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10.6 Classwork: Tangent applications

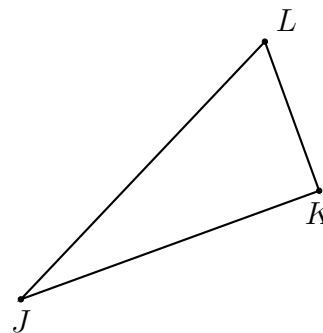
CCSS.HSG.SRT.C.8

For a right triangle, $\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$

1. Do Now: Given right $\triangle JKL$ with $\overline{JK} \perp \overline{KL}$, $JK = 10$, $m\angle J = 31^\circ$. Let x be the length of the side opposite $\angle J$, $x = KL$.

(a) Mark up the triangle.

(b) Find x .



2. $\triangle ABC$ is shown with $m\angle C = 90^\circ$ and the lengths of the triangle's sides are $AC = 8$, $BC = 15$.
(not drawn to scale)

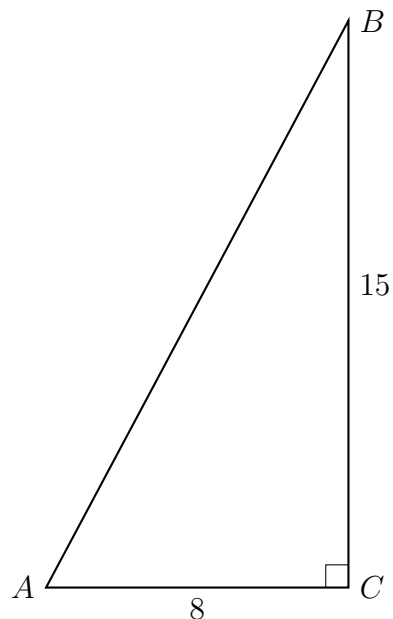
(a) Write down the value of $\tan A$.

(b) Find the measure of $\angle A$.

(c) Write down the value of $\tan B$.

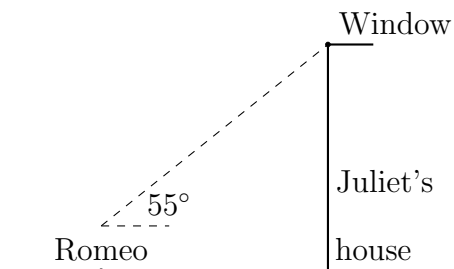
(d) Find the measure of $\angle B$ two different ways.

(e) Find AB .

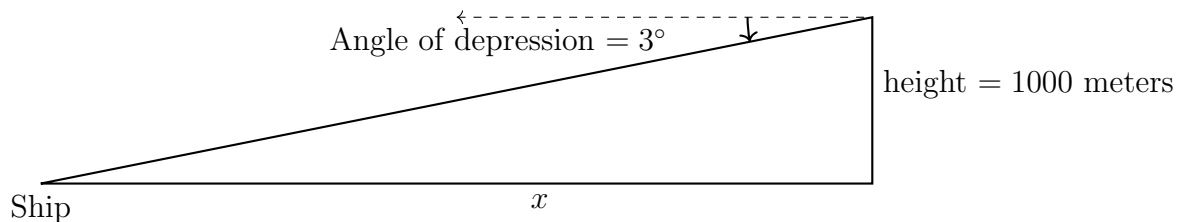


3. Romeo is standing 8 meters away from Juliet's house, looking up at Juliet's window. He is two meters tall and looks up at a 55° angle.

Find the height of Juliet's window ledge to the *nearest meter*. (not drawn to scale)

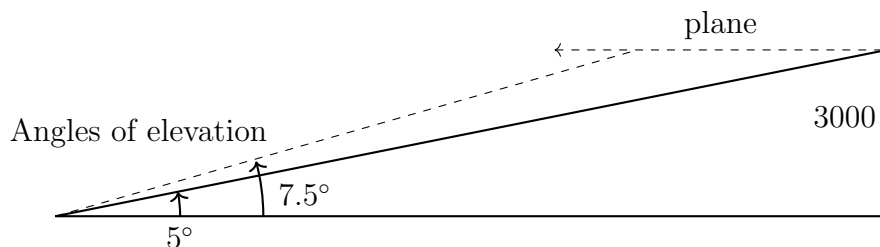


4. From the top of a lighthouse, a ship is visible at an angle of depression of 3° . If the lighthouse is 1000 meters tall, determine the distance of the ship from the lighthouse, x , to the *nearest kilometer*.



5. An airplane flying at an altitude of 3,000 meters is observed twice. The first time the angle of elevation is 5° and exactly one minute later the angle of elevation is 7.5° .

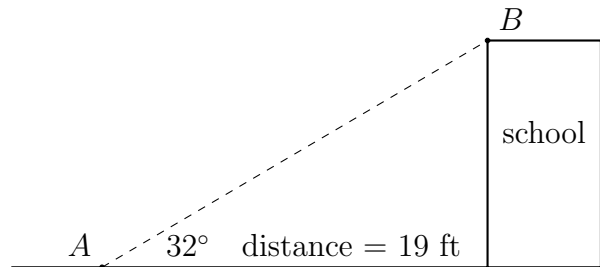
Find the distance the plane flies over the minute and its speed in kilometers per hour.



