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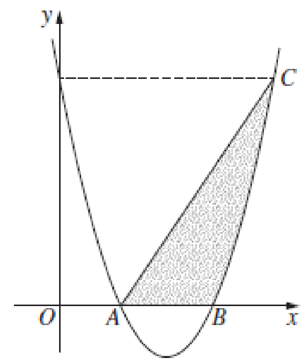
2015 16 a The diagram shows the curve with equation $y = x^2 - 7x + 10$. The curve intersects the x-axis at points A and. The point C on the curve has the y-coordinate as the y-intercept of the curve.

(i) Find the x-coordinates of points A and B. **1**

(ii) Write down the coordinates of C. **1**

(iii) Evaluate $\int_0^2 (x^2 - 7x + 10)\ dx$. **1**

(iv) Hence, or otherwise, find the area of the shaded region. **2**



(i) $x^2 - 7x + 10 = 0$

$(x - 2)(x - 5) = 0$

$x = 2, 5$

$\therefore$ the x-coordinates are 2 and 5.

State Mean: **0.93**

(ii) y-intercept of $x^2 - 7x + 10$ is 10.

Substitute $y = 10$ in $y = x^2 - 7x + 10$:

$10 = x^2 - 7x + 10$

$x^2 - 7x = 0$

$x(x - 7) = 0$

$x = 0, 7$ $\therefore C(7, 10)$

State Mean: **0.79**

(iii) $\int_0^2 (x^2 - 7x + 10)\ dx$

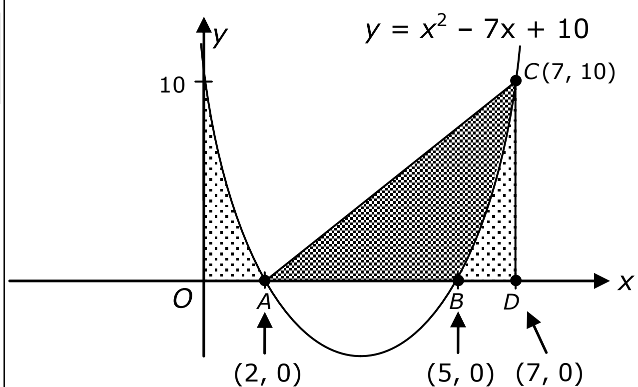
$= \left[\dfrac{x^3}{3} - \dfrac{7x^2}{2} + 10x\right]_0^2$

$= \dfrac{2^3}{3} - \dfrac{7(2)^2}{2} + 10(2) - 0$

$= 8\dfrac{2}{3}$

State Mean: **0.86**

(iv)



Parabola is symmetrical:

Area $=$ Area of $\Delta ACD - \int_0^2 (x^2 - 7x + 10)\ dx$

$= \dfrac{1}{2} \times 5 \times 10 - 8\dfrac{2}{3}$

$= 16\dfrac{1}{3}$

$\therefore$ shaded area is $16\dfrac{1}{3}$ units^2.

State Mean: **0.98**

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by BOSTES.

Board of Studies: Notes from the Marking Centre

(a)(i) This part was done well by the majority of candidates. A small percentage of students factorised incorrectly.

(a)(ii) This part was done well by the majority of candidates.

Common problems were:

- making an incorrect substitution for $y = 10$
- stating the x and y co-ordinates in the wrong order.

(a)(iii) This part was done well by the majority of candidates.

Common problems were:

- differentiating instead of integrating
- substituting the limits incorrectly
- including a constant of integration.

(a)(iv) A variety of methods was used in this part. In the better responses, candidates recognised the symmetry of the parabola and used the answer from (a)(iii).

Common problems were:

- incorrectly calculating the area between the line $y = 2x - 4$ and the curve
- finding the incorrect equation of the line
- evaluating a single integral involving a line and a parabola
- incorrectly using a complex approach involving rectangle, trapezium and integrals.