**TEACHER’S GUIDE**

**Unit**

**10**

**COORDINATE GEOMETRY AND LINEAR LAW**

# KEY CONCEPTS

**Distance formula**

1. Derived from Pythagoras’ Theorem
2. Given 2 pairs of coordinates, the distance or length = $\sqrt{\left(y\_{2}-y\_{1}\right)^{2}+\left(x\_{2}-x\_{1}\right)^{2}}$

# Gradient formula

1. Gradient = $\frac{Rise}{Run}$
2. Given 2 pairs of coordinates, gradient = $\frac{\left(y\_{2}-y\_{1}\right)}{\left(x\_{2}-x\_{1}\right)}$

# Equation of a straight line

1. General equation: *y* = *m*𝑥+ *c*, where *m* is the gradient and *c* is the *y*-intercept.
2. Can be found if given gradient and *y*-intercept.
3. Can be found if given gradient and a pair of coordinates.
4. Can be found if given 2 pairs of coordinates.

# Midpoint formula

The midpoint of point A ($x\_{1}$, $y\_{1}$) and point B ($x\_{2}$, $y\_{2}$) is given by ( $\frac{x\_{1}+x\_{2}}{2}$ ,$ \frac{y\_{1}+y\_{2}}{2}$ )

 Shoelace method for finding area of triangle/quadrilateral

1. For a quadrilateral *ABCD* with vertices *A*($x\_{1}$, $y\_{1}$), *B*($x\_{2}$, $y\_{2}$), *C*($x\_{3}$, $y\_{3}$), D($x\_{4}$, $y\_{4}$) in an anticlockwise direction,

Area of quadrilateral = $\frac{ 1 }{2}$ $\left|\begin{array}{c}x\_{1} x\_{2} x\_{3} x\_{4} x\_{1}\\y\_{1} y\_{2 }y\_{3} y\_{4} y\_{1}\end{array}\right|$

= $\frac{ 1 }{2}$ ($x\_{1}y\_{2}$ +$x\_{2}y\_{3}$+$x\_{3}y\_{4}$+$x\_{4}y\_{1}$ – ( $y\_{1}x\_{2}$+$y\_{2}x\_{3}$+$y\_{3}x\_{4}$+$y\_{4}x\_{1} $))

1. Formula is applicable to triangles and general polygons.

# Parallel lines and perpendicular lines formula

1. Given that *m*1 and *m*2 are the gradients of a pair of perpendicular lines, *m*1*m*2 = – 1
2. Parallel lines have the same gradient.

**Mathematics Workbook**

# WORKED EXAMPLES

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**Level 1**

***Worked Example 1***

Given that *A* (–1, 6) and *B* (8, –3), find the length of *AB*.

Solution

Length of *AB =*$\sqrt{\left[6-(-3)\right]^{2}+(-1-8)^{2}}$ = 9$\sqrt{2}$ units

***Worked Example 2***

Given that *A* (–4, –3) and *B* (7, 9), find the gradient of *AB*.

Solution

Gradient of *AB* = $\frac{9-(-3)}{7-(-4)}$ = $\frac{12}{11}$

***Worked Example 3***

Find the equation of the line, given the following:

1. Gradient = 4 and *y*-intercept = –5.
2. Gradient = –2 and the line passes through (7, 3).
3. The line passes through (2, 3) and (11, 8).
4. The line is parallel to 2*y* = 5𝑥– 3 and passes through the point (–2, 5).
5. The line is perpendicular to 3𝑥+ 4*y* = 7 and passes through the point (3, –1).

Solution

(a) *y* = 4𝑥– 5

(b) $\frac{(y-3)}{(x-7)}$ = –2

*y* – 3 = – 2𝑥+ 14

*y* = –2𝑥+ 17

(c) $\frac{(y-3)}{(x-2)}$ = $\frac{(8-3)}{(11-2)}$

*y* – 3 = $\frac{ 5 }{9}$𝑥– $\frac{10}{9}$

*y* = $\frac{ 5 }{9}$𝑥 – $\frac{ 1 }{9}$

1. From 2*y* = 5𝑥– 3, gradient = $\frac{ 5 }{2}$ = 2.5

$\frac{(y-5)}{\left[x-(-2)\right]}$ = 2.5

*y* – 5 = 2.5𝑥+ 5

*y* = 2.5𝑥+ 10

1. From 3𝑥+ 4*y* = 7, gradient = – $\frac{ 3 }{4}$

$\frac{y-(-1)}{x-3}$ = – $\frac{ 3 }{4}$

*y* + 1 = – $\frac{ 3 }{4}$𝑥 +$ \frac{ 9 }{4}$

*y* = –$ \frac{ 3 }{4}$𝑥 +$ \frac{ 5 }{4}$

Unit 10 **Coordinate Geometry and Linear Law**

***Worked Example 4***

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State the gradient and *y*-intercept for $\frac{ 7 }{9}$*y* + $\frac{14}{3}$𝑥= $\frac{11}{5}$

