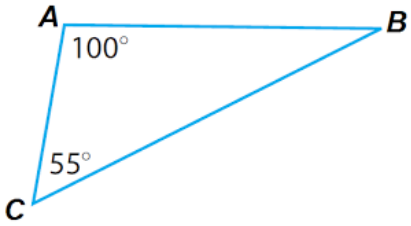
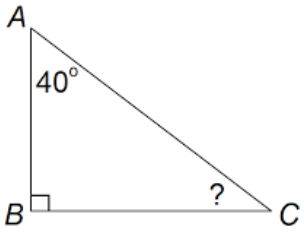
Reflection Does It! Part 3 - Hinged Mirrors

Oct 12, 2024

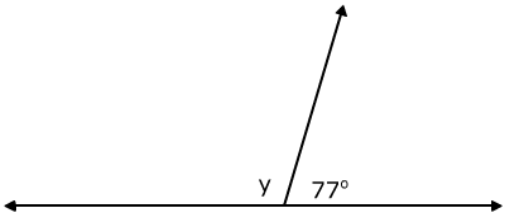
Warm-up: Facts about Angles

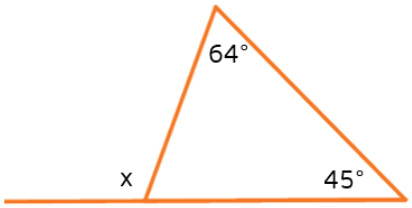
1. For each triangle, find the measure of the missing angle.

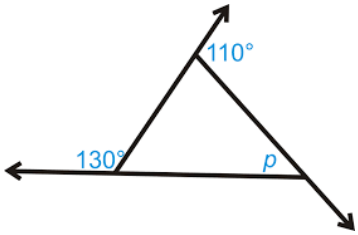


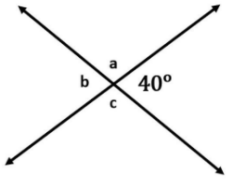


2. What are the measures of the missing angles in these figures?

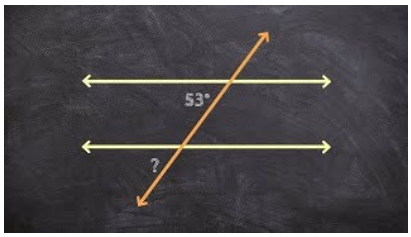


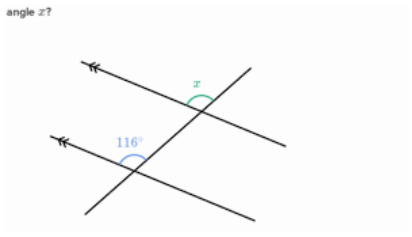


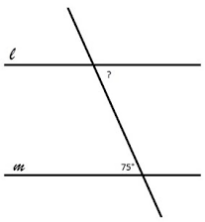


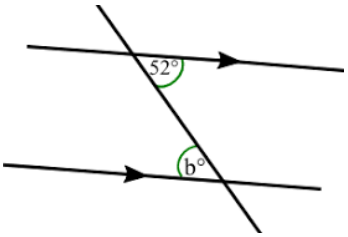


3. What are the missing angles labeled in these figures? Assume that the two lines that look parallel are parallel.

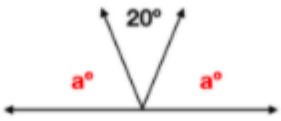


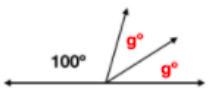






4. What are the missing angles labeled in these figures?

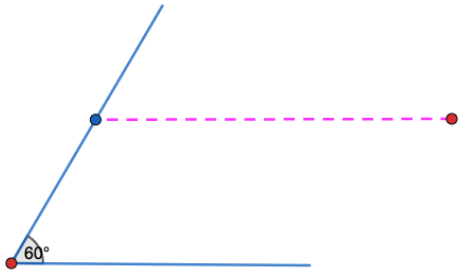




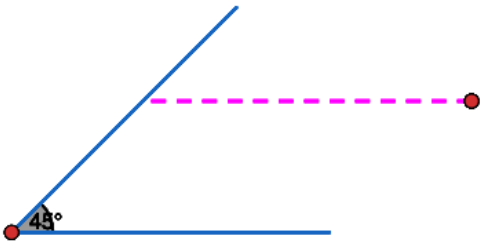
Hinged Mirrors

Two hinged mirrors form an angle. A light beam enters the hinged mirror angle parallel to one of the sides and is reflected from the sides according to the usual law that the angle of incidence is equal to the angle of reflection.

