Written Exercises

Draw a triangle that satisfies the conditions stated. If no triangle can satisfy the conditions, write *not possible*.

A

1. **a.** An acute isosceles triangle
   b. A right isosceles triangle
   c. An obtuse isosceles triangle

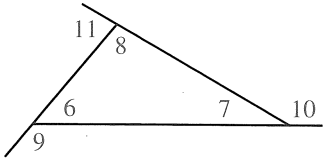
2. **a.** An acute scalene triangle
   b. A right scalene triangle
   c. An obtuse scalene triangle

3. A triangle with two acute exterior angles

4. A triangle with two obtuse exterior angles

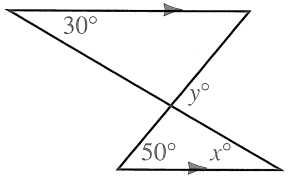
Complete.

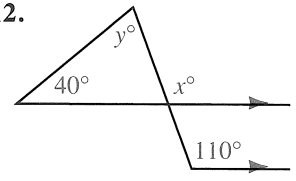
5. $m\angle 6 + m\angle 7 + m\angle 8 =$ ___?___.
6. If $m\angle 6 = 52$ and $m\angle 11 = 82$, then $m\angle 7 =$ ___?___.
7. If $m\angle 6 = 55$ and $m\angle 10 = 150$, then $m\angle 8 =$ ___?___.
8. If $m\angle 6 = x$, $m\angle 7 = x - 20$, and $m\angle 11 = 80$, then $x =$ ___?___.
9. If $m\angle 8 = 4x$, $m\angle 7 = 30$, and $m\angle 9 = 6x - 20$, then $x =$ ___?___.
10. $m\angle 9 + m\angle 10 + m\angle 11 =$ ___?___.

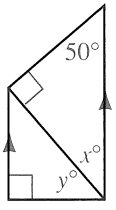


Exs. 5–10

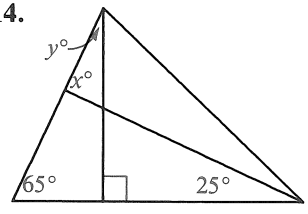
Find the values of x and y.

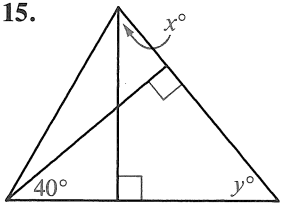
11. 

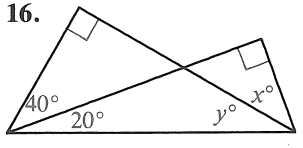
12. 

13. 

B

14. 

15. 

16. 

17. The lengths of the sides of a triangle are $4n$, $2n + 10$, and $7n - 15$. Is there a value of n that makes the triangle equilateral? Explain.
18. The lengths of the sides of a triangle are $3t$, $5t - 12$, and $t + 20$.
    a. Find the value(s) of t that make the triangle isosceles.
    b. Does any value of t make the triangle equilateral? Explain.

19. The largest two angles of a triangle are two and three times as large as the smallest angle. Find all three measures.

20. The measure of one angle of a triangle is 28 more than the measure of the smallest angle of the triangle. The measure of the third angle is twice the measure of the smallest angle. Find all three measures.

21. In $\triangle ABC$, $m\angle A = 60$ and $m\angle B < 60$. What can you say about $m\angle C$?

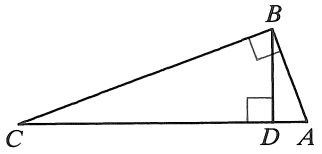
22. In $\triangle RST$, $m\angle R = 90$ and $m\angle S > 20$. What can you say about $m\angle T$?

23. Given: $\overline{AB} \perp \overline{BC}$; $\overline{BD} \perp \overline{AC}$

a. If $m\angle C = 22$, find $m\angle ABD$.

b. If $m\angle C = 23$, find $m\angle ABD$.

c. Explain why $m\angle ABD$ always equals $m\angle C$.

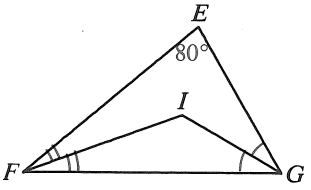


24. The bisectors of $\angle EFG$ and $\angle EGF$ meet at I.

a. If $m\angle EFG = 40$, find $m\angle FIG$.

