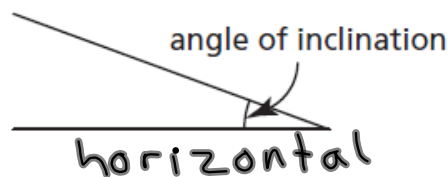


## Section 2.1 The Tangent Ratio Continued

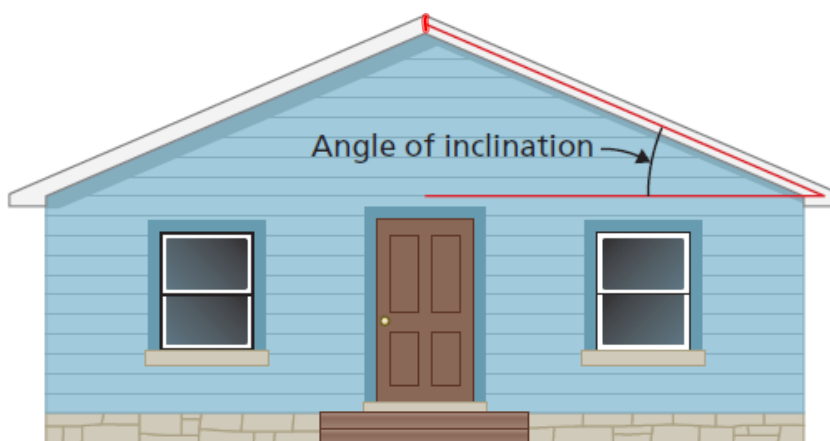
The **angle of inclination** of a line or line segment is the acute angle it makes with the horizontal.



See page 70 of text.

South-facing solar panels on a roof work best when the **angle of inclination** of the roof, that is, the angle between the roof and the horizontal, is approximately equal to the latitude of the house.

When an architect designs a house that will have solar panels on its roof, she has to determine the width and height of the roof so that the panels work efficiently.



## Using the Tangent Ratio to Find an Angle of Inclination

1. The latitude of Fort Smith, NWT, is approximately  $60^\circ$ . Determine whether this design for a solar panel is the best for Fort Smith. Justify your answer.

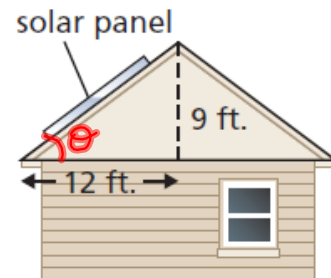
Find angle of inclination.

$$\tan \theta = \frac{o}{a}$$

$$\tan \theta = \frac{9}{12}$$

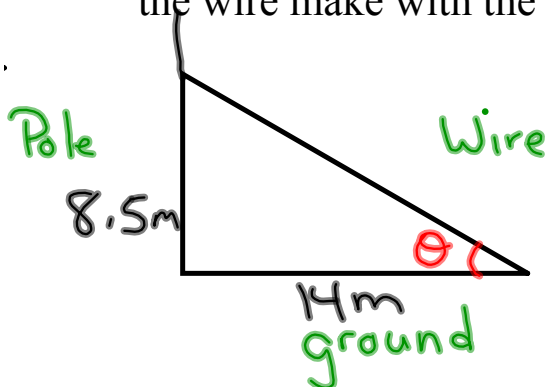
$$\theta = \tan^{-1}(9/12)$$

$$\theta = 37^\circ$$



The angle of inclination is  $37^\circ$ , but the best design needs to be at  $60^\circ$ . So, this is not a good design.

2. A guy wire is fastened to a cell-phone tower 8.5 m above the ground. The wire is anchored to the ground 14.0 m from the base of the tower. What angle, to the nearest degree, does the wire make with the ground?



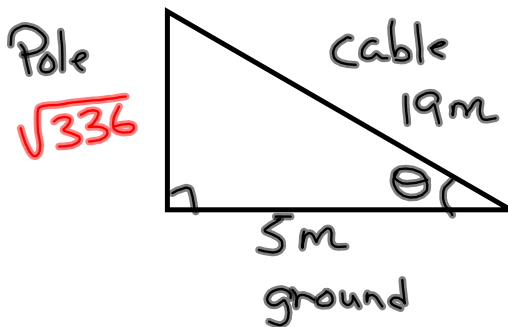
$$\tan \theta = \frac{o}{a}$$

$$\tan \theta = \frac{8.5}{14}$$

$$\theta = \tan^{-1}(8.5/14)$$

$$\theta = 31^\circ$$

3. A support cable is anchored to the ground 5 m from the base of a telephone pole. The cable is 19 m long. It is attached near the top of the pole. What angle, to the nearest degree, does the cable make with the ground?



$$b^2 = c^2 - a^2$$

$$b^2 = 19^2 - 5^2$$

$$b^2 = 336$$

$$b = \sqrt{336}$$

$$\tan \theta = \frac{b}{a}$$

$$\tan \theta = \frac{\sqrt{336}}{5m}$$

$$\theta = \tan^{-1}(\sqrt{336}/5)$$

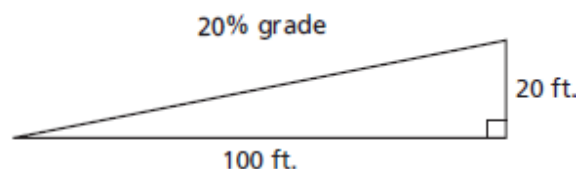
$$\theta = 75^\circ$$

$$2^{\text{nd}} \tan \sqrt{336}$$

$$\tan^{-1}(\sqrt{336} \div 5)$$

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4. The grade or inclination of a road is often expressed as a percent. When a road has a grade of 20%, it increases 20 ft. in altitude for every 100 ft. of horizontal distance.



Calculate the angle of inclination, to the nearest degree, of a road with each grade.

a) 20%

b) 25%

6. Draw (to scale) a right triangle where  $\tan\theta = 0.25$ .