
UNIT 8

AUTUMN second half

## COORDINATES AND SHAPE

**SECTION 1** Lines and rectangles

**SECTION 2** Triangles and coordinates

**SECTION 3** Fun with coordinates

UNIT 8

# COORDINATES AND SHAPE

SUGGESTED TIME **3 hours**

## TEACHING OBJECTIVES

- Recognise parallel and perpendicular lines.
- Identify and recognise properties of rectangles.
- Classify triangles and recognise lines of symmetry.
- Recognise positions, read and plot coordinates in the first quadrant.
- Recognise where a shape will be after a translation.
- Solve shape puzzles.

**SECTION 1** Lines and rectangles

**SECTION 2** Triangles and coordinates

**SECTION 3** Fun with coordinates

## HOMEWORK

- After discussing Section 1 Star Challenge 1, Section 2 Star Challenge 3 can be used as a homework exercise.
- Section 2 Star Challenge 2, and Section 3 Star Challenges 4 and 5 consolidate the use of coordinates.

# Unit 8 Checklist for pupils

## Lines and rectangles

You will:

- learn about rectangles and parallel and perpendicular lines ☐

## Triangles and coordinates

You will:

- classify triangles using their properties ☐
- read and label points on a coordinate diagram ☐

## Fun with coordinates

You will:

- solve problems using coordinates ☐

UNIT 8

# SECTION 1: LINES AND RECTANGLES

## DIRECT TEACHING POINTS

- Teach the meanings of vertical, horizontal, parallel and perpendicular.
  Focus mental activities on these ideas, for example:

  Encourage pupils to discuss the following statements and decide whether each of them is sensible or not.

  1 A table top is meant to be horizontal.

  2 All walls are vertical.

  3 No aeroplanes take off vertically.

  4 House roofs are horizontal.

  5 All horizontal lines are parallel.

  6 Any horizontal line is perpendicular to any vertical line.

- Practical work and exercise 2 can reinforce the properties of rectangles.


*vertical* *horizontal* *parallel* *perpendicular*
*rectangle* *diagonal* *right angle*

UNIT 8

# Lines and rectangles

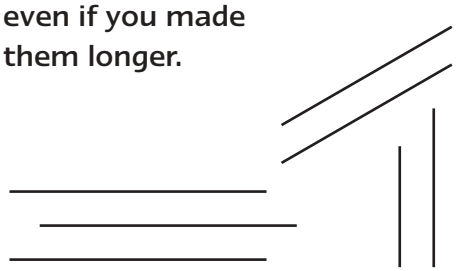
## 1 Parallel and perpendicular lines

Lines in a diagram are often labelled by CAPITAL LETTERS at the ends.

A ——— B

Lines which go in the same direction are called **parallel lines**.
Parallel lines are always the same distance apart.

They would never meet, even if you made them longer.



Lines which cross so that they form a right angle are called **perpendicular lines**.

They include lines which would cross if you made them longer.

*State whether each of the following statements is true (T) or false (F):*

1 AB is parallel to OP .....

2 EF is parallel to IJ .....

3 KL is parallel to CD .....

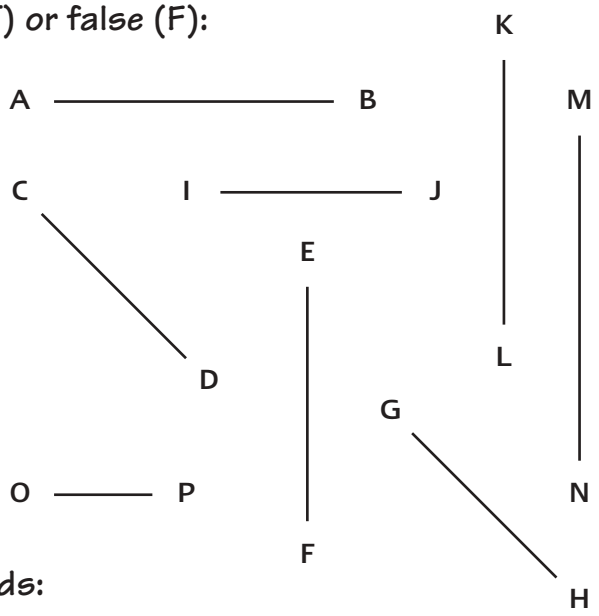
4 GH is parallel to CD .....

