

Name _____

Date _____

14.1 Coordinates and distance — worked answers

Read and write coordinates in all four quadrants, and find the distance between two points that share an x- or a y-coordinate, without a grid. · 66 questions

A · Fluency — Quadrants, distances, points and midpoints.

- 1 In which quadrant is the point (3, 4)?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 1

x is positive and y is positive, which is quadrant 1. Quadrants are numbered anticlockwise from the top right.

- 2 In which quadrant is the point (−2, 5)?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 2

x is negative and y is positive, which is quadrant 2. Quadrants are numbered anticlockwise from the top right.

- 3 In which quadrant is the point (−4, −3)?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 3

x is negative and y is negative, which is quadrant 3. Quadrants are numbered anticlockwise from the top right.

- 4 In which quadrant is the point (5, −1)?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 4

x is positive and y is negative, which is quadrant 4. Quadrants are numbered anticlockwise from the top right.

5 In which quadrant is the point $(1, 6)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 1

x is positive and y is positive, which is quadrant 1. Quadrants are numbered anticlockwise from the top right.

6 In which quadrant is the point $(-6, 2)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 2

x is negative and y is positive, which is quadrant 2. Quadrants are numbered anticlockwise from the top right.

7 In which quadrant is the point $(-1, -1)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 3

x is negative and y is negative, which is quadrant 3. Quadrants are numbered anticlockwise from the top right.

8 In which quadrant is the point $(2, -5)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 4

x is positive and y is negative, which is quadrant 4. Quadrants are numbered anticlockwise from the top right.

9 In which quadrant is the point $(4, 4)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 1

x is positive and y is positive, which is quadrant 1. Quadrants are numbered anticlockwise from the top right.

- 10** In which quadrant is the point $(-3, -6)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 3

x is negative and y is negative, which is quadrant 3. Quadrants are numbered anticlockwise from the top right.

- 11** In which quadrant is the point $(6, -2)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 4

x is positive and y is negative, which is quadrant 4. Quadrants are numbered anticlockwise from the top right.

- 12** In which quadrant is the point $(-5, 3)$?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 2

x is negative and y is positive, which is quadrant 2. Quadrants are numbered anticlockwise from the top right.

- 13** How far apart are $(1, 3)$ and $(7, 3)$?

Answer: 6

Both points have $y = 3$, so the line joining them is horizontal. Count along the x -direction: $7 - 1 = 6$. No grid is needed — subtract the x -coordinates.

- 14** How far apart are $(-4, 2)$ and $(2, 2)$?

Answer: 6

Both points have $y = 2$, so the line joining them is horizontal. Count along the x -direction: $2 - (-4) = 6$. No grid is needed — subtract the x -coordinates.

- 15** How far apart are $(-6, -1)$ and $(-1, -1)$?

Answer: 5

Both points have $y = -1$, so the line joining them is horizontal. Count along the x -direction: $-1 - (-6) = 5$. No grid is needed — subtract the x -coordinates.

- 16** How far apart are $(0, 5)$ and $(8, 5)$?

Answer: 8

Both points have $y = 5$, so the line joining them is horizontal. Count along the x -direction: $8 - 0 = 8$. No grid is needed — subtract the x -coordinates.

- 17** How far apart are $(-3, 4)$ and $(5, 4)$?

Answer: 8

Both points have $y = 4$, so the line joining them is horizontal. Count along the x -direction: $5 - (-3) = 8$. No grid is needed — subtract the x -coordinates.

- 18** How far apart are $(2, -6)$ and $(9, -6)$?

Answer: 7

Both points have $y = -6$, so the line joining them is horizontal. Count along the x-direction: $9 - 2 = 7$.
No grid is needed — subtract the x-coordinates.

- 19** How far apart are $(-7, 0)$ and $(-2, 0)$?

Answer: 5

Both points have $y = 0$, so the line joining them is horizontal. Count along the x-direction: $-2 - -7 = 5$.
No grid is needed — subtract the x-coordinates.

- 20** How far apart are $(-5, -4)$ and $(6, -4)$?

