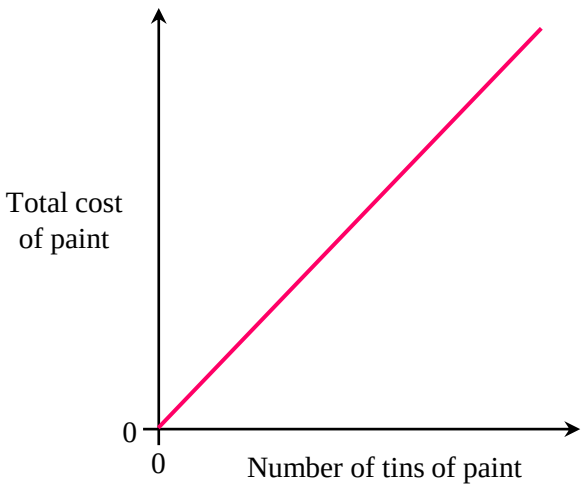
Direct and Inverse Proportion

SCAN ME

REVISE THIS TOPIC

1 Sarah is painting the walls of her house.
The total cost of the paint needed is directly proportional to the number of tins of paint that Sarah buys.

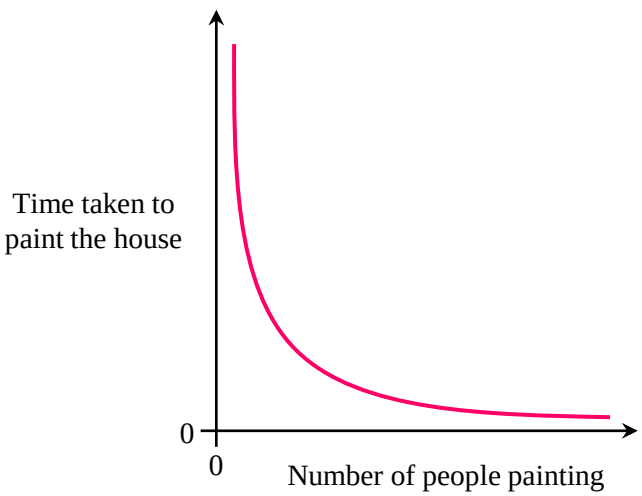
(a) On the axes, sketch a graph showing this relationship.



(1)

Sarah asks her friends to help her paint the house.
The time taken to paint the house is inversely proportional to the number of people painting.

(b) On the axes, sketch a graph showing this relationship.



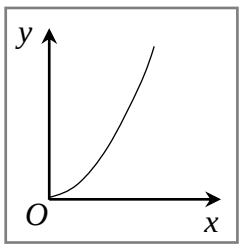
(1)

(Total for Question 1 is 2 marks)

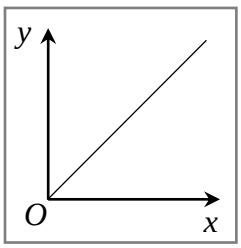
2 The graphs of y against x represent different types of proportionality.

Match each type of proportionality in the table to the correct graph.

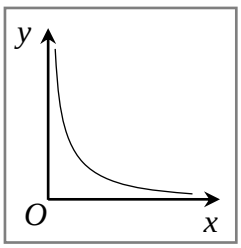
Graph A



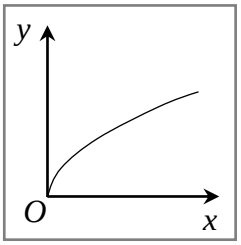
Graph B



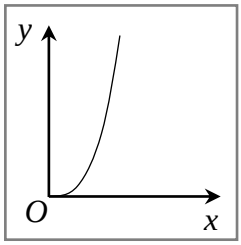
Graph C



Graph D



Graph E



Type of proportionality	**Graph Letter**
$y \propto x$	B
$y \propto x^2$	A
$y \propto x^3$	E
$y \propto \sqrt{x}$	D
$y \propto \frac{1}{x}$	C

(Total for Question 2 is 3 marks)

