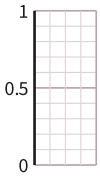
Fix it 1 One small square

Count the small squares between two labels on the frequency density axis. Share the gap between the labels by that number: that is what one small square is worth. It is not always 1.

EXAMPLE

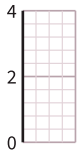
Up the frequency density axis, what is one small square worth?



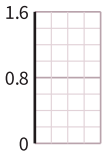
1. From 0 to 0.5 is 5 small squares.
2. 0.5 ÷ 5 = 0.1
3. One small square is 0.1.

YOUR TURN

1. This is part of a frequency density axis. What is one small square worth?



2. This is part of a frequency density axis. What is one small square worth?



3. This is part of a frequency density axis. What is one small square worth?

Check: Count up from 0 by your answer, one square at a time. You land on the next label.

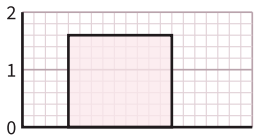
The Maths Habit

Fix it 2 Read the height

The height of a bar is its frequency density. Find the label just below the top of the bar, then add one small square's worth for each square up to the top.

EXAMPLE

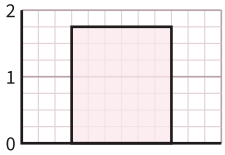
One small square up is 0.2. How tall is the bar?



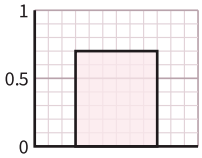
1. The label below the top is 1.
2. Then 3 squares up: 3 × 0.2 = 0.6
3. Height 1 + 0.6 = 1.6, its frequency density.

YOUR TURN

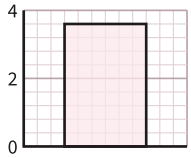
1. One small square up is 0.25. How tall is the bar?



2. One small square up is 0.1. How tall is the bar?



3. One small square up is 0.4. How tall is the bar?



Check: Count the squares from 0 to the top. That many lots of one small square is your height.

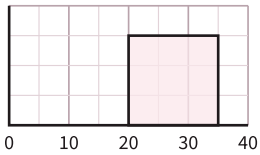
The Maths Habit

Fix it 3 Class width

The class width is how wide the class is: its upper bound take away its lower bound. On a histogram, read where the bar starts and where it stops off the x axis.

EXAMPLE

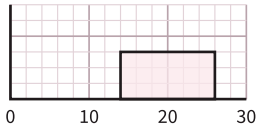
One small square across is 5.
What is the class width of the bar?



1. It starts at 20.
2. It stops 1 square after 30, at 35.
3. Class width: 35 − 20 = 15

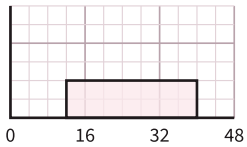
YOUR TURN

1. One small square across is 2. What is the class width of the bar?



2. What is the class width of $2.5 < x \leq 4$?

3. One small square across is 4. What is the class width of the bar?



Check: Add your class width on to where the bar starts. You get where it stops.

The Maths Habit

Fix it 4 Frequency is the area

frequency = frequency density × class width. The frequency is the area of the bar, not its height.

EXAMPLE

The bar for $20 < m \leq 35$ has frequency density 1.2. Find its frequency.

1. Class width: 35 − 20 = 15
2. Frequency = frequency density × class width
3. 1.2 × 15 = 18
4. Not 1.2: the height is not the frequency.

YOUR TURN

1. The bar for $40 < h \leq 50$ has frequency density 2.5. Find its frequency.

2. The bar for $5 < d \leq 20$ has frequency density 0.6. Find its frequency.

3. The bar for $1.5 < w \leq 2$ has frequency density 26. Find its frequency.

Check: Divide your frequency by the class width. You get the height back.

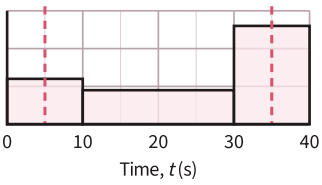
The Maths Habit

Fix it 5 Split the range

Mark the two ends of the range on the x axis. Split it at every class boundary in between. A piece can be only part of a bar: use just the part inside the range.

EXAMPLE

Split the range 5 to 35 at the class boundaries. How wide is each piece?



1. The boundaries inside it are 10 and 30.
2. Pieces: 5 to 10, 10 to 30, 30 to 35
3. Widths: 5, 20 and 5

YOUR TURN

1. The classes are $0 < x \leq 20$ and $20 < x \leq 30$. Split the range 12 to 30 at the class boundaries. How wide is each piece?

2. The classes are $40 < h \leq 50$, $50 < h \leq 60$ and $60 < h \leq 80$. Split the range 45 to 70 at the class boundaries. How wide is each piece?

3. The classes are $0 < t \leq 15$, $15 < t \leq 20$ and $20 < t \leq 40$. Split the range 10 to 26 at the class boundaries. How wide is each piece?

Check: Add up the widths of your pieces. You get the width of the whole range.

The Maths Habit

Fix it 6 Estimate from the pieces

Each piece's frequency is frequency density × the width of the piece. Add the pieces. It is an estimate: it assumes the values are spread evenly in each class.

EXAMPLE

The pieces are 5 to 10, 10 to 30 and 30 to 35, in bars with frequency density 1.2, 0.9 and 2.6. Estimate how many values are between 5 and 35.

1. 5 to 10: $1.2 \times 5 = 6$
2. 10 to 30: $0.9 \times 20 = 18$
3. 30 to 35: $2.6 \times 5 = 13$
4. Estimate: $6 + 18 + 13 = 37$

YOUR TURN

1. The pieces are 12 to 20 in a bar with frequency density 1.5, and 20 to 30 in a bar with frequency density 0.7. Estimate how many values are between 12 and 30.

2. The pieces are 45 to 50, 50 to 60 and 60 to 70, in bars with frequency density 0.8, 2.4 and 1.3. Estimate how many values are between 45 and 70.

3. The class $60 < s \leq 90$ has a frequency of 24. Estimate how many values are between 60 and 70.

Check: Your estimate is no more than the total of the whole bars the range touches.

The Maths Habit