Mercalli and ME!

Name_____ Period_____

Using the Modified Mercalli Scale, work out the MM number for each of the eyewitness accounts you gathered and write it next to the comment.

Grid Reference		Comment	MM
Across	35.5	I was woken by my bedside clock falling off the table. When I sat up, the mirror hanging on the wall at the foot of my bed was moving.	
Down	18.5		
Across	35.9	I was making a cup of coffee in the kitchen when I heard a crack and a great piece of plaster fell off the wall. Every cup in the house was broken. Later when I went outside, I noticed that the chimney was also cracked.	
Down	18.0		
Across	37.2	I don't know what all the fuss was about! My wife and I thought it was just a car passing in the street.	
Down	16.6		
Across	32.5	No one in our house felt anything, even Grandma and she is a very light sleeper.	
Down	13.0		
Across	36.7	I was frightened. The whole house seemed to sway and the shutters on my bedroom window banged against the house. Later, the only damage I could find was a cracked window.	
Down	17.9		
Across	38.1	I was on the roof of our two-story house fixing the satellite at the time. I could feel the house slightly swaying. My wife inside couldn't feel a thing.	
Down	19.8		
Across	35.7	Dad ran around the house waking all us up. There was dust everywhere and big chunks of the ceiling had fallen down. The sofa had moved almost the whole way across the living room floor. Mom's favorite light stand had fallen over and was broken. The little bell in the clock was ringing.	
Down	17.8		
Across	37.0	I thought a car had hit the side of the house. I ran outside to see if there was any damage, but I could find none.	
Down	17.4		
Across	36.3	I had just driven home from work and was walking from the car when I heard a creaking sound like our house makes in a strong storm. The night was very still, and other than the sound I could not feel a thing.	
Down	16.8		
Across	32.3	Dad was in the barn loft moving hay when he felt the barn sway. We were in the house and couldn't feel a thing.	
Down	18.2		
Across	31.5	We were playing cards with friends and none of us felt or heard anything.	
Down	19.2		
Across	34.2	We could feel something, but we did not know what it was. We were watching TV at the time.	
Down	18.7		
Across	36.1	We had been away overnight but when we got home we found quite a few windows cracked and the good dinner set had most plates broken. The rest of the house seemed undamaged.	
Down	17.3		
Across	38.0	The first we knew about it was when we heard it on the radio.	
Down	13.1		
Across	34.5	We all felt it and then we spent the rest of the night arguing if it was an earthquake.	
Down	16.5		

Mercalli and ME!

