Unit 1 – Worksheet Answer Key

Worksheet 1.1

1) 5.33×10^5 m

2)a. 0.28 m/s b. 14 m/s c. 22 m/s d. 28 m/s

3)a. 38 m/s b. 47 m c. 120 m

4) a. i. 50m/s^2 ii. -10 m/s^2 iii. 50 m/s^2 b. B, since v = 0 c. Area under curve from A → B : 22m

5) a. d_{total} = 47.4 m → so OK! b. d_{total} = 60.2 m → Mooseburgers!

6) 3 m/s^2

7) 13.3 m/s

8) 69.6 m/s

9) 4.0 m/s^2

10) 2.29 s

11) Yes, after 8 s the passenger is 64 m from station, and train is 62 m. Therefore they meet.

12) a. a = slope = 0.67m/s^2 b. y = 0.67x – 5 c. 69 m d. 39 m

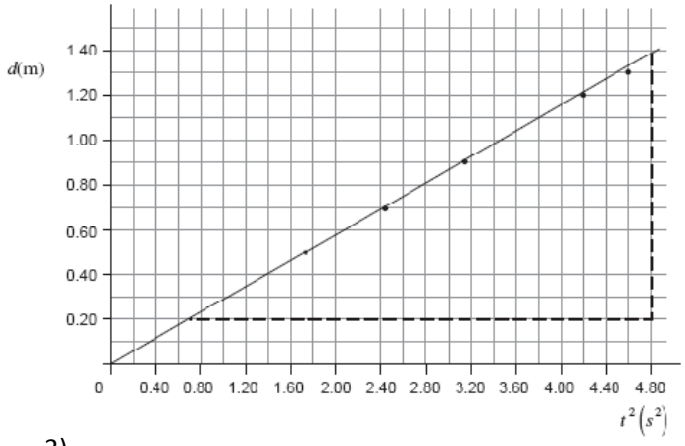
13) A: 0 m/s^2 B: -2m/s^2 C: 0 m/s^2 D: 2.5 m/s^2 E: -2 m/s^2

Worksheet 1.2

1) Don't do!

2)

a) Plot a straight line graph of d vs. t^2. **(2 marks)**



b) From your straight line graph, determine the slope of the line. (Include units.) **(1 mark)**

$slope = \frac{\Delta d}{\Delta t^2} = 0.28 \text{ m/s}^2$ ← **1 mark**

c) What is the acceleration due to gravity on the surface of this asteroid? **(2 marks)**

$d = \frac{1}{2}at^2$

$d = (0.28 \text{ m/s}^2)t^2$

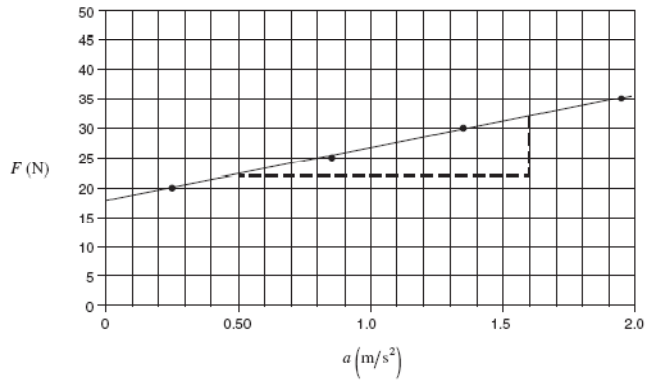
$\therefore \frac{1}{2}a = 0.28 \text{ m/s}^2$

$a = 0.56 \text{ m/s}^2$ ← **2 marks**

(Allocate one mark for 0.28 m/s^2 only.)

3)

Plot the data on the graph below and draw a line of best fit. Extend the line back to the 'y' axis so that you have a y-intercept point and determine the slope of the line.



(1 mark)

$slope = \frac{10 \text{ N}}{1.1 \text{ m/s}^2}$

$= 9.1 \text{ kg}$ ← **2 marks**

Using your slope value and your y-intercept value from the graph, determine the coefficient of friction between the block and the floor.

$F - F_{fr} = ma$

$F = ma + F_{fr}$

$y\text{-}intercept = F_{fr} = 17.5 \text{ N}$

$slope = mass = 9.1 \text{ kg}$

$17.5 = \mu mg$

$17.5 = \mu(9.1)9.8$ ← **1 mark**

$\mu = 0.20$ ← **1 mark**

4)