5 OP is perpendicular to MN .....

6 KL is perpendicular to AB .....

7 IJ is perpendicular to AB .....

8 MN is perpendicular to EF .....




*Fill in the missing words:*

9 GH is ..... to CD

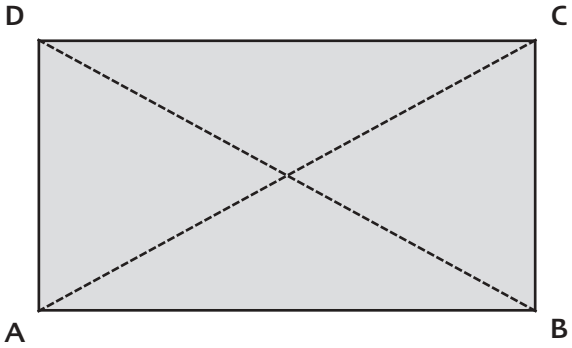
10 KL is ..... to IJ

UNIT 8

# Lines and rectangles

## 2 Properties of rectangles

*Complete the following statements about this rectangle:*




1 Line AB is parallel to line .....

2 Line AB is the same length as line .....

3 Line AD is perpendicular to line .....

4 Line AC is the same length as line .....

5 Line BC is parallel to line .....

6 One diagonal is AC. The other diagonal is .....

7 Angle A is a right angle. There are ..... right angles.

*State whether each of the following is true (T) or false (F):*

8 A rectangle has five sides. .....

9 The opposite sides of a rectangle are the same length. .....

10 The opposite sides of a rectangle are parallel. .....

11 The angles of a rectangle are all right angles. .....

12 A rectangle has three diagonals. .....

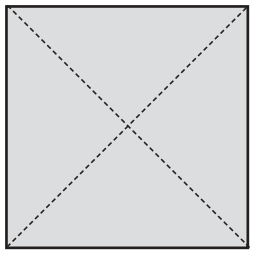
13 The diagonals of a rectangle are the same length. .....

*State whether each of the following is true (T) or false (F):*

14 The diagonals of a square are the same length. .....

15 The diagonals of a square are perpendicular to each other. .....

A square is a rectangle with four equal sides.



UNIT 8

# Lines and rectangles

STAR CHALLENGE 1

## How many different rectangles can you find?

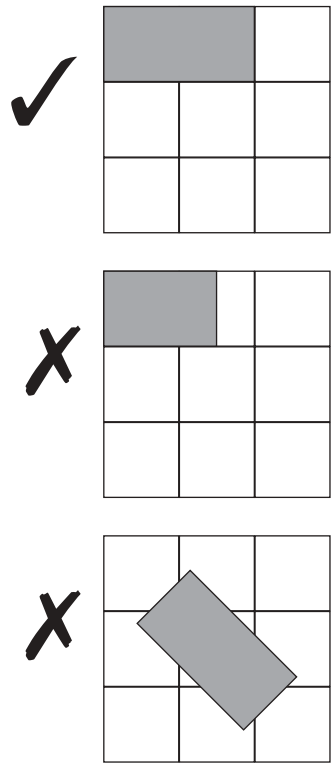
6 correct 2 stars
5 correct 1 star

Rules for this challenge:

Rectangles must cover whole squares.

Rectangles can go up or down.

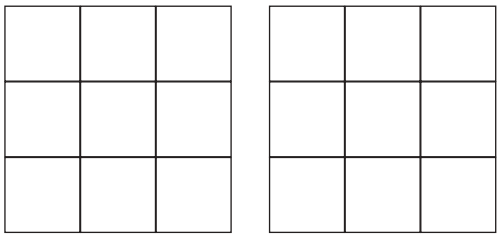
Rectangles cannot go diagonally.

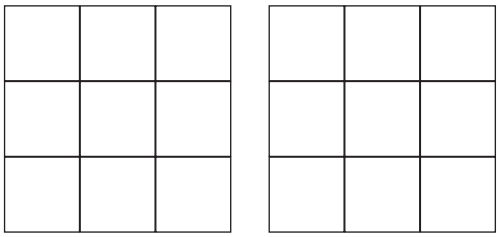


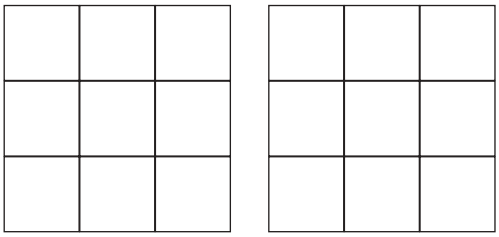

There are 6 different-sized rectangles that can be drawn on this 3 by 3 grid.

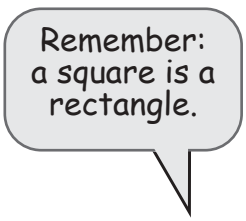
The rectangles must obey the above rules.

Try to find all 6 rectangles.










UNIT 8

# SECTIONS 2 AND 3: TRIANGLES AND COORDINATES
# FUN WITH COORDINATES

## DIRECT TEACHING POINTS

- Teach the classification of triangles. Point out that some triangles can have a dual classification, for example, right-angled isosceles.
- Revise the key mathematical vocabulary listed below.
- Check pupils' understanding of coordinates.
- Section 2 Star Challenge 2 revises the names of quadrilaterals.
- Encourage pupils to generalise the results of Section 2 Star Challenge 3.
- Explain the term translation and model simple examples of combining two translations.
- Incorporate some examples of line symmetry in oral work at the beginning of a lesson.

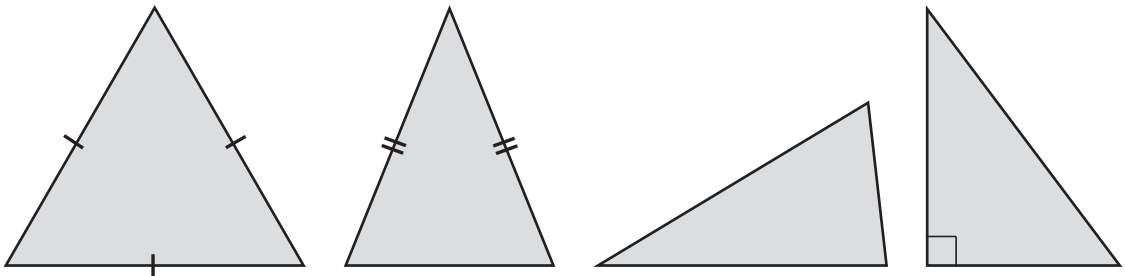

*triangle* *scalene* *isosceles* *equilateral* *right angle*
*quadrilateral* *square* *rectangle* *parallelogram* *rhombus*
*vertex* *vertices* *lines of symmetry* *reflection* *translation*
*coordinate* *axis* *axes* *origin*

