 = 2$

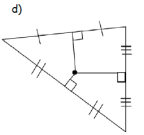
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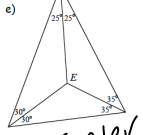
Do Now: Determine whether each picture shows the triangle's incenter, circumcenter, or centroid.

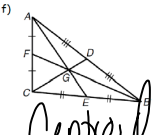
a)  Circumcenter

b)  Circumcenter

c)  Incenter

d)  Circumcenter

e)  Incenter

f)  Centroid

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Vocabulary:

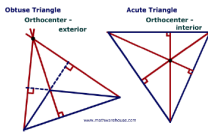
Orthocenter - The point where the three altitudes of the triangle intersect. One of a triangle's points of concurrency.

PROPERTIES OF THE ORTHOCENTER

- The 3 altitudes intersect
- If triangle is obtuse, orthocenter will be on the outside.

Obtuse Triangle
Orthocenter - exterior

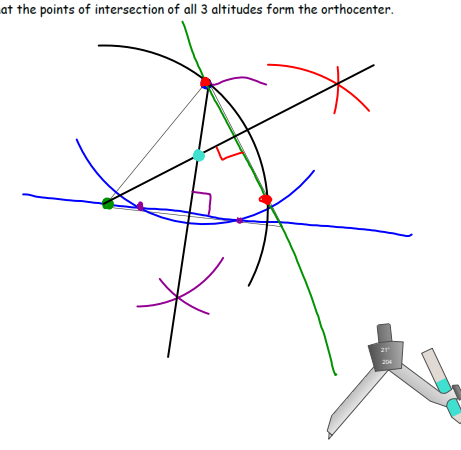
Acute Triangle
Orthocenter - interior



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Let's CONSTRUCT the ORTHOCENTER!

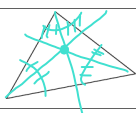
*Use the construction for creating a perpendicular line from a point not on the line, so that the points of intersection of all 3 altitudes form the orthocenter.




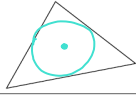
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LET'S PRACTICE ALL POINTS OF CONCURRENCY!

1. Name the 3 properties of the INCENTER.

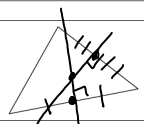
a)  Intersection of the \neq bisectors


b)  Equidistant from all 3 sides

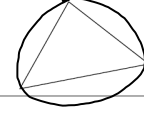
c)  Center of the inscribed circle

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2. Name the 3 properties of the CIRCUMCENTER.

d)  Intersection of the perpendicular bisectors

e)  Equidistant from all three vertices

f)  Center of the circumscribed circle

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3. Name 2 properties of the CENTROID.	
g) Intersection of the medians	
h) 2:1 ratio	
4. Name the 1 property of the ORTHOCENTER.	
i) Intersection of the altitudes	

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SKETCH the following and state whether the points of concurrency represent the INCENTER, CIRCUMCENTER, CENTROID, ORTHOCENTER

5. Two angles bisectors:	6. Two perpendicular bisectors:
 incenter	 Circumcenter
7. Two medians:	8. Two altitudes:
 centroid	 orthocenter

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SKETCH the following and state whether the points of concurrency represent the INCENTER, CIRCUMCENTER, CENTROID, ORTHOCENTER

9. Two angles bisectors:	10. Two perpendicular bisectors:
11. Two medians:	12. Two altitudes:
13. Two angles bisectors:	14. Two perpendicular bisectors:
15. Two medians:	16. Two altitudes:

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17. Which of the following is NOT true about the incenter?

- (1) It is equidistant from the triangle's 3 sides.
- (2) It is the point of concurrency of the triangle's 3 angle bisectors.
- (3) It is the center of the triangle's inscribed circle.
- (4) It is the center of the triangle's circumscribed circle.

18. Which of the following is NOT true about the circumcenter?

- (1) It is the center of the triangle's circumscribed circle.
- (2) It is the point of concurrency of the triangle's 3 perpendicular bisectors.
- (3) It is equidistant from the triangle's 3 vertices.
- (4) None of the above.

19. Which of the following is NOT true about the centroid?

- (1) It is the point of concurrency of the triangle's 3 medians.
- (2) It divides each median into a ratio of 1:2
- (3) It is located 2/3 of the way from each vertex to its opposite side.
- (4) It is located 2/3 of the way from each side to its opposite vertex.

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20. Explain the difference between an altitude and a perpendicular bisector of a triangle.

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