# SHENTON COLLEGE

## *11 PHYSICS A1/A2    Motion and Forces Test 1*

Name

/50 =          %

48 marks for working + 2 mark for correct units and significant figures

## Question 1

Use a sign convention to calculate the resultant vector for the following vector sums:

**a**    24.5 N west + 12.0 N east + 15.2 N east + 7.50 N west.                     (2 marks)

**b**    17.5 N north – 10.0 N south.                                          (2 marks)
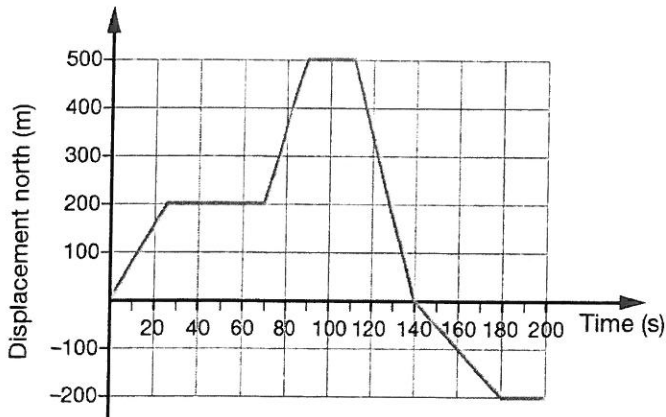
## Question 2

Three tractors are connected by chains to the same point. The force exerted by tractor A is 3000 N north, tractor B is 4000 N south-west and tractor C is 2000 N south. Use a **scaled vector diagram** to find the magnitude of the resultant of these three forces at that point.

(4 marks)

## Question 3

The graph below shows the displacement of a farmer on a motorcycle, riding north (positive) and south (negative) along a boundary of her property while counting livestock.



**a**    What was the total distance travelled by the farmer over the entire period?          (1 mark)

**b**    What was the total displacement of the farmer over the entire period?              (1 mark)

## Question 8

You are on a ride at the Royal Show. You are strapped into a chair that is <u>ascending</u> at 2.75 ms$^{-1}$. You look over the edge of the chair and your sunglasses fall off. Assuming no air resistance, how long before the sunglasses hit the ground if they fell out when your head was 25.0 m above the ground? (3 marks)

## Question 9

In a cartoon, the Road Runner is trying to escape the Coyote. The Coyote is on a ledge 80.0 m directly above a road when he sees the Road Runner travelling towards him at a constant velocity of 12.4 ms$^{-1}$. The Coyote drops a large rock (1.00 m in diameter) off the ledge when the Road Runner is 50.0 m from the point on the road directly below the ledge. Does the Coyote catch the Road Runner? Show all working to justify your answer. (4 marks)

## Question 10

A car is travelling on the highway at a constant speed of 25.0 ms$^{-1}$ in an 80 kmhr$^{-1}$ zone as it passes a police car. The police officer accelerates from rest at 2.25 ms$^{-2}$ at the exact moment that the speeding car passes him. How long will it take the police car to catch up to the speeder? Assume that the speeding car and the police car travel the same distance during this time. (4 marks)

Changes

| Name | | /32 =     % |
|------|--|-------------|

### Finding the value of g.

### What to do.

Work in a groups of 3 or 4. Collect the following equipment to complete the experiment.

- LabQuest Mini
- 2 photogates
- Metre rule
- Glue stick
- Retort stand, boss heads, clamps

1. Ensure that the correct software is loaded and ready to go.
2. Set up the equipment as described by your teacher
3. Set the vertical distance between the top of the first photogate and the top of the second photogate to 20 cm.
4. Hold the glue stick as close as possible to the infra red beam – do not block the beam.
5. Drop the glue stick through both photogates.
6. The software will determine the time for the glue stick to fall through each light gate and also the time to fall 20 cm.
7. Calculate the difference in time for first light gate and the second light gate. Record these times in the table.
8. Also record the time taken between the light gates.
9. Repeat this procedure again.
10. Repeat steps 3 to 6 but change the distances to 40, 60, 80 and 100 cm.
11. Pack up all equipment.

### Results.

| Distance fallen – s (m) cm | TIME (s) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | initial | | | final | | | total | | |
| | Δ t | Δ t | av | Δ t | Δ t | av | t | t | av |
| 0. 20 | | | | | | | | | |
| 0. 40 | | | | | | | | | |
| 0. 60 | | | | | | | | | |
| 0. 80 | | | | | | | | | |
| 0. 100 | | | | | | | | | |

[3]

What is the relationship between the distance and velocity squared?

_____

_____

[2]

Find the slope of the graph, including units.

[2]

Use this slope to find g. Express your answer to three significant figures.

[4]

Read the value of the y-intercept. _____

Explain what this value is equal to, using previously calculated information.

[3]

**Post lab discussion.**

1. What was the independent variable? _____     [1]

2. What was the dependent variable? _____     [1]

3. Is your value of g within the error you determined? _____     [1]

4. Describe two errors that could have contributed to an inaccurate result.

_____

_____

_____

_____

[2]