DIRECT AND INVERSE PROPORTION – PRACTICE QUESTIONS

metatutor

1.
B is directly proportional to A.
When A = 6, B = 72.

(a) Find an equation for B in terms of A.

$B = kA$
$72 = k \times 6$
$72 = 6k$
$12 = k$

$B = 12A$

(b) Find the value of B when A = 4.5.

$B = 4.5 \times 12 = 54$

2.
D is directly proportional to C.
When C = 5, D = 90.

(a) Find an equation for D in terms of C.

$D = kC$
$90 = k \times 5$
$18 = k$

$D = 18C$

(b) Find the value of D when C = 7.

$D = 18 \times 7 = 126$

(c) Find the value of C when D = 126.

$126 = 18C$
$C = 7$

3.
F is directly proportional to E^2.
When E = 3, F = 108.

(a) Find an equation for F in terms of E.

$F = kE^2$
$108 = k \times 3^2$
$108 = 9k$
$12 = k$
$F = 12E^2$

(b) Find the value of F when E = 2.

$F = 12 \times 2^2 = 48$

(c) Find the value of E when F = 1200.

$1200 = 12E^2$
$100 = E^2$
$E = 10$

4.
G is directly proportional to $\sqrt{H}$.
When H = 400, G = 60.

(a) Find an equation for G in terms of H.

$G = k\sqrt{H}$
$60 = k \times \sqrt{400}$
$60 = 20k$
$k = 3$
$G = 3\sqrt{H}$

(b) Find the value of G when H = 64.

$G = 3 \times \sqrt{64} = 24$

(c) Find the value of H when G = 75.

$75 = 3\sqrt{H}$
$25 = \sqrt{H}$
$5 = H$

5.
Q is inversely proportional to P.
When P = 0.5, Q = 16.

(a) Find an equation for Q in terms of P.

$Q = \frac{k}{P}$

$16 = \frac{k}{0.5}$

$8 = k$

$Q = \frac{8}{P}$

(b) Find the value of Q when P = 4.

$Q = 8/4 = 2$

(c) Find the value of P when Q = 1.6.

$1.6 = \frac{8}{P}$

$1.6P = 8$

$P = \frac{8}{1.6} = 5$

6.
M is inversely proportional to N.
When N = 6, M = 11.

(a) Find an equation for M in terms of N.

$M = \frac{k}{N}$

$11 = \frac{k}{6}$

$66 = k$

$M = \frac{66}{N}$

(b) Find the value of N when M = 132.

$132 = \frac{66}{N}$

$N = \frac{66}{132} = \frac{1}{2}$

(c) Find the value of M when N = 22.

$M = \frac{66}{22} = 3$

7.
O is inversely proportional to P^3.
When P = 3, O = 2.

(a) Find an equation for O in terms of P.

$O = \frac{k}{P^3}$

$2 = \frac{k}{3^3}$

$2 = \frac{k}{27}$

$54 = k$

$O = \frac{54}{P^3}$

(b) Find the value of O when P = 2.

$O = \frac{54}{2^3} = 6.75$

(c) Find the value of P when O = 432.

$432 = \frac{54}{P^3}$ $P^3 = \frac{54}{432}$ $P = \sqrt[3]{\frac{54}{432}} = \frac{1}{2}$

8.
T is inversely proportional to $\sqrt{U}$.
When U = 16, T = 20.

(a) Find an equation for T in terms of U.

$T = \frac{k}{\sqrt{U}}$

$20 = \frac{k}{\sqrt{16}}$

$80 = k$

$T = \frac{80}{\sqrt{U}}$

(b) Find the value of U when T = 160.

$160 = \frac{80}{\sqrt{U}}$ $\sqrt{U} = \frac{80}{160}$ $U = \left(\frac{80}{160}\right)^2 = \frac{1}{4}$

(c) Find the value of T when U = 64.

$T = \frac{80}{\sqrt{64}} = \frac{80}{8} = 10$

9.
W is directly proportional to V^2.
When V = 5, W = 400.

(a) Find an equation for W in terms of V.

$W = kV^2$
$400 = k \times 5^2$
$400 = 25k$
$k = 16$

$W = 16V^2$

(b) Find the value of W when V = 1.5.

$W = 16 \times 1.5^2 = 36$

(c) Find the value of V when W = 6.

