

Review of Homework

- 5 The cost of serving tea and biscuits varies directly with the square root of the number of people at the buffet. It costs £25 to serve tea and biscuits to 100 people.
- a How much will it cost to serve tea and biscuits to 400 people?
 - b For a cost of £37.50, how many could be served tea and biscuits?

6)

$$C = k\sqrt{P}$$

$$C = £25$$

$$P = 100$$

$$25 = k\sqrt{100}$$

$$25 = 10k$$

$$2.5 = k$$

$$C = 2.5\sqrt{P}$$

a) when $P = 400$

$$C = 2.5\sqrt{400}$$

$$C = 2.5 \times 20$$

$$C = \underline{\underline{£50}}$$

b) $37.50 = 2.5\sqrt{P}$

$$\frac{37.50}{2.5} = \sqrt{P}$$

$$15 = \sqrt{P}$$

$$15^2 = P$$

$$P = 225$$

225 people

7 In an experiment, the temperature, in °C, varied directly with the square of the pressure, in atmospheres. The temperature was 20 °C when the pressure was 5 atm.

a) What will the temperature be at 2 atm?

b) What will the pressure be at 80 °C?

$$C = kP^2$$

$$20 = k \times 5^2$$

$$20 = 25k$$

$$\frac{20}{25} = k$$

$$k = 0.8$$

$$C = 20$$

$$P = 5$$

$$\underline{C = 0.8P^2}$$

$$a) P = 2 \Rightarrow C = 0.8 \times 2^2$$

$$C = 3.2^\circ C$$

$$b) C = 80$$

$$80 = 0.8P^2$$

$$\frac{80}{0.8} = P^2$$

$$100 = P^2$$

$$P = \sqrt{100}$$

$$\underline{P = 10 \text{ atm}}$$

8 The weight, in grams, of ball bearings varies directly with the cube of the radius measured in millimetres. A ball bearing of radius 4 mm has a weight of 115.2 g.

- a What will a ball bearing of radius 6 mm weigh?
- b A ball bearing has a weight of 48.6 g. What is its radius?

$$W = k r^3$$

$$\begin{cases} r = 4 \\ w = 115.2 \end{cases}$$

$$115.2 = k \times 4^3$$

$$115.2 = 64k$$

$$\frac{115.2}{64} = k$$

$$k = 1.8$$

$$W = 1.8 r^3$$

a) $r = 6 \text{ mm}$

$$W = 1.8 \times 6^3$$

$$W = 388.8 \text{ g}$$

b) $w = 48.6$

$$48.6 = 1.8 r^3$$

$$\frac{48.6}{1.8} = r^3$$

$$27 = r^3$$

$$\sqrt[3]{27} = r$$

$$\underline{r = 3 \text{ mm}}$$



9 The energy, in J, of a particle varies directly with the square of its speed in m/s. A particle moving at 20 m/s has 50 J of energy.

- a How much energy has a particle moving at 4 m/s?
- b At what speed is a particle moving if it has 200 J of energy?

$$E = kv^2$$

$$v = 20$$

$$E = 50$$

$$50 = k \times 20^2$$

$$\frac{50}{400} = k$$

$$k = \frac{1}{8}$$

$$E = \frac{v^2}{8}$$

a) When $v = 4$ $E = \frac{4^2}{8} = \frac{16}{8} = 2$ j

b) When $E = 200$

$$200 = \frac{v^2}{8}$$

$$1600 = v^2$$

$$\sqrt{1600} = v$$

$$v = 40 \text{ m s}^{-1}$$

10 The cost, in £, of a trip varies directly with the square root of the number of miles travelled. The cost of a 100-mile trip is £35.

- a What is the cost of a 500-mile trip (to the nearest £1)?
- b What is the distance of a trip costing £70?

$$C = k\sqrt{m}$$

$$\begin{cases} m = 100 \\ C = 35 \end{cases}$$

$$35 = k\sqrt{100}$$

$$35 = 10k$$

$$3.5 = k$$

$$C = 3.5\sqrt{m}$$

$$a) \text{ when } m=500 \quad C = 3.5 \sqrt{500} = \pounds 78.26$$

$$b) \text{ when } C = \pounds 70$$

$$70 = 3.5 \sqrt{m}$$

$$\frac{70}{3.5} = \sqrt{m}$$

$$20 = \sqrt{m}$$

$$20^2 = m$$

$$m = 400 \text{ miles}$$

Inverse Proportion

Inverse proportion involves one variable increasing as the other decreases

Ex Gravitational Force and Distance between objects

Example 1

T is inversely proportional to m

If $T=6$ when $m=2$, find the following

a) T when $m=4$

b) m when $T=4.8$

$$T = \frac{k}{m}$$

$$6 = \frac{k}{2}$$

$$12 = k$$

$$T = \frac{12}{m}$$

$$a) \quad T = \frac{12}{4}$$

$$\underline{T = 3}$$

$$b) \quad 4.8 = \frac{12}{m}$$

$$4.8m = 12$$

$$m = \frac{12}{4.8}$$

$$\underline{m = 2.5}$$

4) M varies inversely with t^2

$$M = 9 \text{ when } t = 2$$

a) Find M when $t = 3$

b) Find t when $M = 1.44$

$$M = \frac{k}{t^2}$$

$$9 = \frac{k}{2^2}$$

$$9 = \frac{k}{4}$$

$$36 = k$$

$$M = \frac{36}{t^2}$$

a) when $t = 3$

$$M = \frac{36}{3^2}$$

$$\underline{M = 4}$$

b) when $M = 1.44$

$$1.44 = \frac{36}{t^2}$$

$$1.44t^2 = 36$$

$$t^2 = \frac{36}{1.44}$$

$$e^2 = 25$$

$$t = \sqrt{25}$$

$$t = +5$$