UNIT 8

# Triangles and coordinates

## 1 Classifying triangles

Triangles can be described as:



**equilateral** (3 equal sides)

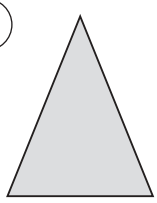
**isosceles** (2 equal sides)

**scalene** (no equal sides)

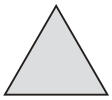
**right-angled**

*Say whether each of the triangles below is equilateral, isosceles, scalene or right-angled:*

A



B



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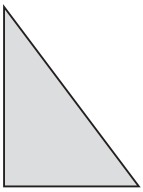

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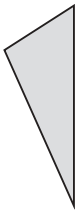

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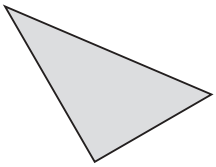

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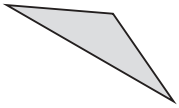

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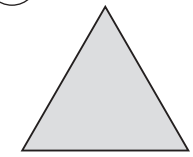

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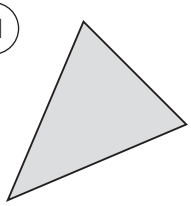

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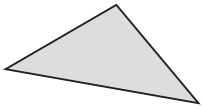

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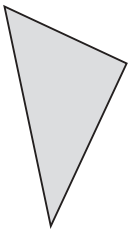

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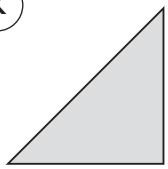

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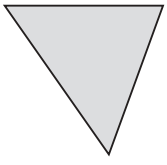
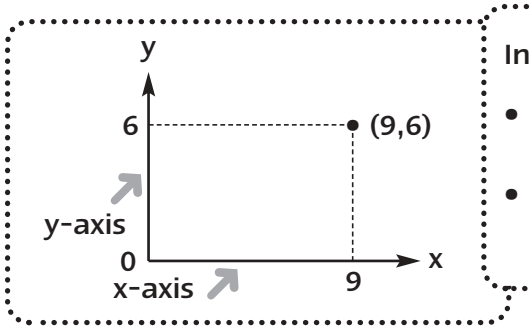


UNIT 8

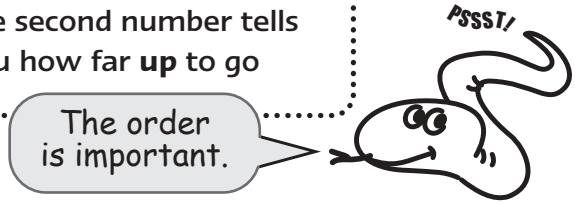
# Triangles and coordinates

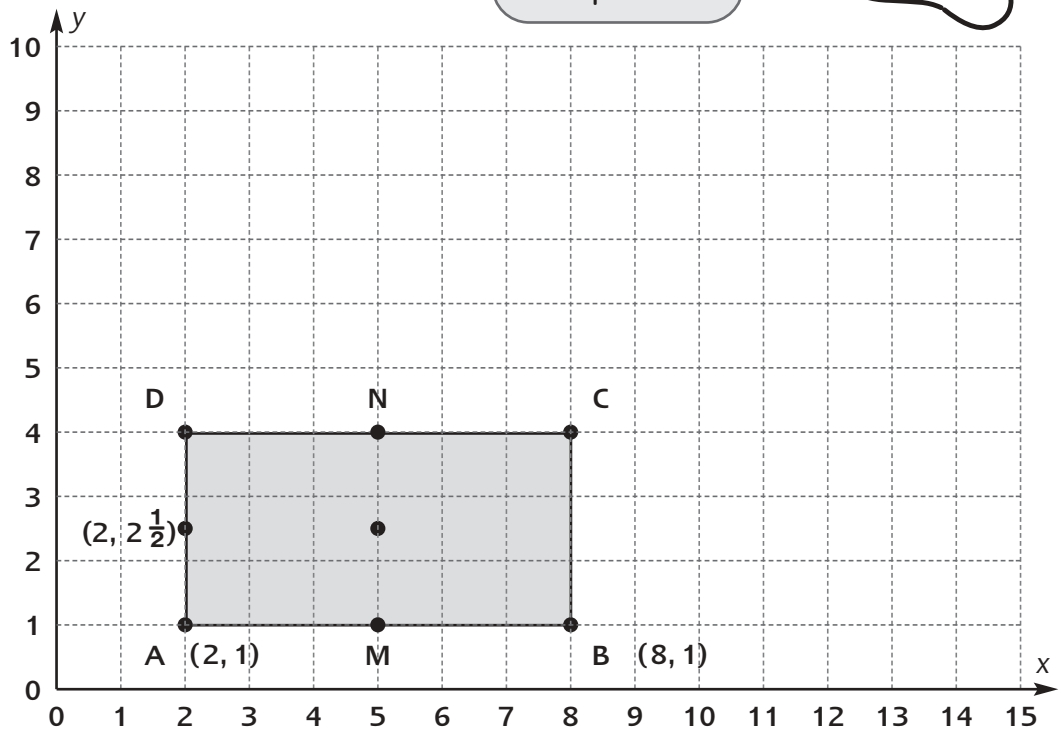
## 2 Rectangles and coordinates




In a set of coordinates:

- the first number tells you how far **across** to go
- the second number tells you how far **up** to go




1 What are the coordinates of C and D?

(……, ……) (……, ……)

2 M is halfway between A and B.

Coordinates of M are (……, ……)

3 N is halfway between C and D.

Coordinates of N are (……, ……)

4 The centre of the rectangle has coordinates (……, ……)

5 Translate (move) the rectangle 2 squares to the right and 5 squares up. Draw its new position. What are the coordinates of the vertices after the translation?

