Unit 22: Variation

1. M/J 18/P12/Q4

y is inversely proportional to the square of x.

Given that $y = 10$ when $x = 3$, find y when $x = \frac{1}{2}$. [2]

2. M/J 17/P12/Q12

y is inversely proportional to the square of x.
The table shows some values for x and y.

x	2	4	p
y	3	$\frac{3}{4}$	48

(a) Find the equation connecting x and y. [2]

(b) Find the value of p. [1]

3. O/N 17/P12/Q3

y is inversely proportional to x.

Given that $y = \frac{1}{6}$ when $x = 30$, find y when $x = 10$. [2]

4. O/N 17/P11/Q8

y varies directly as the square of x.

Given that $y = \frac{1}{5}$ when $x = \frac{1}{2}$, find y when $x = 10$. [2]

5. M/J 16/P11/Q15

(a) y is directly proportional to the square of x.
Given that $y = 8$ when $x = 4$, find y when $x = 3$. [2]

(b) p is inversely proportional to q.
It is known that $p = 15$ for a particular value of q.
Write down the value of p when this value of q is doubled. [1]

6. O/N 15/P12/Q3

y varies directly as the square root of x.

Given that $y = 18$ when $x = 9$, find y when $x = 4$. [2]

7. O/N 15/P11/Q9

(a)

p	27	33
q	9	r

Given that p is directly proportional to q, find the value of r. [1]

(b)

x	2	10
y	25	1

Complete the sentence below describing the relationship between x and y.

y is inversely proportional to ..... [1]

(c) M is directly proportional to L^3.
How many times larger is M when L is multiplied by 2? [1]

8. M/J 15/P12/Q7

y is inversely proportional to the square of x.
Given that $y = 24$ when $x = 2$, find y when $x = 8$. **[2]**

9. M/J 15/P11/Q9

y is inversely proportional to the square of x.
Given that $y = 3$ when $x = 2$, find y when $x = 5$. **[2]**

10. O/N 14/P12/Q10

y is inversely proportional to x.
Given that $y = 9$ when $x = 8$, find y when $x = 6$. **[2]**

11. O/N 13/P12/Q6

y is inversely proportional to x.
Given that $y = 20$ when $x = 2$, find y when $x = 5$. [2]

12. M/J 13/P12/Q15

P is directly proportional to the square of Q.
When $P = 9$, $Q = 6$.
(a) Find the formula for P in terms of Q. **[1]**
(b) Find the values of Q when $P = 25$. **[2]**

13. M/J 13/P11/Q21

R is directly proportional to the **cube** of p.
When $p = 2$, $R = 24$.
(a) Find the formula for R in terms of p. **[1]**
(b) Find the value of p when $R = 192$. **[2]**
(c) Which of the diagrams below represents the graph of R against p?

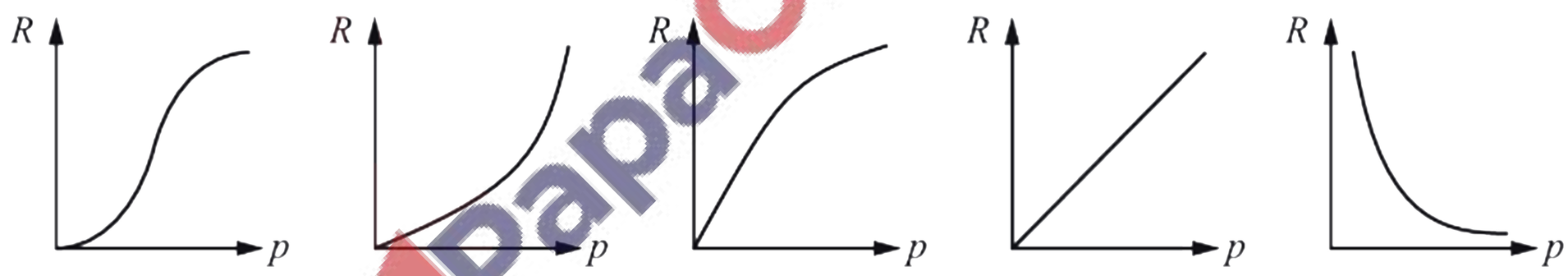

Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

[1]

14. M/J 12/P12/Q5

y is inversely proportional to the square of x.
Given that $y = 2$ when $x = 6$, find the value of y when $x = 2$. [2]

15. O/N 11/P12/Q13

y is inversely proportional to x.
The table shows some values of x and y.

x	3	4	q	n
y	20	p	5	m

(a) Find p. [1]
(b) Find q. [1]
(c) Express m in terms of n. [1]