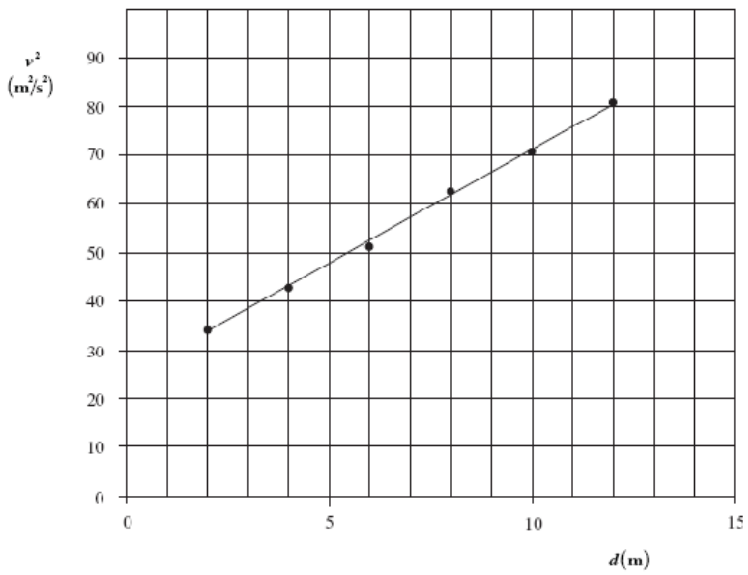
5. **(5 marks)**

A student measures the final speed of an accelerating car at various displacements. The data collected is shown below.

FINAL SPEED (m/s)	v^2	DISPLACEMENT (m)
5.9	34.8	2.0
6.5	42.3	4.0
7.2	51.8	6.0
7.9	62.4	8.0
8.4	70.6	10.0
9.0	81.0	12.0

Plot a graph of the final speed squared, v^2, versus the displacement, d, of the car on the graph below.

Graph of v^2 vs d



Determine the slope of the line of best fit to the data and state what the slope represents. Extend the line to the y-axis and use the y-intercept to determine the initial speed of the car.

Slope calculation:

$$m = \frac{\Delta v^2}{\Delta d}$$

$$= \frac{81 - 42}{12 - 4.0}$$

$$= 4.8 \text{ m/s}^2$$

Slope = $2 \times$ acceleration of the car ← **2 marks**

y – intercept $= 24 \text{ m}^2/\text{s}^2$

$\therefore v_i = (24)^{\frac{1}{2}} = 4.9 \text{ m/s}$ ← **1 mark**

Worksheet 1.3

1) 0.39 2) 0.42 3) 0.90 4) 13° 5) 74° 6) 27°

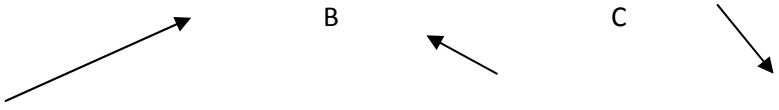
1) x = 63; y = 30. 2) x = 14; y = 39 3) R = 7.6; θ = 23° 4) R = 56; θ = 53° 5) R_1 = 4.47; R_2 = 3.16 6) $R_{resultant}$ = 10.0

1) R_x = 1.7 cm; R_y = 9.8 cm 2) R_x = 3.4 cm; R_y = 9.4 cm 3) R_x = 5.0 cm; R_y = 8.7 cm 4) R_x = 7.1 cm; R_y = 7.1 cm

5) R_{para} = 2 cm; R_{perp} = 3.5 cm 6) R_{para} = 3.5 cm; R_{perp} = 2 cm

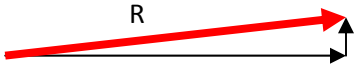
Vector Addition by Components

1) A B C



2) Ax = 5.17 cm; Ay = 1.88 cm; Bx = -1.69 cm; By = 0.62 cm; Cx = 1.05 cm; -2

3) 4.53 cm 4) 0.24 cm 5) R



6) R = 4.54 cm θ = 3.0°

Draw and Add Vectors

1) 11.3 m 22^{o} E of N 2) 188 m/s 23^{o} W of S 3) 9.4 m 29^{o} E of S 4) 72 m/s 78^{o} E of S

Change in Quantity

1) 10 m/s^2 53^{o} E of S 2) 15 m/s^2 68^{o} E of S 3) 9.8 m/s^2 down 4) 367m/s^2 back

5) Don't Do! 6) 9.7 m/s^2 30^{o} S of E

Worksheet 1.4

1) a. 2.7 m/s 33^{o} b. 33^{o} c. 21.6 m d. 41^{o}

Vector Problems

1) 148 m 3) 67^{o} 5) 23.6^{o}

7) swimmer 5: 494 s, ends up 693 m downstream, swimmer 6: 545 s

9) 587 km E and 749 km N

Vector Problems (Cosine or Trigonometric Methods)

1) 9.5 km/h 30^{o} E of N

3) 271 km/h 11^{o} W of N; 2.1 h

5) 288 km/h 8^{o} E of N

Worksheet 1.5

1) Vx = 36.8 m/s; Vyo = 30.8 m/s

3) a. Vx = 30.8 m/s; Vyo = 36.8 m/s b. 7.50 s c. 231 m d. 30.8 m/s horizontal

5) a. 10.0 s b. 279 m c. Oh Yeah!

7) a. Vx = 20.8 m/s; Vyo = 12 m/s b. 2.45 s c. 50.9 m d. 7.34 m e. 24 m/s 30^{o} below horiz

9) 11 m High

11) 1.28 s

13) 24.7 m/s 53^{o} above horiz