3 y is directly proportional to x
$y = 60$ when $x = 4$

Find the value of y when $x = 20$

$y = kx$

$60 = k \times 4$

$k = \frac{60}{4}$

$k = 15$

$y = 15x$ $\quad$ $y = 15 \times 20$

300

(Total for Question 3 is 3 marks)

4 R is inversely proportional to G
$R = 80$ when $G = 3$

Work out the value of R when $G = 16$

$R = \frac{k}{G}$ $\quad$ $R = \frac{240}{G}$

$80 = \frac{k}{3}$ $\quad$ $R = \frac{240}{16}$

$k = 80 \times 3$

$k = 240$

15

(Total for Question 4 is 3 marks)

5 H is directly proportional to p^2
$H = 50$ when $p = 10$

Work out the value of H when $p = 6$

$H = kp^2$
$50 = k \times 10^2$
$50 = k \times 100$
$k = \frac{50}{100}$
$k = 0.5$

$H = 0.5p^2$
$H = 0.5 \times 6^2$
$H = 0.5 \times 36$

18

(Total for Question 5 is 3 marks)

6 J is inversely proportional to $\sqrt{F}$
$J = 12$ when $F = 9$

Work out the value of J when $F = 4$

$J = \frac{k}{\sqrt{F}}$
$12 = \frac{k}{\sqrt{9}}$
$12 = \frac{k}{3}$
$k = 12 \times 3$
$k = 36$

$J = \frac{36}{\sqrt{F}}$
$J = \frac{36}{\sqrt{4}}$
$J = \frac{36}{2}$

18

(Total for Question 6 is 3 marks)

7 q is directly proportional to r^3
$q = 250$ when $r = 10$
Work out the value of q when $r = 3$
Give your answer as a mixed number.

$q = kr^3$

$250 = k \times 10^3$

$250 = k \times 1000$

$k = \frac{250}{1000}$

$k = \frac{1}{4}$

$q = \frac{1}{4}r^3$

$q = \frac{1}{4} \times 3^3$

$q = \frac{1}{4} \times 27$

$q = \frac{27}{4}$

$6\frac{3}{4}$

(Total for Question 7 is 4 marks)

8 v is inversely proportional to the square of e
$v = 0.2$ when $e = 8$

Work out the value of v when $e = 10$

$V = \frac{k}{e^2}$

$0.2 = \frac{k}{8^2}$

$0.2 = \frac{k}{64}$

$k = 0.2 \times 64$

$k = 12.8$

$V = \frac{12.8}{e^2}$

$V = \frac{12.8}{10^2}$

$V = \frac{12.8}{100}$

0.128

(Total for Question 8 is 3 marks)

9 (a) x is directly proportional to y

Complete the table of values.

x	2	6	9
y	1	3	4.5

(2)

(b) b is inversely proportional to c

Complete the table of values.

b	5	10	200
c	4	2	0.1

(2)

(c) p is directly proportional to q^2

Complete the table of values.

p	4	64	100
q	1	4	5

(2)

(d) m is inversely proportional to $\sqrt{n}$

Complete the table of values.

m	24	6	30
n	25	400	16

(2)

(Total for Question 9 is 8 marks)

10 m is directly proportional to the cube root of n
$m = 8$ when $n = 8000$

Work out the value of m when $n = 1.25 \times 10^{-4}$

$m = k \times \sqrt[3]{n}$

$8 = k \times \sqrt[3]{8000}$

$8 = k \times 20$

$k = \frac{8}{20}$

$k = \frac{2}{5}$

$m = \frac{2}{5}\sqrt[3]{n}$

$m = \frac{2}{5} \times \sqrt[3]{0.000125}$

$m = \frac{2}{5} \times 0.05$

0.02

(Total for Question 10 is 3 marks)

11 The table shows a set of values for x, y and z

x	2	8	50
y	100	25	4
z	1	2	5

Use a phrase from the box below to complete each of the statements.
Each phrase could be used once, more than once or not at all.

directly proportional	inversely proportional	not proportional

x is inversely proportional to y

y is inversely proportional to z^2

x is directly proportional to z^2

(Total for Question 11 is 3 marks)

12 A is directly proportional to B^3
When $A = 6$, $B = 2$

B is inversely proportional to C
When $B = 150$, $C = 0.2$

Work out the value of A when $C = 45$
Give your answer as a fraction in its simplest form.

