21) a) horizontal component of 40 lb. pulling force: 
\[ 40 \cos (60^\circ) = 20 \text{ lb} \]
Vertical component of 40 lb. pulling force: 
\[ 40 \sin (60^\circ) = 20 \sqrt{3} \text{ lb.} \approx 34.641 \text{ lb.} \]
b) horizontal component moves the wagon along the ground
c) \(50^\circ\) would increase the horizontal component 
\[ 40 \cos (50^\circ) \approx 25.712 \text{ lb.} \]
"easier to pull the wagon"

22) a) find component of 50 lb. force parallel to the ramp 
\[ 50 \sin (20^\circ) = 17.101 \text{ lb.} \]
b) find component of 50 lb. force perpendicular to the ramp 
(i.e. supporting vector) 
\[ 50 \cos (20^\circ) \approx 46.985 \text{ lb.} \]
c) What force is needed to counteract the force pushing the box down the ramp? 17.10 lb. up the ramp
22a) What force is necessary to counteract the box falling down a 50° ramp? (i.e., what upward force \( N \) to the ramp will hold the box in place on the ramp?)
\[
50 \sin (50°) \approx 38.302 \text{ lb},
\]

23) [Diagram with vectors: \( N \) at 108°, \( 15 \text{ knots} \) to the right, \( 180° \) counterclockwise from \( N \) to \( E \).]

\[\text{East-West component: } 15 \sin (72°) \approx 14.266 \text{ knots}\]

24) [Diagram with vector: \( 700 \) at 30°, \( 240° \) clockwise from \( N \) to \( E \).]
\[
d^2 = 700^2 + 50^2 - 2(700)(50) \cos (30°)
\]
\[
d = 700^2 + 50^2 - 70000 \sqrt{3}
\]
\[
= 492500 - 70000 \sqrt{3}
\]
\[
\approx 431,878.222 \text{ knots}
\]

a) What is the east-west component of the airplane's velocity?
\[
700 \sqrt{3} \text{ knots } \times 666.218 \text{ knots} = \frac{d}{350}
\]

b) What is the north-south component of the plane's velocity?
\[
d^2 - 350^2 = (E-W)^2
\]
\[
E-W \approx 556.218 \text{ knots}
\]