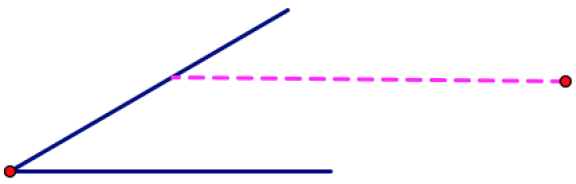
5. Prove that the beam will eventually leave the hinged mirror angle for this 60° angle. How many times will it reflect off of the mirrors before leaving?



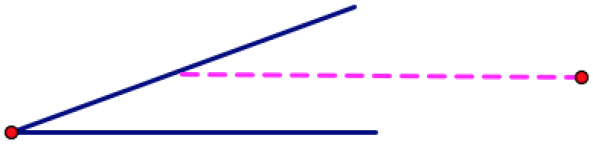
6. What if the angle between the mirrors is 45°?



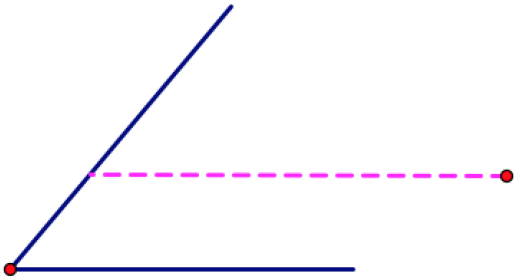
7. What if the angle is 30°?



8. What if the angle between the mirrors is 20 degrees?

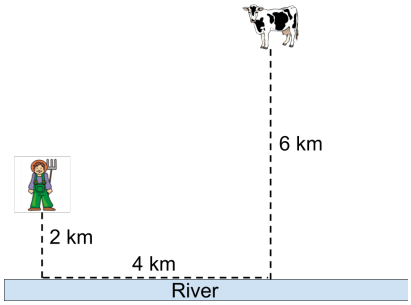


9. What if the angle is 50 degrees?

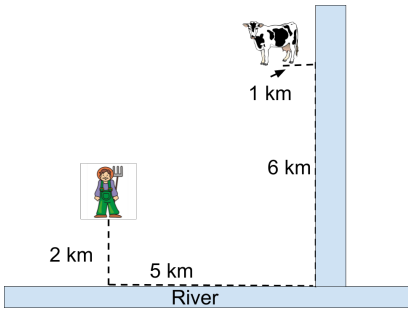


Cows and Bridges

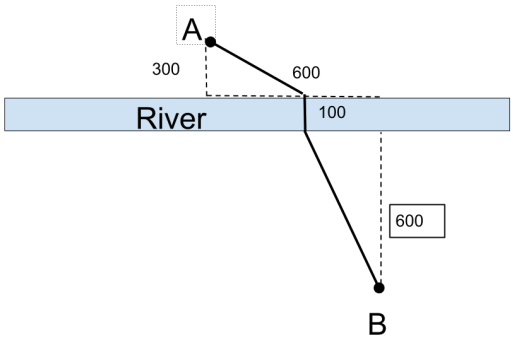
10. During a hot summer day, a farmer and a cow find themselves on the same side of a river. The farmer is 2 km from the river and the cow is 6 km from the river. If each of them would walk straight to the river, they would find themselves 4 km from each other. Unfortunately, the cow has broken its leg and cannot walk. The farmer needs to get to the river, dip his bucket there, and take the water to the cow. To which point on the river should the farmer walk so that his total walk to the river and then to the cow is as short as possible? Prove your claim.



11. What if the farmer and the cow are near the fork of a river, like this one? Which branch of the river should the farmer go to, and where on the river should he go?



12. Two tiny towns, A and B, are on opposite sides of a river with parallel straight sides. A road with a bridge that crosses the canal perpendicularly is to be built. Where should the bridge be located so that the length of the road from A to B is to be minimized?



A is located 300 meters from the river, B is located 600 meters from the river, and the river itself is 100 meters wide. The river runs west to east, and town A is 600 meters west of B, and also 1000 meters north of B.