Year 12 Science: Motion, vectors and projectiles

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. A cyclist speeds up uniformly from 2.0 m s^{-1} to 8.0 m s^{-1} in 4.0 s. What is her acceleration?

2. How far does she travel in those 4.0 s?

3. A ball is thrown straight up at 14.7 m s^{-1}. How high does it rise?

4. A rock rolls horizontally off a cliff 44.1 m high at 5.00 m s^{-1}. How far from the foot of the cliff does it land?

5. A plane heads north at 70.0 m s^{-1} through air that is moving east at 24.0 m s^{-1}. What is its velocity over the ground?

Exam-style question: the driving range

At a golf driving range, Tama hits a ball from the ground at 30.0 m s^{-1} at 25.0° above the horizontal. A safety fence 3.00 m high stands 60.0 m away on level ground. Ignore air resistance and use g = 9.8 m s^{-2}.

6. Describe the force on the ball during its flight and what it does to the horizontal and vertical parts of its velocity.

7. Calculate the horizontal and vertical components of the ball's initial velocity.

8. By calculating, decide whether the ball clears the fence.

9. Explain why the ball's speed is smallest at the top of its path, but not zero.

Fix the mistake

10. Correct this statement: "At the top of its path the ball has stopped, so its acceleration is zero there."

11. Correct this statement: "Time to reach the posts = 45.0 m ÷ 25.0 m s^{-1}, using the launch speed."

12. Correct this statement: "A ball thrown up at 14.7 m s^{-1}: $v_f^2 = 14.7^2 + 2 \times 9.8 \times d$, so d comes out negative."

13. Correct this statement: "The heavier ball has more weight, so it falls faster and lands sooner."