Solution

$\frac{ 7 }{9}$*y* = – $\frac{14}{3}$𝑥 + $\frac{11}{5}$

*y* = $\frac{ 9 }{ 7 }$ (– $\frac{14}{3}$ 𝑥 + $\frac{11}{5}$)

*y* = – 6𝑥+ $\frac{99}{35}$

Gradient = –6 and *y*-intercept = $\frac{99}{35}$

***Worked Example 5***

Find the equation of the line in the diagram.

*y*

3

–2

*x*

Solution Gradient = $\frac{ 2 }{3}$

*y* = $\frac{ 2 }{3}$𝑥– 2

***Worked Example 6***

Sketch the graph of $\frac{ 3 }{ 2 }$*y* + 4𝑥– 9 = 0, showing the *x* and the *y* intercepts clearly.

Solution

$\frac{ 3 }{2}$*y* = – 4𝑥+ 9

*y* = – $\frac{ 8 }{3}$𝑥+ 6

When *y* = 0, $\frac{ 8 }{3}$𝑥 = 6

𝑥= $\frac{ 9 }{4}$

*y*

6

$$\frac{ 9 }{4}$$

*y* = – $\frac{ 8 }{3}$𝑥+ 6

*x*

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***Worked Example 7***

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Find the coordinates of the midpoint of *P*(–8, 1) and *Q*(7, 9).

Solution

$\left( \frac{-8+7}{2}, \frac{1+9}{2} \right)$ = $\left(-\frac{ 1 }{2} , 5\right)$

***Worked Example 8***

Find the area of the quadrilateral *ABCD*.

*x*

*y*

C(3, 8)

D(–4, 4)

A(–2, 0)

B(5, –3)

Solution

Area = $\frac{ 1 }{2}$ $\left|\begin{array}{c}-2 5 3 -4 -2\\ 0 -3 8 4 0\end{array}\right|$

You may start with any vertices, just make sure you do it in an anticlockwise manner.

I selected point A first simply because the coordinates have small numbers and contains a 0, so that multiplication of the numbers will be easier later on.

= $\frac{ 1 }{2}$[6 + 40 + 12 + 0 – (0 – 9 – 32 – 8)]

= 53.5 units square

Unit 10 **Coordinate Geometry and Linear Law**

# CLASSWIZ WORKSHEET

**CLASSWIZ WORKSHEETS**

**Level 1**

1. Given the coordinates of 2 points, find the length connecting the 2 points.

|  |  |
| --- | --- |
| (a) (2, 6) and (–5, 6) | (b) (7, –1) and (–2, –1) |
| (c) (5, –3) and (5, 8) | (d) (3, 4) and (3, –4) |
| (e) (1, 9) and (2, –3) | (f ) (–3, 6) and (4, 9) |
| (g) (–3, 7) and (1, –1) | (h) (1, 8) and (8, 1) |

**Mathematics Workbook**

1. Given the following coordinates, calculate the gradient.

**CLASSWIZ WORKSHEETS**

|  |  |
| --- | --- |
| (a) (2, 6) and (–5, 6) | (b) (5, –3) and (5, 8) |
| (c) (5, –3) and (9, 8) | (d) (–1, 4) and (3, –4) |
| (e) (1, 9) and (2, –3) | (f ) (–3, 6) and (4, 9) |
| (g) (–3, 7) and (1, –1) | (h) (1, 8) and (8, 1) |

