Coram Deo Academy **Name:**
Online Trigonometry
Vectors Worksheet B

Lesson 7.6: Vector Operations

Position Vectors

1. The term **scalar** refers to a ____________________ quantity, rather than a ____________________ quantity.
2. **Component form** of a vector names a vector by telling you how far over and up to go from the vector's starting point. When a vector is written in **component form**, it is written as $v = \langle v_1, v_2 \rangle$, where v_1 is the horizontal component of the vector and v_2 is the vertical component of the vector. The horizontal component of a vector can be found by calculating the __________________ between it's starting and ending x-values. The vertical component of a vector can be found by calculating the __________________ between it's starting and ending y-values.
3. The **length**, or **magnitude** of a vector $v = \langle v_1, v_2 \rangle$ is given by $|\boldsymbol{v}| =$ _________________.

Operations on Vectors

4. To multiply a vector **v** by a positive real number, we multiply its _____________ by the number. The ________________ of the vector, however, stays the same. You can think of multiplying a vector by a real number as changing the "scale" of the vector. You are scaling it larger or smaller. Thus, the product of a real number and a vector is called ______________ ______________________.
5. If vector $\boldsymbol{u} = \langle u_1, u_2 \rangle$ and $\boldsymbol{v} = \langle v_1, v_2 \rangle$,
   a. To get the sum, you add the horizontal components together and the vertical components together: **u + v** = ________________________.
   b. To get the difference, you subtract the second horizontal component from the first, and subtract the second vertical component from the first:
      u - v = ________________________.
6. The zero vector has a horizontal component of _______ and a vertical component of ________.

Unit Vectors

7. A vector of length _____ is called a **unit vector**.
8. A unit vector parallel to the x-axis is called _____ and equals __________ in component form.
9. A unit vector parallel to the y-axis is called _____ and equals __________ in component form.
10. Express the vector $\langle 2, 3\rangle$ as a **linear combination** of unit vectors **i** and **j**.

Direction Angles

11. If a unit vector starts at (0, 0) (in standard position), it's terminal point would lie on the _________ ____________.
12. Thus, the unit vector could be denoted $\boldsymbol{u} = \langle cos\theta, sin\theta\rangle$ in component form, or **u** = ________________________ when expressed as a linear combination of unit vectors **i** and **j**.
    So cos θ represents the horizontal length of the vector and sin θ represents the vertical length of the vector.
13. Which of the following results in a scalar, or number rather than a vector? (k represents a scalar)
    a. k**v**
    b. **u** + **v**
    c. **u · v**
14. If θ is the angle between two non-zero vectors, then cos $\theta =$ ___________.
15. If the dot product of two non-zero vectors u and v is zero, then the vectors are perpendicular. Give an example of two perpendicular vectors and show that their dot product is zero.