$A = k_1 B^3$
$6 = k_1 \times 2^3$
$6 = k_1 \times 8$
$k_1 = \frac{6}{8}$
$k_1 = \frac{3}{4}$
$A = \frac{3}{4} B^3$

$B = \frac{k_2}{C}$
$150 = \frac{k_2}{0.2}$
$k_2 = 150 \times 0.2$
$k_2 = 30$
$B = \frac{30}{C}$

when $C = 45$
$B = \frac{30}{45}$
$B = \frac{2}{3}$

when $B = \frac{2}{3}$
$A = \frac{3}{4} \times \left(\frac{2}{3}\right)^3$
$A = \frac{3}{4} \times \frac{8}{27}$
$A = \frac{24}{108}$
$\frac{2}{9}$

(Total for Question 12 is 5 marks)

13 F, G and H have positive values.

F is directly proportional to the square root of G
When $F = 1$, $G = 0.16$

G is inversely proportional to the cube of H
When $G = 1000$, $H = 0.2$

Work out the value of H when $F = 20$

$F = k_1 \sqrt{G}$
$1 = k_1 \times \sqrt{0.16}$
$1 = k_1 \times 0.4$
$k_1 = \frac{1}{0.4}$
$k_1 = 2.5$
$F = 2.5\sqrt{G}$

$G = \frac{k_2}{H^3}$
$1000 = \frac{k_2}{0.2^3}$
$k_2 = 1000 \times 0.2^3$
$k_2 = 8$
$G = \frac{8}{H^3}$

when $F = 20$
$20 = 2.5\sqrt{G}$ (÷2.5)
$8 = \sqrt{G}$
$8^2 = G$
$G = 64$

when $G = 64$
$64 = \frac{8}{H^3}$
$H^3 = \frac{8}{64}$
$H = \sqrt[3]{\frac{1}{8}}$
$\frac{1}{2}$

(Total for Question 13 is 5 marks)

14 A, B and C are positive values.

A is inversely proportional to the square root of B
When $A = 1.5$, $B = 100$

B is directly proportional to C^2
When $B = 0.09$, $C = 0.1$

Find a formula for A in terms of C.
Give your answer in its simplest form.

$A = \frac{k_1}{\sqrt{B}}$

$1.5 = \frac{k_1}{\sqrt{100}}$

$1.5 = \frac{k_1}{10}$

$k_1 = 1.5 \times 10$

$k_1 = 15$

$A = \frac{15}{\sqrt{B}}$

$B = k_2 C^2$

$0.09 = k_2 \times 0.1^2$

$k_2 = \frac{0.09}{0.1^2}$

$k_2 = 9$

$B = 9C^2$

$A = \frac{15}{\sqrt{9C^2}}$

$A = \frac{15}{3C}$

$A = \frac{5}{C}$

$A = \frac{5}{C}$

(Total for Question 14 is 5 marks)

15 f is directly proportional to g^2

When $f = 2\frac{2}{3}$, $g = 4$

g is inversely proportional to h
When $g = 40$, $h = 0.3$

Find a formula for f in terms of h.
Give your answer in its simplest form.

$f = k_1 g^2$

$2\frac{2}{3} = k_1 \times 4^2$

$\frac{8}{3} = k_1 \times 16$

$\frac{8}{3 \times 16} = k_1$

$k_1 = \frac{8}{48}$

$k_1 = \frac{1}{6}$

$f = \frac{1}{6} g^2$

$g = \frac{k_2}{h}$

$40 = \frac{k_2}{0.3}$

$k_2 = 40 \times 0.3$

$k_2 = 12$

$g = \frac{12}{h}$

$f = \frac{1}{6} \times \left(\frac{12}{h}\right)^2$

$f = \frac{1}{6} \times \frac{144}{h^2}$

$f = \frac{144}{6h^2}$

$f = \frac{24}{h^2}$

$f = \frac{24}{h^2}$

.....

(Total for Question 15 is 5 marks)