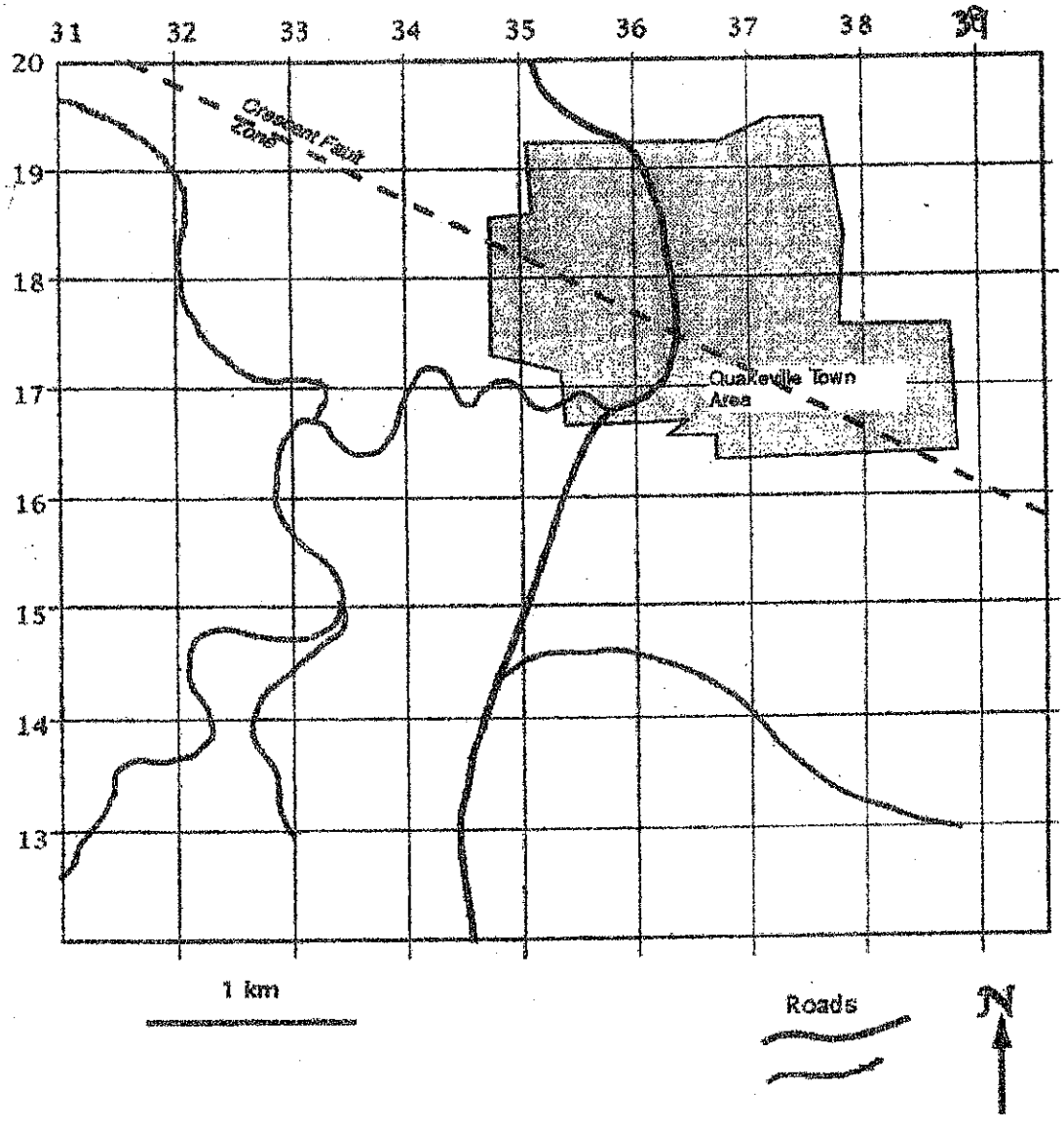
Name_____ Period_____

PLOTTING

1. Using the map and grid references provided, find each location on the map and write on the MM number. Circle the MM number.
2. Draw circles separating areas of equal intensity on your map using the MM numbers you have plotted.

(HINT: Draw one circle around all of the MM numbers. Next, draw a circle so the lowest MM numbers (I) are not included, but all the other numbers are. Now draw a circle that includes all the numbers greater than I and II. Continue this process until there is a circle around each group of numbers).

Map of Quakeville Region



Mercalli and ME!

Name_____Period_____

REFLECTION QUESTIONS:

1. Describe your experience trying to rank the witness comments with the Modified Mercalli Scale.

2. Describe your experience trying to come to agreement with others on your rankings. Do you think scientists have the same experiences? Why or why not?

3. What was the greatest intensity (MM number) for this earthquake?

4. Where was the epicenter of the earthquake located? How does this location relate to the existing fault?

5. Do you think this method of measuring earthquakes is helpful or useful? Why or why not?

Quakeville Earthquake

. NEWS FLASH . . NEWS FLASH . . NEWS FLASH .

8.35 pm . . .Reports have just come in that Quakeville has again been shaken by an earthquake. At this stage the extent of damage from the quake is unknown. Stay tuned for further reports throughout the evening. . . . .

You are the reporter for the local newspaper and your editor wants you to write an item and put a map into the next issue. You quickly pick up the telephone and call people you know around town and ask them what they felt and saw around 8.30pm on the evening of the earthquake. (These comments are on separate sheets). You also gather some background information about past earthquakes to include in your item.

Background information
Quakeville is often shaken by earthquakes. A large fault, known as the Crescent Fault, runs almost right under the town. The Crescent Fault is known to slip about once every ten years. The last earthquake was in 1985. No damage was done to any buildings. In 1942 an earthquake destroyed every brick house in town but no one was killed. It had a Modified Mercalli Intensity maximum of MM IX.

MODIFIED MERCALLI (MM) SCALE OF EARTHQUAKE INTENSITY

MM I Not felt by humans, except in especially favourable circumstances, but birds and animals may be disturbed. Reported mainly from the upper floors of buildings more than ten storeys high. Dizziness or nausea may be experienced. Branches of trees, chandeliers, doors, and other suspended systems of long natural period may be seen to move slowly. Water in ponds, lakes, reservoirs, etc., may be set into seiche oscillation.

MM II Felt by a few persons at rest indoors, especially by those on upper floors or otherwise favourably placed. The long-period effects listed under MM I may be more noticeable.

