



Step graphs

Year 8 About 60 minutes No calculator 47 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Needed today [1 mark]
How many minutes are there in 3.5 hours? Work out $4 \times \text{£}2.35$.

Answer

Answer

- A3** From chapter 4 [1 mark] **A4** From chapter 3 [1 mark]
Work out the mean of 6, 9, 10 and 15. Work out the size of one exterior angle of a regular hexagon.

Answer

Answer

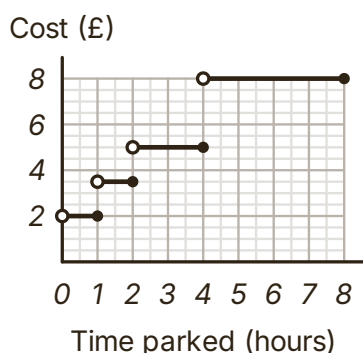
B Example, then your turn

Year 8

On these graphs a filled circle is included in its step and an open circle is not. Your teacher works through each example with you. Then try the one beside it.

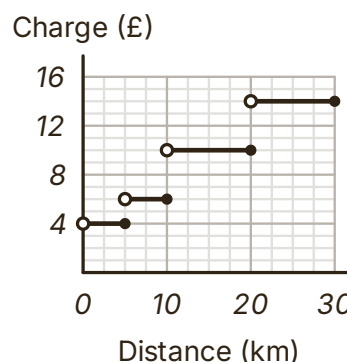
EXAMPLE 1

The step graph shows the charges at a car park. (a) Work out the cost of parking for 40 minutes, for exactly 2 hours, and for 4 hours 20 minutes. (b) Jo has £5. What is the longest time she can park? (c) Sam paid £3.50. Write down the range of times he could have parked for.



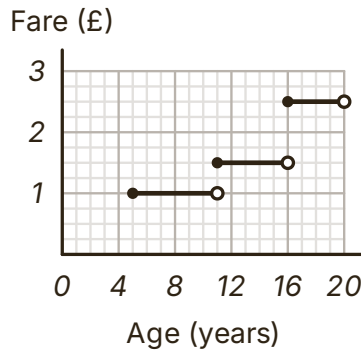
Hint To read a cost, go up from the time to the step above it. To read backwards, go across from the cost to its step: the step runs from its open circle to its filled circle.

- B1** The step graph shows the charge for a delivery. (a) Work out the charge for a delivery of 8 km, of exactly 10 km, and of 25 km. (b) A delivery cost £10. Write down the range of distances it could have been. [5 marks]



EXAMPLE 2

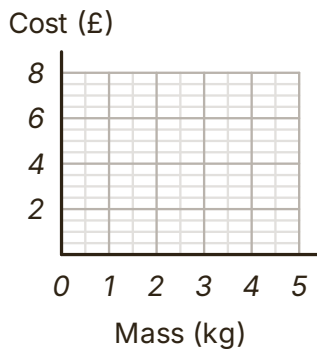
The graph shows bus fares by age. Children under 5 travel free. Here the filled circle is at the START of each step. Work out the fare for a person aged (a) 11, (b) 15, (c) 16.



Hint At age 11 there is an open circle on the £1 step and a filled circle on the £1.50 step. The filled circle is the one that counts.

EXAMPLE 3

A courier charges £3 for a parcel up to 1 kg, £4.50 for more than 1 kg up to 2 kg, £5.50 for more than 2 kg up to 3 kg, and £7 for more than 3 kg up to 5 kg. Draw a step graph to show these charges.



Hint Draw one flat line for each charge. Put an open circle at the start of each line and a filled circle at the end.

B2 The graph shows the price of a bowling game by age. [3 marks]

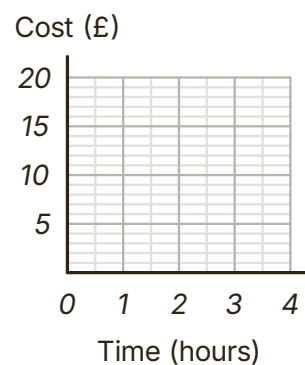
The filled circle is at the start of each step. Work out the price for a person aged (a) 9, (b) 10, (c) 16.



Answer (a) £ ... (b) £ ... (c) £ ...

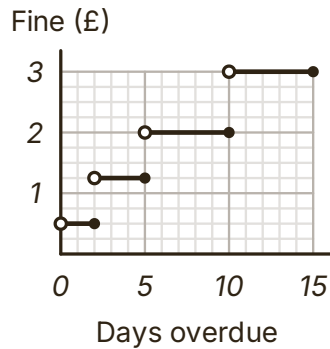
B3 A boat costs £8 to hire for up to 1 hour, £14 for more than 1 hour up to 2 hours, and £18 for more than 2 hours up to 4 hours. Draw a step graph on the grid to show these charges. [3 marks]

Draw a step graph on the grid to show these charges.



