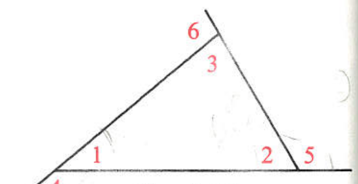
Written Exercises

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.** A scalene right triangle
   b. A scalene isosceles triangle
   c. A scalene obtuse triangle
3. A triangle with two acute exterior angles
4. An obtuse equilateral triangle

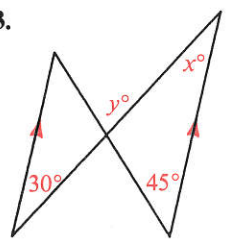
Complete.

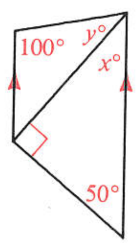


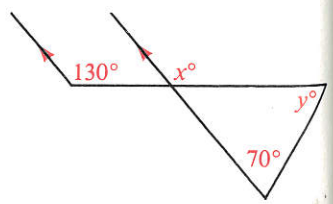
Exs. 5–12

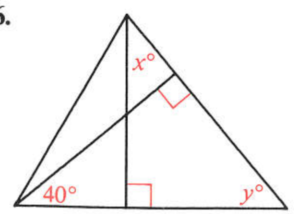
5. If $m\angle 1 = 40$ and $m\angle 2 = 60$, then $m\angle 6 =$ __?__.
6. If $m\angle 1 = 45$ and $m\angle 3 = 70$, then $m\angle 5 =$ __?__.
7. If $m\angle 2 = 50$ and $m\angle 3 = 65$, then $m\angle 4 =$ __?__.
8. If $m\angle 4 = 135$ and $m\angle 2 = 60$, then $m\angle 3 =$ __?__.
9. If $m\angle 5 = 120$ and $m\angle 1 = 40$, then $m\angle 3 =$ __?__.
10. If $m\angle 1 = x$, $m\angle 2 = x + 10$, and $m\angle 6 = 120$, then $x =$ __?__.
11. If $m\angle 2 = 2x - 5$, $m\angle 3 = 3x + 10$, and $m\angle 4 = 140$, then $x =$ __?__.
12. $m\angle 4 + m\angle 5 + m\angle 6 =$ __?__.

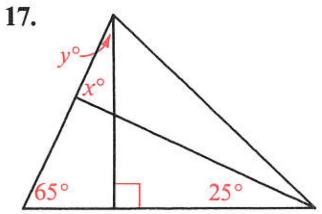
Find the values of *x* and *y*.

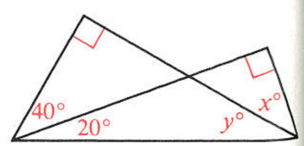
13.


14.


15.


16.


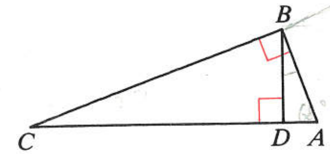
17.


18.


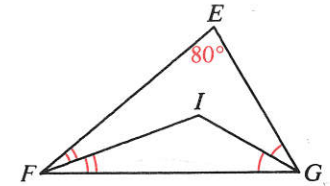
B

19. 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?
20. The largest two angles of a triangle are two and three times as large as 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 $m\angle T$?

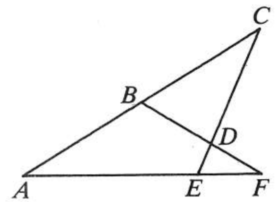
23. Given: $\overline{AB} \perp \overline{BC}$; $\overline{BD} \perp \overline{AC}$
    a. If $m\angle C = 22$, find $m\angle ABD$.
    b. If $m\angle C = 23$, find $m\angle ABD$.
    c. Explain why $m\angle ABD$ always equals $m\angle C$.



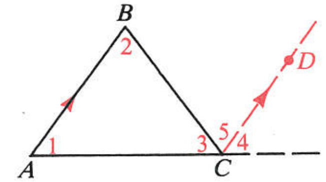
24. The bisectors of $\angle EFG$ and $\angle EGF$ meet at I.
    a. If $m\angle EFG = 40$, find $m\angle FIG$.
    b. If $m\angle EFG = 50$, find $m\angle FIG$.
    c. Explain your results in (a) and (b).



