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| **MATHEMATICS DEPARTMENT 2015**  **Year 11 Specialist - Test Number 1 – Basic Vectors Resource Free Section** |

**Name: \_\_\_\_\_\_\_SOLUTIONS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Marks: 30**

**Time Allowed: 25 minutes**

**Instructions:** You **ARE** **NOT** permitted any notes or calculator.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 Which of the following best describes the direction of the position vector of P(4, −5)?

A 51°

B 219°

C −25°

D 309°

E 129°

[1 mark]

2 Calculate the resultant of the forces shown below.



A 21 N to the left

B 123 N

C 37 N to the right

D 21 N to the right

E 65 N to the left

[1 mark]

3 This diagram shows vectors m, n and a third vector.   
Which of the following best describes the third vector?

A m + n

B −n + m

C n + m

D m − n

E n − m

[1 mark]

4 If a = −2i + 7j, which of the following vectors is opposite in direction to a?

A (−2, −7)

B 

C 5i − 10j

D (6, −21)

E −7i + 2j

[1 mark]

5 This diagram shows vectors p and q.   
Which of the following best represents the   
resultant of p and q? (circle one)



[1 mark]

6 Which of the following is perpendicular to a = (0, −7)?

A i + j

B (−3, 1)

C −7i + j

D (−1, 1)

E −4i

[1 mark]

\*\*End of Multiple Choice Questions\*\*

7 Write the following vectors in polar form.

a A vector q with norm 6 in the positive direction of the y-axis

b A vector v of magnitude 8 in a direction 45° clockwise from the x-axis

[2 marks]

8 Convert the following vectors to component form.

a (8, 60°)



b (5, 210°)



[4 marks]



9 Convert the following vectors to polar form.

a (3,−3)

magnitude =

reference angle = but in Q4 so

)



b (, 1)

magnitude =

reference angle = but in Q2 so

)



[4 marks]

10 Find the norm of each of the following vectors.

a (−2, 7)

b 

Pythagorean Triple: 10, 24, 26

26

[2 marks]

11 Given d = (8, −2) and e = (−4, −2), find:

4(2d − 3e)



[2 marks]

12 Write the following vector as a linear combinations i and j.

a m = (2,−5)

[1 mark]

13 Find the value of α and β given that **m** and **n** are non-parallel vectors and the following is true:

(α-β+1)**m**=(β-3)**n**

α-β+1=0 and β-3=0



α-3+1=0 β=3



α=2



[3 marks]



14 Given = (5, 20) state .

[1 mark]

15 OABC is a trapezium with OC parallel to, and twice as long as, AB. D is the mid-point of BC.

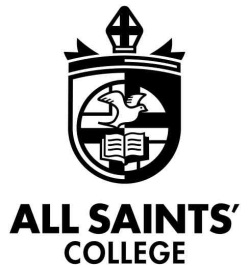
If and , express each of the following in terms of and/or



[5 marks]



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| **MATHEMATICS DEPARTMENT 2015**  **Year 11 Specialist - Test Number 1 – Basic Vectors Resource Rich Section** |



**Name: \_\_\_\_\_\_SOLUTIONS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Marks: 20**

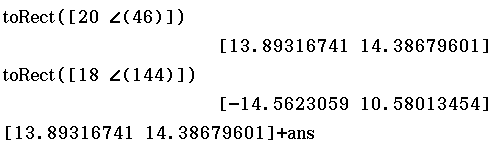
**Time Allowed: 20 minutes**

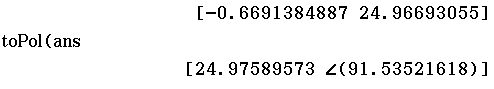
**Instructions:** You **ARE** allowed 1 page of notes (both sides) and a CAS calculator.  
  
***You must show your working to receive full marks whenever a question is worth more than 2 marks.***

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16 Given f = (20, 46°), g = (18, 144°) find f + g by first changing to component form. Give your answer in polar form to the nearest whole number.







[3 marks]

17 Find the displacement vector for the following movement.

A(3, 4) to B(5, −3)

(5,-3) – (3,4) = (2,-7)

[1 mark]

18 Use a parallelogram of vectors to demonstrate that addition of geometric vectors is commutative.

****



Vector addition is commutative because the diagram shows a + b = b + a.