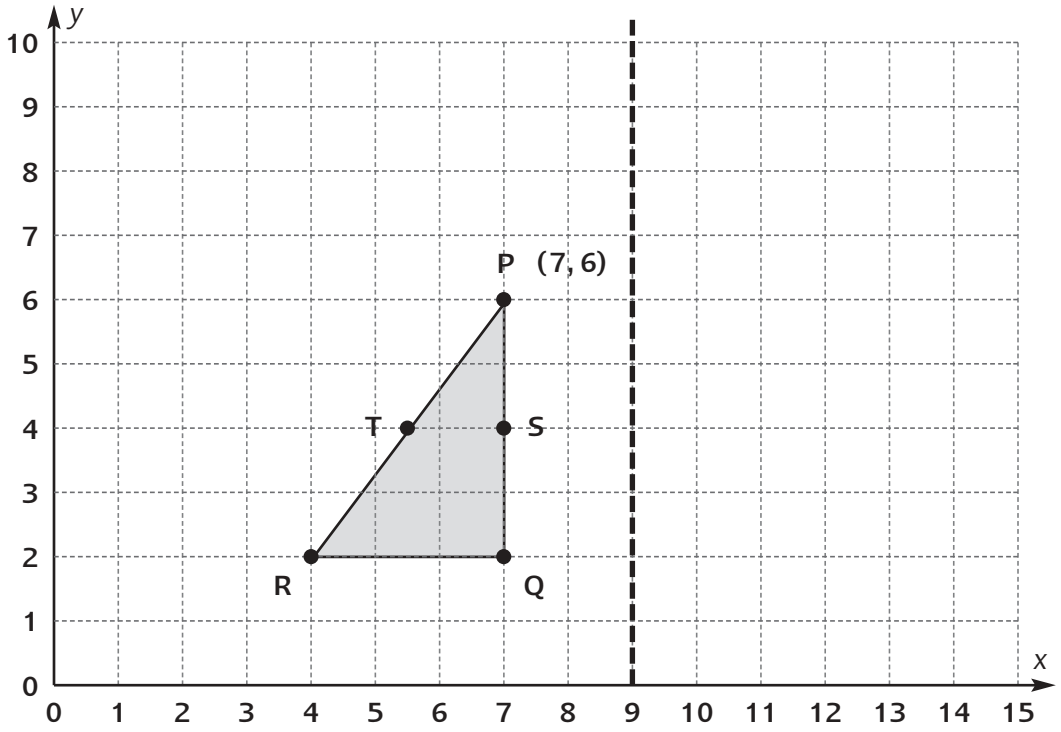
(……, ……) (……, ……)

(……, ……) (……, ……)

6 Draw the lines of symmetry on the rectangle you have just drawn.

# Triangles and coordinates

## 3 Triangles and coordinates




1 P, Q, R are the vertices of this triangle. What are the coordinates of Q and R?

(……, ……) (……, ……)

2 S is halfway between P and Q. Coordinates of S are (……, ……)

3 T is halfway between P and R. Coordinates of T are (……, ……)

4 Translate (move) the triangle 3 squares to the left and 2 squares up.
Draw its new position.
What are the coordinates of the vertices after the translation?

(……, ……)

(……, ……) (……, ……)

5 Reflect the original triangle PQR on the other side of the dotted line.
Draw its new position.
What are the coordinates of the vertices after the reflection?

(……, ……)

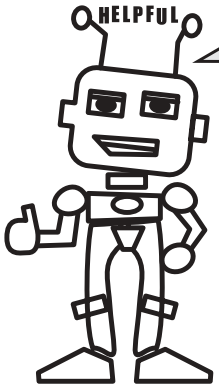
(……, ……) (……, ……)

UNIT 8

# Triangles and coordinates

STAR CHALLENGE 2

## Plotting pictures

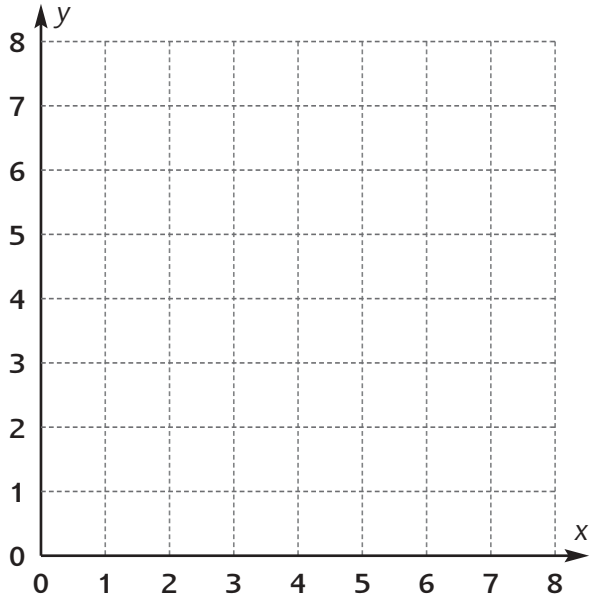



To plot a point, find its position on the grid and mark it with a small ✘.