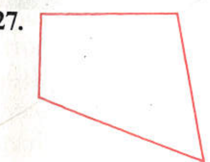
25. Given: $\angle ABD \cong \angle AED$
    Prove: $\angle C \cong \angle F$

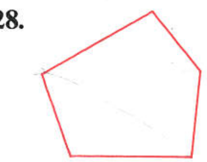


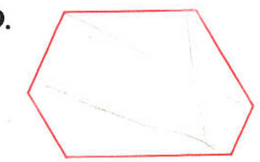
26. Prove Theorem 2-11 by using the figure below.



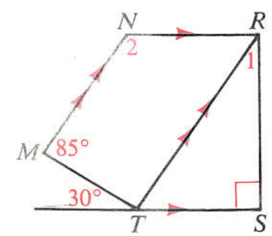
Find the sum of the measures of the angles of each figure. (*Hint:* Divide each figure into triangles.)

27.


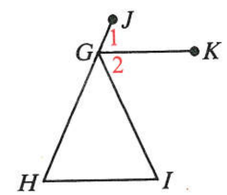
28.


29.


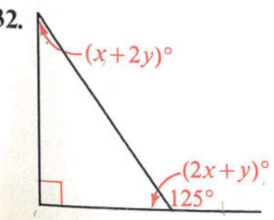
30. Find the measures of $\angle 1$ and $\angle 2$.

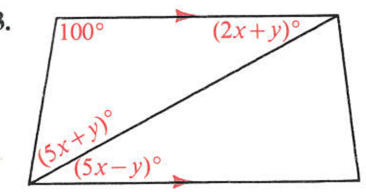


31. Given: $\overrightarrow{GK}$ bisects $\angle JGI$; $m\angle H = m\angle I$
    Prove: $\overline{GK} \parallel \overline{HI}$



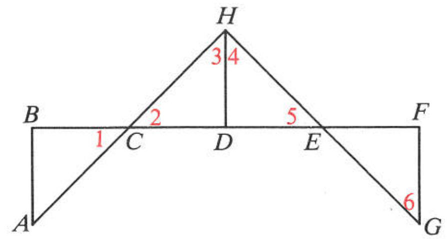
Find the values of *x* and *y*.

32.


33.


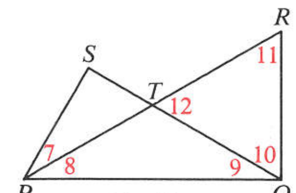
34. Given: $\overline{AB} \perp \overline{BF}$; $\overline{HD} \perp \overline{BF}$; $\overline{GF} \perp \overline{BF}$; $\angle A \cong \angle G$

Which numbered angles must be congruent?



C 35. Given: $\overrightarrow{PR}$ bisects $\angle SPQ$; $\overline{PS} \perp \overline{SQ}$; $\overline{RQ} \perp \overline{PQ}$

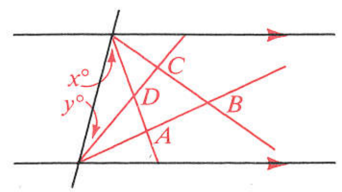
Which numbered angles must be congruent?



