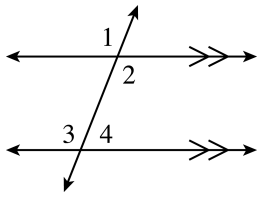
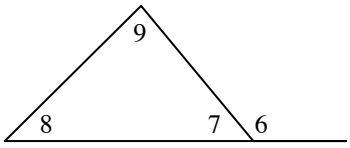
Students learn the relationships created when two parallel lines are intersected by a transversal. They also study angle relationships in triangles.

Parallel lines



- corresponding angles are equal: $m\angle 1 = m\angle 3$
- alternate interior angles are equal: $m\angle 2 = m\angle 3$
- same-side interior angles are supplementary: $m\angle 2 + m\angle 4 = 180^\circ$

Triangles

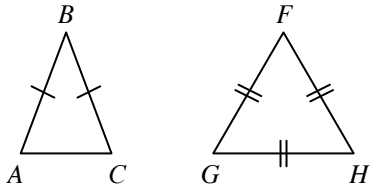


- interior angles are supplementary: $m\angle 7 + m\angle 8 + m\angle 9 = 180^\circ$
- exterior angle equals sum of remote interior angles: $m\angle 6 = m\angle 8 + m\angle 9$

Also shown in the above figures:

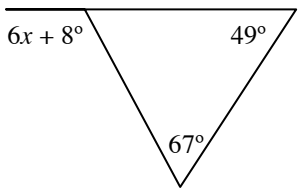
- vertical angles are equal: $m\angle 1 = m\angle 2$
- straight angles measure 180º: $m\angle 3 + m\angle 4 = 180^\circ$ and $m\angle 6 + m\angle 7 = 180^\circ$

In addition, an isosceles triangle, ΔABC, has $BA = BC$ and $m\angle A = m\angle C$. An equilateral triangle, ΔGFH, has $GF = FH = HG$ and $m\angle G = m\angle F = m\angle H = 60^\circ$.



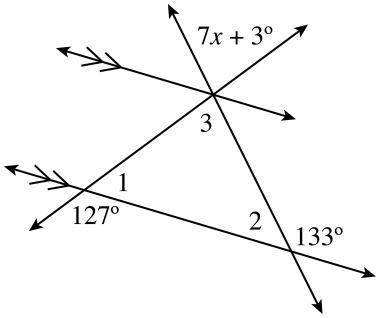
For more information, see the Math Notes boxes in Lessons 9.1.2, 9.1.3, and 9.1.4 of the *Core Connections, Course 3* text.

Example 1



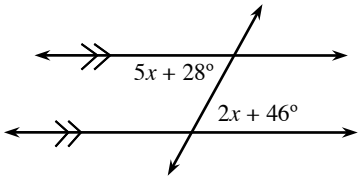
Solve for x.
Use the Exterior Angle Theorem:
$6x + 8^\circ = 49^\circ + 67^\circ \Rightarrow 6x^\circ = 108^\circ \Rightarrow x = \frac{108^\circ}{6} \Rightarrow x = 18^\circ$

Example 2



Solve for x.
There are a number of relationships in this diagram. First, $\angle 1$ and the 127º angle are supplementary, so we know that $m\angle 1 + 127^\circ = 180^\circ$ so $m\angle 1 = 53^\circ$. Using the same idea, $m\angle 2 = 47^\circ$. Next, $m\angle 3 + 53^\circ + 47^\circ = 180^\circ$, so $m\angle 3 = 80^\circ$. Because angle 3 forms a vertical pair with the angle marked $7x + 3^\circ$, $80^\circ = 7x + 3^\circ$, so $x = 11^\circ$.

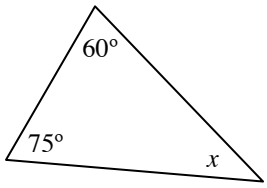
Example 3

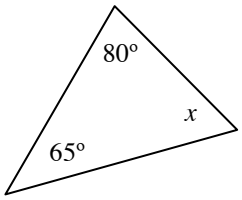


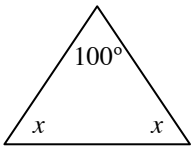
Find the measure of the acute alternate interior angles. Parallel lines mean that alternate interior angles are equal, so $5x + 28° = 2x + 46° \Rightarrow 3x = 18° \Rightarrow x = 6°$. Use either algebraic angle measure: $2(6°) + 46° = 58°$ for the measure of the acute angle.

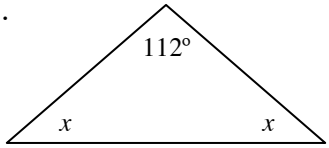
Problems

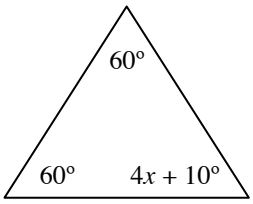
Use the geometric properties you have learned to solve for x in each diagram and write the property you use in each case.

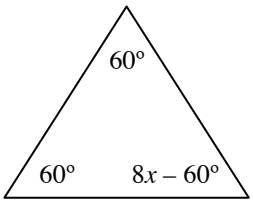
1. 

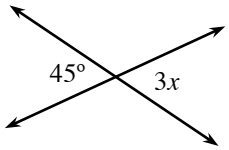
2. 

