

**Intermediate Wildland Fire Behavior, S-290  
Pre-Qualifying Test**

**Name** \_\_\_\_\_ **Score** \_\_\_\_\_  
**Home Unit** \_\_\_\_\_

**Part 1 – Flame and “Your Personal Rate of Spread.”**

1. Your walking distance time = \_\_\_\_\_.
2. Your jogging distance time = \_\_\_\_\_.
3. Your running distance time = \_\_\_\_\_.
4. What was your established distance?
5. From the FLAME publication, if a fire experiences a 10-fold increase in wind (EWS ratio) and the fire moves from litter to crown, what is the increase in expected rate of spread?
6. From the FLAME publication, what factors drive huge, and sometimes rapid changes in Rate of Spread?

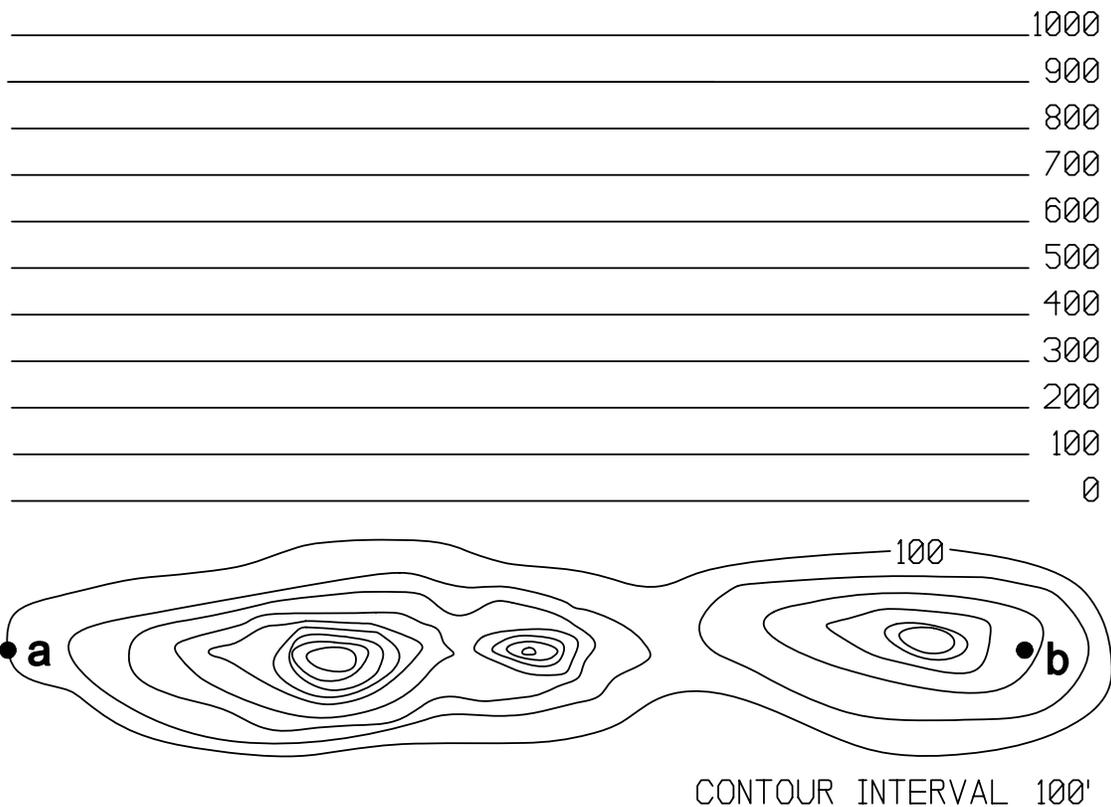
**Part 2 – Basic Firefighter Math** (Be sure and show your work, not just the answer.)

1. You are asked to prepare five gallons of mixed pump gas for a Mark 3 pump. The proper fuel mix is 32 to 1 (32:1) or 32x (times) the parts of gas to one part oil. How much 2 cycle oil (oz) is needed to prepare five gallons of mixed fuel?
2. The forward rate of spread of a wildland fire is 20 times (20x) the backing rate of spread. Write this as a fraction and in ratio notation.
3. Your crew boss instructs you to pick up tools from supply. He wants 3x the number of pulaskis to shovels. There are 20 people in your crew; each crew member is issued only one tool. How many pulaskis and shovels do you request from supply?

4. Your wage is \$12 per hour and you worked 60 hours (flat rate, no premium pay for overtime) on the Uncle Sam fire. Taxes and other deductions from your pay total \$216.
- a. What is the ratio of withholding to what you earned? Simplify.
  