Answer: 11

Both points have $y = -4$, so the line joining them is horizontal. Count along the x-direction: $6 - -5 = 11$. No grid is needed — subtract the x-coordinates.

- 21** How far apart are $(2, 1)$ and $(2, 8)$?

Answer: 7

Both points have $x = 2$, so the line joining them is vertical. Subtract the y-coordinates: $8 - 1 = 7$, and a distance is never negative, so it is 7.

- 22** How far apart are $(-3, -2)$ and $(-3, 5)$?

Answer: 7

Both points have $x = -3$, so the line joining them is vertical. Subtract the y-coordinates: $5 - -2 = 7$, and a distance is never negative, so it is 7.

- 23** How far apart are $(4, -6)$ and $(4, -1)$?

Answer: 5

Both points have $x = 4$, so the line joining them is vertical. Subtract the y-coordinates: $-1 - -6 = 5$, and a distance is never negative, so it is 5.

- 24** How far apart are $(0, -4)$ and $(0, 3)$?

Answer: 7

Both points have $x = 0$, so the line joining them is vertical. Subtract the y-coordinates: $3 - -4 = 7$, and a distance is never negative, so it is 7.

- 25** How far apart are $(-5, 2)$ and $(-5, 9)$?

Answer: 7

Both points have $x = -5$, so the line joining them is vertical. Subtract the y-coordinates: $9 - 2 = 7$, and a distance is never negative, so it is 7.

- 26** How far apart are $(6, -7)$ and $(6, 2)$?

Answer: 9

Both points have $x = 6$, so the line joining them is vertical. Subtract the y-coordinates: $2 - -7 = 9$, and a distance is never negative, so it is 9.

- 27** How far apart are $(-1, 0)$ and $(-1, 6)$?

Answer: 6

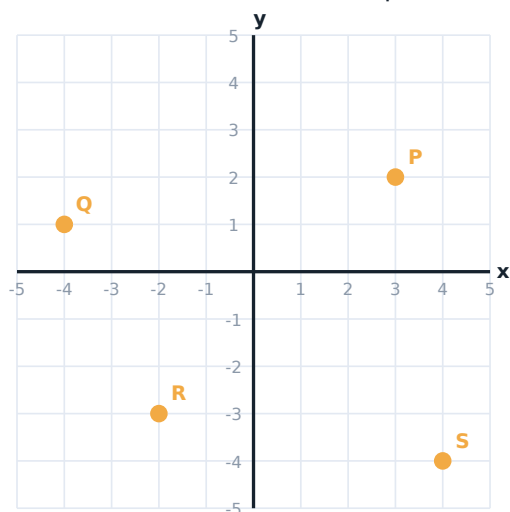
Both points have $x = -1$, so the line joining them is vertical. Subtract the y-coordinates: $6 - 0 = 6$, and a distance is never negative, so it is 6.

- 28** How far apart are $(3, -3)$ and $(3, -9)$?

Answer: 6

Both points have $x = 3$, so the line joining them is vertical. Subtract the y-coordinates: $-9 - -3 = -6$, and a distance is never negative, so it is 6.

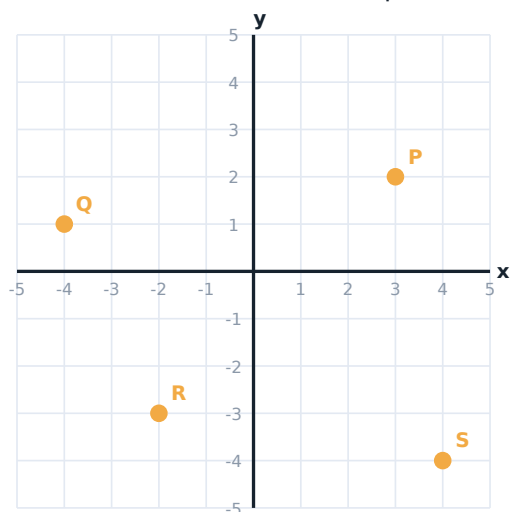
- 29 Write down the coordinates of point **P**.



Answer: (3, 2)

Read across first, then up: P is at (3, 2). x always comes before y.