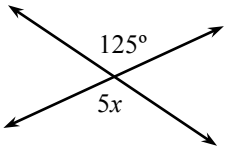
3. 

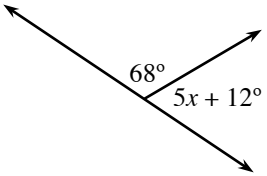
4. 

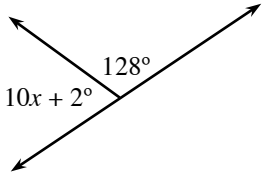
5. 

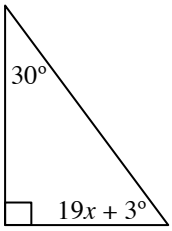
6. 

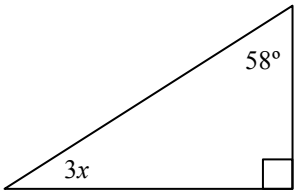
7. 

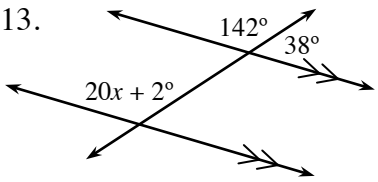
8. 

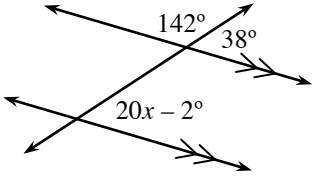
9. 

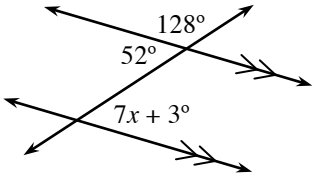
10. 

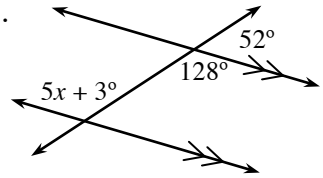
11. 

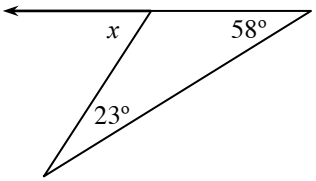
12. 

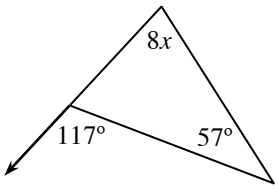
13. 

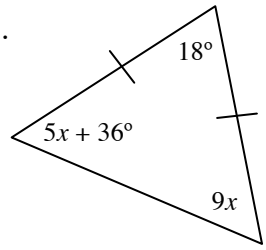
14. 

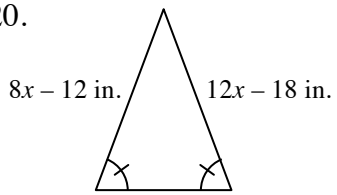
15. 

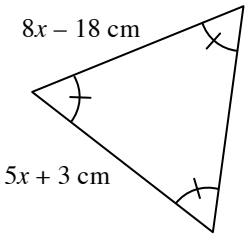
16. 

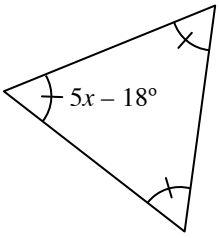
17. 

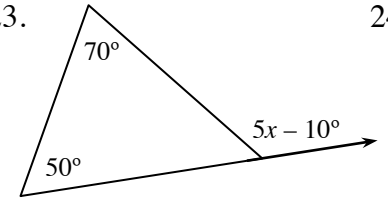
18. 

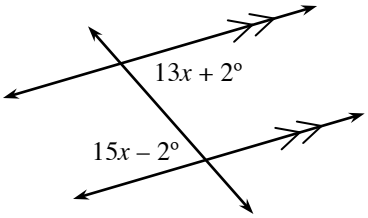
19. 

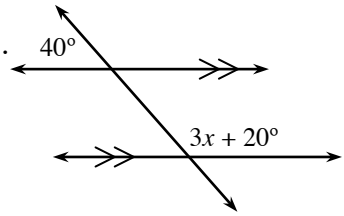
20. 

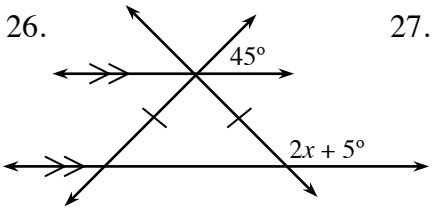
21. 

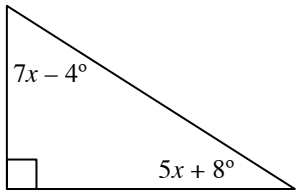
22. 

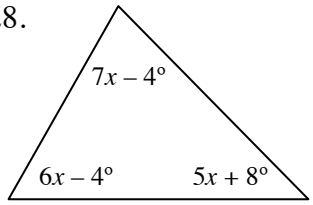
23. 

24. 

25. 

26. 

27. 

28. 

Answers

1.	45°	2.	35°	3.	40°	4.	34°	5.	12.5°	6.	15°
7.	15°	8.	25°	9.	20°	10.	5°	11.	3°	12.	$10\frac{2}{3}$°
13.	7°	14.	2°	15.	7°	16.	25°	17.	81°	18.	7.5°
19.	9°	20.	7.5°	21.	7°	22.	15.6°	23.	26°	24.	2°
25.	40°	26.	65°	27.	$7\frac{1}{6}$°	28.	10°				

