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BLM 3–3

Chapter 3 Review

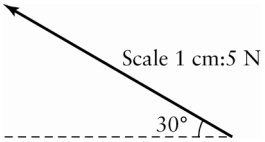
3.1 Vectors

1. Classify each quantity as a scalar or a vector.
- **a)** A snowboarder is travelling at 30 km/h.
- **b)** Sana drove 100 km southeast.
- **c)** Luigi's mass is 92 kg.
- **d)** The golfer hit the ball 200 m.
- **e)** A meteor collides with a planet with a force of 150 000 N.
- **f)** The airplane flew 600 km/h in a NE direction.

2. State the opposite of each vector.
- **a)** 40 m north
- **b)** 570 km/h S35°W
- **c)** 95 km on a bearing of N60°E
- **d)** 80 mph on a true bearing of 103°

3. Describe the magnitude and direction of each vector in words and using symbols.

a)



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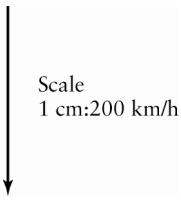
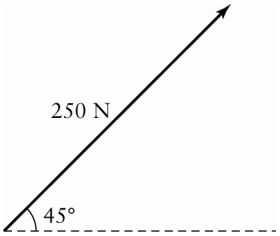


4. For each vector, choose an appropriate scale and draw a diagram. Label the magnitude, direction, and scale.
- **a)** 600 m/s on a bearing of 070°
- **b)** 1800 km heading S30°E
- **c)** a force of 60 N at an inclination of 60° to the horizontal

3.2 Components of Vectors

5. Determine the horizontal and vertical components of each vector to the nearest tenth of a degree and nearest tenth of a unit.

a)



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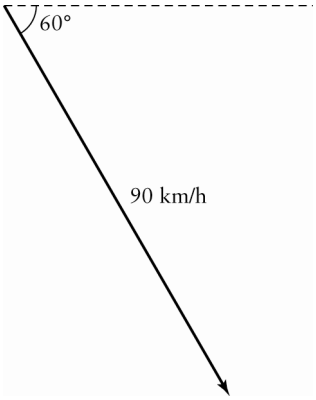

- **c)** a force of 200 N applied at a bearing of 026°
- **d)** a jet travelling N40°E at 900 km/h

6. A crate is pushed up a ramp with a net force of 150 N at an angle of 30° to the ground. Determine the magnitudes of the horizontal and vertical components to the nearest tenth of a newton.

7. A soccer ball is kicked with a velocity of 18 m/s at an angle of 15° with the ground. What is the magnitude of the velocity of the ball's forward motion, to the nearest metre per second?

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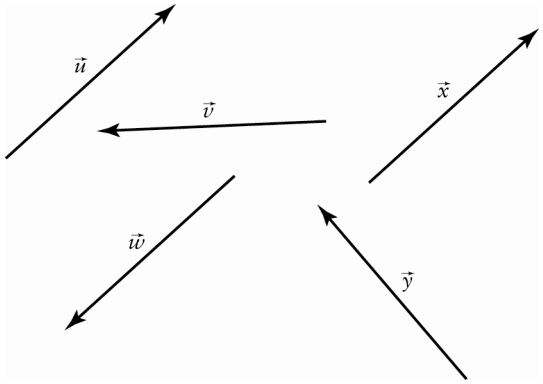
3.3 Adding Vectors

8. Consider the following vectors, all of which have the same magnitude.



a) Which vectors are equivalent?

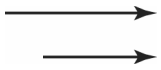
b) Which vectors are opposite?

c) Which vectors have a sum of $2\vec{u}$?

d) Which vectors have a sum of $\vec{0}$?