$6 = 16V^2$ $\quad \frac{6}{16} = V^2$ $\quad V = \sqrt{\frac{6}{16}} = 0.612372\ldots$
$= 0.6$

10.
Y is inversely proportional to $\sqrt[3]{X}$.
When X = 125, Y = 22.

(a) Find an equation for Y in terms of X.

$Y = \frac{k}{\sqrt[3]{X}}$
$22 = \frac{k}{\sqrt[3]{125}}$
$k = 22 \times \sqrt[3]{125}$
$= 110$

$Y = \frac{110}{\sqrt[3]{X}}$

(b) Find the value of Y when X = 1,000.

$Y = \frac{110}{\sqrt[3]{1000}} = 11$

(c) Find the value of X when Y = 13. Give your answer to 3 significant figures.

$13 = \frac{110}{\sqrt[3]{X}}$ $\quad \sqrt[3]{X} = \frac{110}{13}$ $\quad X = \left(\frac{110}{13}\right)^3 = 605.826\ldots$
$= 606$

11.

$e \propto r^2$.

Complete the table.

e	750	120	30
r	10	4	2

$e = kr^2$

$750 = k \times 10^2$

$\frac{750}{100} = k$

$k = 7.5$

$e = 7.5r^2$

$r = 4, e = 7.5 \times 4^2$

$= 120$

$e = 30, 30 = 7.5 \times r^2$

$4 = r^2$

$r = 2$

12.

$L \propto \frac{1}{M}$.

Complete the table.

L	0.5	12	0.15
M	6	0.25	20

$L = \frac{k}{M}$

$0.15 = \frac{k}{20}$

$3 = k$

$L = \frac{3}{M}$

$L = 0.5, 0.5 = \frac{3}{M}$

$M = \frac{3}{0.5}$

$= 6$

$M = 0.25, L = \frac{3}{0.25}$

$= 12$

13.

$P \propto \frac{1}{t^2}$.

Complete the table.

P	0.0125	0.8	20
t	4	0.5	0.1

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

$20 = \frac{k}{0.1^2}$

$0.2 = k$

$P = \frac{0.2}{t^2}$

$t = 4, P = \frac{0.2}{4^2} = 0.0125$

$P = 0.8, 0.8 = \frac{0.2}{t^2}$

$t^2 = \frac{0.2}{0.8}$

$t = \frac{1}{2} = 0.5$

14.

The weight (in grams) of a piece of wire is directly proportional to its length (in centimetres).
A piece of wire weighs 100 grams and is 25 centimetres long.

Find the weight of a piece of wire which is 60 centimetres long.

$W = kL$

$100 = k \times 25$

$k = 4$

$W = 4L$

$L = 60, W = 4 \times 60$

$= 240$ grams

15.

The force F (in Newtons) between two magnets is inversely proportional to the distance D (in metres) between them.
When the magnets are 0.8 m apart, the force between them is 150 Newtons.

Find the distance between the two magnets when the force between them is 220 Newtons.

$F = \frac{k}{D}$

$150 = \frac{k}{0.8}$

$120 = k$

$F = \frac{120}{D}$

$F = 220,$

$220 = \frac{120}{D}$

$D = \frac{120}{220} = 0.54 = 0.5454\ldots$ m

$= 55$ cm

16.
The speed that a long distance runner runs at is inversely proportional to the time they have been running for.
After running for 2 hours, the runner is running at 3 metres per second.

Work out the speed at which the runner is running after 150 minutes.

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

$3 = \frac{k}{2}$

$k = 6$

$S = \frac{6}{T}$

$T = 150$ minutes
$= 2.5$ hours

$S = \frac{6}{2.5} = 2.4$ m/s

17.
The distance, D (in kilometres), travelled by a space shuttle is directly proportional to the square of the amount of fuel carried, F (in gallons).
On Mission 1, the shuttle carried 500 gallons of fuel and travelled 6.5×10^5 kilometres.
On Mission 2, the shuttle travelled 8.8×10^6 kilometres.

Find the number of gallons of fuel carried by the shuttle on Mission 2, to the nearest gallon.

$D = kF^2$

$6.5 \times 10^5 = k \times 500^2$

$k = 2.6$

$D = 2.6F^2$

$D = 8.8 \times 10^6$, $8.8 \times 10^6 = 2.6F^2$

$3384615.385 = F^2$

$F = 1,839.732\ldots$

$= 1,840$ gallons