1 star for each correct picture set and answers

*For each group of points in a picture set:*

- *plot the points in the given order*
- *join them with straight lines as you go along*
- *write down the name of the shape you have made*

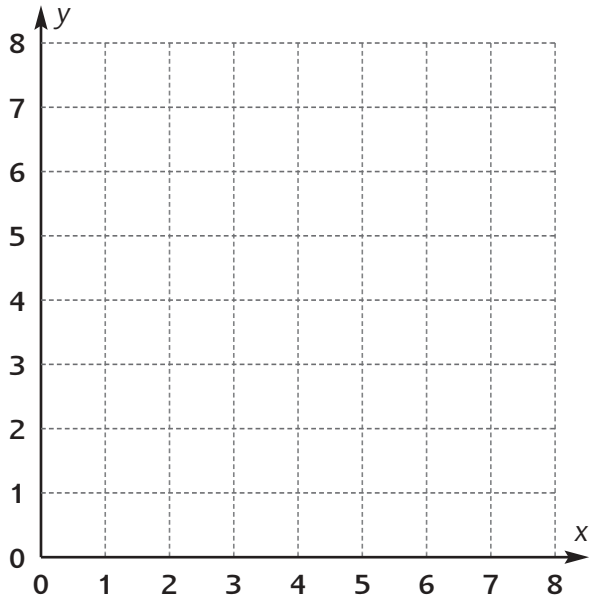



**Picture set 1**

(a) Join (1,5) (3,7) (5,5) (1,5).
Shape: .....

(b) Join (1,2) (1,4) (4,4) (4,2) (1,2).
Shape: .....

(c) Join (6,2) (6,4) (8, 4) (8, 2) (6, 2).
Shape: .....




**Picture set 2**

(a) Join (0, 6) (2, 8) (4, 6) (2, 4) (0, 6).
Shape: .....

(b) Join (1, 1) (3, 3) (7, 3) (5, 1) (1, 1).
Shape: .....

(c) Join (6, 4) (5, 6) (6, 8) (7, 6) (6, 4).
Shape: .....

UNIT 8

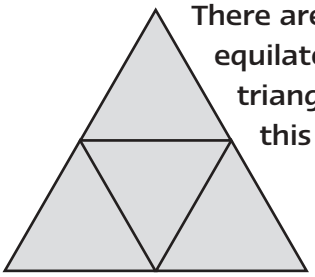
# Triangles and coordinates

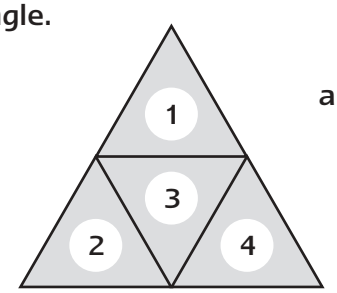
STAR CHALLENGE 3

## Equilateral triangle puzzles

1 star for each correct answer

There are 5 equilateral triangles in this triangle.



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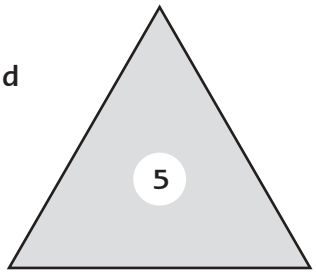
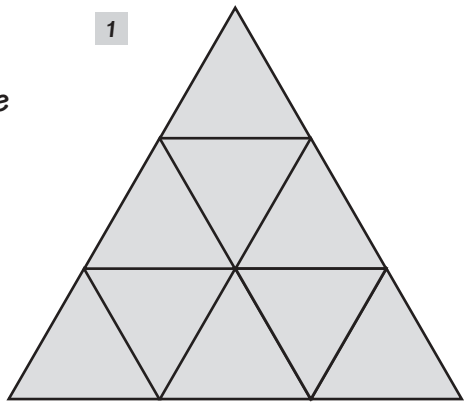


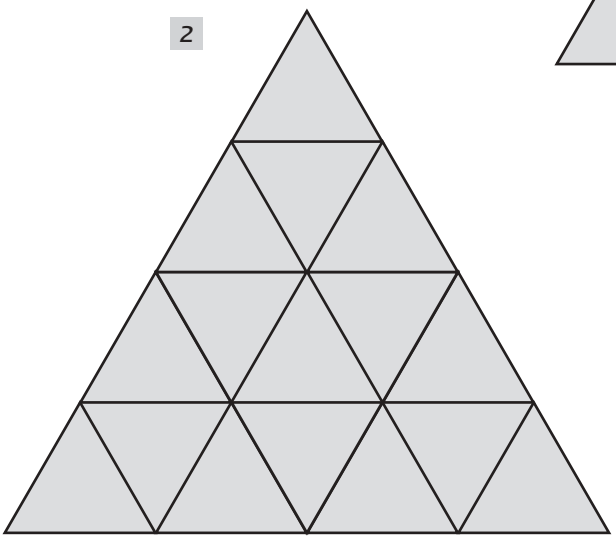

Work out how many equilateral triangles there are in each of these 2 triangles:

1



. . . . . .

