GCSE MATHEMATICS · HIGHER

Targeting Grade 9

Paper 3 · Non-calculator · 50 minutes · 40 marks

Name ..... **Date** .....

Answer **all** questions. Show all your working: answers without working may not get full marks. Diagrams are **not** accurately drawn. You must **not** use a calculator.

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1 Prove algebraically that the sum of the squares of any two consecutive odd numbers is always 2 more than a multiple of 8

(Total for Question 1 is 3 marks)

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2 Solve

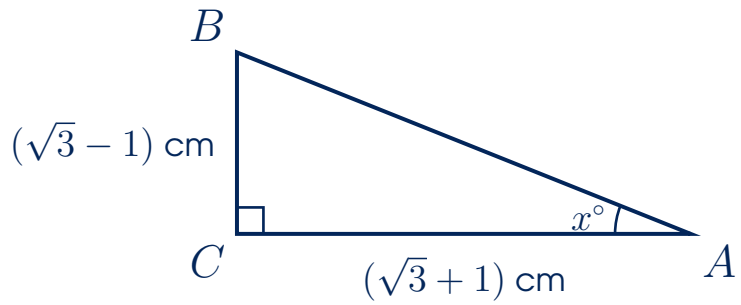
$$\frac{3}{x-2} - \frac{2}{x+1} = 1$$

Give your answers in the form $a \pm \sqrt{b}$ where a and b are integers.

.....

(Total for Question 2 is 4 marks)

3



ABC is a right-angled triangle.

(a) Show that $\tan x° = 2 - \sqrt{3}$

(3)

(b) Work out the perimeter of the triangle.
Give your answer in the form $a\sqrt{2} + b\sqrt{3}$ where a and b are integers.

cm .....

(2)

(Total for Question 3 is 5 marks)

4 The nth term of a sequence is $an^2 + bn$ where a and b are integers.

The 2nd term of the sequence is 2

The 5th term of the sequence is 35

(a) Work out the values of a and b.

$a =$ .....

$b =$ .....

(3)

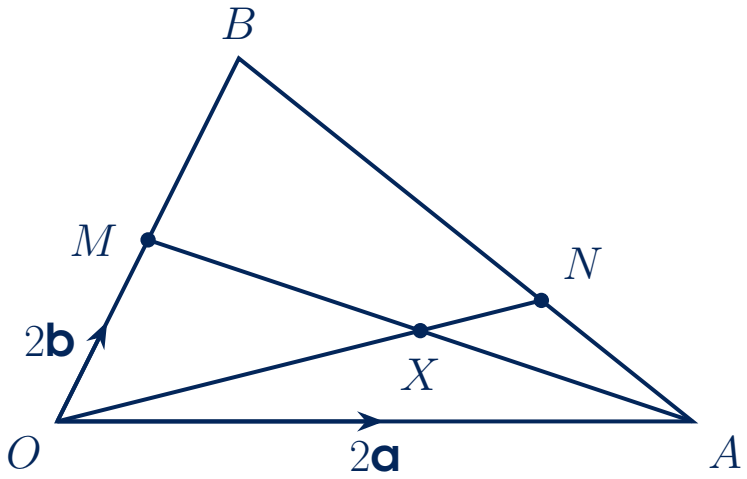
(b) Is 230 a term of the sequence?

You must show how you get your answer.

(3)

(Total for Question 4 is 6 marks)

5



OAB is a triangle.

$\overrightarrow{OA} = 2\mathbf{a}$ $\overrightarrow{OB} = 2\mathbf{b}$

M is the midpoint of OB.

N is the point on AB such that $AN : NB = 1 : 2$

The lines ON and AM intersect at the point X.

$\overrightarrow{OX} = k\overrightarrow{ON}$ where k is a constant.

Work out the value of k.

You must show all your working.

$k =$ .....

(Total for Question 5 is 5 marks)

6 A bag contains 10 counters.

x of the counters are red. The rest of the counters are blue.

There are fewer red counters than blue counters.

Three counters are taken at random from the bag, without replacement.

The probability that all three counters are the same colour is $\frac{1}{5}$

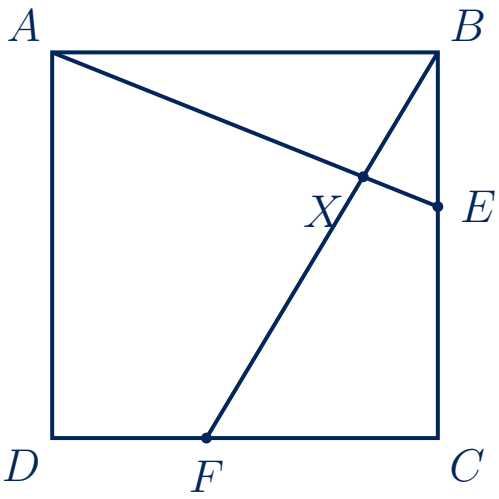
Work out the value of x.

You must show all your working.

$x =$ .....

(Total for Question 6 is 6 marks)

7



$ABCD$ is a square.
E is a point on BC and F is a point on CD such that $BE = CF$.
AE and BF intersect at the point X.

Prove that $AE = BF$ and that AE is perpendicular to BF.

(Total for Question 7 is 5 marks)

8 A is the point with coordinates $(0, 6)$

B is the point with coordinates $(8, 2)$

C is a point on the line with equation $y = x$ such that angle $ACB = 90°$

Work out the two possible pairs of coordinates of C.

Give your answers in the form $(a \pm \sqrt{b}, a \pm \sqrt{b})$ where a and b are integers.

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(Total for Question 8 is 6 marks)

TOTAL FOR PAPER IS 40 MARKS