There are three companies running kayak hire at a popular lake resort: Amy's oars, Ben's kayaks and Cecil's paddles. Their charges are given below:

Amy's oars

£ 12.00 for a whole day

C = ?

C = cost (£)

T = time (hours)

Ben's kayaks

Fixed cost: £ 7.00 plus

£0.75 per hour

C = ?

C = cost (£)

T = time (hours)

Cecil's paddles

Fixed cost: £ 4.00 plus

£ 3.00 every 2 hours

C = ?

C = cost (£)

T = time (hours)

Interpret and compare the charges the kayak hire companies apply for their services.

1. Represent the three kayak hire companies' charges algebraically, using linear equations, and graphically.

2. Three tourists want to hire kayaks for different amounts of time:

Tourist:	Hours
David	2
Emily	4
Francine	8

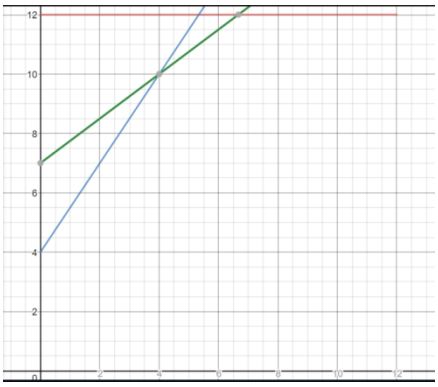
As a mathematical expert, advise the three tourists which is the best kayak hire company for them to use.

3. Write some general advice for tourists about which kayak hire company should be used, depending on the length of their intended hire time. You know that the quality of kayaks is the same at all the three places.

4. Your friend Gilbert wants to start the same type of business. He wants to be successful on the market by being the cheapest, profitable competitor. Describe at least two different ways Gilbert could realistically set his hire charges to achieve this goal. You must give the mathematical equations of your models and interpret them to show how they will be advertised in tourist publications.

Possible solutions:

1.



Amy's oars: C = 12
Ben's kayaks: C = 0.75 T + 7
Cecil's paddles: $C = \frac{3}{2}T + 4$

2.
David: T = 2
Amy's oars: C = **£12.00**
Ben's kayaks: C = 0.75 × 2 + 7.00; C = **£8.50**
Cecil's paddles C = 1.50 × 2 + 4.00; C = **£7.00**
David should use **Cecil's paddles**, since it will only cost £7.00.

Emily: T = 4
Amy's oars: C = **£12.00**
Ben's kayaks: C = 0.75 × 4 + 7.00; C = **£10.00**
Cecil's paddles C = 1.50 × 4 + 4.00; C = **£10.00**
Emily could use either **Ben's kayaks** or **Cecil's paddles**, since they will both cost £10.00.

Francine: T = 8
Amy's oars: C = **£12.00**;
Ben's kayaks: C = 0.75 × 8 + 7.00; C = **£13.00**
Cecil's paddles: C = 1.50 × 8 + 4.00; C = **£16.00**
Francine should use **Amy's oars**, since it will only cost £12.00.

3. Finding the points of intersection of the different graphs will help.

$C = 0.75\,T + 7.00$
$\underline{C = \frac{3}{2}T + 4.00}$

$0.75\,T + 7.00 = 1.50\,T + 4.00$
$3.00 = 0.75\,T$
$T =$ **4 hours**

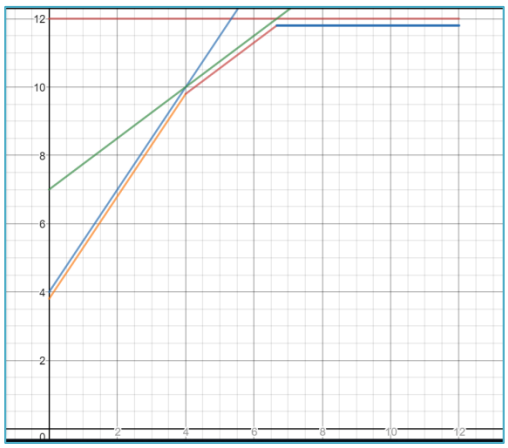
$C = 0.75\,T + 7.00$
$\underline{C = 12.00}$
$0.75\,T + 7.00 = 12.00$
$0.75\,T = 5.00$
$T = 6.67$
$T =$ **6 hours 40 minutes**

If you intend to use kayaks for up to 4 hours, it is the cheapest to use Cecil's paddles.
If you intend to use kayaks between 4 hours and 6 hours and 40 minutes it is cheapest to use Ben's kayaks.
If you intend to use kayaks for longer than 6 hours and 40 minutes it is cheapest to use Amy's oars.

Note: Students might reasonably assume that the companies hire by the hour only. If so, the changeover point is 6 hours instead of 6 hours 40 minutes.

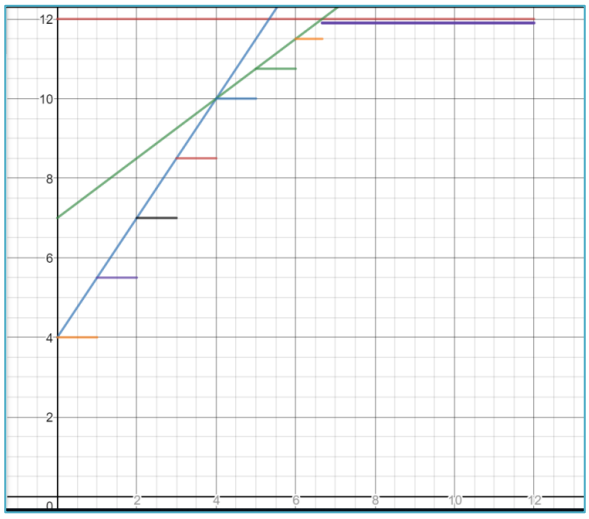
4. In order to be the cheapest provider of kayaks, Gilbert could use one of these two pricing models:

4a. C = 1.50 T + 3.80 for 0 < T < 4 hours
C = 0.75 T + 6.80 for 4 < T < 6.67 hours (6 hours 40 minutes)
C = 11.80 for 6.67 < T < 12 hours



Gilbert's kayak hire	
Up to 4h:	£3.80 fixed rate plus £1.50 an hour
4h to 6h40 :	£6.80 fixed rate plus 75p an hour
Over 6h40 :	£11.80 fixed rate

4b. C = 4.00 {0 < T < 1}
C = 5.50 {1 ≤ T < 2}
C = 7.00 {2 ≤ T < 3}
C = 8.50 {3 ≤ T < 4}
C = 10.00 {4 ≤ T < 5}
C = 10.75 {5 ≤ T < 6}
C = 11.50 {6 ≤ T < 6.67}
C = 11.90 {6.67 ≤ T < 12}



Gilbert's kayak hire	
Up to 1 hour:	£4.00
1 - 2 hours:	£5.50
2 - 3 hours:	£7.00
3 - 4 hours:	£8.50
4 - 5 hours:	£10.00
5 - 6 hours:	£10.75
6h - 6h 40min:	£11.50
Over 6h 40min:	£11.90

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