2



. . . . . .

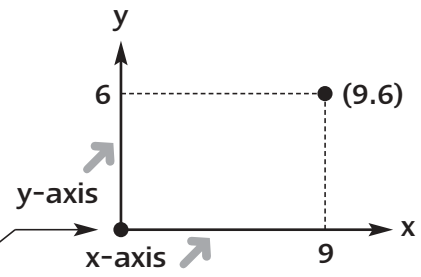
UNIT 8

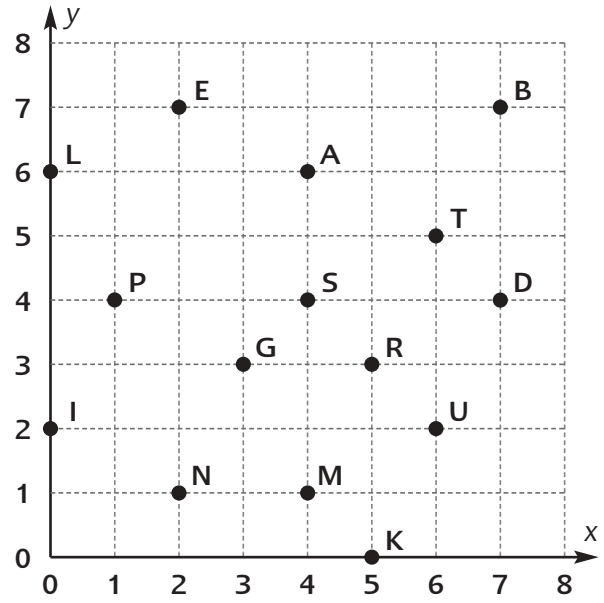
# Fun with coordinates

## 1 Coordinates

In a set of coordinates:

- the first number tells you how far **across** to go
- the second number tells you how far **up** to go
- the order is important
- the point (0, 0) is called the **origin**




1 The coordinates of the point M are (4, 1). What are the coordinates of R? (……, ……)

2 What are the coordinates of D? (……, ……)

3 The point P is found at (1, 4). What letter is found at (2, 1)? ……

4 What letter is found at (2, 7)? ……

5 'TEA' is (6, 5), (2, 7), (4, 6). What would you 'eat' if you 'ate' the points (1, 4), (2, 7), (4, 6), (4, 4)? ……

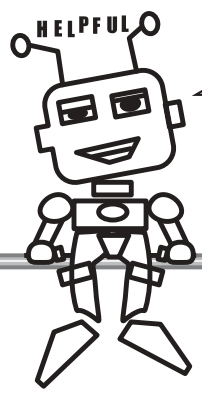
6 Write the following 'meal' as coordinates: BREAD AND MARMALADE

B R E A D A N D

(….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..)

M A R M A L A D E

(….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..) (….., …..)




Don't know what the origin is? Look at the top of the page.

7 What are the coordinates of the origin? (……, ……)

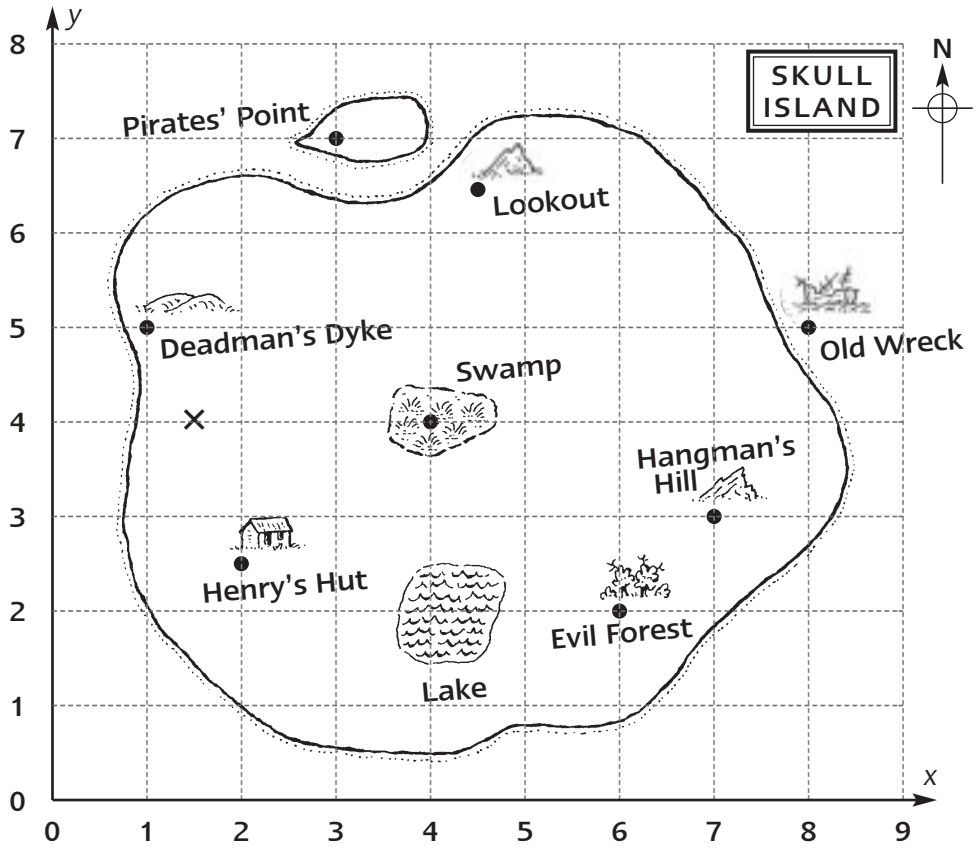
UNIT 8

# Fun with coordinates

STAR CHALLENGE 4

## The treasure map

7–8 correct 1 star




What are the coordinates of:

