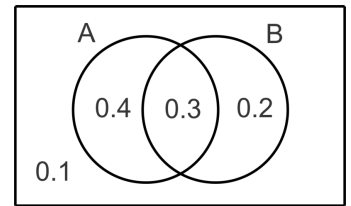


Math SL PROBLEM SET 67

1. **(SP5.5, SP5.6 - R) (CI)** From the Venn diagram included, determine:

(Oxford 3.5, p89)

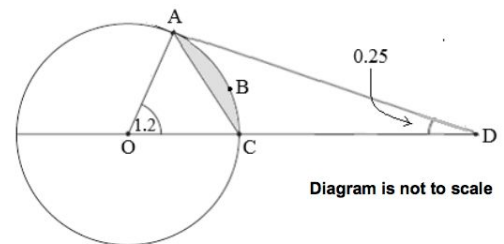
- a. (i) $P(A)$ (ii) $P(B)$ (iii) $P(A \cup B)$ (iv) $P(A \cap B)$ (v) $P(B|A)$
 b. Hence or otherwise, prepare a tree diagram from this information.
 c. Determine: (i) $P(A|B)$ (ii) $P(A|B')$ (iii) $P(A' \cap B')$



2. **(A1.3 - R) (CA)** When the expression $(\frac{1}{4}x + 2a)^7$ is expanded, one of the terms in the expansion is $140x^3$. Find the possible values of a . **(Cirrito 4.1.2, p100)**

3. **(T3.1, T3.6 - R) (CA)** The diagram shows a circle with centre O and a radius of 6 cm. The points A , B , and C lie on the circle. The point D is outside the circle and lies on OC . Angle $AOC = 1.2$ radians and angle $ADO = 0.25$ radians. **(Cirrito 9.7, p309)**

- a. Find the area of the sector $OABC$.
 b. Find the area of the shaded region bounded by the chord AC and the arc ABC .
 c. Determine the length of OD .
 d. Hence or otherwise, the area of region $ABCD$.



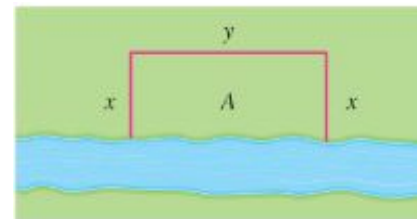
4. **(A1.3 - R) (CA)** Write $\log_3 \frac{x^2}{27}$ in the form of $a + b \log_3 x$ where a and b are integers.

(Cirrito 7.4, p221)

5. **(CA6.3 - E) (CI)** A farmer has 240 m of fencing and she wants to fence off a rectangular field that borders a straight river. She needs no fence along the river (see diagram).

(Cirrito 21.4, p702)

- a. Write an expression for the perimeter of the field.
 b. Hence, write an expression for the area of the field.
 c. What are the dimensions of the field that has the largest area?



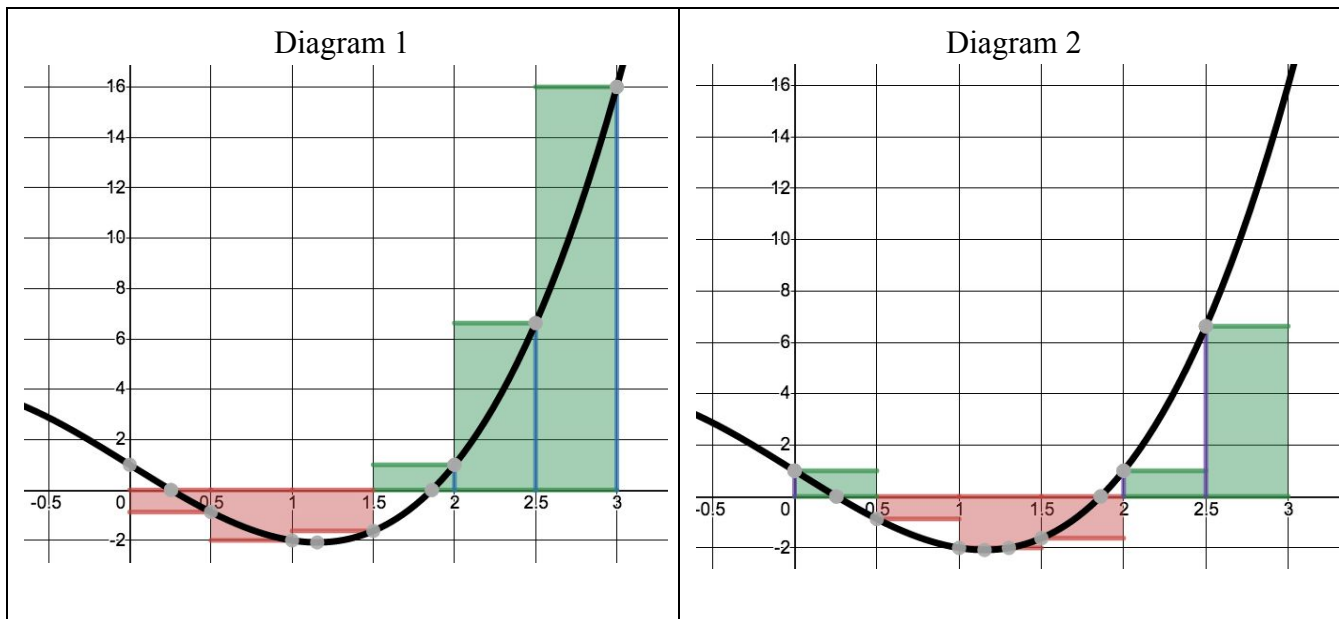
6. **(CA6.5 - N) (CA)** Mr. S wants to calculate the area under the curve of the function $y = x^3 - 4x + 1$ between $x = 0$ and $x = 3$. To help you get started with an **estimate**, Mr S has constructed 6 rectangles using a right end point method (see diagram 1) and then a second diagram using 6 rectangles using a left end point method (see diagram 2)

(Cirrito 22.5, p748)

<https://www.desmos.com/calculator/c5seq9ltar>)

Math SL PROBLEM SET 67

- a. Explain what is meant by the “right end point” and the “left end point” for rectangle construction.
- b. Estimate the area using each rectangle construction method.



7. **(C6.1, C6.4 - R) (CA)** Given the functions $f(x) = \frac{10}{6-x}$ and $g(x) = 9 - \frac{1}{4}x^2$. Sketches of these functions are shown below. The graphs of $f(x)$ and $g(x)$ intersect at three points, one of which is at $D(a,b)$, where $a, b > 0$. (Cirrito 20.1, p643; Cirrito 22.5, p748)

- a. Find the value of a and the value of b .
- b. Evaluate $g'(a)$.

Let L be the normal to the graph of g at D .

- c. Find the equation of L , giving your answer in the form of $y = mx + c$.
- d. Sketch the function $g(x)$ as well as the line L . Label the key features in your sketch.
- e. Given the region enclosed by the graph of $g(x)$ and the line L . Shade this region on your sketch and then find the area of this shaded region.

