Name: ___________________________

GCSE (1 – 9)
Vectors Proof Questions

Instructions

• Use black ink or ball-point pen.
• Answer all questions.
• Answer the questions in the spaces provided
  – there may be more space than you need.
• Diagrams are NOT accurately drawn, unless otherwise indicated.
• You must show all your working out.

Information

• The marks for each question are shown in brackets
  – use this as a guide as to how much time to spend on each question.

Advice

• Read each question carefully before you start to answer it.
• Keep an eye on the time.
• Try to answer every question.
• Check your answers if you have time at the end
\( \overrightarrow{OA} = a \)
\( \overrightarrow{OB} = b \)

P is the point on AB such that \( AP:PB = 1:3 \)

\( \overrightarrow{OP} = k(3a + b) \)

Find the value of \( k \)
$\overrightarrow{OA} = 2a$
$\overrightarrow{OB} = 3b$

P is the point on AB such that AP:PB = 3:2

$\overrightarrow{OP} = k(4a + 9b)$

Find the value of $k$
AP is the point on AB such that AP:PB = 3:2

\[ \overrightarrow{OA} = a \]
\[ \overrightarrow{OB} = 2b \]

P is the point on AB such that AP:PB = 3:2

\[ \overrightarrow{OP} = k(a + 3b) \]

Find the value of \( k \)
4 \( ABCDEF \) is a regular hexagon with centre \( O \).

\[ \overrightarrow{OA} = a \]
\[ \overrightarrow{OB} = b \]

\( M \) is the midpoint of \( BC \).
\( X \) is the point on \( AB \) extended, such that \( AB:BX = 3:2 \)

Prove that \( E, M \) and \( X \) are on the same straight line.
Show that C, M and D are on the same straight line.

\[ \overrightarrow{OA} = 5a \]
\[ \overrightarrow{OB} = 3b \]

C is the point such that OC:CA = 4:1
M is the midpoint of AB
D is the point such that OB:OD = 3:4

(Total for question 5 is 5 marks)
The diagram shows a parallelogram.

\[ \overrightarrow{OA} = 2a \]
\[ \overrightarrow{OB} = 2b \]

D is the point on OC such that OD:DC = 2:1

E is the midpoint of BC

Show that A, D and E are on the same straight line.
\( \overrightarrow{OA} = 5a \)
\( \overrightarrow{OB} = 2b \)

C is the point on OA such that OC:CA = 4:1
D is the point such that AD:DB = 1:2
The line OB is extended to point E

Given that C, D and E are on the same straight line find \( \overrightarrow{BE} \)