

2.2 Percentage Grade Notes

When talking about the slope of a road, it is usually called the grade.

Grade is commonly expressed as a percent.

The steeper the road, the higher it's percent grade.

The following formula can be used to calculate grade.

$$\% \text{ grade} = \frac{\text{rise}}{\text{run}} \times 100$$

Slope

Ex 1

A road rises .140 km over 1.243 km of horizontal distance. What is the percent grade of the road?

$$\begin{aligned} \% \text{ grade} &= \frac{0.140 \text{ km}}{1.243 \text{ km}} \times 100 \\ &= 11.26\% \end{aligned}$$

Show you know:

A roller coaster rises 150 feet over 210 feet of horizontal distance. What is the percent grade of the rail?

$$\begin{aligned} \% \text{ grade} &= \frac{\text{rise}}{\text{run}} \times 100 \\ &= \frac{150}{210} \times 100 \\ &= 71.43\% \end{aligned}$$

Ex 2

The percent grade of a hill is 8%. If the road rises 350ft what is its run?

$$\% \text{ grade} = m \times 100$$

$$m = \frac{\text{rise}}{\text{run}}$$

$$\frac{8}{100} = \frac{m \times 100}{100}$$

$$\frac{8}{100} = \frac{350 \text{ ft}}{x}$$

$$\frac{8}{100} = m$$

$$x = 4375 \text{ ft}$$

Show you know

An incline on a rail line has a percent grade of 4% and covers a horizontal distance of 4323 ft.. What is the elevation change of this section of the railroad?

$$\frac{4}{100}$$

$$m = \frac{\text{rise}}{\text{run}}$$

$$\frac{4}{100} = \frac{x}{4323 \text{ ft}}$$

$$x = 172.92 \text{ ft}$$

Ex 3

Martin is driving his truck on the Trans-Canada Highway. There is a sign indicating a 7% grade.

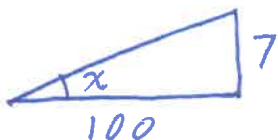
- a) What is the slope of the road, as a fraction?

$$\% \text{ grade} = m \times 100$$

$$\frac{7}{100} = \frac{m \times 100}{100}$$

$$\frac{7}{100} = m = 0.07$$

- b) Find the angle of elevation of the road.



$$\tan = \frac{O}{A}$$

$$\tan x = \frac{7}{100}$$

$$x = 4^\circ$$

Ex 4

1. Steve is building a sundeck on the back of his house. Building code dictates that the deck should slope away from the house. The maximum drop is $\frac{1}{4}$ " per 12 feet or run.

- a. If Steve's deck will be 15 feet long what is the maximum drop of the deck?

$$m = \frac{\text{rise}}{\text{run}}$$

$$\frac{0.02}{12} = \frac{x}{15 \text{ ft}}$$

$$x = 0.03 \text{ ft}$$

- b. What is this expressed a percent grade?

$$\% \text{ grade} = \frac{\text{rise}}{\text{run}} \times 100$$

$$= \frac{0.03}{15} \times 100$$

$$= 0.2\%$$

Show you know

So that water will drain properly, a patio attached to a house should slope downward about 2.5 inches for every 10 feet of run. Calculate:

$$10 \times 12 = 120 \text{ in}$$

- a) The slope

$$m = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{2.5}{120} = 0.02$$

- b) The percent grade.

$$\% \text{ grade} = m \times 100$$

$$= 0.02 \times 100$$

$$= 2\%$$

