

Quadratics Test Paper 2 [28 marks]

1a. [4 marks]

Markscheme

(i) $(2, -17)$ or $x = 2, y = -17$ A1A1 N2

(ii) evidence of valid approach (M1)

e.g. graph, completing the square, equating coefficients

$$f(x) = 2(x - 2)^2 - 17 \quad A1 \quad N2$$

[4 marks]

1b. [3 marks]

Markscheme

evidence of valid approach (M1)

e.g. graph, quadratic formula

$-0.9154759\dots, 4.915475\dots$

$$x = -0.915, 4.92 \quad A1A1 \quad N3$$

[3 marks]

Markscheme

METHOD 1

correct expression for **second** side, using area = 525 (A1)

e.g. let $AB = x$, $AD = \frac{525}{x}$

attempt to set up cost function using \$3 for three sides and \$11 for one side (M1)

e.g. $3(AD + BC + CD) + 11AB$

correct expression for cost A2

e.g. $\frac{525}{x} \times 3 + \frac{525}{x} \times 3 + 11x + 3x$, $\frac{525}{AB} \times 3 + \frac{525}{AB} \times 3 + 11AB + 3AB$, $\frac{3150}{x} + 14x$

EITHER

sketch of cost function (M1)

identifying minimum point (A1)

e.g. marking point on graph, $x = 15$

minimum cost is 420 (dollars) A1 N4

OR

correct derivative (may be seen in equation below) (A1)

e.g. $C'(x) = \frac{-1575}{x^2} + \frac{-1575}{x^2} + 14$

setting their derivative equal to 0 (seen anywhere) (M1)

e.g. $\frac{-3150}{x^2} + 14 = 0$

minimum cost is 420 (dollars) A1 N4

METHOD 2

correct expression for **second** side, using area = 525 (A1)

e.g. let $AD = x$, $AB = \frac{525}{x}$

attempt to set up cost function using \$3 for three sides and \$11 for one side (M1)

e.g. $3(AD + BC + CD) + 11AB$

correct expression for cost A2

e.g. $3\left(x + x + \frac{525}{x}\right) + \frac{525}{x} \times 11$, $3\left(AD + AD + \frac{525}{AD}\right) + \frac{525}{AD} \times 11$, $6x + \frac{7350}{x}$

EITHER

sketch of cost function (M1)

identifying minimum point (A1)

e.g. marking point on graph, $x = 35$

minimum cost is 420 (dollars) A1 N4

OR

correct derivative (may be seen in equation below) (A1)

e.g. $C'(x) = 6 - \frac{7350}{x^2}$

setting their derivative equal to 0 (seen anywhere) (M1)

e.g. $6 - \frac{7350}{x^2} = 0$

minimum cost is 420 (dollars) A1 N4

[7 marks]

3a. [5 marks]

Markscheme

(i) 106 m *AI NI*

(ii) substitute $t = 4.5$ *MI*

$h = 44.9$ m *AI N2*

(iii) set up suitable equation *MI*

e.g. $f(t) = 30$

$t = 4.91$ *AI NI*

[5 marks]

3b. [3 marks]

Markscheme

recognizing that height is 0 *AI*

set up suitable equation *MI*

e.g. $g(t) = 0$

$t = 5.39$ secs *AI N2*

[3 marks]

3c. [6 marks]

Markscheme

A1A2 N3

Note: Award *AI* for correct scales on axes, *A2* for 5 correct points, *AI* for 3 or 4 correct points.

(ii) Jane's function, with 2 valid reasons *A1R1R1 N3*

e.g. Jane's passes very close to all the points, Kevin's has the rock clearly going up initially – not possible if rock falls

Note: Although Jane's also goes up initially, it only goes up very slightly, and so is the better model.

[6 marks]