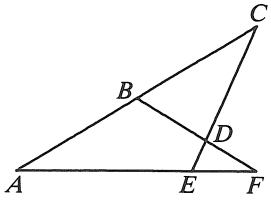
b. If $m\angle EFG = 50$, find $m\angle FIG$.

c. Generalize your results in (a) and (b).

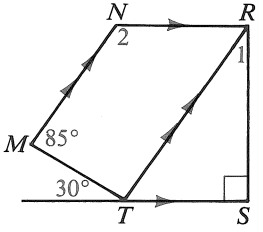


25. Given: $\angle ABD \cong \angle AED$

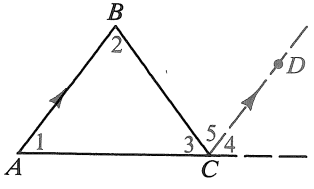
Prove: $\angle C \cong \angle F$



26. Find the measures of $\angle 1$ and $\angle 2$.

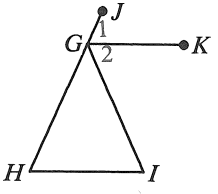


27. Prove Theorem 3-11 by using the diagram below. (Begin by stating what is given and what is to be proved. Draw the auxiliary ray shown.)



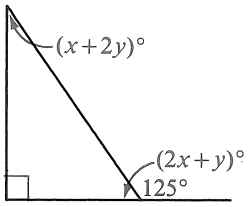
28. Given: $\overrightarrow{GK}$ bisects $\angle JGI$; $m\angle H = m\angle I$

Prove: $\overline{GK} \parallel \overline{HI}$

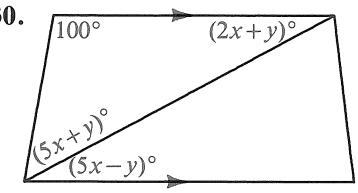


Find the values of x and y.

29.

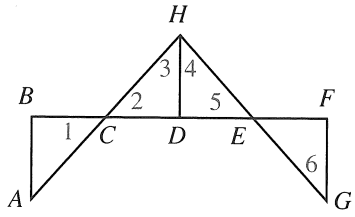


30.



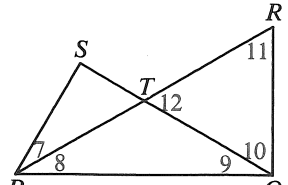
31. Given: $\overline{AB} \perp \overline{BF}$; $\overline{HD} \perp \overline{BF}$; $\overline{GF} \perp \overline{BF}$; $\angle A \cong \angle G$

Which numbered angles must be congruent?



C **32.** Given: $\overrightarrow{PR}$ bisects $\angle SPQ$; $\overline{PS} \perp \overline{SQ}$; $\overline{RQ} \perp \overline{PQ}$

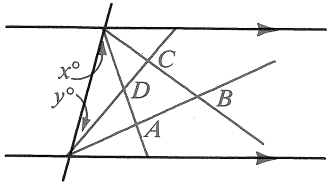
Which numbered angles must be congruent?



Ex. 32

33. **a.** Draw two parallel lines and a transversal.
b. Use a protractor to draw bisectors of two same-side interior angles.
c. Measure the angles formed by the bisectors. What do you notice?
d. Prove your answer to part (c).

34. A pair of same-side interior angles are *trisected* (divided into three congruent angles) by the red lines in the diagram. Find out what you can about the angles of $ABCD$.



Explorations

These exploratory exercises can be done using a computer with a program that draws and measures geometric figures.

Decide if the following statements are true or false. If you think the statement is true, give a convincing argument to support your belief. If you think the statement is false, make a sketch and give all the measurements of the triangle that you find as your counterexample. For each false statement, also discover if there are types of triangles for which the statement is true.

1. The measure of an exterior angle is greater than the measure of any interior angle of a triangle.
2. An exterior angle is always an obtuse angle.
3. An exterior angle and some interior angle are supplementary.
4. The sum of the measures of an exterior angle and the remote interior angles is 180.