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**Worksheet on Vector Dot Products and Simple Matrix Mathematics**

1. Given the vectors *a* = {2, 5, 3} and b = {6, 9, 11}, what is the scalar result of the dot product ? Show your work.

2. What are the norms (lengths) of vectors *a* and *b* from question 1?

3. What is the angle between vectors *a* and *b* from question 1?

4. What are the unit vectors  and **** that coincide with vectors *a* and *b* from question 1?

5. What is the angle between vectors *a* (from question 1) and  (from question 4)? Show your work.

6. Where (in terms of rows and columns) is the value *c*23 located in a matrix *c*?

7. Represent vector *a* from question 1 as a 3x1 matrix where *a*11 is the *x* coordinate of a Cartesian coordinate system, *a*21 is the *y* coordinate, and *a*31 is the *z* coordinate.

8. Represent vector *b* from question 1 as a 1x3 matrix where *b*11 is the *x* coordinate of a Cartesian coordinate system, *b*12 is the *y* coordinate, and *b*13 is the *z* coordinate.

9. If we define matrix *c* as given below, (a) compute the product *d* of the equation *,* showing all your work, and (b)what sort of mathematical object/entity might *d* be considered to be?



10. If we define matrix *e* as given below, (a) compute the product *p* of the equation *,* showing all your work, and (b)what sort of mathematical object/entity might *p* be considered to be?



11. Within the matrix brackets below, provide an example of a *symmetric* 3x3 matrix, and circle the diagonal of the matrix.



12. Within the matrix brackets below, provide an example of an *antisymmetric* 3x3 matrix.



13. Within the matrix brackets below, provide an example of an *asymmetric* 3x3 matrix.



14. Within the matrix brackets below, give the transpose of matrix *e* from question 10.



15. Within the matrix brackets below, show the identity matrix.

