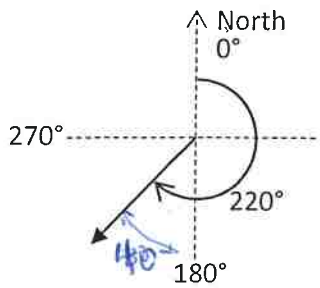
5th

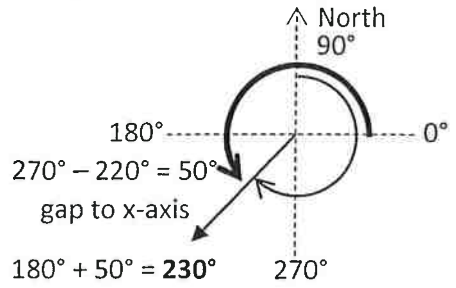
6.10 Bearing and Directional Bearing

Bearing directions are angles given as rotations measured clockwise from North.

Example: bearing of 220°



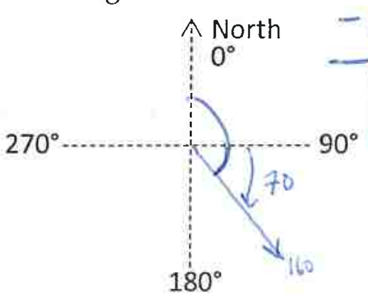
To convert to a measurement in standard position, determine the size of the angle measured from East (remember, quadrants are 90°)



Directions: Sketch the angle given in bearing. Then, determine the angle measured in standard position that is coterminal with the given angle.

* standard position = 450° - bearing

1. bearing of 160°

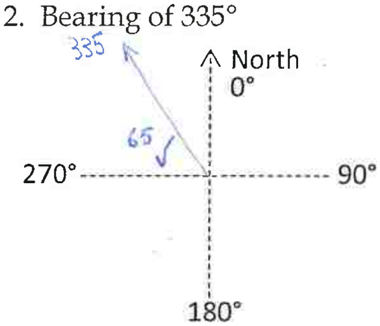


450
−160
290°

360−70 =

Standard Position: 290°

2. Bearing of 335°

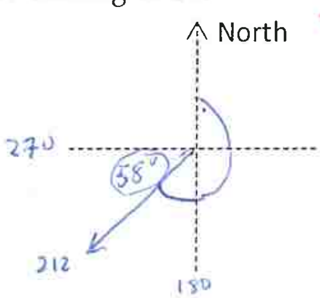


450
−335
115°

180−65=

Standard Position: 115°

3. bearing of 212°

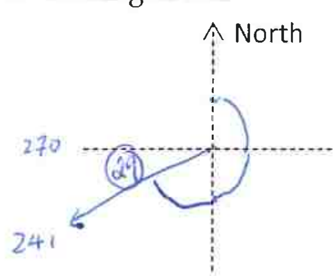


450
−212
238°

180+58=

Standard Position: 238°

4. Bearing of 241°



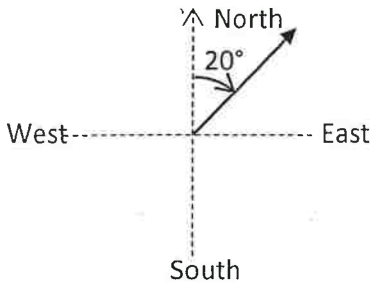
450
−241
209°

180+29

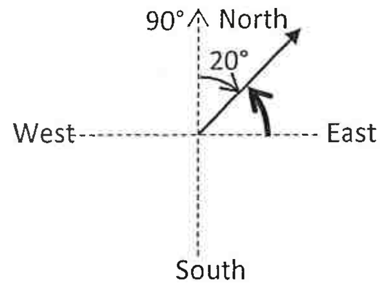
Standard Position: 209°

Directional bearing (also called Quadrant Bearing) directions are angles given as a starting direction (either North or South) and then an acute angle of rotation measured toward the second direction (either East or West).

Example: bearing of N 20° E

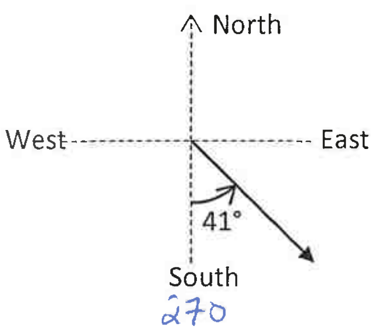


To convert to a measurement in standard position, determine the size of the angle measured from East (remember, quadrants are 90°)

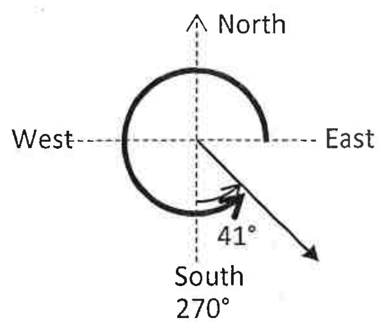


Direction occurs 20° *before* 90° quadrantal
90° – 20° = **70°**

Example: bearing of S 41° E



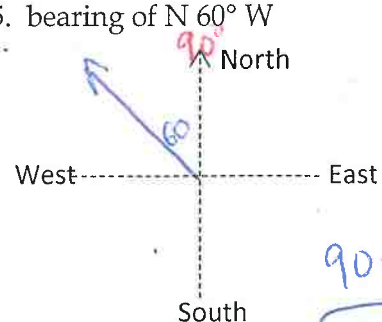
To convert to a measurement in standard position, determine the size of the angle measured from East (remember, quadrants are 90°)



Direction occurs 41° *after* 270° quadrantal
270° + 41° = **311°**

Directions: Sketch the angle given in bearing. Then, determine the angle measured in standard position that is coterminal with the given angle.

