2.2 Acid mine drainage / logarithms

If you are unfamiliar with exponentials and logarithms take a look at the *Foundation Maths Support Pack*, Sections 2.16; 2.17; 2.18; 3.4; 3.5 and 3.6.

Attempt yourself and bring any problems to next class.

Questions:

1. Use a calculator to evaluate the following (3 d.p.s):

   (a) $\exp(5)$

   (b) $\exp(-1)$

   (c) $\exp\left(\sqrt{4^2 + 3^2}\right)$

   (d) $\frac{1}{\exp(1)}$

2. Write down the expressions below in their simplest form:

   (a) $\frac{\exp(-10)}{\exp(-10)}$

   (b) $\frac{\exp(5)}{\exp(-15)}$

   (c) $\frac{\exp(-2)\exp(-1)}{\exp(-5)}$

   (d) $\frac{\exp(-2)^2}{\exp(-3)}$

3. Use a calculator (or otherwise) to evaluate the following (3 d.p.s):

   (a) $\log_{10}(5)$

   (b) $\log_{10}(10)$

   (c) $\log_e(3)$

   (d) $\ln(\exp(1))$

4. Evaluate the following (3 d.p.s):

   (a) $\log_3(3)$. Or what power do I need to raise 3 by to equal 3?

   (b) $\log_5(10)$. Or what power do I need to raise 5 by to equal 10?

   (c) $\log_2(8)$. Or what power do I need to raise 2 by to equal 8?

   (d) $\log_3(59049)$. Or what power do I need to raise 3 by to equal 59049?

5. Solve the following for b:

   (a) $\log_{10}\left(4b^2\right) = 3$.

   (b) $\exp\left(\frac{2b-1}{3}\right) = 5$

Answers:

1. (a) 148.413
   (b) 0.368
   (c) 148.413
   (d) 0.368
   Try and understand why the different expressions give the same answer.

2. Write down the expressions below in their simplest form:
   (a) $\frac{\exp(-10)}{\exp(-10)}$
   (b) $\frac{\exp(5)}{\exp(-15)}$
   (c) $\frac{\exp(-2)\exp(-1)}{\exp(-5)}$
   (d) $\frac{\exp(-2)^2}{\exp(-3)}$

3. Use a calculator (or otherwise) to evaluate the following (3 d.p.s):
   (a) 0.699
   (b) 1.000
   (c) 1.099
   (d) 1.000

4. Evaluate the following (3 d.p.s):
   (a) 1.000
   (b) 1.431.
   (c) 3.000.
   (d) 10.000.

5. Solve the following for b:
   (a) 15.811.
   (b) 2.914