A screenshot of a cell phone

Description automatically generated

**Vectors**

**Instructions**

* Use **black** ink or ball-point pen.
  + **Fill in the boxes** at the top of this page with your name,  
    centre number and candidate number.
* Answer **all** questions.
* Answer the questions in the spaces provided  
  *– there may be more space than you need.*
* You must **show all your working.**
* Diagrams are **NOT** accurately drawn, unless otherwise indicated.
* If your calculator does not have a *π* button, take the value of *π* to be3.142

unless the question instructs otherwise.

**Information**

* The total mark for this paper is **14**. There are **5** questions.
* Questions have been arranged in an ascending order of mean difficulty, as found by all students in the June 2017–November 2019 examinations.
* 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**

1. Read each question carefully before you start to answer it.
2. Keep an eye on the time.
3. Try to answer every question.
4. Check your answers if you have time at the end.

**1 a** =  **b** = 

Work out 2**a** + **b** as a column vector.



(**Total for Question 1 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2 a** =  **b** = 

Work out **a** − 2**b** as a column vector.

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**(Total for Question 2 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3** Here are two column vectors.

**a** =  **b** = 

On the grid below, draw and label the vector **a** − 2**b**



**(Total for Question 3 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4**

**

*ABCD* is a parallelogram.

The diagonals of the parallelogram intersect at *O*.

 = **a** and  = **b**

(*a*)Find, in terms of **b**, the vector .

.......................................................

**(1)**

(*b*)Find, in terms of **a** and **b**, the vector .

.......................................................

**(1)**

(*c*)Find, in terms of **a** and **b**, the vector .

.......................................................

**(1)**

**(Total for Question 4 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**5 a** =  and **b** = 

(a) Write down as a column vector

(i) **a** + **b**

.......................................................

(ii) 2**a** + 3**b**

.......................................................

**(3)**

The vector **c** is drawn on the grid.

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(b) From the point *P*, draw the vector 2**c**

**(1)**

**(Total for Question 5 is 4 marks) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**TOTAL MARKS FOR PAPER: 14**