1. Given the following gradient and y-intercept, find the equation of the line.

|  |  |
| --- | --- |
| (a) Gradient = 3, *y*-intercept = 5 | (b) Gradient = –2, *y*-intercept = 2 |
| (c) Gradient = 0.5, *y*-intercept = 1.5 | (d) Gradient = –4, *y*-intercept = –4 |
| (e) Gradient = – $\frac{ 3 }{5}$ , *y*-intercept =$ \frac{ 5 }{3}$   | (f ) Gradient = 2.2, *y*-intercept = 3.8 |
| (g) Gradient = – $\frac{ 1 }{5} $, *y*-intercept = – $\frac{3}{10}$  | (h) Gradient = 1, *y*-intercept = –$ \frac{ 1 }{3}$  |

Unit 10 **Coordinate Geometry and Linear Law**

1. Given the following gradient and a pair of coordinates, find the equation of the line.

**CLASSWIZ WORKSHEETS**

|  |  |
| --- | --- |
| (a) Gradient = 3, (0, 4) | (b) Gradient = –2, (5, –2) |
| (c) Gradient = 0.5, (1, 1) | (d) Gradient = –4, (8, 9) |
| (e) Gradient = – $\frac{ 3 }{5}$, (–3, –5) | (f ) Gradient = 2.2, (–1, 4) |
| (g) Gradient = –$ \frac{ 1 }{5}$, (–3, 9) | (h) Gradient = 1, (5, 5) |

**Mathematics Workbook**

1. Given the two pairs of coordinates, find the equation of the line.

**CLASSWIZ WORKSHEETS**

|  |  |
| --- | --- |
| (a) (–5, 7), (0, 4) | (b) (–4, 8), (5, –2) |
| (c) (10, 11), (1, 1) | (d) (1, –3), (8, 9) |
| (e) (7, 7), (–3, –5) | (f ) (5, –9), (–1, 4) |
| (g) (6, 7), (–3, 9) | (h) (–9, –4), (5, 5) |

Unit 10 **Coordinate Geometry and Linear Law**

1. State the gradient and the *y*-intercept for the following equations.

**CLASSWIZ WORKSHEETS**

|  |  |  |  |
| --- | --- | --- | --- |
| (a) *y* = 3𝑥+ 1 | (b) | 2*y* = 4𝑥– 3 |  |
| (c) | –3*y* + 5𝑥= 6 | (d) | 9 – 𝑥+ 3*y* = 1 |  |
| (e) | 2𝑥+ 5*y* – 9 = 0 | (f ) | 6*y* – 2𝑥= 4 |  |
| (g) $\frac{ 1 }{3}$𝑥– $\frac{ 5 }{7}$*y* = 1 | (h) – $\frac{ 5 }{4}$*y* + $\frac{ 3 }{5}$𝑥= – $\frac{3}{10}$  |

**Mathematics Workbook**

1. Find the equation of the straight line in the following diagrams.

**CLASSWIZ WORKSHEETS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| (a) *y*1 | Gradient = 2𝑥 | (b) | *y*–5 | 𝑥Gradient = – $\frac{ 3 }{2}$  |
| (c) *y* |  | (d) *y* |  |
| –1 | 4 | 𝑥 | –2.5 | 𝑥 |
|  |  | –5 |  |
| (e) *y* |  | (f ) | *y* |  |
|  | (1, 6) |  | (3, 8) |
|  | 𝑥 | (–8, 2) | 𝑥 |
| 3 |  |  |  |

Unit 10 **Coordinate Geometry and Linear Law**

1. Sketch the graph of the following equations, showing the *x* intercept and *y*-intercept clearly. You may use information found in question 6 for the sketch.

**CLASSWIZ WORKSHEETS**

|  |  |  |  |
| --- | --- | --- | --- |
| (a) *y* = 3𝑥+ 1 | (b) | 2*y* = 4𝑥– 3 |  |
| (c) | –3*y* + 5𝑥= 6 | (d) | 9 – 𝑥+ 3*y* = 0 |  |
| (e) | 2𝑥+ 5*y* – 9 = 0 | (f ) | 6*y* – 2𝑥= 4 |  |
| (g) $\frac{ 1 }{3}$𝑥– $\frac{ 5 }{7}$*y* = 1 | (h) | – $\frac{ 5 }{4}$*y* + $\frac{ 3 }{5}$𝑥= – $\frac{3}{10}$ |

**Mathematics Workbook**

1. Find the equation of a line that passes through (2, 9) and is parallel to *y* = 2𝑥+ 1

**CLASSWIZ WORKSHEETS**

1. Find the equation of a line that passes through (–6, 0) and is parallel to *y* + 5𝑥+ 3 = 0
2. Find the equation of a line that passes through (4, –1) and is parallel to 2*y* = 3𝑥– 1.
3. Find the equation of a line that passes through (–3, 7) and is parallel to 5*y* = –4𝑥+ 3
4. Find the equation of a line that passes through (8, 8) and is parallel to 3*y* + 8𝑥= 2.
5. Find the equation of a line that passes through (5, 1) and is parallel to –2*y* + 𝑥+ 1 = 4.

