Trigonometry

1.
$$\sin 60^\circ = \frac{\overline{BC}}{\overline{AB}}$$
$$\overline{BC} = (sin60^\circ)(\overline{AB})$$
$$= (0.866)(8) = 6.928 \approx 6.93 \text{ rounded to the nearest hundredth}$$

2.
$$\tan(\alpha) = \frac{\sin\alpha}{\cos\alpha} = \frac{12/13}{5/13} = \frac{12}{5}$$

3.
$$\sin x = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{1}{2} \rightarrow \text{hypotenuse=2, opposite=1, so adjacent=}\sqrt{4-1} = \sqrt{3}$$
$$\cos x = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{\sqrt{3}}{2} \rightarrow \text{hypotenuse=2, opposite=1, so adjacent=}\sqrt{4-1} = \sqrt{3}$$

Alternately:

$$\sin^2 x + \cos^2 x = 1$$
$$\cos^2 x = 1 - \sin^2 x = 1 - \frac{1}{4} = \frac{3}{4}$$
$$\cos x = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{2} \text{ for } 0^\circ < x < 90^\circ$$

4.
$$\text{Let } h = \text{height of balloon in miles}$$
$$\tan 57^\circ = \frac{1.3}{h}$$
$$\text{So, } h = \frac{1.3}{\tan 57^\circ}$$

5. $\sin 2x$ reaches its maximum when $2x = \frac{\pi}{2}$ or $x = \frac{\pi}{4}$

6. the diagram given in A is $y = 3sin\theta$

7.
$$\text{for angle A, opp side} = 12$$
$$\text{hypotenuse=13}$$
$$\text{So, adjacent} = \sqrt{(13)^2 - (12)^2} = \sqrt{169 - 144} = \sqrt{25} = 5$$
$$\tan A = \frac{opp}{adj} = \frac{12}{5}$$