Q9. Since both the wrench and the deck have the same constant horizontal velocity, the wrench will hit the deck at the base of the mast.

Q11. (a) A particle moving in a straight line at constant speed will have constant velocity (magnitude and direction both are constant); **no acceleration.**

(b) The motion around a curve causes a change in direction, so **acceleration is nonzero.**

P5. This requires a careful graph.

Note that we are asked to find the distance and direction from B to base camp. It is 310 km, 33° West of South.
\textbf{P10.} \quad \theta = 25^\circ \quad \text{East: } d \cos \theta = 3.10 \text{ km} \quad \text{North: } d \sin \theta = 3.10 \text{ km} \left( \sin 25^\circ \right) = 1.31 \text{ km}

\text{East: } d \cos \theta = 3.10 \text{ km} \left( \cos 25^\circ \right) = 2.81 \text{ km}

\textbf{P11.} \quad \begin{array}{ll}
(3,4) & (4,3) \\
\text{Start: } & \text{End: } \\
\text{3W} & \text{4N} \\
\text{6E} & \text{5E} \\
\end{array}

\Delta \vec{r} = (3.00 \text{ bl}, 4.00 \text{ bl})

\text{or, using magnitude and angle}

\Delta r = \sqrt{(\Delta x)^2 + (\Delta y)^2} = \sqrt{3^2 + 4^2} = 5 \text{ bl}

\tan \theta = \frac{\Delta y}{\Delta x} = \frac{4}{3}, \quad \theta = \tan^{-1} \left( \frac{4}{3} \right) = 53^\circ

\Delta r = 5 \text{ bl}, \quad 53^\circ \text{ N of East}

\text{(b) Total distance travelled: } 3 \text{ bl} + 4 \text{ bl} + 6 \text{ bl} = 13 \text{ bl}
θ = 60° (drawing is inaccurate)

\( d_1: 3 \text{ hrs travel @ 41.0 km/h} \)

\( d_2: 1.5 \text{ hrs travel @ 25.0 km/h} \)

So

\[
d_1 = (3 \text{ h}) \left( \frac{41.0 \text{ km}}{\text{h}} \right) = 123 \text{ km}
\]

\[
d_2 = (1.5 \text{ h}) \left( \frac{25.0 \text{ km}}{\text{h}} \right) = 37.5 \text{ km}
\]

Strategy: Find \( \Delta x \) and \( \Delta y \) components of \( \vec{d} \), then \(|d| = \sqrt{(\Delta x)^2 + (\Delta y)^2} \)

For \( d_1 \):

\[
\Delta x = -d_1 \cos \theta = -(123 \text{ km}) \cos 60° = -61.5 \text{ km}
\]

\( \Delta y \) is to the north.

For \( d_2 \):

\[
\Delta x = 0
\]

\[
\Delta y = d_2 = 37.5 \text{ km}
\]

So for \( d \):

\[
\Delta x = -61.5 \text{ km}
\]

\[
\Delta y = 106.5 + 37.5 = 144 \text{ km}
\]

\[
|d| = \sqrt{(-61.5)^2 + (144)^2} = 157 \text{ km}
\]
River velocity $V_R \rightarrow$

Down:

$\Delta x \rightarrow$

Boat velocity relative to water: $V_B$

$\Delta x = 300 \text{ m}$

Velocity relative to land: $V_1 = V_B + V_R$

Up:

$v \leftarrow \cdots \leftarrow v$

$V_R \rightarrow$

$v_2 = V_R - V_B$ (Boat going to left!)

$v_R = 1.5 \text{ m/s}$

$v_B = 10 \text{ m/s}$

So

$V_1 = 1.5 \text{ m/s} + 10 \text{ m/s} = 11.5 \text{ m/s}$

$V_2 = 1.5 \text{ m/s} - 10 \text{ m/s} = -8.5 \text{ m/s}$

$\Delta x_1 = \Delta x = 300 \text{ m}$

$\Delta x_2 = -\Delta x = -300 \text{ m}$

$V_1 = \frac{\Delta x_1}{\Delta t_1} \Rightarrow \Delta t_1 = \frac{\Delta x_1}{V_1} = \frac{300 \text{ m}}{11.5 \text{ m/s}} = 26.1 \text{ s}$

$\Delta t_2 = \frac{\Delta x_2}{V_2} = \frac{-300 \text{ m}}{-8.5 \text{ m/s}} = 35.3 \text{ s}$

$\Delta t = \Delta t_1 + \Delta t_2 = 26.1 \text{ s} + 35.3 \text{ s} = 61.4 \text{ s}$
V = 30 km/h
\[ V_p = \sqrt{150 \text{ km/h}^2 + 30 \text{ km/h}^2} = 153 \text{ km/h} \]
\[ \theta = \tan^{-1}\left( \frac{V_W}{V_p} \right) = \tan^{-1}\left( \frac{30 \text{ km/h}}{150 \text{ km/h}} \right) = \tan^{-1}(0.20) = 11.3^\circ \]
Course: 11.3° N of West