C16

Proportion

CHAPTER ASSIGNMENT · 114 MARKS

Name _____ Class _____ No. _____ Date _____

Answer every question in the space given. For each one, write the proportion as an equation with k, find k from the pair you are given, then use the equation. You may use a calculator.

Practice questions from *Cambridge IGCSE Mathematics Core and Extended* (4th edition), Chapter 16 (Proportion), for classroom use. Every book exercise and Student assessment question is included. The Check yourself and Chapter quiz questions are Guru Jazzy's own.

Exercise 16.1 · Direct and inverse proportion (Extended)

16.1.1 y is directly proportional to x. If y = 6 when x = 2, find: (a) the constant of proportionality · (b) the value of y when x = 7 · (c) the value of y when x = 9 · (d) the value of x when y = 9 · (e) the value of x when y = 30. [5]

16.1.2 y is directly proportional to x^2. If y = 18 when x = 6, find: (a) the constant of proportionality · (b) the value of y when x = 4 · (c) the value of y when x = 7 · (d) the value of x when y = 32 · (e) the value of x when y = 128. [5]

16.1.3 y is inversely proportional to x^3. If $y = 3$ when $x = 2$, find: (a) the constant of proportionality · (b) the value of y when $x = 4$ · (c) the value of y when $x = 6$ · (d) the value of x when $y = 24$. [4]

16.1.4 y is inversely proportional to x^2. If $y = 1$ when $x = 0.5$, find: (a) the constant of proportionality · (b) the value of y when $x = 0.1$ · (c) the value of y when $x = 0.25$ · (d) the value of x when $y = 64$. [4]

Exercise 16.2 · Writing and using proportion (Extended)

16.2.1 Write each of the following in the form: (i) $y \propto x$ (ii) $y = kx$. [12]

(a) y is directly proportional to x^3

(b) y is inversely proportional to x^3

(c) t is directly proportional to P

(d) s is inversely proportional to t

(e) A is directly proportional to r^2

(f) T is inversely proportional to the square root of g.

16.2.2 If $y \propto x$ and $y = 6$ when $x = 2$, find y when $x = 3.5$. [2]

16.2.3 If $y \propto 1/x$ and $y = 4$ when $x = 2.5$ find:

(a) y when $x = 20$ [2]

(b) x when $y = 5$. [1]

16.2.4 If $p \propto r^2$ and $p = 2$ when $r = 2$, find p when $r = 8$. [2]

16.2.5 If $m \propto 1/r^3$ and $m = 1$ when $r = 2$, find:

(a) m when r = 4 [2]

(b) r when m = 125. [2]

16.2.6 If $y \propto x^2$ and $y = 12$ when $x = 2$, find y when x = 5. [2]

Exercise 16.3 · Proportion problems (Extended)

16.3.1 If a stone is dropped off the edge of a cliff, the height (h metres) of the cliff is proportional to the square of the time (t seconds) taken for the stone to reach the ground.

A stone takes 5 seconds to reach the ground when dropped off a cliff 125 m high.

(a) Write down a relationship between h and t, using k as the constant of proportionality. [1]

(b) Calculate the constant of proportionality. [1]

(c) Find the height of a cliff if a stone takes 3 seconds to reach the ground. [1]

(d) Find the time taken for a stone to fall from a cliff 180 m high. [2]

16.3.2 The velocity (v metres per second) of a body is known to be proportional to the square root of its kinetic energy (e joules). When the velocity of a body is 120 m/s, its kinetic energy is 1600 J.

(a) Write down a relationship between v and e, using k as the constant of proportionality. [1]

(b) Calculate the value of k. [1]

(c) If v = 21, calculate the kinetic energy of the body in joules. [2]

16.3.3 The length (l cm) of an edge of a cube is proportional to the cube root of its mass (m grams). It is known that if l = 15, then m = 125. Let k be the constant of proportionality.

(a) Write down the relationship between l, m and k. [1]

(b) Calculate the value of k. [1]

(c) Calculate the value of l when m = 8. [1]

16.3.4 The power (P) generated in an electrical circuit is proportional to the square of the current (I amps). When the power is 108 watts, the current is 6 amps.

