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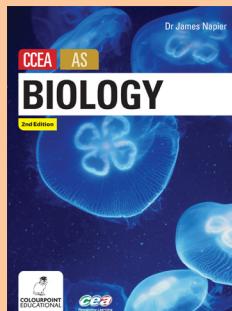
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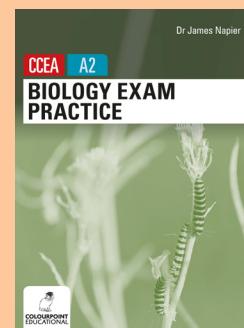
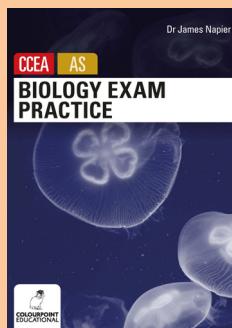


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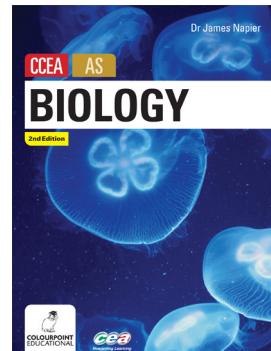


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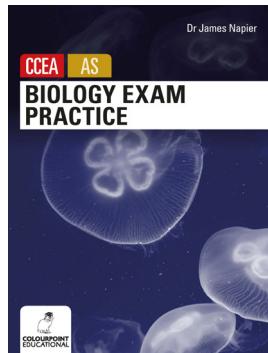


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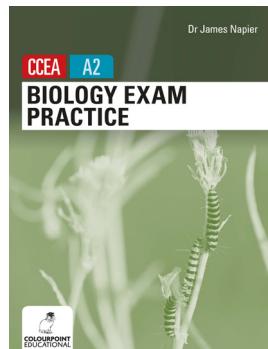


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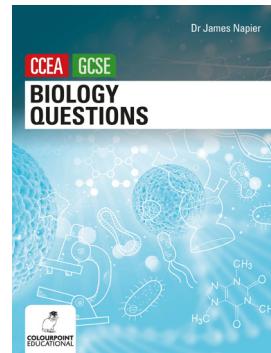
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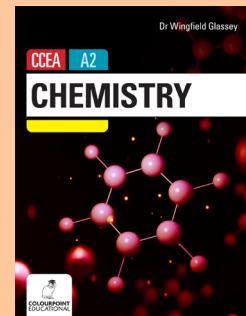
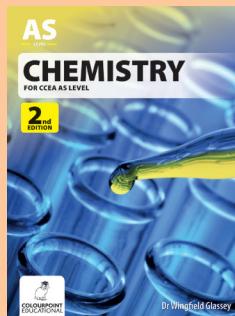
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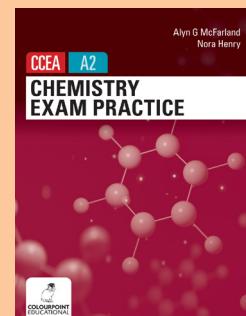
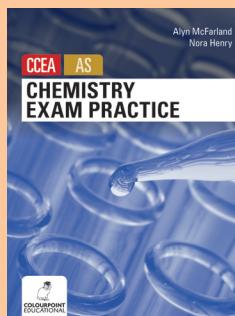


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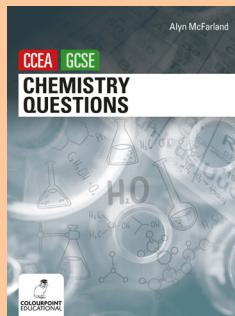
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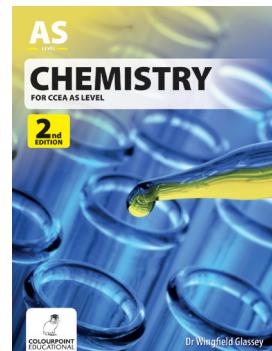
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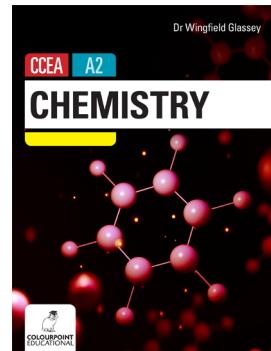
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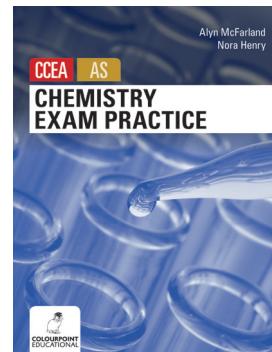
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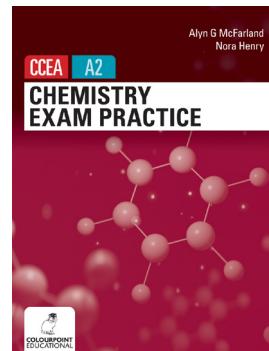