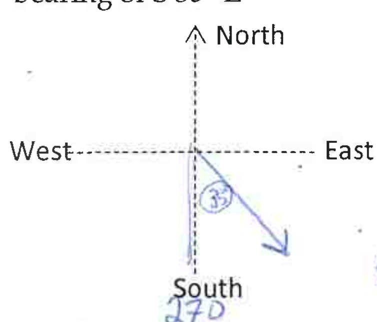
5. bearing of N 60° W



90+60° =

Standard Position: 150°

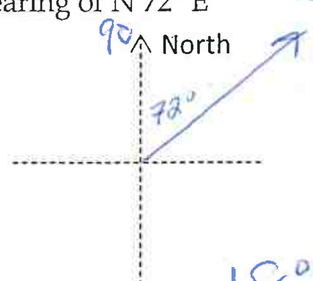
6. bearing of S 35° E



270+35 =

Standard Position: 305°

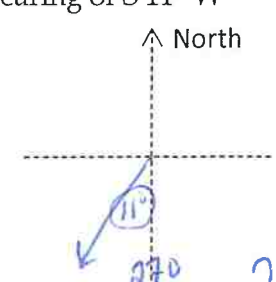
7. bearing of N 72° E



Standard Position: 18°

90-72 =

8. bearing of S 11° W



Standard Position: 259°

270-11 =

6.11 Applications of Vectors: Notes | Date: ___________

Formulas: $|\vec{v}| = \sqrt{a^2+b^2}$ $\theta = \tan^{-1}\left(\frac{b}{a}\right)$ | $\cos\theta = \frac{u\cdot v}{|u|\cdot|v|}$

$\langle |\vec{v}|\cos\theta, |\vec{v}|\sin\theta \rangle$

Ex 1: Train A and Train B depart from the same station. The path that train A takes can be represented by $\langle 33, 12\rangle$. If the path that train B takes can be represented by $\langle 55, 4\rangle$, find the angle between the pair of vectors.

$\cos\theta = \frac{\vec{a}\cdot\vec{b}}{|\vec{a}|\cdot|\vec{b}|}$ | $\cos\theta = \frac{33(55)+12(4)}{\sqrt{33^2+12^2}\cdot\sqrt{55^2+4^2}}$ | $\cos\theta = \frac{1863}{\sqrt{1233}\cdot\sqrt{3041}}$

$\theta = \cos^{-1}\left(\frac{1863}{\sqrt{1233}\cdot\sqrt{3041}}\right)$ | $\boxed{\theta = 15.823^\circ}$

Ex 2: An airplane is flying at a direction of 115° at 530 mph. Find the component form of the velocity of the airplane.

$\theta = 115^\circ$

$|\vec{v}| = 530$

$\langle 530\cos 115, 530\sin 115\rangle$

$\langle -223.988, 480.343\rangle$

Ex 3: A captain sails a boat for 200 kilometers at a bearing of 150°. Find the component form of the velocity of the boat.

$450 - 150^\circ$

$\theta = 300^\circ$

$\langle 200\cos 300, 200\sin 300\rangle$

$\langle 100, -173.205\rangle$

Ex 4: Jordan is riding the bus to school. The bus travels north for 4.5 miles, east for 2 miles, and then N60°E for 1.5 miles. Find the component form of the resultant.

$\vec{v_1}\ \langle 0, 4.5\rangle$

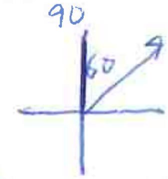
$\vec{v_2}\ \langle 2, 0\rangle$

$v_3\ \langle 1.299, 0.75\rangle$

$\vec{r} = \vec{v_1} + \vec{v_2} + \vec{v_3}$

$\boxed{\vec{r} = \langle 3.299, 5.25\rangle}$

$90 - 60 = 30^\circ$



$\vec{v_3}\ \langle 1.5\cos 30, 1.5\sin 30\rangle$

$\langle 1.299, 0.75\rangle$

Ex 5: An airplane is flying with an airspeed of 500 miles per hour on a heading due north. If a 50-mile per hour wind is blowing at a bearing of 280°, determine the velocity and direction of the plane relative to the ground.

$\theta = 450 - 280 = 170^\circ \rightarrow \vec{w} = \langle 50\cos 170, 50\sin 170\rangle$

$\vec{w} = \langle -49.240, 8.682\rangle$

$\vec{a} = \langle 0, 500\rangle$

$\vec{w} = \langle -49.240, 8.682\rangle$

$\vec{r} = \vec{a} + \vec{w}$

$\vec{r} = \langle -49.240, 508.682\rangle$

velocity (magnitude) $\rightarrow |\vec{r}| =$

$= \sqrt{49.240^2 + 508.682^2}$

$\boxed{|\vec{r}| = 511.060 \text{ mph}}$

Direction: $\theta = \tan^{-1}\left(\frac{508.682}{-49.240}\right)$

$\theta = -84.529 + 180$

Q2 $\rightarrow \boxed{\theta = 95.529^\circ}$