Unit 10 **Coordinate Geometry and Linear Law**

 15. Find the equation of a line that passes through (7, –1) and is perpendicular to *y* = –4𝑥+ 5

**CLASSWIZ WORKSHEETS**

16. Find the equation of a line that passes through (2, –4) and is perpendicular to *y* – 5 = 3𝑥.

17. Find the equation of a line that passes through (–3, 9) and is perpendicular to –*y* = 7𝑥– 3.

18. Find the equation of a line that passes through (2, 1) and is perpendicular to 4*y* = 8𝑥– 3.

19. Find the equation of a line that passes through (3, 3) and is perpendicular to 2*y* + 6𝑥– 5 = 0.

1. Find the equation of a line that passes through (–4, 5) and is perpendicular to 5*y* – 3𝑥– 6 = 2.

**Mathematics Workbook**

1. Find the midpoint of the given two points.

**CLASSWIZ WORKSHEETS**

|  |  |
| --- | --- |
| (a) (–5, 7), (0, 4) | (b) (–4, 8), (5, –2) |
| (c) (10, 11), (1, 1) | (d) (1, –3), (8, 9) |
| (e) (7, 7), (–3, –5) | (f ) (5, –9), (–1, 4) |
| (g) (6, 7), (–3, 9) | (h) (9, –4), (5, 5) |

1. Find the area of the following triangles or quadrilaterals.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| (a) *y* |  |  | (b) | *y* |  |  |  |
|  | (4, 9) |  |  |  |  |  |  |
| (–5, 2) |  |  |  |   | 2 |  |  |
| *O* |  | 𝑥 |  | –2 *O* |  | 5 | 𝑥 |
|  | (2, –2) |  |  |  |  |  |  |
|  |  |  |  |  | –7 |  |  |

Unit 10 **Coordinate Geometry and Linear Law**

**CLASSWIZ WORKSHEETS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| (c) | *y* | (8, 11) | (d) *y*–3 *O*–6 |  | (4, 2)𝑥(6, –5) |
|  |  | 𝑥 |
|  | *O* |  |
| (–7, –1) |  |  |
|  |  | (4, –3) |
| (e) *y*(–3, 5)*O* |  | (7, 7)(5, 1) 𝑥 | (f ) | *y* |  |
| (–8, 6) |  |  |
|  |  | (2, 4) |
|  | *O* | 𝑥 |
| (–7, –2) |  |  |
|  |  | –4 |

# Level 2

**CLASSWIZ WORKSHEETS**

**Mathematics Workbook**

1. The points *A*, *B* and *C* have coordinates (0, 9), (6, 6) and (4, 2) respectively. Show that *AB* is perpendicular to *BC*.

Teacher to note: By observing the *y*-intersect of the two lines, what can be concluded about the lines?

1. The points *A*, *B* and *C* have coordinates (5, *k*), (2, 4) and (8, 6) respectively. Given that angle ABC is a right angle, find the value of *k*.
2. Given that the lines –4𝑥+ 5*y* = 20 and 2*y* = *k*𝑥+ 8 are parallel, find the value of the constant *k*.
3. Given that the lines –𝑥+ 3*y* = 16 and 6*y* + *k*𝑥= 11 are parallel, find the value of the constant *k*.
4. Given that the lines 2𝑥– 3*y* = 22 and 9*y* + 13 = *k*𝑥are parallel, find the value of the constant *k*.

Unit 10 **Coordinate Geometry and Linear Law**

1. Given that the lines 6*y* – 𝑥= 14 and *k*𝑥+ *y* = 27 are perpendicular, find the value of the constant *k*.

**CLASSWIZ WORKSHEETS**

1. Given that the lines 2𝑥+ *y* = 10 and 2*y* + *k*𝑥= 15 are perpendicular, find the value of the constant *k*.
2. Given that the lines 𝑥+ *ky* = 11 and – 𝑥+ *y* = 1 are perpendicular, find the value of the constant *k*.
3. The points *A* and *B* have coordinates (4, 4) and (10, 6) respectively. Find the equation of the perpendicular bisector of *AB*.

