Logic Simplification Derived from Truth Table

Distance:	$< 50ft$	$< 100ft$	$> 100ft$
Speed up:	$green \wedge standing \wedge < 40mph$	$green \wedge standing \wedge < 40mph$	$< 40mph$
Slow down:	$green \wedge standing \wedge > 40mph$	$\neg green \vee walking \vee > 40$	$> 40mph$
Stop:	$\neg green \vee walking$		
Nothing:	$green \wedge standing \wedge = 40mph$	$green \wedge standing \wedge = 40mph$	$= 40mph$

**Table was made to divide logical expressions into parts and make it more readable

Speed Up:

$$(< 50ft \wedge (green \wedge standing \wedge < 40mph)) \vee (< 100ft \wedge (green \wedge standing \wedge < 40mph)) \vee (> 100ft \wedge < 40mph)$$

Distributive	$((green \wedge standing \wedge < 40mph) \wedge (< 100ft \vee < 50ft)) \vee (> 100ft \wedge < 40mph)$
Simplifying	$((green \wedge standing \wedge < 40mph) \wedge < 100ft) \vee (> 100ft \wedge < 40mph)$
Commutative	$((< 40mph \wedge green \wedge standing) \wedge < 100ft) \vee (> 100ft \wedge < 40mph)$
Associative	$(< 40mph \wedge (green \wedge standing \wedge < 100ft)) \vee (> 100ft \wedge < 40mph)$
Distributive	$\boldsymbol{< 40mph \wedge ((green \wedge standing \wedge < 100ft) \vee > 100ft)}$

Slow Down:

$$(< 50ft \wedge (green \wedge standing \wedge > 40mph)) \vee (< 100ft \wedge (\neg green \vee walking \vee > 40)) \vee (> 100ft \wedge > 40mph)$$

Commutative	$(< 50ft \wedge (green \wedge standing \wedge > 40mph)) \vee (> 100ft \wedge > 40mph) \vee (< 100ft \wedge (\neg green \vee walking \vee > 40))$
Associative	$((< 50ft \wedge green \wedge standing) \wedge > 40mph) \vee (> 100ft \wedge > 40mph) \vee (< 100ft \wedge (\neg green \vee walking \vee > 40))$
Distributive	$\boldsymbol{(> 40mph \vee (> 100ft \vee (< 50ft \wedge green \wedge standing))) \vee (< 100ft \wedge (\neg green \vee walking \vee > 40))}$

Note that in this expression, <100 ft is <100ft AND >50ft

Stop:

$$\boldsymbol{(\neg green \vee walking) \wedge < 50ft}$$

No Change:

$$(< 50ft \wedge (green \wedge standing \wedge = 40mph)) \vee (< 100ft \wedge (green \wedge standing \wedge = 40mph)) \vee (> 100ft \wedge = 40mph)$$

Distributive	$((green \wedge standing \wedge = 40mph) \wedge (< 100ft \vee < 50ft)) \vee (> 100ft \wedge = 40mph)$
Simplification	$((green \wedge standing \wedge = 40mph) \wedge < 100ft) \vee (> 100ft \wedge = 40mph)$
Commutative	$((= 40mph \wedge standing \wedge green) \wedge < 100ft) \vee (> 100ft \wedge = 40mph)$
Associative	$(= 40mph \wedge (standing \wedge green \wedge < 100ft)) \vee (> 100ft \wedge = 40mph)$
Distributive	$\boldsymbol{= 40mph \wedge (> 100ft \vee (standing \wedge green \wedge < 100ft))}$