

Math SL PROBLEM SET 4

Section A (Short Answer Qs)

- (A1.1, F2.6 - R) (CA)** Mr. Smith is saving up money to make a downpayment on a house. He invests \$9,000 at 4.35% p.a. compounded monthly. **(Cirrito 7.2, p209 & 8.3, p267)**

 - How much money would he have after 5 years?
 - If he needs \$20,000 for the down payment, how long will it be until he can buy the house?
 - He is impatient and he wants to make his down payment just 5 years from now. How much additional money must he invest today to have enough to do this?
- (SP5.5 - R) (CA)** Jonas can either walk or bike to school. 25% of the time he walks to school, and there is a 16% probability that he is late to first period. The rest of the time he bikes to school and there is only an 8% chance he is late to first block. **(Oxford 3.5, p89)**

 - Complete a tree diagram modelling this situation.
 - What is the probability that Jonas is late for class?
 - Given that Jonas is late to class, what is the probability that he walked to school?
 - Assume that each day is an independent event. What is the probability that Jonas is on time to class every day for a week?
- (Pre S - R) (CA)** Given two points $A(9, 1)$ and $B(3, 5)$. **(Cirrito 2.3, p28)**

 - Write an equation of a line passing through points A and B.
 - Find the midpoint of the line segment AB.
 - Determine the slope of a line that is perpendicular to AB.
 - Hence, find the equation of the perpendicular bisector of the line segment AB.
- (A1.1, F2.6 - R) (CA)** Mr. Santowski has been exposed to radioactive material when he ate a suspiciously green-glowing sandwich the other day. At the point of exposure he got tested and had 1200mg of radioactive substance in his body. When he got test again 4 hours later it was down to 800mg. **(Cirrito 7.2, p209)**

 - What is the half-life of the radioactive material in Mr. Santowski?
 - Hence, write an equation modelling this situation.
 - In order to return to work, the amount of material in his body must be less than 50mg. How long from the time of initial exposure will it be until he can safely return to work?

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5. **(A1.1, F2.6 - R) (CA)** In 2015 Mr. Dunham invested \$5,000 into an account at 6.5% p.a. compounded monthly. **(Cirrito 7.2, p209 & Cirrito 8.3, p267)**

- How much money will he have after 5 years?
- How long would it take for him to double his money?

Mr. Smith decided to wait 6 years before he invested some of his money. At that time he will put \$5,000 into an investment that pays him \$1,000 in interest per year.

- How much money does Mr. Dunham have at the moment that Mr. Smith invests his money?
 - When will Mr. Dunham and Mr. Smith have the same amount of money?
 - Which investment would you choose? Support your answer.
6. **(A1.1, F2.6 - R) (CA)** The population of Mathtown in 2000 was 37,250. By 2015 the population had grown to 49,875. Assume that the population growth happens continuously, and let t represent time in years starting in 2000 (so 2003 is $t = 3$ etc...). **(Cirrito 7.2, p209)**
- Explain why $P(t) = 37250e^{kt}$ is the model for this situation.
 - Show that $k = 0.0195$.
 - What does k represent in the model?
 - Based on this model, what was the population of Mathtown in the year 1990?
 - Assuming the Mathtown population continues to grow at the same rate, in what year will the two be twice as large as it was in the year 2000? (i.e. when will the population double.)
7. **(T3.6 - R) (CA)** Given a triangle $\triangle DEF$, with angle $D = 60^\circ$, side $e = 9$ and side $f = 12$. Solve $\triangle DEF$ and find its area. **(Cirrito 9.5, p290)**
8. **(T3.6 - R) (CA)** Jana is standing on the ground. Looking up at an angle of elevation of 26° she sees Sarah at the top of a tall building. She knows she is standing 60 meters away from the base of the building. **(Cirrito 9.5, p290)**
- How high is the building?
 - Now assume that the ground upon which Jana is standing is inclined at an angle of 10° . Determine the height of the building, assuming the same angle of elevation and distance from the building.