9. Determine the sum of each pair of vectors.

a)



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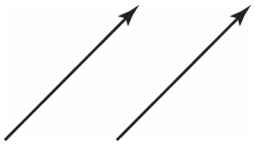
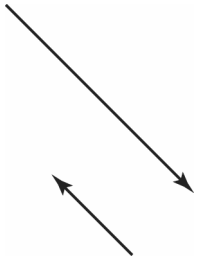
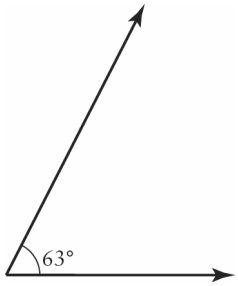


c)



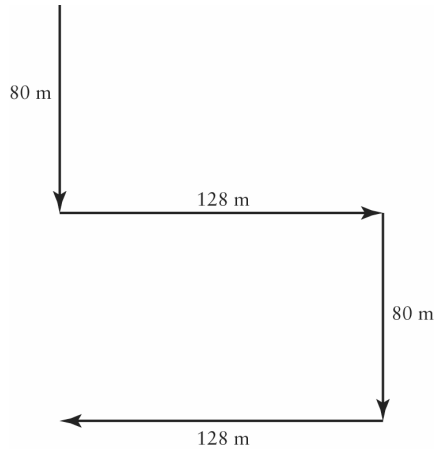
d)



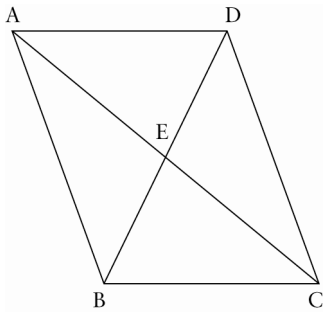
10. a) Explain the difference between distance and displacement.

b) Natasha went for a walk along the path shown. What distance did she travel?

c) What was Natasha's displacement?



11. ABCD is a parallelogram with E the intersection point of the two diagonals, as shown.



Name a vector equivalent to each of the following.

a) $\overrightarrow{AB}$

b) $\overrightarrow{DA}$

c) $\overrightarrow{AC}$

d) $\overrightarrow{AB} + \overrightarrow{BC}$

e) $\overrightarrow{AE} + \overrightarrow{ED}$

f) $\overrightarrow{BC} + \overrightarrow{BA}$

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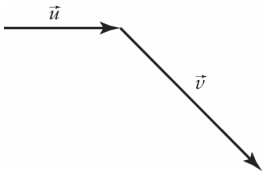
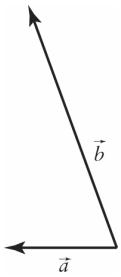
12. Two vectors, $\vec{u}$ and $\vec{v}$, are drawn head-to-tail. Use the triangle method to find the magnitude and direction of their sum.



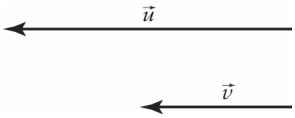
13. Use the parallelogram method to find the magnitude and direction of the sum of $\vec{a}$ and $\vec{b}$.



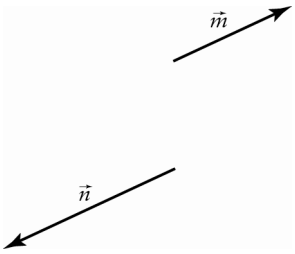
3.4 Subtracting Vectors

14. Draw a diagram to represent each difference.

a) $\vec{u} - \vec{v}$



b) $\vec{n} - \vec{m}$



15. ABCDEF is a regular hexagon and O is its centre. Let $\overrightarrow{OA} = \vec{a}$ and $\overrightarrow{OB} = \vec{b}$. Write each of the following as an expression of $\vec{a}$ and $\vec{b}$.

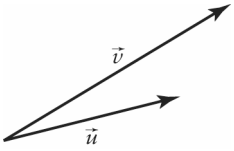
a) $\overrightarrow{AB}$

b) $\overrightarrow{OC}$

c) $\overrightarrow{CO}$

d) $\overrightarrow{DE}$

16. Use this diagram to answer the questions.



a) Find $\vec{u} - \vec{v}$.

b) Find $\vec{v} - \vec{u}$ using the parallelogram method.

17. If $\vec{a}$ and $\vec{c}$ are given vectors and, describe how to find the magnitude and direction of $\vec{b}$.

3.5 Solving Problems Involving Vectors

18. A car travels north at 100 km/h for 2 h. Then, the car travels 60 km/h west for 1 h.

a) Determine the magnitude of the resultant displacement, to the nearest tenth of a kilometre.

b) Determine the direction of the resultant displacement, to the nearest degree.

19. An airplane travelling at an airspeed of 500 km/h and a heading of 225° encounters a wind blowing at 40 km/h from 180°. Determine the airplane's velocity with respect to the ground to the nearest degree and the nearest kilometre per hour.

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