(a) Write down a relationship between P, I and the constant of proportionality, k. [1]

(b) Calculate the value of I when P = 75 watts. [2]

Student assessment 1 (Extended)

SA1.1 $y = kx$. When $y = 12$, $x = 8$. (a) Calculate the value of k. · (b) Calculate y when $x = 10$. · (c) Calculate y when $x = 2$. · (d) Calculate x when $y = 18$. [4]

SA1.2 $y = k/x$. When $y = 2$, $x = 5$. (a) Calculate the value of k. · (b) Calculate y when $x = 4$. · (c) Calculate x when $y = 10$. · (d) Calculate x when $y = 0.5$. [4]

SA1.3 $p = kq^3$. When $p = 9$, $q = 3$. (a) Calculate the value of k. · (b) Calculate p when $q = 6$. · (c) Calculate p when $q = 1$. · (d) Calculate q when $p = 576$. [5]

SA1.4 $m = k/\sqrt{n}$. When $m = 1$, $n = 25$. (a) Calculate the value of k. · (b) Calculate m when $n = 16$. · (c) Calculate m when $n = 100$. · (d) Calculate n when $m = 5$. [5]

SA1.5 $y = k/x^2$. When $y = 3$, $x = 1/3$. (a) Calculate the value of k. · (b) Calculate y when $x = 0.5$. · (c) Calculate both values of x when $y = 1/12$. · (d) Calculate both values of x when $y = 1/3$. [6]

Student assessment 2 (Extended)

SA2.1 y is inversely proportional to x.

(a) Copy and complete the table below: [3]

x	1	2	4	8	16	32
y				4		

(b) What is the value of x when $y = 20$? [1]

SA2.2 Copy and complete the tables below:

(a) $y \propto x$ [2]

x	1	2	4	5	10
y		10			

(b) $y \propto 1/x$ [2]

x	1	2	4	5	10
y	20				

(c) $y \propto \sqrt{x}$ [2]

x	4	16	25	36	64
y	4				

SA2.3 The pressure (P) of a given mass of gas is inversely proportional to its volume (V) at a constant temperature. If P = 4 when V = 6, calculate:

(a) P when V = 30 [2]

(b) V when P = 30. [1]

SA2.4 The gravitational force (F) between two masses is inversely proportional to the square of the distance (d) between them. If F = 4 when d = 5, calculate:

(a) F when d = 8 [2]

(b) d when F = 25. [2]

Check yourself

1 Explain how you can tell from a table of values whether $y \propto x$ or $y \propto 1/x$. Use the pairs (2, 12), (3, 8) and (6, 4) in your answer. [3]

2 $y \propto x^2$. What happens to y when x is multiplied by 3? Explain why. [2]

3 $y \propto \sqrt{x}$ and y = 10 when x = 4. Find y when x = 36, and x when y = 35. [4]

4 The time t hours a tank takes to fill is inversely proportional to the number of pipes n. With 3 pipes it takes 8 hours. How long do 4 pipes take? [3]

5 The graph of y against x^3 is a straight line through the origin with gradient 0.5. Write y in terms of x and find y when x = 4. [3]

Chapter quiz

Q1 y is directly proportional to x. Which equation shows this?

A	B	C	D
$y = kx$	$y = k/x$	$y = x + k$	$y = kx^2$

Q2 The graph of y against x for $y \propto x$ is always...

A	B	C	D
a curve through the origin	a straight line through the origin	a horizontal line	a line that misses the origin

Q3 $y \propto x$ and $y = 12$ when $x = 3$. What is k?

A	B	C	D
36	9	4	15

Q4 $y \propto x$ and $y = 10$ when $x = 4$. Find y when $x = 6$.

A	B	C	D
12	15	16	24

Q5 $y \propto x^2$. If x is doubled, what happens to y?

A	B	C	D
y doubles	y is halved	y is multiplied by 4	y stays the same

Q6 $y \propto x^2$ and $y = 45$ when $x = 3$. Find y when $x = 4$.

A	B	C	D
60	80	48	5

Q7 y is inversely proportional to x. Which equation shows this?

A	B	C	D
$y = kx$	$y = x - k$	$y = k/x$	$y = kx^2$

Q8 $y \propto 1/x$ and $y = 6$ when $x = 4$. What is k?

A	B	C	D
1.5	10	24	2/3

Q9 $y \propto 1/x$ and $y = 8$ when $x = 3$. Find y when $x = 12$.

A	B	C	D
32	2	4	0.5

Q10 $y \propto 1/x^2$. If x is doubled, what happens to y?

A	B	C	D
y is divided by 4	y is doubled	y is halved	y is multiplied by 4

Q11 $y \propto \sqrt{x}$ and $y = 6$ when $x = 9$. Find y when $x = 25$.

A	B	C	D
10	15	50/3	2

Q12 Which graph is a straight line through the origin when $y \propto x^2$?

A	B	C	D
y against x	y against x^2	y against $\sqrt{x}$	y against 1/x

End of assignment · Check your answers against the chapter at gurujazzy.com/subjects/o-level-mathematics/chapter-16-proportion/