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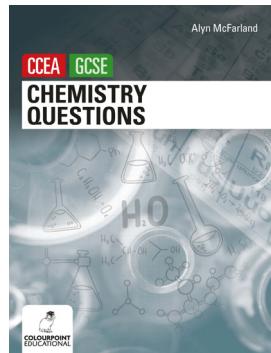
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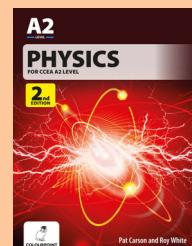
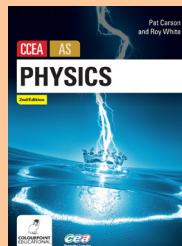
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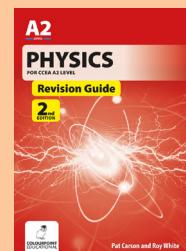
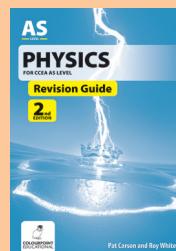


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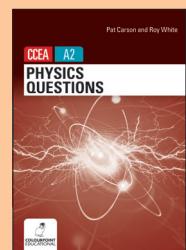
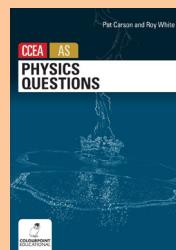
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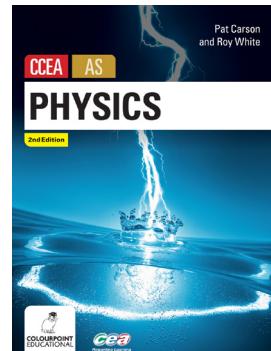


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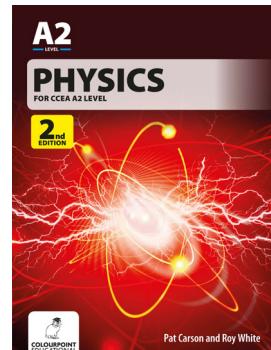


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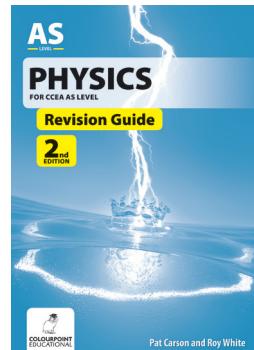


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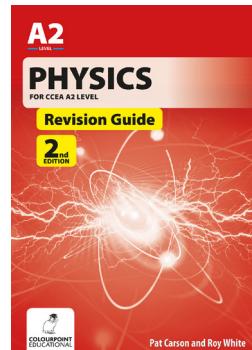


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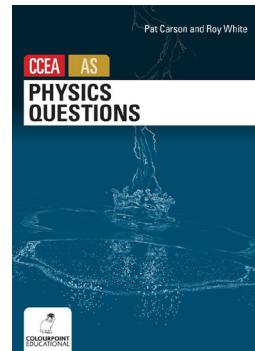


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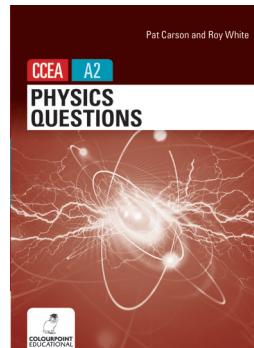
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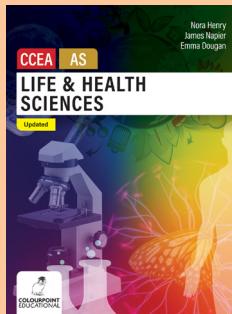
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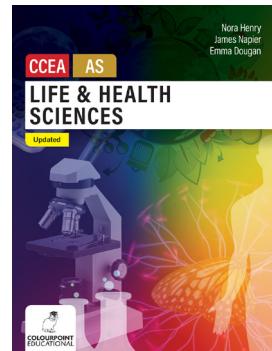
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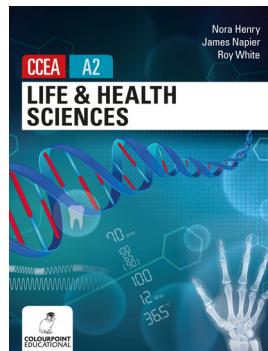
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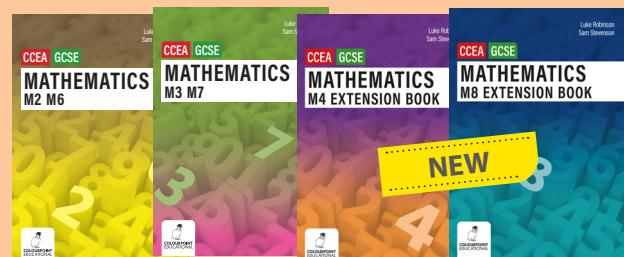