MM III Felt indoors, but not identified as an earthquake by everyone. Vibrations may be likened to the passing of light traffic. It may be possible to estimate the duration, but not the direction. Hanging objects may swing slightly. Standing motorcars may rock slightly.

MM IV Generally noticed indoors, but not outside. Very light sleepers may be awakened. Vibration may be likened to the passing of heavy traffic, or to the jolt of a heavy object falling or striking the building. Walls and frame of building are heard to creak. Doors and windows rattle. Glassware and crockery rattle. Liquids in open vessels may be slightly disturbed. Standing motorcars may rock, and the shock can be felt by their occupants.

MM V Generally felt outside, and by almost everyone indoors. Most sleepers awakened. A few people frightened. Direction of motion can be estimated. Small unstable objects are displaced or upset. Some glassware and crockery may be broken. Some windows crack. A few earthenware toilet fixtures crack. Hanging pictures move. Doors and shutters swing. Pendulum clocks stop, start, or change rate.

MM VI	Felt by all. People and animals alarmed. Many run outside. Difficulty experienced in walking steadily. Slight damage to masonry D. Some plaster cracks or falls. Isolated cases of chimney damage. Windows and crockery broken. Objects fall from shelves, and pictures from walls. Heavy furniture moves. Unstable furniture overturns. Small school bells ring. Trees and bushes shake, or are heard to rustle. Material may be dislodged from existing slips, talus slopes, or slides.
MM VII	General alarm. Difficulty experienced in standing. Noticed by drivers of motorcars. Trees and bushes strongly shaken. Large bells ring. Masonry D cracked and damaged. A few instances of damage to Masonry C. Loose brickwork and tiles dislodged. Unbraced parapets and architectural ornaments may fall. Stone walls crack. Weak chimneys break, usually at the roof-line. Domestic water tanks burst. Concrete irrigation ditches damaged. Waves seen on ponds and lakes. Water made turbid by stirred-up mud. Small slips, and caving-in of sand and gravel banks.
MM VIII	Alarm may approach panic. Steering of motor cars affected. Masonry C damaged, with partial collapse. Masonry B damaged in some cases. Masonry A undamaged. Chimneys, factory stacks, monuments, towers, and elevated tanks twisted or brought down. Panel walls thrown out of frame structures. Some brick veneers damaged. Decayed wooden piles break. Frame houses not secured to the foundation may move. Cracks appear on steep slopes and in wet ground. Landslips in roadside cuttings and unsupported excavations. Some tree branches may be broken off.
MM IX	General panic. Masonry D destroyed. Masonry C heavily damaged, sometimes collapsing completely. Masonry B seriously damaged. Frame structures racked and distorted. Damage to foundations general. Frame houses not secured to the foundations shift off. Brick veneers fall and expose frames. Cracking of the ground conspicuous. Minor damage to paths and roadways. Sand and mud ejected in alluviated areas, with the formation of earthquake fountains and sand craters. Underground pipes broken. Serious damage to reservoirs.
MM X	Most masonry structures destroyed, together with their foundations. Some well-built wooden buildings and bridges seriously damaged. Dams, dykes, and embankments seriously damaged. Railway lines slightly bent. Cement and asphalt roads and pavements badly cracked or thrown into waves. Large landslides on riverbanks and steep coasts. Sand and mud on beaches and flat land moved horizontally. Large and spectacular sand and mud fountains. Water from rivers, lakes, and canals thrown up on the banks.
MM XI	Wooden frame structures destroyed. Great damage to railway lines. Great damage to underground pipes.
MM XII	Damage virtually total. Practically all works of construction destroyed or greatly damaged. Large rock masses displaced. Lines of slight and level distorted. Visible wave-motion of the ground surface reported. Objects thrown upwards into the air.

Categories of non-wooden construction

Masonry A	Structures designed to resist lateral forces of about 0.1 g. Typical buildings of this kind are well reinforced by means of steel or ferro-concrete bands, or are wholly of ferro- concrete construction. All mortar of good quality and the design and workmanship are good. Few buildings erected prior to 1935 can be regarded as Masonry A.
Masonry B	Reinforced buildings of good workmanship and with sound mortar, but not designed in detail to resist lateral forces
Masonry C	Buildings of ordinary workmanship, with mortar of average quality. No extreme weakness, such as inadequate bonding of the corners, but neither designed nor reinforced to resist lateral forces.
Masonry D	Buildings with low standards of workmanship, poor mortar, or constructed of weak materials like mud brick and rammed earth. Weak horizontally.