Sample solutions to the 2022 VCAA papers

Specialist Mathematics Examination 2

Question 4

The polynomial $p(z) = (z - a)(z - b)(z - c)$ has complex roots a, b and c, where $\text{Re}(a) \neq 0$, $\text{Re}(b) \neq 0$, $\text{Re}(c) \neq 0$ and $\text{Im}(b) = 0$. When expanded, the polynomial is a cubic with real coefficients.

Which one of the following statements is **necessarily** true?

A. $a + c = 0$

B. $|a| = |c|$

C. $a - c = 0$

D. $|a| = |b|$

E. $a + b + c = 0$

b is real, as $\text{Im}(b) = 0$

∴ a and c are complex conjugate

So $|a| = |c|$

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Mathematical Methods Examination 2

Question 5

The largest value of a such that the function $f : (-\infty, a] \to R$, $f(x) = x^2 + 3x - 10$, where f is one-to-one, is

A. -12.25

B. -5

C. -1.5

D. 0

E. 2

$f(x) = \left(x + \dfrac{3}{2}\right)^2 - \dfrac{49}{4}$

$TP = \left(-\dfrac{3}{2}, -\dfrac{49}{4}\right)$

∴ $a = -\dfrac{3}{2} = -1.5$

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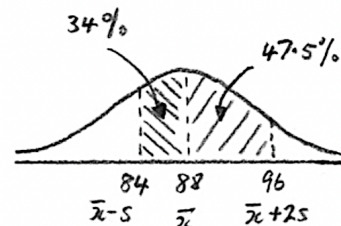
Further Mathematics Examination 1

Question 5

The possum population of a large city park is 2498.

The body lengths of this species of possum are known to be approximately normally distributed with a mean of 88 cm and a standard deviation of 4 cm.

Using the 68–95–99.7% rule, the number of possums in this park with a body length between 84 cm and 96 cm is closest to

A. 2036

B. 2043

C. 2047

D. 2105

E. 2156

$34\% + 47.5\% = 81.5\%$

$\dfrac{81.5}{100} \times 2498 \approx 2036$

34% 47.5%

84   88   96
$\bar{x} - s$ $\bar{x}$ $\bar{x} + 2s$

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