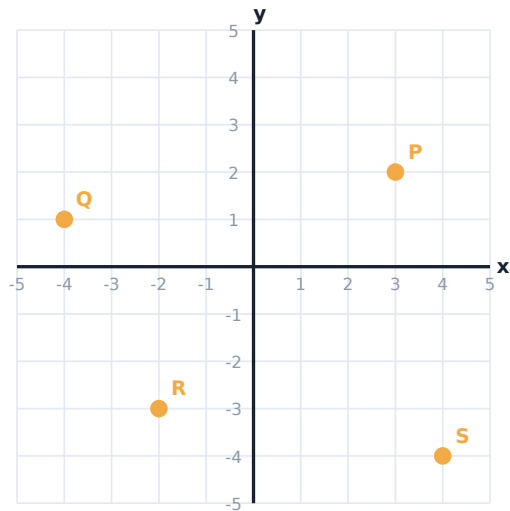
- 30 Write down the coordinates of point **Q**.



Answer: (-4, 1)

Read across first, then up: Q is at (-4, 1). x always comes before y.

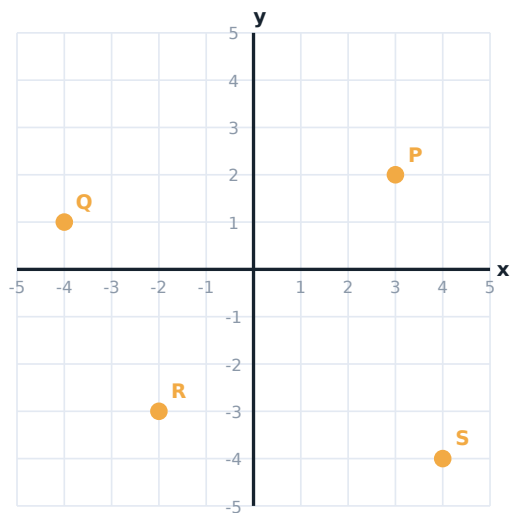
- 31** Write down the coordinates of point **R**.



Answer: $(-2, -3)$

Read across first, then up: R is at $(-2, -3)$. x always comes before y.

- 32** Write down the coordinates of point **S**.



Answer: $(4, -4)$

Read across first, then up: S is at $(4, -4)$. x always comes before y.

- 33** What is the midpoint of $(1, 3)$ and $(7, 3)$?

Answer: $(4, 3)$

The midpoint is halfway along, so average each coordinate. Across: $1 + 7 = 8$, then $8 \div 2 = 4$. Up: $3 + 3 = 6$, then $6 \div 2 = 3$. The midpoint is $(4, 3)$.

- 34** What is the midpoint of $(-4, 2)$ and $(2, 2)$?

Answer: $(-1, 2)$

The midpoint is halfway along, so average each coordinate. Across: $-4 + 2 = -2$, then $-2 \div 2 = -1$. Up: $2 + 2 = 4$, then $4 \div 2 = 2$. The midpoint is $(-1, 2)$.

- 35** What is the midpoint of $(2, 1)$ and $(2, 9)$?

Answer: $(2, 5)$

The midpoint is halfway along, so average each coordinate. Across: $2 + 2 = 4$, then $4 \div 2 = 2$. Up: $1 + 9 = 10$, then $10 \div 2 = 5$. The midpoint is $(2, 5)$.

- 36 What is the midpoint of $(-3, -6)$ and $(-3, 0)$?

Answer: $(-3, -3)$

The midpoint is halfway along, so average each coordinate. Across: $-3 + -3 = -6$, then $-6 \div 2 = -3$. Up: $-6 + 0 = -6$, then $-6 \div 2 = -3$. The midpoint is $(-3, -3)$.

- 37 What is the midpoint of $(-5, 4)$ and $(5, 4)$?

Answer: $(0, 4)$

The midpoint is halfway along, so average each coordinate. Across: $-5 + 5 = 0$, then $0 \div 2 = 0$. Up: $4 + 4 = 8$, then $8 \div 2 = 4$. The midpoint is $(0, 4)$.