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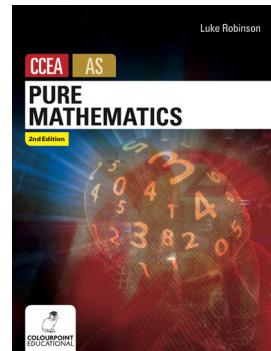


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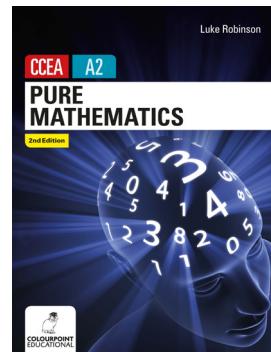


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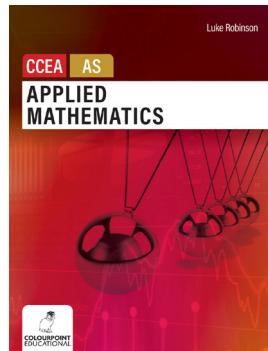
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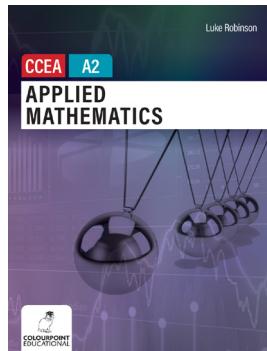
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Chapter 12  
Real-Life Linear Graphs

## REAR-EL

**12.1 Introduction**

Linear graphs, or straight-line graphs, are a common way to represent data in the real world. They can be used to show how things change over time, or to compare two different quantities. In the previous chapter, linear graphs were used to draw a straight line from its equation. For example,  $y = 2x + 3$ .

In this chapter, you will learn how to use linear graphs to model and solve real-life situations, such as calculating the total price of a purchase based on a certain number of items. In the previous chapter, you also learned how to calculate the gradient of a linear graph. In the work on linear graphs in this chapter, you will learn how to interpret the gradient in the context of the question.

**Key words**

- **Linear graph:** a straight-line graph.
- **Gradient:** a measure of the steepness of the line.

**Before you start you should know how to:**

- Plot a straight-line graph.
- Calculate the gradient of a straight-line graph.

**In this chapter you will learn how to:**

- Use linear graphs to model situations
- Calculate the gradient of a real line

**Exercise 12A [Revision]**

- (a)** Copy and complete the table of values, using the equation  $y = -\frac{1}{2}x + 3$

|     |    |    |   |   |   |   |
|-----|----|----|---|---|---|---|
| $x$ | -4 | -2 | 0 | 2 | 4 | 6 |
| $y$ | 5  |    |   |   |   | 1 |

**(b)** Draw coordinate axes, using values -4 to 6 on the  $x$ -axis and 0 to 6 on the  $y$ -axis. Using the values in your table, plot the line  $y = -\frac{1}{2}x + 3$

**(c)** Using two points on your straight line, calculate the line's gradient.

- Without plotting the points on a graph, calculate the gradient of the straight line between each

(a)  $(3, 6)$  and  $(4, 4)$       (b)  $(-4, -1)$  and  $(4, 1)$       (c)

## 12.2 Modelling Using Linear Graphs

- To show the relationship between the price of a product and the number of items bought.
- To calculate the distance travelled by a car using different amounts of petrol.
- To show how the population of a city changes over time.

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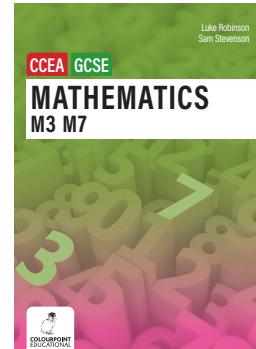
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(M7) 22: Number Systems; 23: Surds; 24: Indices; 25: Standard Form; 26: Simultaneous Equations; 27: Inequalities; 28: Formulae; 29: Sequences; 30: Non-linear Graphs; 31: Real-life Graphs; 32: Graphical Solutions; 33: Proportion and Variation; 34: Transformations; 35: Similarity; 36: Constructions and Loci; 37: Probability



# Chapter 14

## Pythagoras' Theorem and Trigonometry

### 14.1 Introduction

This chapter is about using Pythagoras' Theorem and Trigonometry in right-angled triangles. If you know two of the sides of a right-angled triangle, Pythagoras' Theorem allows you to find the third side.

