proprep™

Workbook

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Related Rates Problems

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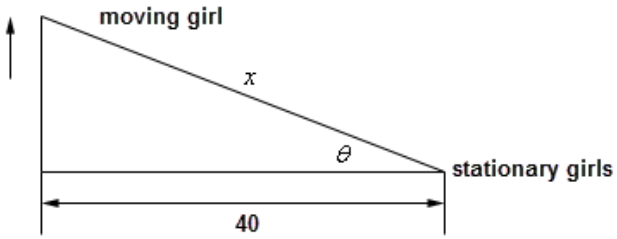
Questions:

1) Determine the rate at which the radius of a spherical balloon is increasing when the diameter of the balloon is 40cm, if it is known that Air is being pumped into the balloon at a rate of $10\text{cm}^3/\text{min}$.

2) A 20-foot ladder is resting against the wall. The bottom is initially 15 ft. away from the wall and is being pushed towards the wall at a rate of $\frac{1}{2}$ ft/sec.
How fast is the top of the ladder moving up the wall 16 seconds after we start pushing?

3) Two girls are 40 ft apart, one of them starts walking north at a rate so that the angle shown in the diagram below is changing at a constant rate of 0.02 rad/min.
At what rate is the distance between the two girls changing when $\theta = 0.5$ radians?



4) A tank of **Gasoline** in the shape of a cone is leaking at a constant rate of $3\ \text{ft}^3/\text{hour}$.
The base radius of the tank is 4 ft and the height of the tank is 13 ft.

a. At what rate is the depth of the gasoline in the tank changing when the depth of the gasoline is 5 ft?
b. At what rate is the radius of the top of the water in the tank changing when the depth of the water is 5 ft?

5) A trough of water is 9 meters deep and its ends are in the shape of isosceles triangles whose 6 meters width and 3 meters height. If water is being pumped in at a constant rate of $6\ \mathrm{m}^3/\mathrm{sec}$. At what rate is the height of the water changing when the water has a height of $110\ \mathrm{cm}$?

6) A light is on top of a $13\ \mathrm{ft.}$ tall pole and a $5\ \mathrm{ft.}$ tall girl is running away from the pole at a rate of $3\ \mathrm{ft/sec}$.

a. At what rate is the tip of the shadow moving away from the pole when the girl is $30\ \mathrm{ft.}$ from the pole?

b. At what rate is the tip of the shadow moving away from the girl when the girl is $30\mathrm{ft.}$ from the pole?

7) A spot light is on the ground $24\ \mathrm{ft.}$ away from a wall and a $4\ \mathrm{ft.}$ tall girl is walking towards the wall at a rate of $2\ \mathrm{ft/sec}$.
How fast the height of the shadow change, when the person is $10\ \mathrm{ft.}$ from the wall? Is the shadow's height increasing or decreasing at this time?

8) Brad and Angelina are riding on bikes, separated by 500 meters. Brad starts riding north at a rate of $4\ \mathrm{m/sec}$ and 6 minutes later Angelina starts riding south at $4\ \mathrm{m/sec}$.
At what rate the distance separating Brad and Angelina will change, 25 minutes after Brad starts riding?

Answer Key

1) $\frac{1}{480\pi}$ cm/sec

2) $\frac{7}{2\sqrt{351}}$ ft/sec

3) 0.498 ft/sec

4) a. -0.403 ft/hour b. -0.124 ft/hour

5) 0.341 m/sec

6) a. 4.875 ft/sec b. 1.875 ft/sec

7) -0.98 ft/sec , The shadow is decreasing

8) 7.991 m/sec