- 38 What is the midpoint of $(6, -8)$ and $(6, -2)$?

Answer: $(6, -5)$

The midpoint is halfway along, so average each coordinate. Across: $6 + 6 = 12$, then $12 \div 2 = 6$. Up: $-8 + -2 = -10$, then $-10 \div 2 = -5$. The midpoint is $(6, -5)$.

B · Reasoning — Why the subtraction rule works, and when it does not.

- 39 Why is the distance between $(2, 5)$ and $(9, 5)$ just $9 - 2$?

- ☐ Because 5 is odd
- ☐ Because both points have the same y, so the line is horizontal
- ☐ Because 9 is bigger than 2
- ☐ It is a coincidence

Answer: Because both points have the same y, so the line is horizontal

Only the x changes, so only the x needs subtracting. That is why the rule is limited to points sharing a coordinate.

- 40 Why can you not find the distance between $(1, 2)$ and $(5, 7)$ the same way?

- ☐ The numbers are too large
- ☐ Both coordinates change, so the line is sloping
- ☐ They are in different quadrants
- ☐ You can

Answer: Both coordinates change, so the line is sloping

A sloping distance needs Pythagoras, which comes in a later stage.

- 41 In which order are coordinates written?

- ☐ (y, x)
- ☐ (x, y)
- ☐ either way
- ☐ largest first

Answer: (x, y)

Along the corridor, then up the stairs. $(3, 1)$ and $(1, 3)$ are different points.

- 42 Which quadrant has both coordinates negative?

- ☐ quadrant 1
- ☐ quadrant 2
- ☐ quadrant 3
- ☐ quadrant 4

Answer: quadrant 3

Bottom left. Numbering runs anticlockwise from the top right.

43 Is the point $(0, -4)$ in a quadrant?

- ☐ Yes
- ☐ No

Answer: No

It sits on the y-axis. Points on an axis belong to no quadrant.

44 Can a distance between two points be negative?

- ☐ Yes
- ☐ No

Answer: No

Distance is a length. Subtracting the other way round gives a negative number, so take the size of the answer.

45 The points $(-3, 2)$ and $(-3, 9)$ are joined. What kind of line is it?

- ☐ horizontal
- ☐ vertical
- ☐ sloping up
- ☐ sloping down

Answer: vertical

The x-coordinate is stuck at -3 , so the line can only run up and down.

46 Where is the point $(0, 0)$?

- ☐ quadrant 1
- ☐ the origin
- ☐ on the x-axis only
- ☐ nowhere

Answer: the origin

It is where the two axes cross.

47 Two points have the same x-coordinate. To find the distance between them you ...

- ☐ add the y-coordinates
- ☐ subtract the y-coordinates
- ☐ subtract the x-coordinates
- ☐ multiply them

Answer: subtract the y-coordinates

The x is doing nothing; all the change is in the y.

48 Do you need a grid to find the distance between $(4, 1)$ and $(4, 8)$?

- ☐ Yes
- ☐ No

Answer: No

$8 - 1 = 7$. The arithmetic works without a picture, which is exactly what objective 7Gp.02 asks for.

C · Challenge — Rectangles, perimeters and areas from coordinates alone.

49 Three vertices of a rectangle are $(1, 1)$, $(6, 1)$ and $(6, 4)$. What is the fourth?

Answer: $(1, 4)$

Opposite sides of a rectangle are equal and parallel, so the fourth vertex is $(1, 1) + (6, 4) - (6, 1) = (1, 4)$. Check it: $(1, 4)$ and $(1, 1)$ share a y-coordinate, as they should.

- 50** Three vertices of a rectangle are $(-3, 2)$, $(2, 2)$ and $(2, 6)$. What is the fourth?

Answer: $(-3, 6)$

Opposite sides of a rectangle are equal and parallel, so the fourth vertex is $(-3, 2) + (2, 6) - (2, 2) = (-3, 6)$. Check it: $(-3, 6)$ and $(-3, 2)$ share a y-coordinate, as they should.

- 51** Three vertices of a rectangle are $(-5, -1)$, $(-1, -1)$ and $(-1, 3)$. What is the fourth?