Ex. 35

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

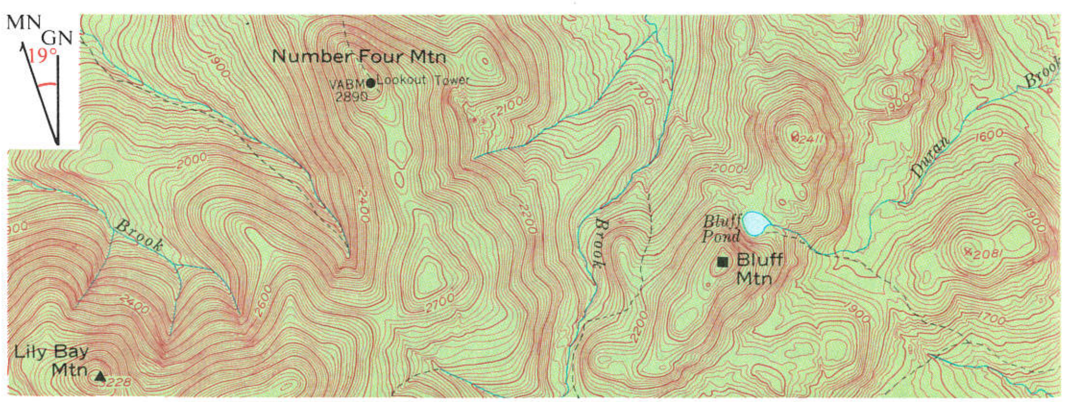
37. A pair of same-side interior angles are trisected (divided into three congruent angles) by the red lines in the diagram. Find out what you can about the angles of $ABCD$.



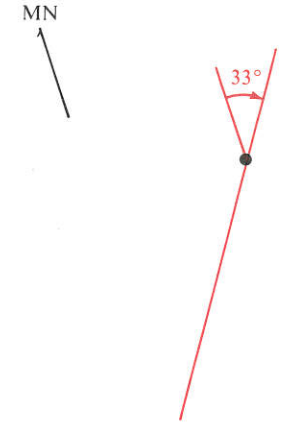
Application

ORIENTEERING

The sport of orienteering involves finding your way from point to point in a wilderness area, using a map and magnetic compass for guidance. You can often locate your position by sighting on specific objects shown on your map. For example, suppose you can see a mountain peak and a lookout tower, both of which are marked on your map (Lily Bay Mountain at ▲ and the lookout tower on Number Four Mountain at ●).

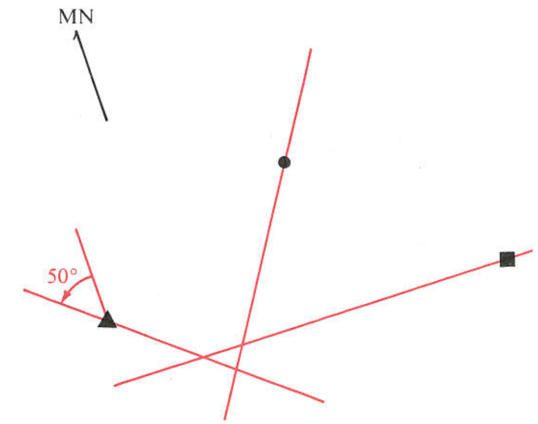


You sight across your compass and find that the lookout tower is 33° east of magnetic north (MN). On your map you draw a line through the tower that makes this same angle with the direction of magnetic north shown on your map. (Be sure to use magnetic north rather than true north. Hiking maps and nautical charts usually give both, but they may differ by as much as 20°. All compass readings used here are given in terms of magnetic north.)



You are somewhere on this line. To find out where, take a sighting on the peak of Lily Bay Mountain. It is 50° west of north. Draw a line through the peak making a 50° angle with magnetic north. You are close to the point where the two lines cross.

If a third landmark is visible, say the summit of Bluff Mountain (■ on the map), you may want to check your position with a third sighting. The three lines should cross at a single point. Usually there is some error in sighting and drawing angles, and instead of meeting exactly at a point the three lines form a triangle. If the triangle is small, you know that your true position is very close to it.



Exercises

1. Sailors use this method of finding their position when navigating near shore, sighting on lighthouses, smokestacks, and other landmarks shown on their charts. They call the small triangle formed by three sighting lines a "cocked hat," and usually mark their position at the corner closest to the nearest hazard. Why is this a sensible rule?
2. Another orienteering party sights on Lily Bay Mountain and the lookout tower and finds the following angles: mountain, 58° west of north; tower, 40° east of north. Are they north of you or south of you?
3. Lillian and Ray both sight Lily Bay Mountain at 70° west of north, but Lillian sees the lookout tower at 40° east of north, while Ray sees it at 20° east of north. Which person is closer to Bluff Mountain?
4. If you head due east from Lily Bay Mountain (90° east of magnetic north), will you pass Bluff Mountain on your right or on your left?