  - a. What percent is being withheld from your pay?
  
  - a. How many hours did you work just to pay for the withholdings?
  
  - a. What is the ratio of total hours worked vs. number of hours to pay for withholdings?
5. If there is a 1200 feet change in elevation, over a horizontal distance of one mile, what is the % slope?
6. If you have an 18 in. rise in elevation along a 6 foot stick, what would the slope be?

### Part 3 – Maps

1. Draw a profile (horizontal line) showing the elevations from point a to point b. At each contour intersection, draw a vertical line up to the corresponding elevation. Put a dot at the correct height profile then connect the dots.



#### Using the map provided:

2. How many inches per mile does the map represent?
3. What is the map scale of this map? With inches as a unit of measure, what does this ratio mean?

4. One inch on this map equals how many feet on the ground?
  
5. What is the contour interval of your map?
  
6. What is an index contour?
  
7. Choosing from the Map Feature List in the table below, write in the map feature displayed for each point.

<u>Point</u>	<u>Corresponding Map Feature</u>	<u>Map Feature List</u>
A		North Aspect
B		East Aspect
C		Bench Mark
D		Canyon Bottom or Valley
E		West Aspect
F		Intersecting Drainage
G		Ridgeline
H		South Aspect
I	Bench Mark ( free answer)	Intermittent Stream
J		Hill Top

## Part 4 – Visualization Exercise

Two hours ago, you initially observed forward fire spread between two fence posts taking 10 minutes. Currently you observe that it is taking just 4 minutes to burn between fence posts. Fuel and topography have not changed.

10. Your crew is working 8 fence posts in front of the main fire, and requires 30 minutes more to complete the line, and another 5 minutes to get safely out of the way. Assuming all things remain constant:
  - a. Will the crew complete the line before the fire arrives at their location? Show your calculations.
  - b. Can they get safely out?
  - c. What else could you do in order to complete the section of line and still allow time to get to the safety zone?
  - d. What other fire behavior indicators would help with your decision?
  
2. From your answers in Part 1 (your Rate of Spread), what is the change, expressed as a ratio, from walking to jogging? How many times faster were you able to run the distance?

## **Part 5 – Basic Principles of Fire Behavior Test**

1. Three environmental factors that affect wildland fire behavior are:
  - a. fuels, solar radiation, weather
  - b. fuels, RH, temperature
  - c. fuels, weather, topography
  - d. large fuels, fine fuels, topography
2. List four factors of topography which can influence fire ignition and spread.
3. List five weather factors which may produce rapid fire spread.
4. What is the general wind?
5. What are local winds? Give two examples.
6. When a cold front or thunderstorm is expected, what is the most significant weather change you can expect?

7. Winds associated with a cold front are strongest when?
  
8. Describe the intensity and direction of the winds produced by a thunderstorm.
  
9. Describe the effect relative humidity has on wildland fire behavior.
  
10. List four visible indicators of a stable air mass, and four visible indicators of an unstable air mass.

Stable

Unstable

## Part 6 – Fuel Groups/Models Test

1. What are the four fuel groups in the Fire Behavior Prediction System (FBPS)?
2. For each fuel group, how many fuel models are in each?
3. Give the four fuel timelag categories used to classify dead fuel. Then give the range of fuel sizes for each category.
4. What fuel size is most responsible for the spread of fire?



## Part 7 – Fireline Handbook - Appendix B

1. What is the range in moisture of extinction within each of the four fuel groups? On which page of the appendix did you find your information?
  
  
  
  
  
  
  
  
  
  
10. Using the Fire Behavior Characteristics Chart for light fuels found on page B-57, list the major flame length divisions marked, and associated fireline intensities. For each of the major divisions, list interpretations that affect tactics and firefighter safety.
  
  
  
  
  
  
  
  
  
  
3. The spread rate of a going fire is 10 chains per hour, with three foot flame lengths.
  - a. What is the Heat per Unit Area?
  
  
  
  
  
  
  
  
  
  
  - b. What is the Fireline Intensity?
  
  
  
  
  
  
  
  
  
  
  - c. There is a 10-fold increase in rate of spread for this afternoon. What is the expected flame length and fire intensity?
  
  
  
  
  
  
  
  
  
  
4. At the moment, light winds are blowing across the fire, but in the distance, a large flag is fully extended. Looking at the tree tops, saplings are swaying violently, even some larger trees sway noticeably.

Use the Beaufort scale for estimating 20-foot windspeed in Appendix B and give a range of estimated windspeed based on these observations.

What might this indicate later in the day?

