

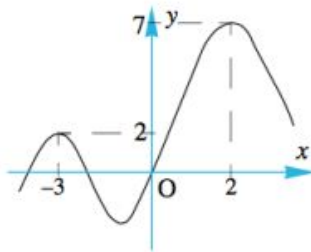
Math SL PROBLEM SET 8

Section A (Short Answer)

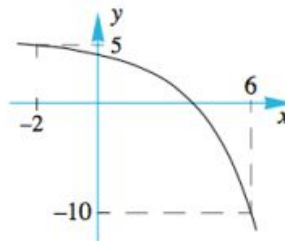
1. **(SP5.5 - R) (CI)** Of the 28 students in a class, 12 have a part time job, 22 have a part time job or do regular volunteer work, and 4 of the students have a part time job and do regular volunteer work. *(Cirrito 15.2, p508)*
 - a. Display the data in a Venn diagram.
 - b. How many of the students do not have a part time job or do not volunteer regularly?
 - c. How probable is it that a student does volunteer work given that they have a part time job?

2. **(C6.1 - N) (CA)** Recall that an average rate of change between any two points on a function can be determined using the difference quotient $\frac{f(x_2) - f(x_1)}{x_2 - x_1}$. Find the average rate of change in the following examples. Sketch a diagram in each case. *(Cirrito 18.1.2, p582)*
 - a. In the function $f(x) = x^2 + 2x - 1$ between $x = 0$ and $x = 2$.
 - b. Use the two diagrams below to also calculate the average rate of change, given the x coordinates specified.

(d) $x \in [-3, 2]$



(e) $x \in [-2, 6]$

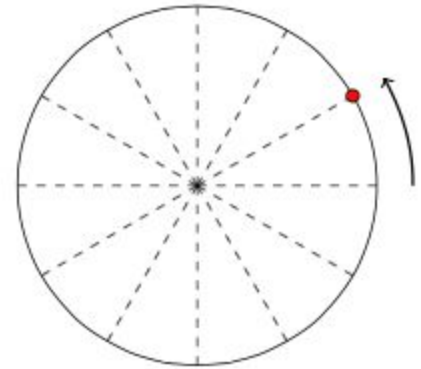


3. **(A1.2 - R) (CA)** Use your calculator to evaluate the following logarithmic expressions:
 $\log_6 36 = ??$ and $\log_3 \frac{1}{9} = ??$. So, in a log equation (like $\log_5 125 = 3$), explain the meaning/significance of the three numbers (the 5, the 125, the 3) *(Cirrito 7.3, p217)*

4. **(A1.2 - R) (CA)** Solve the following logarithmic equations. *(Cirrito 7.3, p217)*
 - (a) $\log_2 x = 4$
 - (b) $\log_3 9 = x$
 - (c) $\log_4 x = \frac{1}{2}$
 - (d) $\log_x 3 = \frac{1}{2}$
 - (e) $\log_x 2 = 4$
 - (f) $\log_5 x = 3$

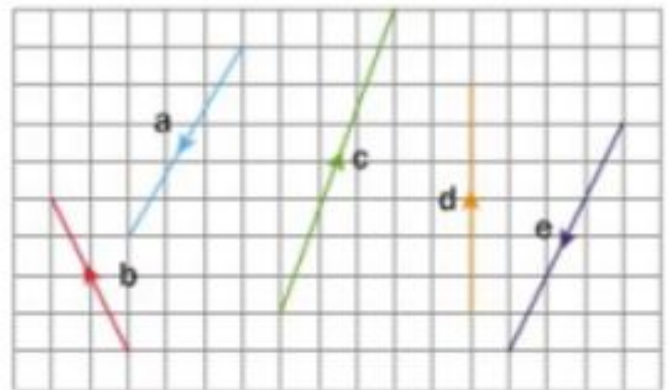
Math SL PROBLEM SET 8

5. **(T3.2 - E) (CA)** A wheel of radius 1 m has a single point marked on its circumference with a blob of red paint. Initially, the blob is level with the wheel's axle and the wheel is turned so that the blob rises initially. The blob starts to the right of the axle from our point of view, so initially it is 1 m to the right of the axle. [*\(Cirrito 10.3, p337\)*](#)



- Use your calculator to determine how far the blob is to the right of the axle after the wheel has rotated through an angle of: 15° , 30° , 45° , 60° , 75° , 90° .
 - Without using your calculator, determine how far the blob is to the right of the axle after the wheel has been rotated by 105° , 120° , 135° , 150° , 165° , 180° , 195° , 210° , 225° , 240° , 255° , 270° , 285° , 300° , 315° , 330° , 345° , 360° .
 - Draw a graph showing how far the blob is to the right of the axle after the wheel has rotated through an angle of θ° .
6. **(SP5.5 - E) (CI)** To get out of jail free in the board game MONOPOLY®, you have to roll doubles with a pair of standard dice. Determine the probability of getting out of jail on your first or second roll. [*\(Oxford 3.3, p77\)*](#)

7. **(V4.1 - N) (CI)** Go on line and find a definition for a vector. Note that mathematically, vectors can be written in many forms, two common ones being *column vector form* and *base vector form* (also known as *unit vector form*). [*\(Cirrito 12.2, p410\)*](#)



- Given the following diagram, write the following vectors in both column vector form and unit vector form.
- How would you determine the magnitude of vector **a**? What is its magnitude?