1 the Old Wreck? (……, ……)

2 the centre of the Swamp? (……, ……)

3 Henry's Hut? (……, ……)

What would be found at:

4 (3, 7)? ……

5 (6, 2)? ……

6 What would be found at $(4\frac{1}{2}, 6\frac{1}{2})$? ……

7 Long John Silver marked the spot where he buried the treasure with an X. What are the coordinates of the position of the treasure? (……, ……)

8 What would be found halfway from Hangman's Hill to Deadman's Dyke? ……

UNIT 8

# Fun with coordinates

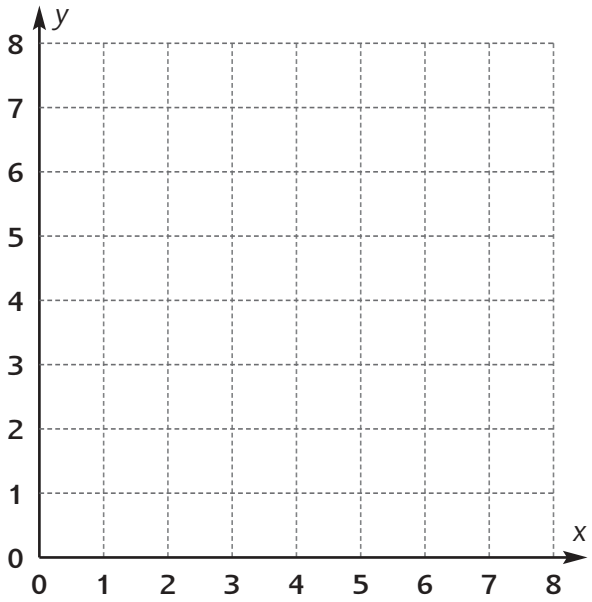
STAR CHALLENGE 5

## More picture puzzles

1 star for each correct picture set and answers

*For each group of points in a picture set:*

- *plot the points in the given order*
- *join them with straight lines as you go along*
- *write down the answers to the questions*




Picture set *1*

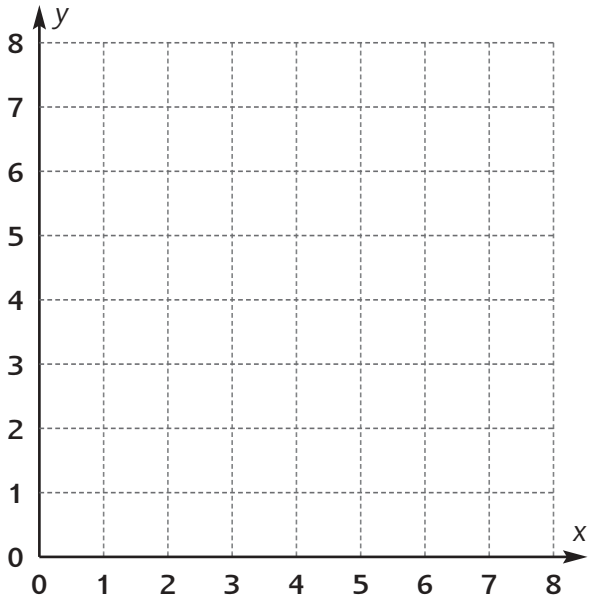
Join (4, 0) (1, 5) (7, 5) (4, 0).

Start again.

Join (1, 2) (4, 7) (7, 2) (1, 2).

What are the coordinates of the centre of this shape? (....., .....)

Describe the shape you have made: .....




Picture set *2*

Join (1, 7) (0, 6) (1, 5) (5, 5)

(5, 6) (5 $\frac{1}{2}$, 5) (7, 4) (7, 3)

(5, 3 $\frac{1}{2}$) (4, 1) (3, 3) (2, 3)

(1, 1) (0, 3) (1, 5)

What have you drawn? .....

What should the coordinates of the eye be? (....., .....)

UNIT 8

# Unit 8 Answers

## Section 1 Lines and rectangles

### 1 Parallel and perpendicular lines

| | | | | | |
|---|---|---|---|---|---|
| 1 | T | 5 | T | 9 | parallel |
| 2 | F | 6 | T | 10 | perpendicular |
| 3 | F | 7 | F | | |
| 4 | T | 8 | F | | |

### 2 Properties of rectangles

Note: CD is the same as DC

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | CD | 5 | AD | 9 | T | 13 | T |
| 2 | CD | 6 | BD | 10 | T | 14 | T |
| 3 | CD or AB | 7 | 4 | 11 | T | 15 | T |
| 4 | BD | 8 | F | 12 | F | | |