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1. The points *A*, *B* and *C* have coordinates (1, 4), (3, 1) and (5, 6) respectively.

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*y*

*C*(5, 6)

*A*(1, 4)

*N*

*B*(3, 1)

𝑥

* 1. Find the equation of *BC*.
	2. Given that the shortest distance from *A* to *BC* is given by *AN*, find the equation of *AN*.
	3. Hence, find the coordinates of *N*.
	4. Find the distance *AN*.
	5. Find the area of triangle *ABC*.

Unit 10 **Coordinate Geometry and Linear Law**

1. The straight line *y* = 3𝑥– 7 cuts the curve *y* = 2𝑥2 – 𝑥– 5 at point *A*.

**CLASSWIZ WORKSHEETS**

*y*

*y =* 2𝑥2 *–* 𝑥 *–* 5

*O*

*A*

*y =* 3𝑥 *–* 7

𝑥

* 1. Find the coordinates of point *A*.
	2. A line passes through point *A* and is parallel to 2*y* + 3𝑥+ 9 = 0. Find the equation of the line.
	3. Given that the line cuts the *x*-axis at point *P*, find the *x*-coordinate of point *P*.
	4. Find the area of triangle *POA*.

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1. In the diagram, the line *y* = $\frac{ 1 }{2}$𝑥passes through points *A*(4, 2) and *B*. Given that the perpendicular

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bisector of line *AB* is *DM*, where coordinates of *D* is (3, 9) and *M* is on *AB.*



*D* (3, 9)

*y =* $\frac{ 1 }{2}$ 𝑥

*B*

*M*

*A*

(4, 2)

* 1. Find the equation of *DM*.
	2. Find the coordinates of *M*.
	3. Find the coordinates of *B*.
	4. Find the area of triangle *ABD*.

Unit 10 **Coordinate Geometry and Linear Law**

1. In the diagram, *PQRS* is a rhombus where *P* (2, 9.5), *Q* (7, 12) and *R* (8, 6.5),

**CLASSWIZ WORKSHEETS**

*y*

*Q* (7, 12)

*P* (2, 9.5)

*R* (8, 6.5)

*S*

𝑥

* 1. Find the midpoint of *PR*.
	2. Find the coordinates of *S*.
	3. Find the area of rhombus *PQRS*.

**Mathematics Workbook**

1. In the diagram, triangle *ABC* is such that *A* (1, 6), *B* (6, 5) and equation of *BC* is *y* + 9𝑥= 59. The gradient of *AC* is 2.

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*y*

C

*y* + 9𝑥= 59

A(1, 6)

B(6, 5)

𝑥

* 1. Find the equation of *AC*.
	2. Find the coordinates of *C*.
	3. Show that triangle *ABC* is not an isosceles triangle.
	4. Find the coordinates of *D*, given that *ABCD* is a parallelogram.
	5. Find the area of parallelogram *ABCD*.

Unit 10 **Coordinate Geometry and Linear Law**

1. In the diagram, trapezium *ABCD* is such that *A* (2, *p*), *B* (5, 9), *C* (*a*, *a* + 1) and *D* (8, 3). *BC* is parallel to *AD*

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and the equation of *AD* is given by 2*y* + 𝑥= 14.

*y*

B(5, 9)

C(*a*, *a* – 1)

A(2, *p*)

D(8, 3)

𝑥

* 1. Find the value of *p*.
	2. Find the equation of *BC*.
	3. Hence find the coordinates of *C*.
	4. Find the area of trapezium *ABCD*.

**Mathematics Workbook**

1. In the table of experimental values, the modelled equation is that of a linear function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| *y* | –0.99 | –4 | –7.02 | –10.05 | –12.97 | –16 |

 **ClassWiz set-up**

Press w6 for statistics and select 2 for “*y* = *a* + *b*𝑥”. Key in the table of values, followed by T4.

1. In the table of experimental values, the modelled equation is that of a quadratic function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 2 | 4 | 6 | 8 | 10 | 12 |
| *y* | 5.01 | 3.02 | –2.99 | –12.98 | –27 | –45 |

 **ClassWiz set-up**

Press w6 for statistics and select 3 for“*y* = *a* + *b*𝑥+ *c*𝑥2”. Key in the table of values, followed by T4.