If you know one of the sides of a right-angled triangle and the two acute angles, you can use trigonometry to find the other two sides. This is called solving a right-angled triangle.

Pythagoras' Theorem is one of the most famous theorems in mathematics, and was known around 500 BC. He discovered the relationship between the three sides of a right-angled triangle. Pythagoras' Theorem is often known as the Pythagorean Theorem.

**Key words**

- Hypotenuse** – The hypotenuse is the longest side in a right-angled triangle.
- Right angle** – An angle of  $90^\circ$ .
- Side, centre and tangent** – The three trigonometric functions sine, cosine and tangent are ratios of the side lengths of a right-angled triangle.

**Before you start you should know how to:**

- Use Pythagoras' Theorem in a right-angled triangle.
- Find approximations to numbers by rounding.
- Work with fractions.

**In this chapter you will learn how to:**

- Use Pythagoras' Theorem in a right-angled triangle.
- Find the length of the hypotenuse of a right-angled triangle given the other two sides.
- Find the length of one of the other sides, given the other two sides.
- Find the length of a side and an acute angle.
- Find the length of a side and an acute angle given the other two sides.
- Use trigonometry to find the length of a side of a right-angled triangle.
- Calculate the following:
  - $4^2 + 5^2 =$
  - $\sqrt{16 + 25} =$
  - Round the following numbers to 1 decimal place:
    - 1.45
    - 1.455
    - 1.4555
  - Round the following numbers to 2 decimal places when appropriate:
    - $5 \times 2.1 =$
    - $100 \times 0.21 =$
    - $0.45 \times 0.9 =$
    - $0.45 \times 0.09 =$

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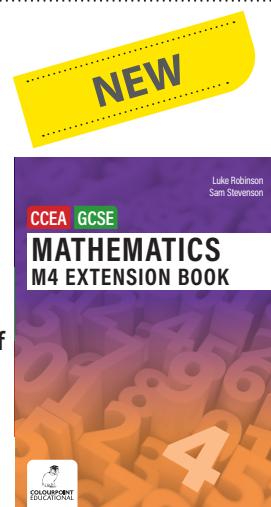
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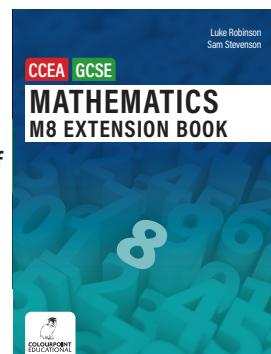
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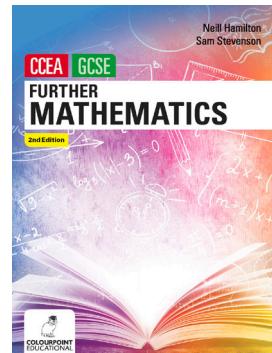
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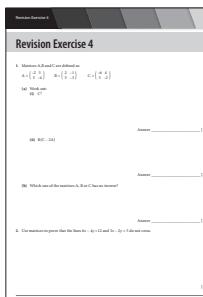
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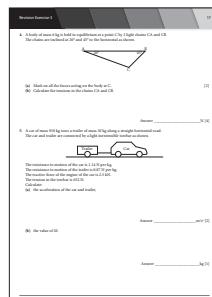
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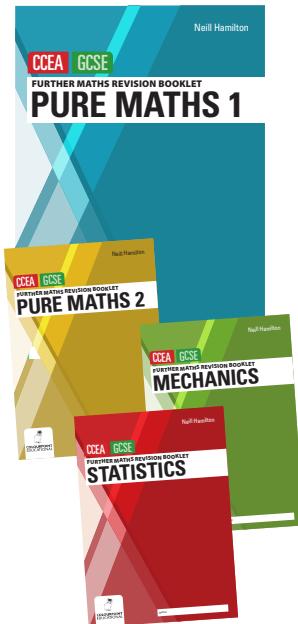
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## Sample pages

**M2**

Revision Exercise 5

31

### Revision Exercise 5

1. (a) P and Q have coordinates  $(-3, 1)$  and  $(5, 5)$  respectively. Calculate:

(i) the midpoint of PQ.

Answer \_\_\_\_\_

(ii) the length of the line PQ correct to 3 significant figures.