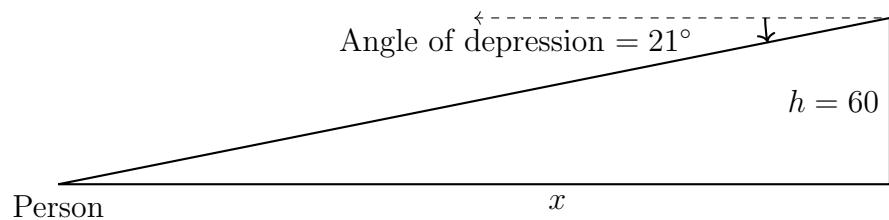
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6. Shown is a building with student A on the ground waving up to student B . Point A is 19 feet from the base of the building, and the angle of elevation from A to B is 32° .

Find how high up student B is from the ground to the *nearest foot*. (not to scale)

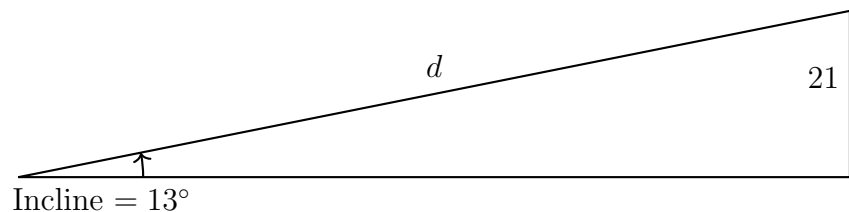


7. From the top of a subway station, a person is visible at an angle of depression of 21° . If the subway station is 60 feet tall, determine the distance from the person to the base of the subway station, x , to the *nearest foot*.



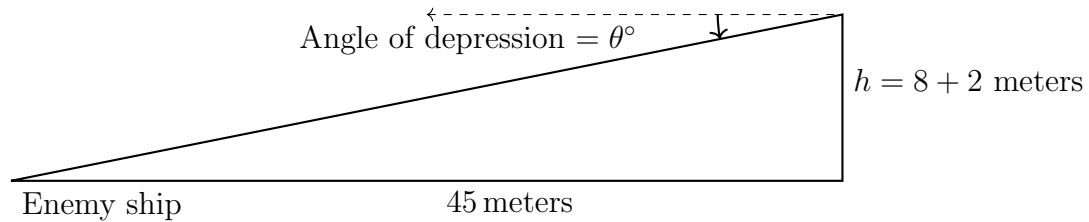
8. A child sleds from the top of a hill to a group of friends standing at the base of the hill. The hill is 21 feet tall, and the hill's incline is 13° . Find the distance, d , from the sledder to the group of friends to the *nearest foot*.

(hint: First find the horizontal distance, the base of the triangle. Then use the Pythagorean theorem to find the hypotenuse, d .)



9. A pirate, who is two meters tall, is standing on a mast 8 meters tall. Looking down, the pirate sees an enemy ship 45 meters away.

Find the angle of depression to the nearest degree.

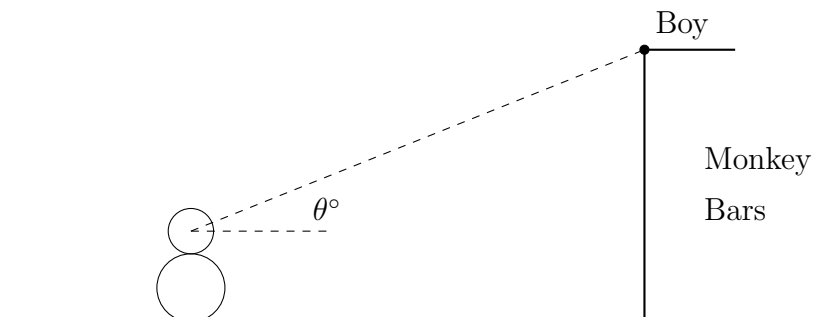


10. A snowman is standing 10 meters away from the base of a set of monkey bars, looking up at a boy 3 meters off the ground. The snowman is 1 meter tall.

(a) Mark the triangle.

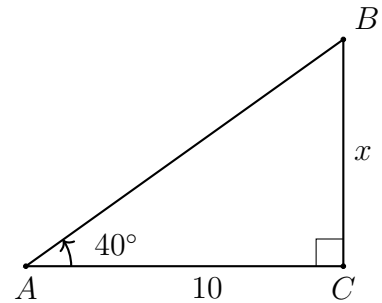
(b) Find the angle from the snowman's head to the boy, θ , to the *nearest degree*.

(not drawn to scale)



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11. Given right $\triangle ABC$ with $AC = 10$, $m\angle A = 40^\circ$. Find the value of $BC = x$.



12. Graph and label $\triangle ABC$ with $A(0,0)$, $B(5,3)$, and $C(5,0)$. Calculate the length of each side of the triangle.