- C1** The graph shows a library's fines for overdue books. Lee returns four books. Two are 4 days overdue, one is 7 days overdue and one is 12 days overdue. Work out his total fine.

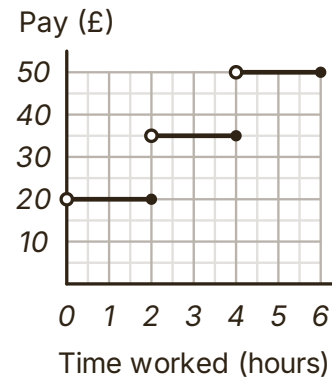
[3 marks]



Answer £ ...

- C2** The graph shows a waiter's pay for one day at the weekend. Jaya works 3 hours on Saturday and 5 hours on Sunday. She is also given 10% of her pay as tips. How much does she get altogether?

[3 marks]



Answer £ ...

- C3** A parcel firm charges £6.50 to send a parcel of up to 2 kg. For a parcel over 2 kg, it charges £1.20 more for each extra 500 g, or part of 500 g. Work out the cost of sending a parcel of 3.3 kg.

[3 marks]

Answer £ ...

- C4** Which of these gives a step graph? Give a reason. A: the distance a car travels at a steady speed. B: the cost of hiring a bike at £5 for each hour or part of an hour. C: the temperature of a cup of tea as it cools.

[2 marks]

Answer

D1 The step graph shows the charges at a station car park.

- (a) Write down the cost of parking for 1 hour. [1 mark]

Answer £ ...

- (b) Rosa parks from 10:35 to 13:05. Work out the cost. [2 marks]

Answer £ ...

- (c) Tom parks twice: once for 45 minutes and once for 3 hours 20 minutes. He pays with a £10 note. How much change should he get? [2 marks]

Answer £ ...

- (d) Work out the cost per hour of parking for exactly 4 hours and for exactly 6 hours. Which is cheaper per hour? [2 marks]

Total for D1: 7 marks

- D2** Ella says, "Parking for exactly 2 hours costs £6, because the price goes up at 2 hours." [2 marks]

A car park charges £4 for more than 1 hour up to and including 2 hours, and £6 for more than 2 hours up to 4 hours. Is Ella correct? Give a reason for your answer.

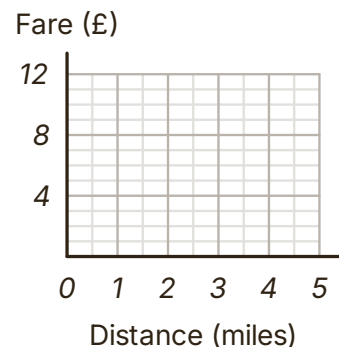
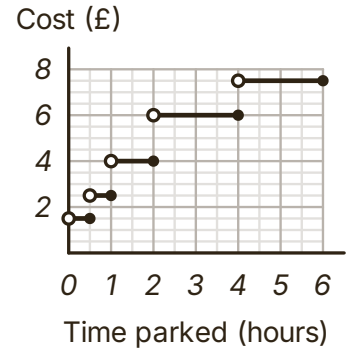
D3 A taxi charges £3 for a journey up to 1 mile. For each extra mile, or part of a mile, it charges £2 more. The charges go up to 5 miles.

- (a) Draw a step graph on the grid to show the charges for journeys up to 5 miles. [3 marks]

- (b) Work out the fare for a journey of 3.4 miles. [1 mark]

Answer £ ...

Total for D3: 4 marks



D4 Company A charges for parcels using the table. Company B charges £2.30 for each kilogram, or part of a kilogram. Megan wants to send a parcel with a mass of 3.6 kg. Which company is cheaper, and by how much? You must show your working. [4 marks]

Mass, m (kg)	Cost (£)
$0 < m \leq 1$	4.20
$1 < m \leq 2$	5.90
$2 < m \leq 5$	8.50
$5 < m \leq 10$	12.00

E Extension Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

E1
Car park A charges £1.80 for each hour or part of an hour. Car park B charges £3 for up to 2 hours, £6 for more than 2 hours up to 5 hours, and £9 for more than 5 hours up to 12 hours. For which stays of up to 6 hours is car park B cheaper? Give your answer as ranges of time.
[4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1

Hint 1

Work out both costs for each hour: a stay of up to 1 hour, more than 1 up to 2 hours, and so on.
- Hint 2

Up to 1 hour: A £1.80, B £3. More than 1 up to 2 hours: A £3.60, B £3.
- Hint 3

Continue: 2–3 h: A £5.40, B £6; 3–4 h: A £7.20, B £6; 4–5 h: A £9, B £6; 5–6 h: A £10.80, B £9. So B is cheaper for more than 1 up to 2 hours, and for more than 3 up to 6 hours.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can read a cost from a step graph, and read a step graph backwards.

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- I can use open and filled circles to tell which end of a step is included.

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- I can draw a step graph from a list of charges.

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- I can work out charges such as "each extra 500 g or part of 500 g".

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