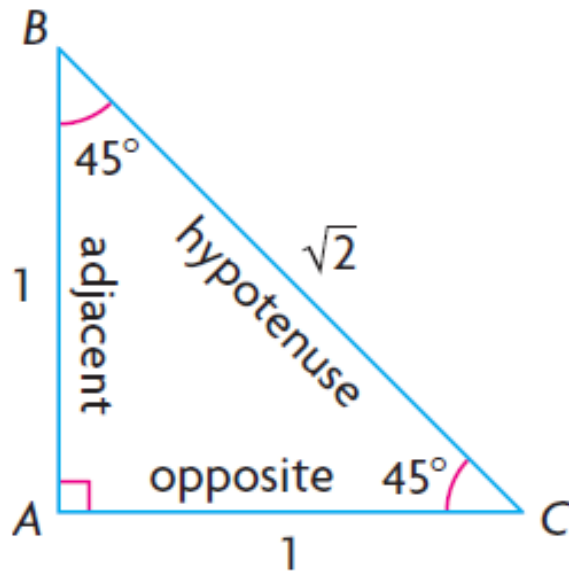


## 5.2 - Evaluating Trigonometric Ratios for Special Angles

- EX. 1
- Use triangle ABC to calculate exact values of sine, cosine and tangent for  $45^\circ$ .



$$BC^2 = AB^2 + AC^2$$

$$BC^2 = 1^2 + 1^2$$

$$BC^2 = 2$$

$$BC = \sqrt{2}$$

# Example #1 cont'd

$$\sin B = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos B = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan B = \frac{\text{opposite}}{\text{adjacent}}$$

$$\sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$\cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\tan 45^\circ = \frac{1}{1}$$

$$= \frac{1 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$$

$$= \frac{1 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$$

$$= 1$$

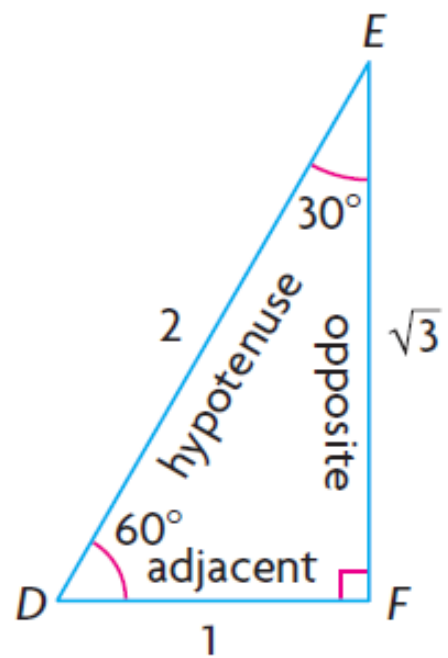
$$= \frac{\sqrt{2}}{2}$$

$$= \frac{\sqrt{2}}{2}$$

Therefore, these are the exact values of sine, cosine and tangent respectively.

## Example #2

- Use triangle DEF to calculate exact values of sine, cosine, and tangent for  $30^\circ$  and  $60^\circ$ .



$$DE^2 = DF^2 + EF^2 \quad \sin D = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$2^2 = 1^2 + EF^2$$

$$4 = 1 + EF^2$$

$$3 = EF^2$$

$$\sqrt{3} = EF$$

$$\sin D = \frac{EF}{DE}$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

$$\cos D = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\cos D = \frac{DF}{DE}$$

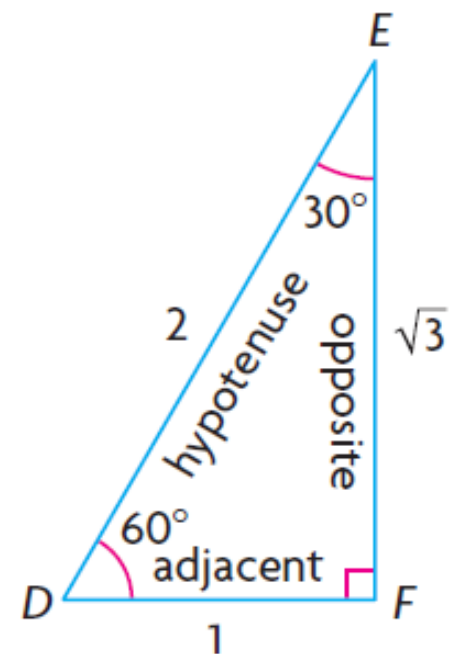
$$\cos 60^\circ = \frac{1}{2}$$

$$\tan D = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan D = \frac{EF}{DF}$$

$$\tan 60^\circ = \frac{\sqrt{3}}{1}$$

## Example #2 cont'd...



$$\sin E = \frac{DF}{DE}$$

$$\cos E = \frac{EF}{DE}$$

$$\tan E = \frac{DF}{EF}$$

$$\sin 30^\circ = \frac{1}{2}$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan 30^\circ = \frac{1}{\sqrt{3}}$$