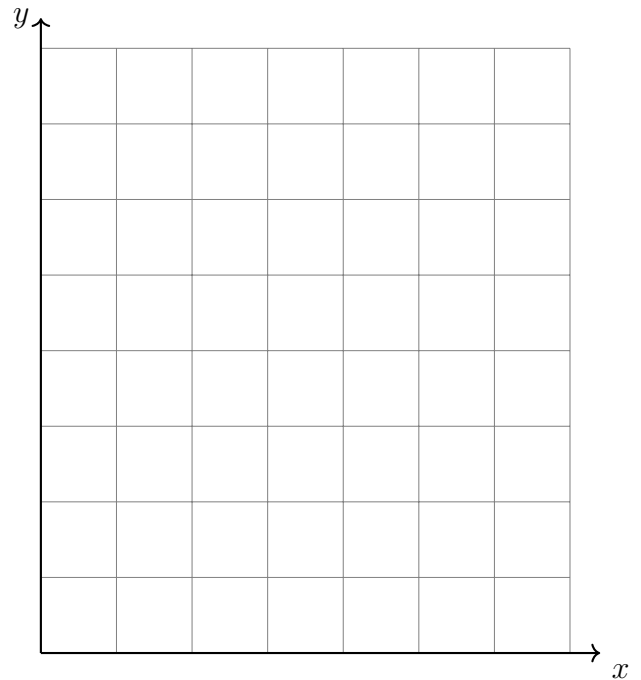
(a) $AC =$ _____

(b) $BC =$ _____

- (c) For the hypotenuse, express the length as a radical, then round to the nearest hundredth.

(hint: use the Pythagorean theorem $a^2 + b^2 = c^2$)

$AB =$ _____



- (d) Find the slope of each line.

$m_{AB} =$ _____

$m_{AC} =$ _____

$m_{BC} =$ _____

13. Calculate each value. Round to the nearest thousandth.

(a) $\tan 39^\circ$

(b) $\tan 11^\circ$

14. Find θ . Round to the nearest whole degree.

(a) $\theta = \tan^{-1}\left(\frac{3}{10}\right)$

(b) $\tan \theta = \frac{2.6}{4.9}$

15. Convert radians and degrees. (nearest whole degree, nearest hundredth radian).

(a) $85^\circ =$

(b) $1.15 \text{ radians} =$

16. Solve each equation for x , rounding to the nearest tenth.

(a) $\tan 33^\circ = \frac{x}{21}$

(b) $\tan 16^\circ = \frac{3.7}{x}$

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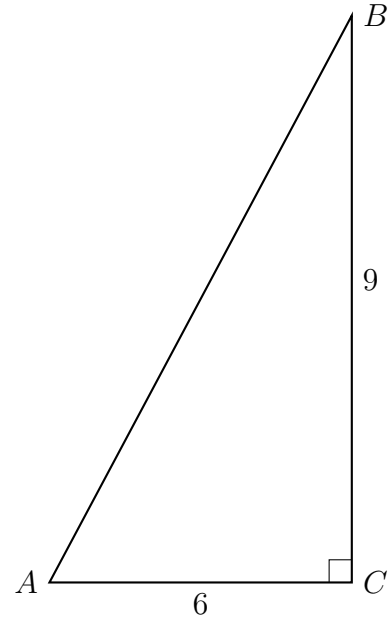
17. $\triangle ABC$ is shown with $m\angle C = 90^\circ$ and the lengths of the triangle's sides are $AC = 6$, $BC = 9$.
(not drawn to scale)

(a) Write down the value of $\tan A$.

(b) Find the measure of $\angle A$.

(c) Write down the value of $\tan B$.

(d) Find the measure of $\angle B$.

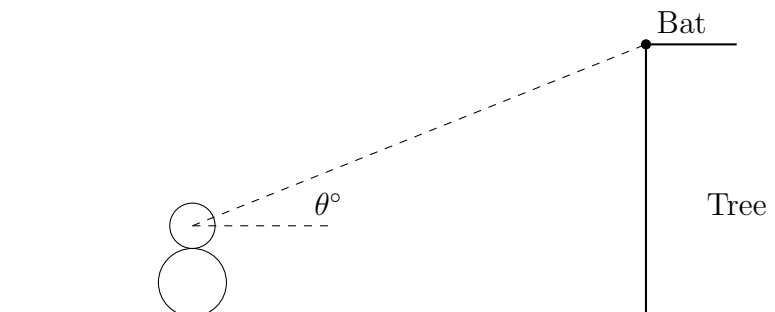


18. A bear is standing 22 feet away from the base of a tree, looking up at a bat 16 feet off the ground. The bear is 5 feet tall.

(a) Mark the scenario.

(b) Find the angle of elevation the bear views the bat, θ , to the nearest tenth degree.

(not drawn to scale)



19. The right $\triangle ABC$ has a base of $AC = 6$ units. The area of the triangle is 15 square units. Find the lengths of all three sides and measures of all angles of the triangle.

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(“solve the triangle”)