Answer \_\_\_\_\_



ABC is a tile in a child's mosaic. It is a right angled triangle.  
 $AB = 2.4$  cm and  $BC = 6.2$  cm.

Calculate:

(i) the area of ABC.

Answer \_\_\_\_\_ cm<sup>2</sup>

(ii) the length of AC.

Answer \_\_\_\_\_ cm

2. (a) Write the number 60 as a product of its prime factors.

Answer \_\_\_\_\_

(b) Find the LCM (lowest common multiple) of 60 and 42.

Answer \_\_\_\_\_

(c) Find the HCF (highest common factor) of 60 and 42.

Answer \_\_\_\_\_

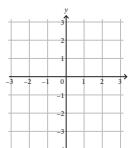
(d) Find the HCF (highest common factor) of 60 and 42.

Answer \_\_\_\_\_

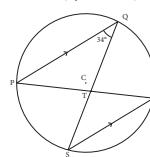
**M4**

Revision Exercise 1

6. ABC is a triangle. A(2, -4), B(3, 2), C(-3, 3). Prove that ABC is a right-angled triangle.



7. C is the centre of the circle shown below. PQ is parallel to SR.  $\angle PQS = 34^\circ$



Find the size of the angle:

(a)  $\angle PRS$

Answer \_\_\_\_\_\*

(b)  $\angle QSR$

Answer \_\_\_\_\_\*

(c)  $\angle PTQ$

Answer \_\_\_\_\_\*

(d)  $\angle PTS$

Answer \_\_\_\_\_\*

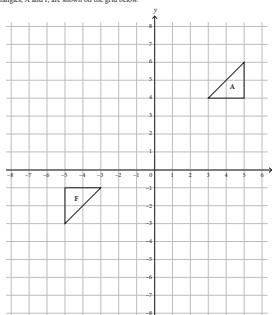
**M6**

22

Revision Exercise 2B

17

3. Two triangles, A and E, are shown on the grid below.



(a) Translate triangle A to the left and 2 up.

Label the new triangle B.

[1]

(b) Reflect triangle A in the y-axis.

Label this reflection C.

[1]

(c) Reflect triangle A in the line  $y = 1$ .

Label this reflection D.

[2]

(d) Rotate triangle D  $90^\circ$  clockwise about the origin.

Label this image E.

[3]

(e) Describe the transformation that maps triangle E onto triangle F.

Answer \_\_\_\_\_

[2]

**M8**

Revision Exercise 2A

17

8. The inverse square law states that the force of attraction,  $F$  newtons, on an object is inversely proportional to the square of the distance,  $x$  cm, from the object.

When  $F = 20$ ,  $x = 8$

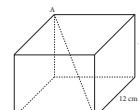
(a) Express  $F$  in terms of  $x$ .

Answer \_\_\_\_\_ [3]

(b) What happens to  $F$  when the value of  $x$  is doubled?

Answer \_\_\_\_\_ [2]

9.



A cuboid has dimensions 12 cm by 9 cm by 7 cm as shown in the diagram above.

(a) Calculate the length of the space diagonal AB.

Answer \_\_\_\_\_ cm [4]

(b) Find the angle that AB makes with the base of the cuboid.

Answer \_\_\_\_\_ \* [2]



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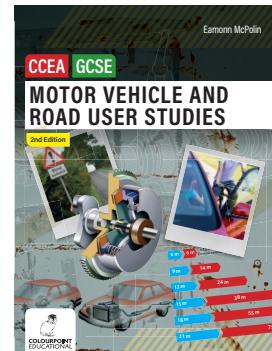
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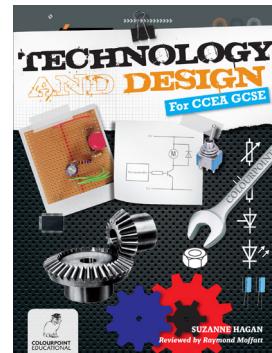
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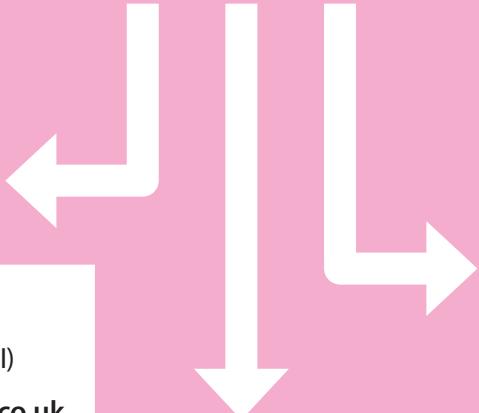
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