1. In the table of experimental values, the modelled equation is that of a logarithmic function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 0.5 | 1 | 2 | 3 | 4 | 5 |
| *y* | –1.58 | 0.5 | 2.58 | 3.79 | 4.65 | 5.33 |

 **ClassWiz set-up**

Press w6 for statistics and select 4 for “*y* = *a* + *b* ln (𝑥)”. Key in the table of values, followed by T4.

1. In the table of experimental values, the modelled equation is that of an exponential function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 |
| *y* | 22.17 | 163.79 | 1210.28 | 8942.87 | 66079.40 |

 **ClassWiz set-up**

Press w6 for statistics and select R1 for “*y* = *ae*(*b*𝑥)”. Key in the table of values, followed by T4.

Unit 10 **Coordinate Geometry and Linear Law**

1. In the table of experimental values, the modelled equation is that of an exponential function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| *y* | 4.81 | 6.25 | 8.13 | 10.57 | 13.74 | 17.86 |

 **ClassWiz set-up**

Press w6 for statistics and select R2 for “*y* = *ab*𝑥”. Key in the table of values, followed by T4.

1. In the table of experimental values, the modelled equation is that of a power function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| y | 1 | 1.41 | 1.73 | 2.01 | 2.24 | 2.45 |

 **ClassWiz set-up**

Press w6 for statistics and select R3 for “*y* = *a*𝑥*b*”. Key in the table of values, followed by T4.

1. In the table of experimental values, the modelled equation is that of an inverse function fit. Using the ClassWiz calculator, key in the table of values and find the equation.

ed by

ollow

in the table of values, f

T4.

 **ClassWiz set-up**

Press w6 for statistics and select R4 for “*y* = *a* + $\frac{ b }{x}$”. Key

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| *y* | 7.01 | 4.99 | 4.33 | 4 | 3.81 | 3.67 |

1. In the table of experimental values, the modelled equation is that of an exponential OR linear function fit. Using the ClassWiz calculator, key in the table of values and find the most suitable equation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| y | 2.63 | 2.29 | 2.00 | 1.76 | 1.54 | 1.35 |

 **ClassWiz set-up**

Press w6 for statistics and select R1 for “*y* = *aeb*𝑥”. Key in the table of values, followed by T4. Press w6 for statistics and select 2 for “*y* = *a* +

*b*𝑥”. Key in the table of values, followed by T4. Select the function that has a better fit.

**Mathematics Workbook**

1. In the table of experimental values, the modelled equation is that of a logarithmic fit OR power function fit. Using the ClassWiz calculator, key in the table of values and find the most suitable equation.

**CLASSWIZ WORKSHEETS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| *y* | 2 | 2.52 | 2.88 | 3.17 | 3.42 | 3.63 |

 **ClassWiz set-up**

Press w6 for statistics and select 4 for “*y* = *a* + *b* ln (𝑥)”. Key in the table of values, followed by T4. Press w6 for statistics and select R3 for “*y* = *a*𝑥*b*”. Key in the table of values, followed by T4. Select the function that has a better fit.

1. Express each of the following non-linear equations into linear form. State the gradient and the vertical intercept.

(a) *y* = 𝑥2 + 1 (b) 2*y* = 3𝑥– 𝑥2

(c) 2𝑥+ *y* = 𝑥*y* (d) *y* $\sqrt{x}$– 3𝑥= $\frac{1}{\sqrt{x}}$

(e) *𝑥y*2 = 3𝑥 – 2*y* (f ) *y*  = 2 × 5𝑥

(g) 2*y* = 5𝑥1.5 (h) 3*y* – 2*e*-𝑥 = 0

Unit 10 **Coordinate Geometry and Linear Law**

## Level 3

**CLASSWIZ WORKSHEETS**

1. In the following diagrams, a straight-line graph is drawn with respect to its axes and coordinates are shown. Write the non-linear equation, expressing *y* in terms of *x*.
	1. (b)

$\frac{y}{x-1}$

*y*



(–8, 3)

(5, 8)

𝑥

0

–3

2

𝑥3

0

(c) (d)

*y*$\sqrt{x}$

𝑥$y^{2}$

( $\frac{ 1 }{2}$, 8)

(2$\frac{ 1 }{2}$, 2)

$$\frac{1}{x^{2}}$$

(6, 20)

(1, 7)

𝑥

0

0

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1. The diagram shows the straight-line graph of lg *y* against 𝑥, passing through (0, 5) and having a gradient of –2.