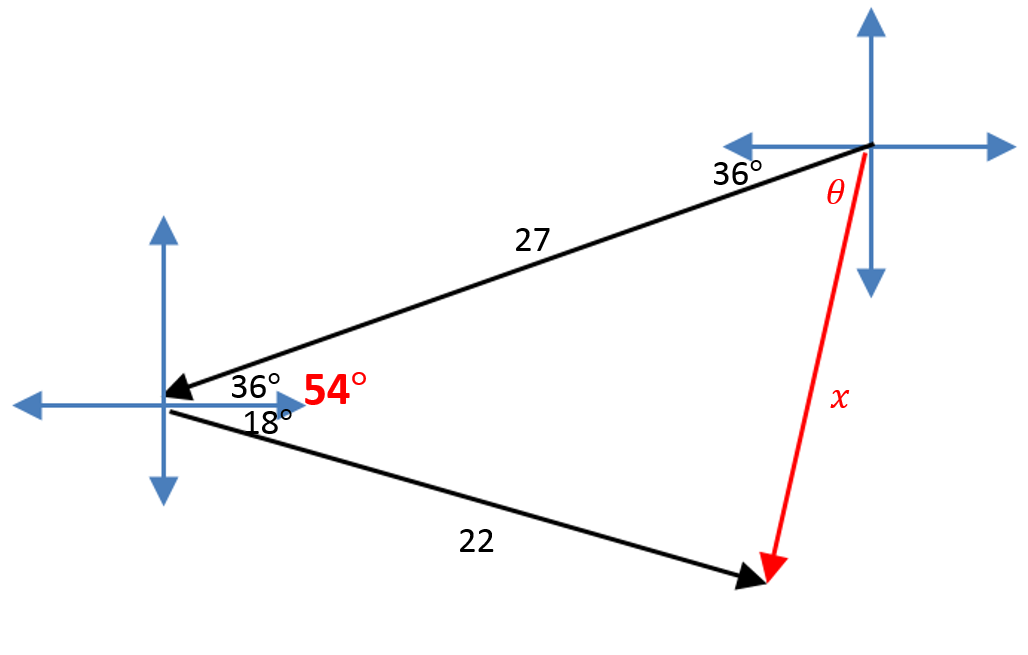
[2 marks]

19 State a vector parallel to with a magnitude the same as the vector . Leave your answer in exact form.

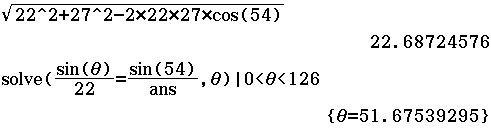


[3 marks]

20 Given x = (27, 216°) and y = (22, 342°), find x + y without changing to component form. (to 1 d.p.)





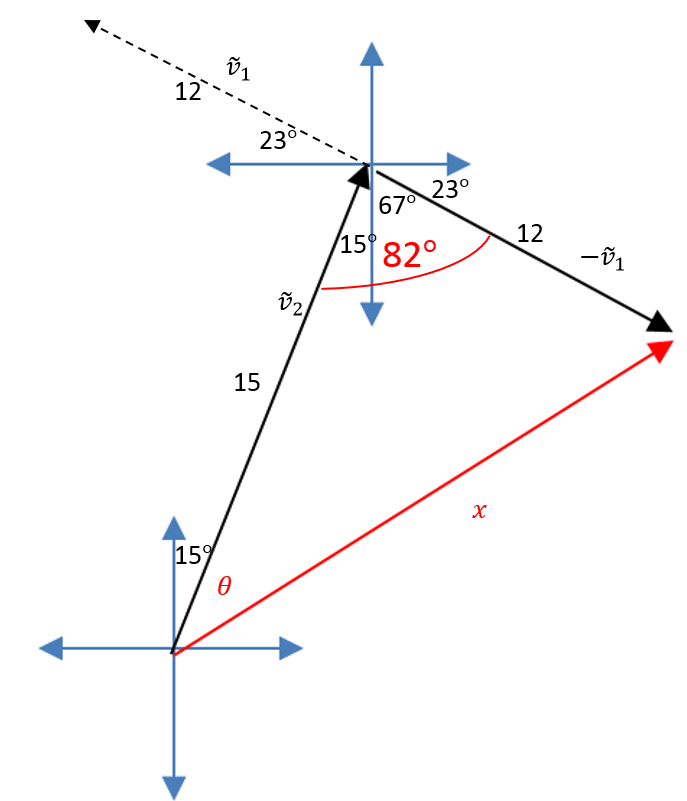
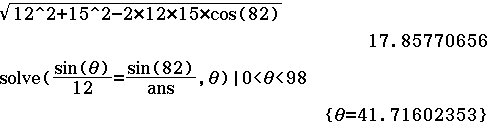




)

[5 marks]

21 A car travelling at 12 m/s at a bearing of 293° changes to 15 m/s at a bearing of 015°. What is the change   
in velocity? (to 1.d.p.)





Alternate Working:





[6 marks]