

Examination Practice Questions

You should have:

A ruler, protractor, compasses, a pen, pencil, eraser, calculator.
For some questions, you may need tracing paper.

Instructions

- Use **black** ink or ball-point pen.
- Answer the questions in the spaces provided – *there may be more space than you need*.
- **Calculators may be used.**

Information

- The marks for each question are shown in brackets.
- Use the number of marks for each question as a guide as to how much time to spend on each question. As a rough guide, you can multiply the number of marks by 1.2 to see how many minutes you should spend on a question.
- Questions been carefully compiled from or modelled on a variety of past papers and will generally get more challenging as the document progresses. Some of the later questions will go beyond the core grade level for this topic.

Advice

- Read each question carefully before you start to answer it.
- Don't forget to have fun.
- Check your answers at the end.

Q1.

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b is directly proportional to a
 b is 10 when a is 8

Work out b when a is 9

$$b = k \times a$$

$$a = 9$$

$$10 = k \times 8$$

$$b = \frac{10}{8} \times 9$$

$$k = \frac{10}{8} \quad (M_1)$$

$$\underline{\underline{b = 11.25}} \quad (A_1)$$

$$\therefore b = \frac{10}{8} a$$

(2 marks)

Q2.

AtoZrevision.com

q is directly proportional to r .
 q is 68 when r is 20.
 Work out q when r is 25.

$$q = k \times r$$

$$r = 25$$

$$68 = k \times 20$$

$$q = \frac{68}{20} \times 25$$

$$k = \frac{68}{20} \quad (M_1)$$

$$q = \frac{68}{20} r$$

$$\underline{\underline{= 85}} \quad (A_1)$$

(2 marks)

Q3.

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y is directly proportional to x .

When $x = 500$, $y = 10$

Find a formula for y in terms of x .

$$y = kx$$

$$10 = k \times 500$$

$$k = \frac{1}{50} \quad (M_1)$$

$$y = \frac{x}{50}$$

$$\underline{\underline{y = \frac{x}{50}}} \quad (A_1)$$

(2 marks)

The time, T seconds, it takes a water heater to boil some water is directly proportional to the mass of water, m kg, in the water heater.

When $m = 250$, $T = 600$

Find T when $m = 400$

$$T = k \times M \quad (M_1)$$

$$600 = k \times 250$$

$$k = \frac{600}{250} \quad (M_1)$$

$$T = \frac{600}{250} M$$

$$m = 400$$

$$T = \frac{600}{250} \times 400 = \underline{\underline{960}} \quad (A_1)$$

(3 marks)

A ball falls vertically after being dropped.

The ball falls a distance d metres in a time of t seconds.

d is directly proportional to the square of t .

$$d = k \times t^2 \quad (M_1)$$

The ball falls 20 metres in a time of 2 seconds. Calculate the time the ball takes to fall 605 m.

$$20 = k \times 4 \quad \therefore k = 5 \quad (M_1)$$

$$d = 5 \times t^2$$

$$605 = 5 \times t^2 \quad (M_1)$$

$$\frac{605}{5} = t^2 \quad \therefore \underline{\underline{t = 11}} \quad (A_1)$$

$$(or 121)$$

$$[t \neq -11]$$

(4 marks)

The distance, D , travelled by a particle is directly proportional to the square of the time, t , taken.

When $t = 40$, $D = 30$

Find D when $t = 2$

$$D = k \times t^2 \quad (M_1)$$

$$30 = k \times 40^2 \quad 1600$$

$$\frac{30}{1600} = k \quad (M_1)$$

WHEN $t = 2$

$$D = \frac{30}{1600} t^2$$

$$D = \frac{30}{1600} \times 4$$

$$= \frac{120}{1600} \quad (A_1)$$

(3 marks)

The height of a balloon, h , varies directly as the square root of its surface area, A .

When the balloon's surface area is 81 its height is 12

What is the height when its surface area is 144?

$$h = k \times \sqrt{A} \quad (M_1)$$

$$12 = k \times \sqrt{81} \quad 9$$

$$k = \frac{12}{9} = \frac{4}{3} \quad (M_1)$$

WHEN S.A. is 144:

$$h = \frac{4}{3} \sqrt{144} = 16 \quad (A_1)$$

(3 marks)

Q8.

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The time period, T , of a simple pendulum is directly proportional to the square root of the length, d , of the pendulum.

When $d = 6$, $T = 5$

Find the value of T when $d = 3$

$$T = k \times \sqrt{d} \quad (M_1)$$

$$5 = k \times \sqrt{6}$$

$$k = \frac{5}{\sqrt{6}} \quad \therefore T = \frac{5}{\sqrt{6}} \sqrt{d}$$

(A₁)

When $d = 3$

$$T = \frac{5}{\sqrt{6}} \times \sqrt{3} = \underline{\underline{3.54}} \quad (A_1)$$

(M₁)

(4 marks)

Q9.

AtoZrevision.com

P is directly proportional to the cube of Q .

When $Q = 15$, $P = 1350$

Find a formula for P in terms of Q .

$$P = k \times Q^3 \quad (M_1)$$

$$(M_1) \quad 1350 = k \times 15^3 \quad 3375$$

$$= \frac{1350}{3375} = k = 0.4$$

$$\therefore P = 0.4 \times Q^3 \quad (A_1)$$

(3 marks)

The mass, in milligrams, of a steel ball bearing is directly proportional to the cube of its diameter, in millimetres.

A 3.5 mm diameter ball bearing has a mass of 170 mg.

Calculate the mass of a ball bearing with a diameter of 5.5 mm.

$$M = k \times d^3 \quad (M_1)$$

$$170 = k \times 3.5^3$$

$$k = \frac{170}{3.5^3} \quad (M_1) \quad \therefore m = \frac{170}{3.5^3} \times d$$

when $d = 5.5$

$$m = \frac{170}{3.5^3} \times 5.5 = 660 \quad (A_1)$$

NEAREST WHOLE NUMBER (2 marks)