$$= \frac{1 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

$$= \frac{\sqrt{3}}{3}$$

$$\sin E = \cos D$$

$$\cos E = \sin D$$

$$\tan E = \cot D$$

$$\sin 30^\circ = \cos 60^\circ$$

$$\cos 30^\circ = \sin 60^\circ$$

$$\tan 30^\circ = \cot 60^\circ$$

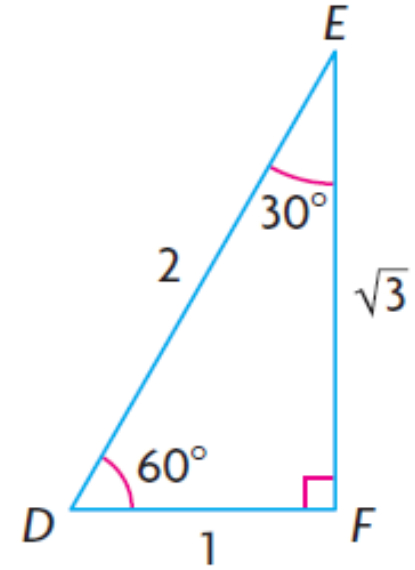
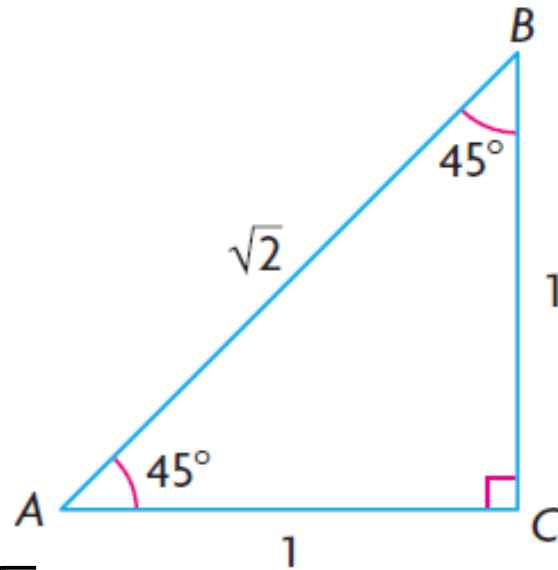
# Example #3

- Determine the exact value of  $(\sin 45^\circ)(\cos 45^\circ) + (\sin 30^\circ)(\sin 60^\circ)$ .
- $(\sin 45^\circ)(\cos 45^\circ) + (\sin 30^\circ)(\sin 60^\circ)$

- $= \left(\frac{\sqrt{2}}{2}\right) \left(\frac{\sqrt{2}}{2}\right) + \left(\frac{1}{2}\right) \left(\frac{\sqrt{3}}{2}\right)$

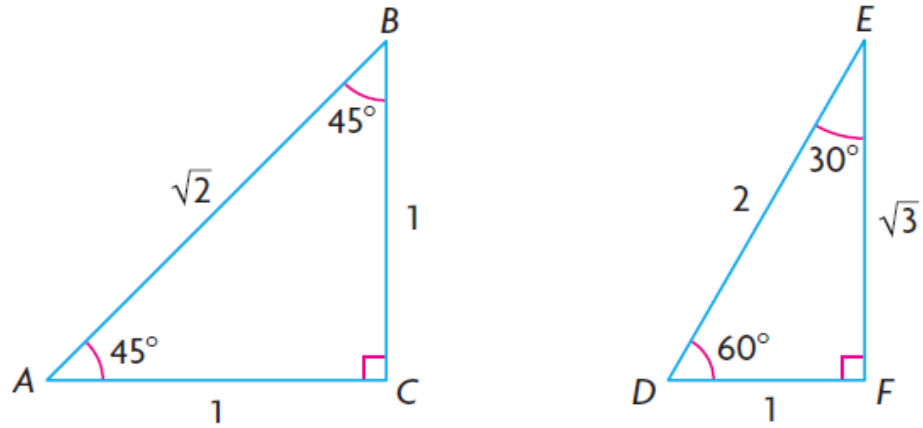
- $= \frac{2}{4} + \frac{\sqrt{3}}{4}$

- $= \frac{2 + \sqrt{3}}{4}$



- Therefore the exact value is  $\frac{2 + \sqrt{3}}{4}$ .

# In Summary...



$\theta$	$\sin \theta$	$\cos \theta$	$\tan \theta$
$30^\circ$	$\frac{1}{2} = 0.5$	$\frac{\sqrt{3}}{2} \doteq 0.8660$	$\frac{\sqrt{3}}{3} \doteq 0.5774$
$45^\circ$	$\frac{\sqrt{2}}{2} \doteq 0.7071$	$\frac{\sqrt{2}}{2} \doteq 0.7071$	1
$60^\circ$	$\frac{\sqrt{3}}{2} \doteq 0.8660$	$\frac{1}{2} = 0.5$	$\sqrt{3} \doteq 1.7321$