Resultant of Forces
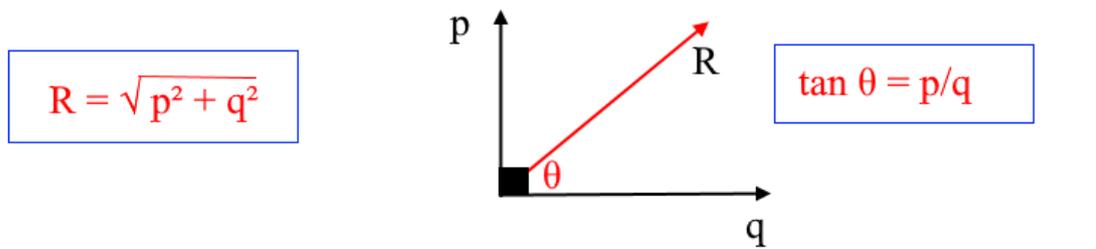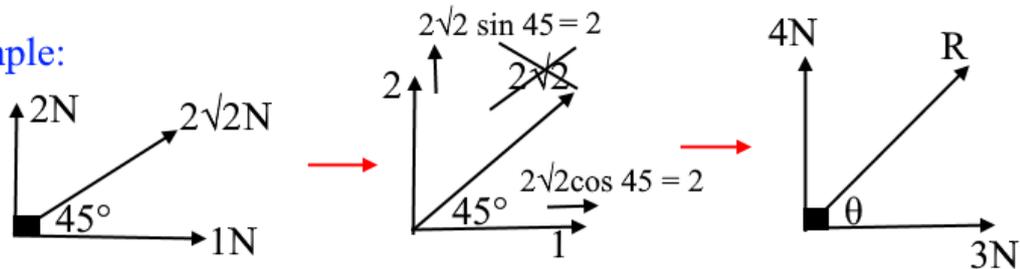
The resultant of two forces is a vector; it has both a direction and an angle from a given direction.

Resultant of Two Forces

$$R = \sqrt{p^2 + q^2}$$

$$\tan \theta = p/q$$

Example:

2N   2√2N

45°   →1N

2√2 sin 45 = 2

2√2cos 45 = 2

$$R = \sqrt{4^2 + 3^2}$$
$$= 5N$$

4N   R

3N

$$\tan \theta = 4/3$$
$$\theta = \tan^{-1}(4/3)$$
$$\theta = 53.1°$$

Based on the above example, the resultant of any number of forces that act at a point can be calculated.

When the forces do not act along the main axes, they can be resolved along the directions.

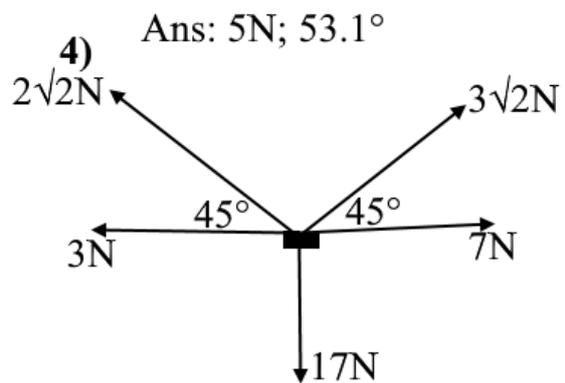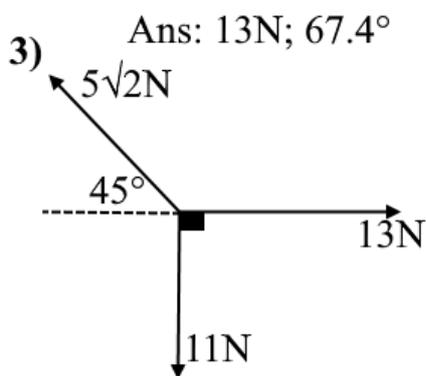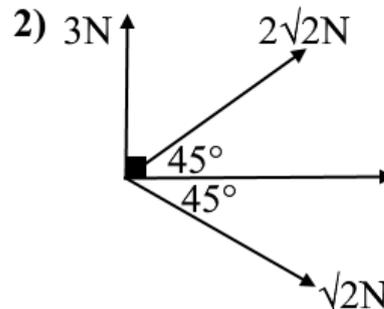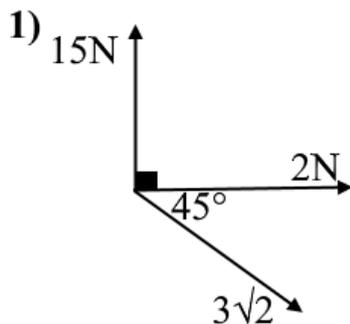When a force is resolved, it always has two components:

- The components are on either side of the force in question
- The components are perpendicular to one another

The ==component== closer to the angle is the one with the ==cosine== of the angle.

$$x = p\cos(\theta)$$
$$y = p\sin(\theta)$$
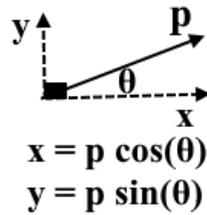
These are some practice questions. Make sure the magnitude and the angel of resultant force are calculated.

Find the resultant of the following system of forces.
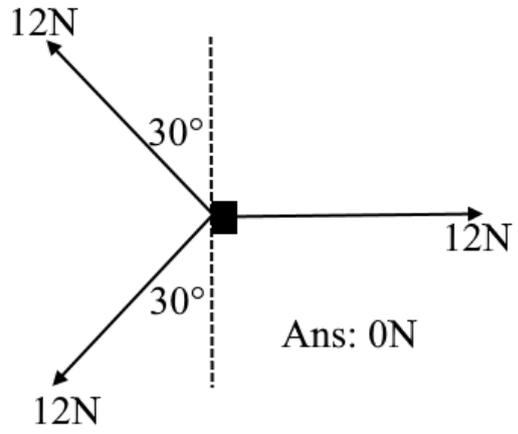
1)

15N

2N

45°

$3\sqrt{2}$

Ans: 13N; 67.4°

2) 3N $2\sqrt{2}$N

45°
45°

$\sqrt{2}$N

Ans: 5N; 53.1°

3)
$5\sqrt{2}$N

45°

13N

11N

Ans: 10N; -36.9°

4)
$2\sqrt{2}$N $3\sqrt{2}$N

45°   45°

3N   7N

17N

Ans: 13N; 67.4°

5)

4√2N

45°

4N

Ans: 4√5N; 26.6°

6)

12N

30°

30°

12N

12N

Ans: 0N