After Test Assignment : Calculus Precursor

(Tomorrow we start a 6 day unit on Calculus and this HW assignment is a warm up for that)

From now on, the word "**slope**" and "***gradient***" **mean the same thing** $m = \frac{y_2 - y_1}{x_2 - x_1}$

1. Find the equation of the straight line joining each of the following points. Use Point-Slope form (we'll need it for calculus) $y - y_1 = m(x - x_1)$ hint: first find m

   (a) (–2, –4) and (1, –7)

   (b) Then convert to *gradient-intercept* form ($y = mx + b$) a.k.a. slope-intercept form

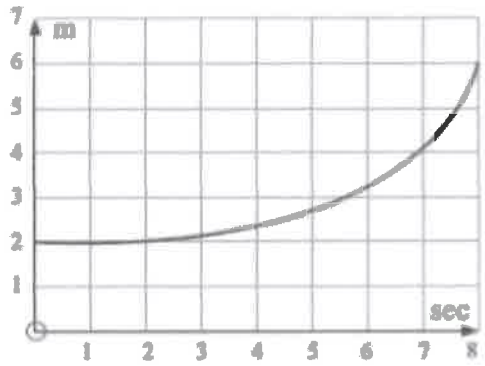
2. Find the equation of the straight lines below, given its gradient and the coordinates of a point on the straight line. *Point-slope form*

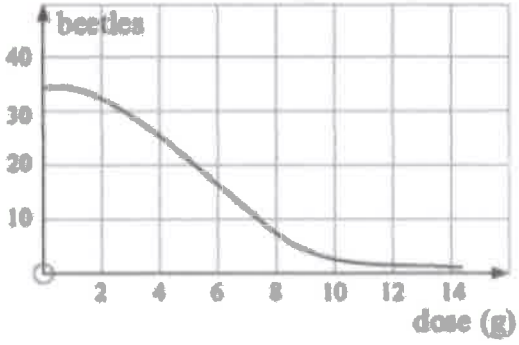
   $-\frac{1}{2}$, (5, 7)

3. New tires have a tread depth of 8 mm. After driving for 32,178 km the tread depth was reduced to 2.3 mm. What was the wearing rate of the tires in km travelled per mm of depth.

   (The value you calculated can also be called the average wear rate)

5. Before answering this question, first go to question #4 on the back side. Then come back. Estimate the **average speed in graph between 2 and 7 seconds** and ***average rate of beetle decrease from dose 4 to 14***





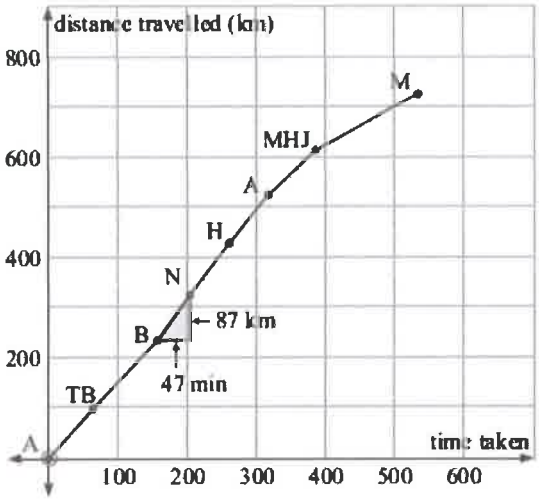
HINT: For average rate, draw a straight segment between the two points of interest and then find the slope.

AVERAGE RATE OF CHANGE

Consider a trip from Adelaide to Melbourne. The following table gives places along the way, distances travelled and time taken.

Place	*Time taken (min)*	*Distance travelled (km)*
Adelaide tollgate	0	0
Tailem Bend	63	98
Bordertown	157	237
Nhill	204	324
Horsham	261	431
Ararat	317	527
Midland H/W Junction	386	616
Melbourne	534	729

We plot the *distance travelled* against the *time taken* to obtain a graph of the situation. Even though there would be variable speed between each place we will join points with straight line segments.



We can find the average speed between any two places.

For example, the average speed from Bordertown to Nhill is:

$$\frac{\text{distance travelled}}{\text{time taken}}$$

$$= \frac{324 - 237 \text{ km}}{204 - 157 \text{ min}}$$

$$= \frac{87 \text{ km}}{\frac{47}{60} \text{ h}}$$

$$\div 111 \text{ km/h}$$

We notice that the average speed is the $\dfrac{y\text{-step}}{x\text{-step}}$ on the graph.

So, the average speed is the **gradient of the line segment** joining the two points which means that the faster the trip between two places, the greater the gradient of the graph.

If $s(t)$ is the distance travelled function then the average speed over the time interval from $t = t_1$ to $t = t_2$ is given by:

$$\textbf{Average speed} = \frac{s(t_2) - s(t_1)}{t_2 - t_1}.$$

Calculate the average speed between *Nhill* and *Melbourne. Then go back and answer question #4.*