Answer: $(-5, 3)$

Opposite sides of a rectangle are equal and parallel, so the fourth vertex is $(-5, -1) + (-1, 3) - (-1, -1) = (-5, 3)$. Check it: $(-5, 3)$ and $(-5, -1)$ share a y-coordinate, as they should.

- 52** Three vertices of a rectangle are $(0, -4)$, $(5, -4)$ and $(5, 0)$. What is the fourth?

Answer: $(0, 0)$

Opposite sides of a rectangle are equal and parallel, so the fourth vertex is $(0, -4) + (5, 0) - (5, -4) = (0, 0)$. Check it: $(0, 0)$ and $(0, -4)$ share a y-coordinate, as they should.

- 53** A rectangle has vertices $(2, 1)$, $(8, 1)$, $(8, 5)$ and $(2, 5)$. What is its perimeter?

Answer: 20

The horizontal sides are $8 - 2 = 6$ long and the vertical sides are $5 - 1 = 4$ long. Perimeter = $6 + 6 + 4 + 4 = 20$.

- 54** A rectangle has vertices $(-3, -2)$, $(4, -2)$, $(4, 3)$ and $(-3, 3)$. What is its area?

Answer: 35

Width $4 - (-3) = 7$, height $3 - (-2) = 5$, so the area is $7 \times 5 = 35$.

- 55** A square has one side joining $(-1, 2)$ to $(5, 2)$. What is the length of a side?

Answer: 6

$5 - (-1) = 6$. Every side of a square is that length.

- 56** The points $(-4, 3)$ and $(7, 3)$ are the ends of a horizontal line. How long is it?

Answer: 11

$7 - (-4) = 11$. Subtracting a negative adds.

- 57** A vertical line runs from $(2, -6)$ to $(2, 9)$. How long is it?

Answer: 15

$9 - (-6) = 15$.

- 58** A rectangle has vertices $(0, 0)$, $(9, 0)$, $(9, 4)$ and $(0, 4)$. How much longer is its length than its width?

Answer: 5

The length is 9 and the width is 4, so $9 - 4 = 5$.

D · Word problems — Maps, ships, gardens and drones.

- 59** On a town map, the library is at $(2, 7)$ and the school is at $(2, 1)$. Each unit is 1 km. How many kilometres apart are they?

Answer: 6

Both have $x = 2$, so the distance is $7 - 1 = 6$ units, which is 6 km.

- 60** A ship sails from $(-5, 4)$ to $(6, 4)$. Each unit is 1 nautical mile. How far does it sail?

Answer: 11

$6 - (-5) = 11$ nautical miles.

- 61** A chess-style grid has a rook at (3, 8). It moves to (3, 2). How many squares does it move?

Answer: 6

The x is unchanged, so it moves $8 - 2 = 6$ squares.

- 62** A garden is a rectangle with corners at (0, 0), (12, 0), (12, 5) and (0, 5), in metres. What is its perimeter, in metres?

Answer: 34

Two sides of 12 m and two of 5 m: $12 + 12 + 5 + 5 = 34$.

- 63** A drone flies from (−2, −3) to (−2, 6). Each unit is 10 m. How many metres does it climb?

Answer: 90

$6 - (-3) = 9$ units, and $9 \times 10 = 90$ m.

- 64** A footpath runs straight from (−4, 5) to (8, 5). Where is the halfway point?

Answer: (2, 5)

Average the x-coordinates: $-4 + 8 = 4$, and $4 \div 2 = 2$. The y stays at 5, so the halfway point is (2, 5).

- 65** A field is a rectangle with corners (1, 2), (11, 2), (11, 8) and (1, 8), in units of 10 m. What is its area, in square metres?

Answer: 6000

The sides are $11 - 1 = 10$ units and $8 - 2 = 6$ units, so 100 m by 60 m. Area = $100 \times 60 = 6000$ m².

- 66** Two lamp posts stand at (7, −3) and (7, 9) on a plan where one unit is 5 m. How many metres apart are they?

Answer: 60

$9 - (-3) = 12$ units, and $12 \times 5 = 60$ m.