# Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_Block:\_\_\_\_\_

**IB Math SL *-*** *Vector Applications Practice*

**4a.** The following diagram shows the cuboid (rectangular solid) OABCDEFG, where O is the origin, and  ,  ,  .



(i) Find  .

(ii) Find  .

(iii) Show that  .

***[5 marks]***

**4b.** Write down a vector equation for

(i) the line OF;

(ii) the line AG.

(ii) any correct equation for (AG) in the form  ***A2 N2***

***[4 marks]***

**4c.** Find the obtuse angle between the lines OF and AG.

***[4 marks]***

 **5a.** The diagram shows quadrilateral ABCD with vertices A(1, 0), B(1, 5), C(5, 2) and D(4, −1) .

(i) Show that  .

(ii) Find  .

(iii) Show that  is perpendicular to  .

***[5 marks]***

**5b.** The line (AC) has equation  .

(i) Write down vector ***u*** and vector ***v*** .

(ii) Find a vector equation for the line (BD).

***[4 marks]***

**5c.** The lines (AC) and (BD) intersect at the point  . Show that  .

***[3 marks]***

**5d.** The lines (AC) and (BD) intersect at the point  . **Hence** find the area of triangle ACD.

***[5 marks]***

**6a.** *[4 marks]*

The line  passes through the points P(2, 4, 8) and Q(4, 5, 4) .

(i) Find  .

(ii) Hence write down a vector equation for  in the form  .

**6b.** *[7 marks]*

The line  is perpendicular to  , and parallel to  , where  .

(i) Find the value of *p* .

(ii) Given that  passes through  , write down a vector equation for  .

**6c.** *[7 marks]*

The lines  and  intersect at the point A. Find the *x*-coordinate of A.

**7a.** *[3 marks]*

The following diagram shows the obtuse-angled triangle ABC such that  and  .



(i) Write down  .

(ii) Find  .

**7b.** *[7 marks]*

(i) Find  .

(ii) Hence, find  .

**7c.** *[6 marks]*

The point D is such that  , where  .

(i) Given that  , show that  .

(ii) Hence, show that  is perpendicular to  .

**9a.** *[5 marks]*

The diagram shows a parallelogram ABCD.



The coordinates of A, B and D are A(1, 2, 3) , B(6, 4,4 ) and D(2, 5, 5) .

(i) Show that  .

(ii) Find  .

(iii) **Hence** show that  .

**9b.** *[3 marks]*

**9c.** *[7 marks]*

(i) Find .

(ii) **Hence** find angle *A*.

**9d.** *[3 marks]*

Hence, or otherwise, find the area of the parallelogram.

**10a.** *[4 marks]*

*In this question, distance is in metres.*

Toy airplanes fly in a straight line at a constant speed. Airplane 1 passes through a point A.

Its position, *p* seconds after it has passed through A, is given by  .

(i) Write down the coordinates of A.

(ii) Find the speed of the airplane in .

**10b.** *[5 marks]*

After seven seconds the airplane passes through a point B.

(i) Find the coordinates of B.

(ii) Find the distance the airplane has travelled during the seven seconds.

**10c.** *[7 marks]*

Airplane 2 passes through a point C. Its position *q* seconds after it passes through C is given by  .

The angle between the flight paths of Airplane 1 and Airplane 2 is  . Find the two values of *a*.