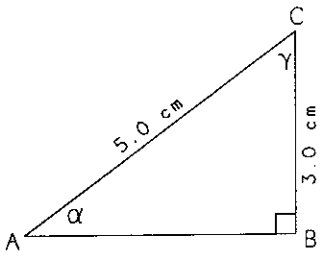
Skill Drill 10

Following the questions which deal with abstract triangles, there are problems which apply trigonometry to concrete situations. A few problems resemble those given in other drills, but different questions are asked. In this drill, feel free to use a calculator whenever it is needed.

1. Review of major ideas—refer to the right triangle ABC shown here.



(a) Using the Pythagorean Theorem find the length of side AB.

(b) Determine sin α, cos α, and tan α from ratios of side lengths.

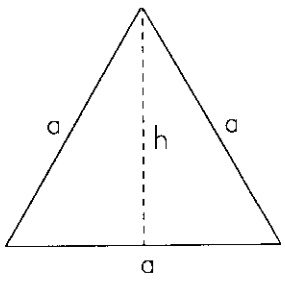
(c) Find α and γ using inverse trig functions.

(d) Drop a perpendicular from vertex B to the hypotenuse AC. Find the length h of this line (an "altitude" of ABC) using a trig function of α.

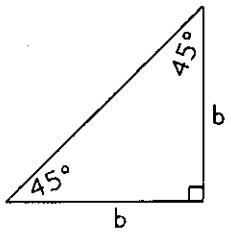
NOTE: Triangle ABC in the problem above and all other triangles which are similar to it are the only possible right triangles whose side lengths form rational fractions (3/5, 3/4, 4/5).

2. Use the Pythagorean Theorem to find cos 60° and tan 60°. Take the same approach used to find sin 60° in the example problem of Review 10.

3. Find the altitude h of an equilateral triangle whose sides a are each 1 cm in length. Do this using (a) the Pythagorean Theorem, and (b) a trig function of a vertex angle.

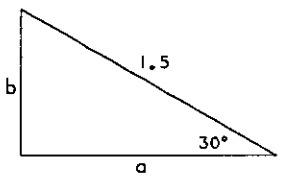


4. Apply the Pythagorean Theorem to the isosceles right triangle shown here to find sin 45°, cos 45° and tan 45°.

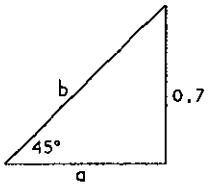


5. Use trig functions to determine the lengths of sides a and b (in arbitrary units) of the right triangles shown below.

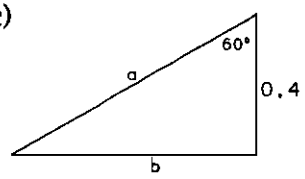
(a)



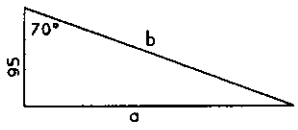
(b)



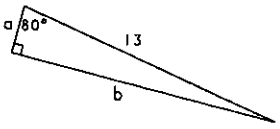
(c)



(d)



(e)



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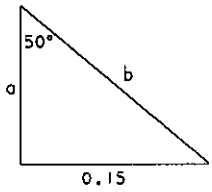
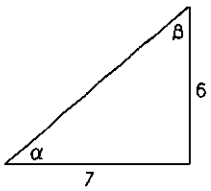
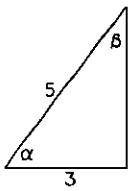


6. Use inverse trig functions to determine, to an accuracy of 0.1°, angles α and β in the right triangles whose side lengths (in arbitrary units) are shown in the figures below.

(a)



(b)



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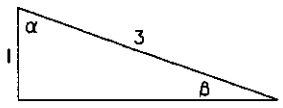

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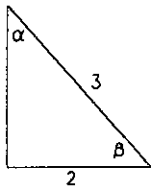
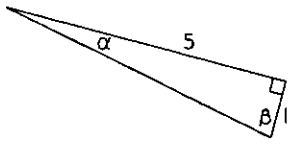


(e)



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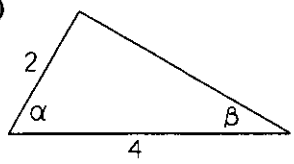
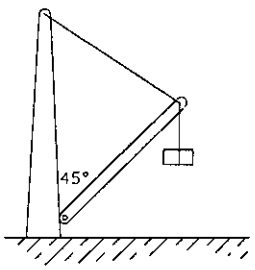
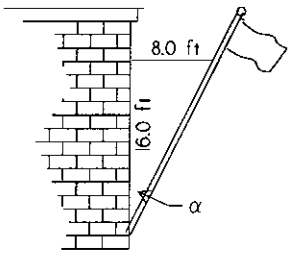


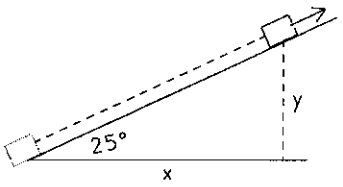
7. A heavy load is supported from the end of a boom, 6.0 m in length, held out from the mast of a derrick by a guy wire, as shown. If the boom makes a 45° angle with respect to the mast, how far from the mast is the end of the boom?



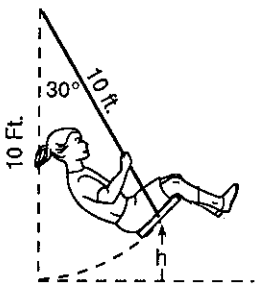
8. A flag pole is held out from the side of a building by a horizontal tie rope attached 16.0 feet above the bottom of the pole, as shown. (a) If the tie rope is 8.0 feet in length, what is angle α? (b) Use a trig function of α to find how far from the building the top of the pole is, assuming it is 22.0 feet long.



9. A box is being pulled up a 25° incline. After it has moved 3.0 meters along the incline, what is the distance x it has moved in the horizontal direction and what elevation y has it achieved?



10. A child is swinging on a garden swing with supporting rope lengths of 10.0 feet. When the swing angle (with respect to the vertical) is 30°, how high is the child compared with her lowest position?



11. A stairway is built so that each step is 8 inches higher and is set back 10 inches from the next lower step. At what angle θ with respect to the horizontal does the stairway rise?