

Math SL PROBLEM SET 33

Section A (Skills/Concepts Consolidation)

1. **(SP 5.4 - R) (CA)** The following data set relates the fuel consumption of a small car compared to the speed at which the car was driven. **(Oxford 10.3, p345; Oxford 10.4, p349)**

Speed (km/hr)	60	65	70	75	80	85	90	95	100	105	110	120	130	140	150
Fuel consumption (km/L)	16.9	16.8	15.9	15.9	14.4	14.3	13.2	14.3	12.1	12.0	10.2	9.8	9.0	8.0	7.1

- a. Assuming this relationship is linear, determine the equation of the line of best fit.
- b. Use your model to predict the fuel consumption for a speed of 82 km/hr and 170 km/hr.
- c. Determine the value of the correlation coefficient and hence, describe the relationship.
- d. Assuming this relationship is exponential, determine the equation of the line of best fit.
- e. Use your model to predict the fuel consumption for a speed of 82 km/hr and 170 km/hr.
- f. Determine the value of the correlation coefficient and hence, explain whether the relationship is best modeled with a linear or exponential function.
2. **(V4.3 - N) (CI)** I have been observing the motion of a bug that is crawling on my graph paper. When I started watching, it was at the point (1, 2). Ten seconds later it was at (3, 5). Another ten seconds later it was at (5, 8). After another ten seconds it was at (7, 11). **(Cirrito 12.7.2, p452)**
- a. Draw a picture that illustrates what is happening.
- b. Write a description of any pattern that you notice. What assumptions are you making?
- c. Where was the bug 60 seconds after I started watching it?
- d. Where was the bug 25 seconds after I started watching it?
- e. Where was the bug 26 seconds after I started watching it?
3. **(F2.4, F2.7 - E) (CI)** Find the value(s) of q for which the quadratic equation $qx^2 - 4qx + 5 - q = 0$ has no roots. **(Cirrito 2.4.2, p45)**
4. **(T3.4 - N) (CA)** Graph the function $f(x) = \tan(x)$ on the domain of $-180^\circ \leq x \leq 360^\circ$. Label the x - and y -intercept(s) as well as the asymptotes. Hence, sketch the following transformed tangent functions and list the transformations being described by the equation. **(Cirrito 16.3.2, p341)**
- a. $g(x) = \tan(x - 45^\circ)$
- b. $h(x) = 4 - \tan(x)$

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5. **(T3.6 - R) (CA)** Given $\triangle ABC$ wherein side $b = 24$ cm, $\angle BAC = 47^\circ$ and $\angle ABC = 83^\circ$.
(Cirrito 9.5.1, p290)
- Solve $\triangle ABC$.
 - Find the altitude of $\triangle ABC$, using side a as the “base” of the triangle.

Section B (Skills/Concepts Practice)

6. **(A1.2 - E) (CI) SKILL:** Laws of Logs. Simplify the following (Express as single logs)
- $\log_3(2x) + \log_9 w$
 - $\log_2 x - \log_4(7y)$
 - $2\log_4 x + 3\log_8(x + 1)$
 - $\log_9 x - \frac{1}{2}\log_3(2x - 3) + \log_{27}(x + 1)$
7. **(A1.2 - E) (CI) SKILL:** Laws of Logs. Solve the following logarithmic equations:
- $\log_2(x) + \log_4\left(\frac{1}{x} + 1\right) = \frac{1}{2}$
 - $\log_9(2 - x) + \log_3\left(\frac{2}{x}\right) = 1$
8. **(A1.3 - E) (CA) SKILL:** Binomial Expansion. Find the constant term in the following expansions:
- $\left(x - \frac{1}{2x}\right)^{10}$
 - $\left(3x^2 - \frac{1}{6x}\right)^{12}$
9. **(A1.3 - E) (CA) SKILL:** Binomial Expansion. Find the coefficient of x^{-3} in the expansion of $(x - 1)^3\left(\frac{1}{x} + x\right)^6$.
10. **(A1.3 - E) (CA) SKILL:** Binomial Expansion. Find the term independent of x in the expansion of the following:
- $(2 - x)^3\left(\frac{1}{3x} - x\right)^6$
 - $\left(2x - \frac{1}{x}\right)^6\left(\frac{1}{2x} + x\right)^6$

Section C (Skills/Concepts HW)

- Binomial expansions. Cirrito, Exercise 4.1.2, p103, Q3,11,12
- Binomial expansions: Oxford, Exercise 6O, p188, Q9,10
- Laws of Logarithms: Oxford, Exercise 4N, p124, Q1,4,5