1. Given:

$m = 1500 \text{ kg}$

$r = 36 \text{ m}$

$v = 18 \ \frac{\text{m}}{\text{s}}$

Need to find: F .

Solving:

$$F = \frac{mv^2}{r} = \frac{1500 \cdot 18^2}{36} = 13500 \text{ N}.$$

Answer: 13500 N.

2. Given:

$m = 1500 \text{ kg}$

$r = 36 \text{ m}$

$F_{friction} = 15660 \text{ N}$

Need to find: $v_{\max}$.

Solving:

$$F_{friction} = \frac{mv_{\max}^2}{r} \Rightarrow v_{\max}^2 = \frac{r \cdot F_{friction}}{m} \Rightarrow v_{\max} = \sqrt{\frac{r \cdot F_{friction}}{m}}$$

$$v_{\max} = \sqrt{\frac{36 \cdot 15660}{1500}} = \sqrt{375.84} \approx 19.4 \ \frac{\text{m}}{\text{s}}.$$

Answer: $19.4 \ \frac{\text{m}}{\text{s}}$.

3. Given:

$m = 1500 \text{ kg}$

$v = 22.5 \ \frac{\text{m}}{\text{s}}$

$F_{friction} = 15660 \text{ N}$

Need to find: $r_{\min}$.

Solving:

$$F_{friction} = \frac{mv^2}{r_{\min}} \Rightarrow r_{\min} = \frac{mv^2}{F_{friction}}$$

$$r_{\min} = \frac{mv^2}{F_{friction}} = \frac{1500 \cdot \left(22.5\right)^2}{15660} = 48.5 \text{ m.}$$

Answer: 48.5 m.