

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 1 (Quadratics 1)

Without using a calculator:

Task 1

- 1 State the nature of the roots of $5x^2 - x = -11$
- 2 Solve $\sqrt{2x} = 6$.
- 3 Find the midpoint of $(a, 4b)$ and $(3a, 2b)$.
- 4 Write $x^2 - 10x - 3$ in the form $(x + a)^2 + b$

Task 2

- 1 For what value of k does the equation $2x^2 - 7x + k + 5 = 0$ have equal roots
- 2 Find the midpoint of $(-3, 2)$ and $(-7, 0)$.
- 3 PQRS is a parallelogram with vertices $P(3,4,0)$, $Q(7,6,-3)$ and $R(8,5,2)$.
Find the coordinates of S.
- 4 Show that the roots of $(p - 2)x^2 - (3p - 2)x + 2p = 0$ are always real

Task 3

- 1 In the equation $2x^2 + kx - 2k = 0$, find the range of values for k such that the roots of the equation are real.
- 2 Find the size of angle that the line joining the points $A(0,-2)$ and $B(4\sqrt{3}, 2)$ makes with the positive direction of the x-axis.
- 3 Write $x^2 - 7x - 3$ in the form $(x + a)^2 + b$
- 4 Simplify $\frac{6p^{-1} \times 3p^5}{9p^{-4}}$

Task 4

1 Express $2x^2 + 8x - 9$ in the form $a(x+b)^2 + c$.

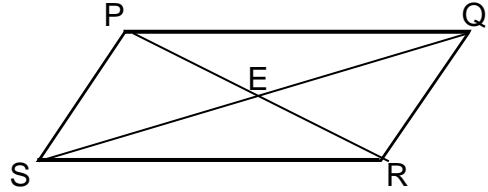
Hence, write down the coordinates of the turning point and state its nature.

2 Simplify $2\sqrt{12} + \sqrt{40} + 3\sqrt{90}$

3 PQRS is a parallelogram whose diagonals meet at E.

P is the point $(-2, -2)$, Q is $(0, 2)$ and E is $(2, 0)$.

The equation of RS is $y = 2x - 10$. TRUE/FALSE



4 Solve $\frac{15}{2x} = \frac{1}{3}$

Task 5

1 Prove that the roots of the equation $2x^2 + px - 3 = 0$ are real for all values of p

2 Sketch the function $f(x) = 3 - 4x - 2x^2$

3 P is the point $(-1, 2, -1)$ and Q is $(3, 2, -4)$.

a) Write down \vec{PQ} in component form

b) Calculate the length of \vec{PQ}

c) Find the components of a unit vector which is parallel to \vec{PQ}