Math SL PROBLEM SET 8

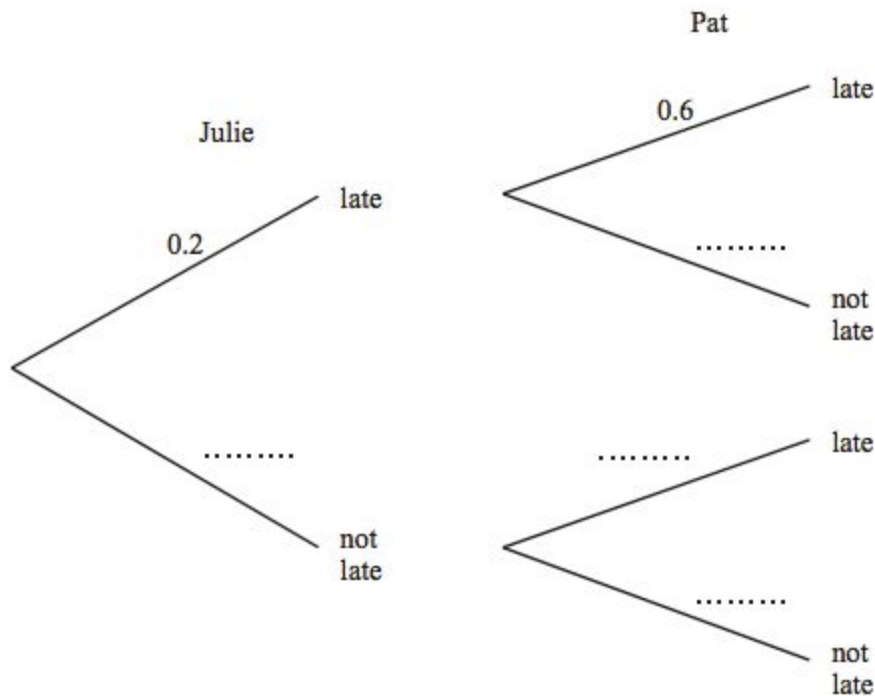
Section B (Extended Response/Investigation)

8. **(A1.3, SP5.8 - N) (CA)** To investigate the “binomial expansion”, work through the following questions. Use WOLFRAMALPHA to help with the expansions if you wish. *(Cirrito 4.1.1, p95)*
- Expand and simplify $(a + b)^0$.
 - Expand and simplify $(a + b)^1$.
 - Expand and simplify $(a + b)^2$.
 - Expand and simplify $(a + b)^3$.
 - Expand and simplify $(a + b)^4$.
 - Expand and simplify $(a + b)^5$.
 - A useful strategy in math is to look for patterns and then make predictions from those patterns. PREDICT the expansion and simplification of $(a + b)^7$.
 - Recall your expansion of $(a + b)^4$ from Qe. Use this expansion to PREDICT the expansion of $(3x^2 - 4)^4$.
 - Go online to find out what the term “binomial probabilities” implies and means.
 - Now, let a represent the probability that a randomly selected student in SL math passes math and is equal to 0.8 and let b represent the probability that a randomly selected student DOES NOT pass math and is equal to 0.2.
 - Explain why $a + b$ must be equal to 1.
 - Recall your expansion of $(a + b)^4$ from Qe. Write it out again here.
 - Explain how you would use your expansion to help determine the probability of the following event $\Rightarrow$ I randomly select 4 students and i want to know how probable it is that 2 of these students will pass math.

Math SL PROBLEM SET 8

9. **(SP5.5, 5.6 - R) (CI)** Julie and Pat are going to the cinema. Let A be the event that Julie will arrive late and $P(A)$ is 0.2 Let B be the event that Pat will arrive late and $P(B)$ is 0.6 The two events are independent. (*Oxford 3.5, p89*)

- Explain what “independence” means in this context.
- Complete the tree diagram, showing this information.



- Work out the probability that Julie and Pat will both arrive late.
- Work out the probability that either Julie or Pat will both arrive late.
- Complete a Venn diagram, showing this information.
- Use the formula $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ and explain what the answer means. Compare to your answer from Qd.