

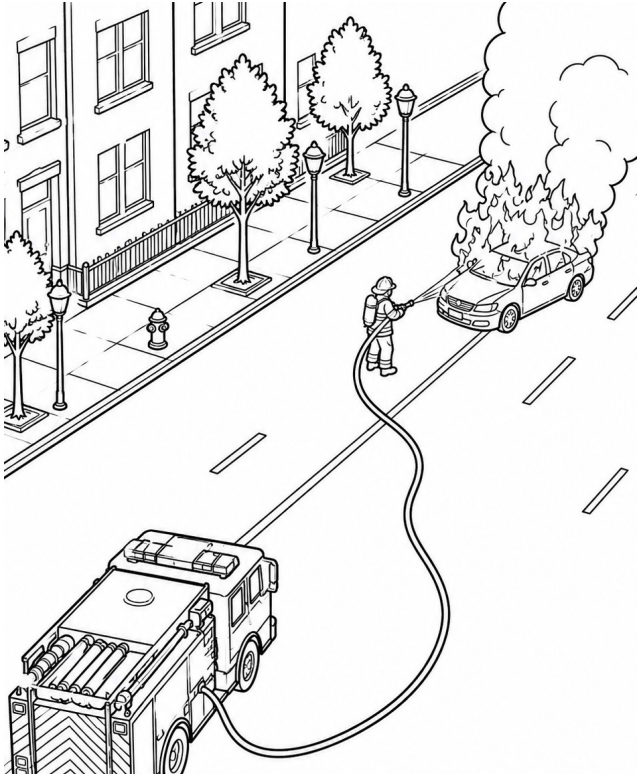
Student Name: \_\_\_\_\_

Date: \_\_\_\_\_

Class: \_\_\_\_\_

Score: \_\_\_\_\_

## Scenario: Vehicle Fire - Single Attack Line



## Given / Reference

- Apparatus: Engine 181
- Water source: Onboard tank only
- Attack line: 200 ft of 1 3/4-inch hose
- Nozzle: Fog nozzle, 95 GPM at 100 PSI
- Hose coefficient (C): 15.5
- Appliance loss: 0 PSI
- Elevation change: 0 PSI
- Tank water: 750 gallons

## Student Questions

1. Which parts of the PDP formula affect this scenario, and which parts are zero?

\_\_\_\_\_

2. Using  $FL = C \times Q^2 \times L$ , what is the friction loss in the 200-foot 1 3/4-inch attack line?

\_\_\_\_\_

3. What pump discharge pressure (PDP) is required to supply this line?

\_\_\_\_\_

4. If Engine 181 is operating from tank water only, approximately how many minutes of water are available at this flow?

\_\_\_\_\_

5. If a second identical 200-foot 1 3/4-inch line with the same nozzle is added, how much tank water would remain after 3 minutes of flowing both lines?

\_\_\_\_\_

## Required Equations

•  $FL = C \times Q^2 \times L$

•  $Q = GPM / 100$

•  $PDP = NP + FL + \text{Appliance Loss} \pm \text{Elevation}$

•  $\text{Water Duration (min)} = \text{Tank Gallons} / \text{Total GPM}$

•  $\text{Remaining Water} = \text{Tank Gallons} - (\text{Total GPM} \times \text{Minutes})$

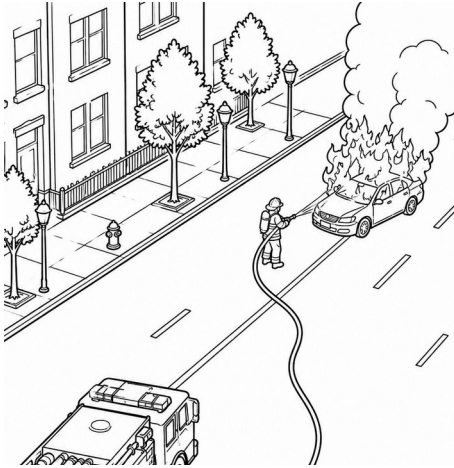
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## Scenario Givens

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- Appliance loss: 0 PSI
- Elevation change: 0 PSI
- Tank water: 750 gallons

## Instructor Answer Key

### 1. PDP formula components

**Answer: Include nozzle pressure and attack-line friction loss.**

Appliance loss = 0 PSI and elevation change = 0 PSI.

Breakdown: This is a level single attack line with no appliance, so PDP = NP + FL.

### 2. Friction loss in the 200-foot 1 3/4-inch line

Formula:  $FL = C \times Q^2 \times L$

$Q = 95 / 100 = 0.95$

$L = 200 / 100 = 2$

$FL = 15.5 \times (0.95)^2 \times 2$

$FL = 15.5 \times 0.9025 \times 2$

$FL = 27.98 \text{ PSI}$

**Rounded Answer: 28 PSI**

### 3. Required pump discharge pressure (PDP)

Formula:  $PDP = NP + FL + \text{Appliance Loss} \pm \text{Elevation}$

$PDP = 100 + 28 + 0 + 0$

**Answer: 128 PSI**

### 4. Water available from tank only

Formula:  $\text{Water Duration} = \text{Tank Gallons} / \text{Total GPM}$

$\text{Water Duration} = 750 / 95$

$\text{Water Duration} = 7.89 \text{ minutes}$

**Rounded Answer: 7.9 minutes (about 7 min 53 sec)**

### 5. Tank water remaining after 3 minutes with two identical lines flowing

$\text{Total GPM} = 95 + 95 = 190 \text{ GPM}$

$\text{Water Used} = \text{Total GPM} \times \text{Minutes}$

$\text{Water Used} = 190 \times 3 = 570 \text{ gallons}$

$\text{Remaining Water} = 750 - 570 = 180 \text{ gallons}$

**Answer: 180 gallons remaining**

Accept reasonable rounding: +/- 1 PSI and +/- 0.1 minute.