8. (a) Factorise $4p^2 - q^2$

(1)

(b) Hence, prove by contradiction, that there are no positive integers p and q such that

$$4p^2 - q^2 = 46$$

(4)

(Total for Question 8 is 5 marks)

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9. $ABCD$ is a parallelogram with AB parallel to DC and AD parallel to BC.
The position vectors of A, B, C and D relative to a fixed origin O are
a, **b**, **c** and **d** respectively.

Given that

$$\mathbf{a} = \mathbf{i} + \mathbf{j} - 2\mathbf{k} \qquad \mathbf{b} = 3\mathbf{i} - \mathbf{j} + 6\mathbf{k} \qquad \mathbf{c} = -\mathbf{i} + 3\mathbf{j} + 6\mathbf{k}$$

(a) find the position vector **d**,

(3)

(b) find the angle between the sides AB and BC of the parallelogram,

(4)

(c) find the area of the parallelogram $ABCD$.

(2)

The point E lies on the line through the points C and D, so that D is the midpoint of CE.

(d) Use your answer to part (c) to find the area of the trapezium $ABCE$.

(2)

(Total for Question 9 is 11 marks)

TOTAL FOR PAPER IS 75 MARKS