MTH 112: Earthquake and Interest worksheet

Magnitude in Richter Scale	Energy Released in Joules	Comment
2.6	2.0×10^{8}	April 8, 2008 Jasper, Alabama
3.1	1.1×10^{9}	May 16, 2008 Coffeeville, Alabama
4.6	2.0×10^{11}	April 29, 2003 Fort Payne, Alabama
5.1	1.1×10^{12}	October 18, 1916 Largest Earthquake recorded in Alabama (Birmingham)
5.4	2.8×10^{12}	Energy released by the Hiroshima atomic bomb.
6.3 - 6.9	7.6×10^{13} to 5.6×10^{14}	About 120 shallow earthquakes of this magnitude occur each year on the Earth.
6.7	2.8×10^{14}	Northridge, California earthquake January 17, 1994.
7.4	3.2×10^{15}	Turkey earthquake August 17, 1999. More than 12,000 people killed.
7.9	1.5×10^{16}	Deadliest earthquake in the last 100 years. Tangshan, China, July 28, 1976. Approximately 255,000 people perished.
8.3	5.96×10^{16}	San Francisco earthquake of April 18, 1906.
8.8	3.98×10^{17}	Off the coast of Ecuador, Jan 31, 1906 (Tsunami)
9.3	2.2×10^{18}	December 26, 2004 Sumatra earthquake (Tsunami)
9.5	4.5×10^{18}	Most powerful earthquake recorded in the last 100 years. Southern Chile on May 22, 1960. Claimed 3,000 lives.

FORMULAS

1. Magnitude of an Earthquake:

$$M = \frac{2\log\left(\frac{E}{10^{4.4}}\right)}{3}$$

Magnitude on Richter Scale	Destructive Power
M < 4.5	Small
4.5 < M < 5.5	Moderate
5.5 < M < 6.5	Large
6.5 < M < 7.5	Major
M > 7.5	Greatest

2.

Compound Interest/Growth: $A = P\left(1+\frac{r}{n}\right)^{nt}$

3. Continuous Compound Interest/Growth: $A = Pe^{rt}$

Examples:

1. The 1906 San Francisco earthquake released approximately 5.96×10^{16} joules of energy. What was its magnitude on the Richter Scale? Compute the answer to one decimal place.

2. If an earthquake released approximately 2.34×10^{6} joules of energy. What was its magnitude on the Richter Scale? Compute the answer to one decimal place.

3. How much money would be accumulated in an account if after 3 yrs $1500 is invested at 6% compounded monthly? compounded quarterly? compounded weekly? compounded daily? compounded annually? compounded continuously?

4. Which company would yield more interest if $5000 was invested for 2 years, and what is that interest?
Company A: 6.5% compounded quarterly or Company B: 5.5% compounded weekly

Exercises:

1. The largest recorded earthquake to date (2001) was in Colombia in 1906, with an energy release of 1.99×10^{17} joules of energy. What was its magnitude on the Richter scale? Compute the answer to one decimal place.

2. Anchorage, Alaska, had a major earthquake in 1964 that released 7.08×10^{16} joules of energy. What was its magnitude on the Richter scale? Compute the answer to one decimal place.

3. How much money will be in an account after 5 yrs, if $2000 is invested at 5% compounded monthly? compounded quarterly? compounded daily? compounded annually? compounded weekly? compounded continuously?

4. Which company would yield more interest if $8000 is invested for 5 yrs?
Company A: 5.4% compounded monthly? or Company B: 4.5% compounded daily

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ANSWERS TO EXAMPLES:

1. M = 8.3, 2. M = 1.3
3: CM $1795.02, CQ $1793.43 , CW $1795.64 , CD $1795.80, CA $ 1786.52, CC $1795.83
4. Company A: $5688.19 Company B: $5581.07 Company A would yield more interest

ANSWERS TO EXERCISES:

1. M = 8.6, 2. M= 8.3
3: CM $2566.72, CQ $2564.07 , CD $2568.01, CA $2552.56, CW $2567.74, CC $2568.05
4. Company A: $10,473.37 , Company B: $10,018.44 Company A would yield more interest