16. M/J 11/P12/Q8

y is directly proportional to the square of x.
Given that $y = 2$ when $x = 4$, find y when $x = 10$. [2]

17. O/N 10/P12/Q7, O/N 10/P13/Q7

y is directly proportional to the square of x.
Given that $y = 50$ when $x = 5$, find the value of y when $x = 3$. [2]

18. O/N 10/P11/Q7

y varies inversely as the square of x.
Given that $y = 4$ when $x = 3$, find the value of y when $x = 2$. [2]

19. M/J 10/P12/Q12, M/J 10/P13/Q12

It is given that y is inversely proportional to the square of x and that $y = 48$ when $x = \frac{1}{2}$.
Find
(a) the formula for y in terms of x, [2]
(b) the values of x when $y = 3$. [1]

20. M/J 10/P11/Q17

y is inversely proportional to x^2.
Some values of y and x are given in the table below.

x	3	2	q
y	4	p	1

Find
(a) the formula for y in terms of x, [2]
(b) the value of p, [1]
(c) the two values of q. [1]

21. O/N 09/P1/Q6

y is inversely proportional to x.
Given that $y = 250$ when $x = 4$, find y when $x = 80$. [2]

22. M/J 09/P1/Q12

y is directly proportional to the square root of x.
Given that $y = 12$ when $x = 36$,
find
(a) the formula for y in terms of x, [2]
(b) the value of x when $y = 10$. [1]

23. O/N 08/P1/Q10

T is inversely proportional to the square of L.
Given that $T = 9$ when $L = 2$, find
(a) the formula for T in terms of L,
(b) the values of L when $T = 25$. [2]

24. M/J 08/P1/Q10

It is given that y is directly proportional to the square of x and that $y = 1$ when $x = \frac{1}{2}$.
Find
(a) the formula for y in terms of x, [2]
(b) the values of x when $y = 9$. [1]

Answers Section

1. M/J 18/P12/Q4

360 **2**

2. M/J 17/P12/Q12

(a) $y = \frac{12}{x^2}$ oe **2**

(b) [±] $\frac{1}{2}$ oe **1**

3. O/N 17/P12/Q3

$\frac{1}{2}$ oe nfww **2**

4. O/N 17/P11/Q8

80 **2**

5. M/J 16/P11/Q15

(a) 4.5 oe **2**

(b) 7.5 or any equiv. **1**

6. O/N 15/P12/Q3

(±) 12 WWW **2**

7. O/N 15/P11/Q9

(a) 11 **1**

(b) x^2 **1**

(c) 8 **1**

8. M/J 15/P12/Q7

$\frac{96}{64}$ oe isw **2**

9. M/J 15/P11/Q9

$\frac{12}{25}$ oe **2**

10. O/N 14/P12/Q10

12 **2**

11. O/N 13/P12/Q6

8 **2**

12. M/J 13/P12/Q15

(a) $(P =)\ \frac{1}{4}Q^2$ oe seen **1**

(b) 10, – 10 **2**

13. M/J 13/P11/Q21

(a) $(R =)\ 3p^3$ seen **1**

(b) 4 **2**

(c) (Diagram) 2 **1**

14. M/J 12/P12/Q5

18 **2**

15. O/N 11/P12/Q13

(a) 15 oe **1**

(b) 12 oe **1**

(c) 60 **1**

16. M/J 11/P12/Q8

12.5 oe **2**

17. O/N 10/P12/Q7, O/N 10/P13/Q7

18 **2**

18. O/N 10/P11/Q7

9 **2**

19. M/J 10/P12/Q12, M/J 10/P13/Q12

(a) $\frac{12}{x^2}$ **2**

(b) 2 –2 **1**

20. M/J 10/P11/Q17

(a) $y = \frac{36}{x^2}$ **2**

(b) 9 cao **1**

(c) ±6 cao **1**

21. O/N 09/P1/Q6

12.5, $12\frac{1}{2}$, $\frac{25}{2}$ **2**

22. M/J 09/P1/Q12

(a) $(\pm)2\sqrt{x}$ **2**

(b) 25 cao **1**

23. O/N 08/P1/Q10

(a) $T = \frac{36}{L^2}$, or $\left(\frac{6}{L}\right)^2$ **2**

(b) $(\pm)\frac{6}{5}$ o.e. **1**

24. M/J 08/P1/Q10

(a) $y = 4x^2$ **2**
or $y = kx^2$ with $k = 4$ seen anywhere

(b) $\frac{3}{2}$ and $-\frac{3}{2}$ oe www cao **1**