## Section 2 Triangles and coordinates

### 1 Classifying triangles

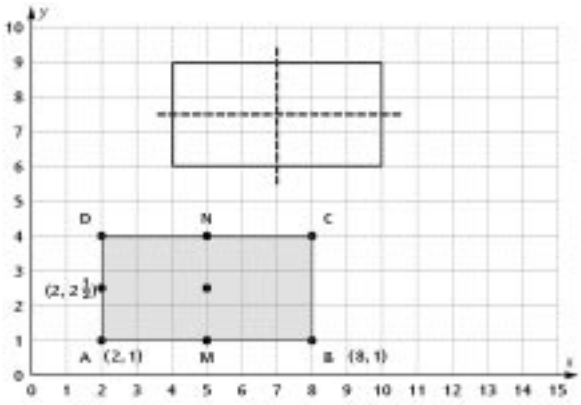
| | | | |
|---|---|---|---|
| A isosceles | B equilateral | C right-angled | D scalene |
| E right-angled | F isosceles | G equilateral | H isosceles |
| I isosceles | J right-angled | K right-angled and isosceles | |
| L isosceles | | | |

UNIT 8

# Unit 8 Answers

## Triangles and coordinates *continued*

### 2 Rectangles and coordinates




1 C (8, 4), D (2, 4)

2 M (5, 1)

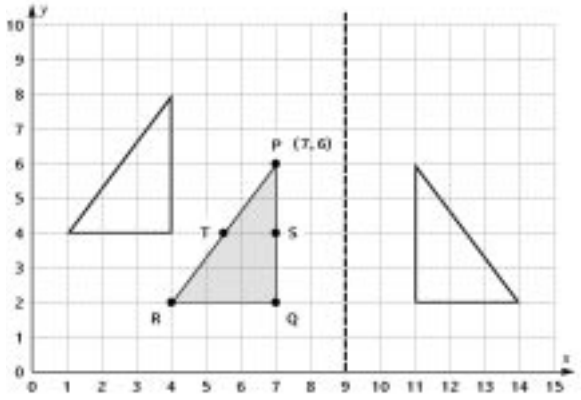
3 N (5, 4)

4 $(5, 2\frac{1}{2})$

5 See diagram for position of rectangle (4, 6) (10, 6) (10, 9) (4, 9)

6 See lines of symmetry on the diagram

### 3 Triangles and coordinates




1 (7, 2) (4, 2)

2 S (7, 4)

3 T $(5\frac{1}{2}, 4)$

4 See diagram for position of triangle (4, 4) (4, 8) (1, 4)

5 See diagram for position of triangle (11, 2) (14, 2) (11, 6)

## Section 3 Fun with coordinates

### 1 Coordinates

1 (5, 3) 2 (7, 4) 3 N 4 E

5 Peas

6 (7, 7) (5, 3) (2, 7) (4, 6) (7, 4) (4, 6) (2, 1) (7, 4)

(4, 1) (4, 6) (5, 3) (4, 1) (4, 6) (0, 6) (4, 6) (7, 4) (2, 7)

7 (0, 0)

UNIT 8

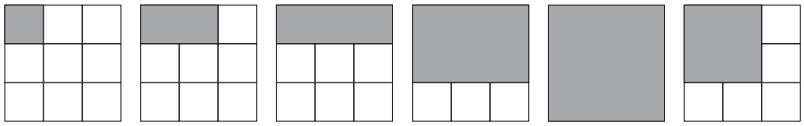
# Unit 8 Answers

## Star Challenge answers

### STAR CHALLENGE 1

How many different rectangles can you find?

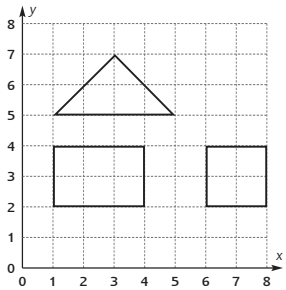
6 correct 2 stars
5 correct 1 star

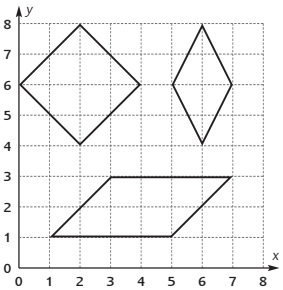


### STAR CHALLENGE 2

Plotting pictures

1 star for each correct picture set and answers




Picture set 1

(a) triangle
(b) rectangle
(c) square

Picture set 2

(a) square
(b) parallelogram
(c) rhombus

### STAR CHALLENGE 3

Equilateral triangle puzzles

1 star for each correct answer

1 13 2 27

### STAR CHALLENGE 4

The treasure map

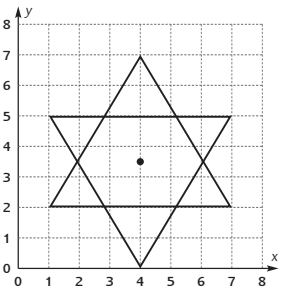
7–8 correct 1 star

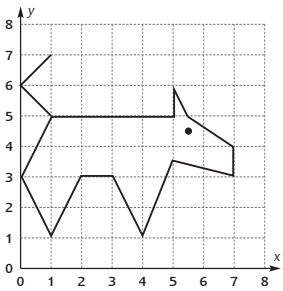
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | (8, 5) | 3 | (2, $2\frac{1}{2}$) | 5 | Evil Forest | 7 | ($1\frac{1}{2}$, 4) |
| 2 | (4, 4) | 4 | Pirates' Point | 6 | Lookout | 8 | Swamp |

### STAR CHALLENGE 5

More picture puzzles

1 star for each correct picture set and answers




Picture set 1

(4, $3\frac{1}{2}$), star

Picture set 2

dog, ($5\frac{1}{2}$, $4\frac{1}{2}$)