**CLASSWIZ WORKSHEETS**

𝑥

lg *y*

(0, 5)

0

The variables 𝑥and *y* are connected by the equation *y* = *hk*𝑥, where *h* and *k* are constants.

* 1. Find the value of *h* and of *k*.
	2. Find the equation relating 𝑥and *y*.
1. The diagram shows the straight-line graph of 𝑥*y* against *y*, passing through (3, 8) and having a gradient of –3.

𝑥*y*

(3, 8)

0

*y*

The variables 𝑥and *y* are connected by the equation *y* = $\frac{a}{x+b}$ , where *a* and *b* are constants. Find the

value of *a* and of *b*.

Unit 10 **Coordinate Geometry and Linear Law**

1. The variables *x* and *y* are related such that a straight-line graph is obtained by plotting $\frac{y}{x^{2}}$ against $\frac{ 1 }{x}$.

**CLASSWIZ WORKSHEETS**

The line passes through (1, 5) and (8, 17).

* 1. Express *y* in terms of 𝑥.
	2. Find the value of *y* when 𝑥= $\frac{ 1 }{2}$ .
1. The variables *x* and *y* are related such that a straight-line graph is obtained by plotting (*y* – 𝑥) against

𝑥2. The line passes through (2, –1) and (5, 12).

* 1. Express *y* in terms of 𝑥.
	2. Find the value of *y* when 𝑥= 1.

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1. The variables 𝑥and *y* are related by the equation $\frac{ p }{x}$+ $\frac{ q }{y}$= 1, where *p* and *q* are constants. A straight-

**CLASSWIZ WORKSHEETS**

line graph is obtained by plotting $\frac{ 1 }{y}$against $\frac{ 1 }{x}$. The line passes through (7, –4) and (12, –7).

* 1. Find the value of *p* and *q*.
	2. Express *y* in terms of 𝑥.
1. The variables *x* and *y* are related such that a straight-line graph is obtained by plotting lg *y* against lg

𝑥. The line passes through (1, –4) and (4, 1). Express lg *y* in terms of 𝑥.

Unit 10 **Coordinate Geometry and Linear Law**

1. The variables 𝑥and *y* are related such that a straight-line graph is obtained by plotting 𝑥*y* – 𝑥2 against

**CLASSWIZ WORKSHEETS**

𝑥. The line passes through (1, 3) and (4, –3).

1. Express *y* in terms of 𝑥.
2. Find the value of *y* when 𝑥= 1.5.
3. The variables 𝑥and *y* are related such that a straight-line graph is obtained by plotting *y*$\sqrt{x}$against $\sqrt{x}$. The line passes through (4, 9) and (9, 21).
	1. Express *y* in terms of 𝑥.
	2. Find the value of *y* when 𝑥= 25.

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## Level 4

**CLASSWIZ WORKSHEETS**

1. The table shows experimental values of two variables 𝑥and *y*.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 | 6 |
| *y* | 0.99 | 0.81 | 0.54 | 0.57 | 0.50 | 0.44 |

It is known that 𝑥and *y* are related by the equation *y* = $\frac{h}{k+x}$, and one of the values of *y* has an

abnormally large error.

* 1. Plot $\frac{ 1 }{y}$ against *x* and draw a straight-line graph.
	2. Use your graph to
		1. Identify the abnormally large error of *y* and estimate its correct value.
		2. Estimate the value of *h* and *k.*
		3. Find the value of *x* when *y* = 0.7.

Unit 10 **Coordinate Geometry and Linear Law**

1. The table shows experimental values of two variables 𝑥and *y*.

**CLASSWIZ WORKSHEETS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 𝑥 | 1 | 2 | 3 | 4 | 5 |
| *y* | 1.85 | 13.6 | 100.86 | 745.24 | 5506.61 |

It is known that 𝑥and *y* are related by the equation *y* = *keh*𝑥.

* 1. Plot ln *y* against 𝑥and draw a straight-line graph.
	2. Use your graph to
		1. Estimate the value of *h* and *k.*
		2. Estimate the value of 𝑥when *y* = 0.7.