Chapter 6: Graphs of straight lines

Starter 6 (page 98)
1 Hint: The two squares that remain do not have to be the same size. Try removing two of the matches that meet in the centre of the original pattern.
2 Hint: Move the horizontal match half of its length to the right (or left).
3 Hint: Begin by removing the two upper left matches; place one of them to complete the fourth side of a square that now forms the face of the new fish.
4 Hint: Drag the right hand match slightly out, so a small square is formed where the matches meet.

Exercise 6.1 (page 100)
1 A (1, 2), B (−1, −2), C (−2, 3), D (3, −2), E (−3, 0)
2 a) M b) (0, 1) c) J d) K e) (6, −1) f) N g) D
3 (1, 3)
4 (1½, −3)

Exercise 6.2 (page 103)
1

<table>
<thead>
<tr>
<th>x</th>
<th>−4</th>
<th>0</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>y</td>
<td>−7</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

\[ y = 2x + 1 \]

<table>
<thead>
<tr>
<th>x</th>
<th>−5</th>
<th>0</th>
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<tbody>
<tr>
<td>y</td>
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<td>4</td>
<td>9</td>
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</table>

\[ y = x + 4 \]

<table>
<thead>
<tr>
<th>x</th>
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</thead>
<tbody>
<tr>
<td>y</td>
<td>−13</td>
<td>−1</td>
<td>14</td>
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\[ y = 3x − 1 \]

<table>
<thead>
<tr>
<th>x</th>
<th>−2</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>−7</td>
<td>−3</td>
<td>5</td>
</tr>
</tbody>
</table>
The graphs of the two lines are parallel.
The graphs of the two lines are parallel.

Exercise 6.3 (page 106)
1 \( m = 3, c = 1 \)  2 \( m = 1, c = 2 \)
3 \( m = -2, c = 6 \)  4 \( m = \frac{1}{2}, c = 1 \)
5 \( m = \frac{1}{4}, c = 2 \)  6 \( m = -\frac{2}{3}, c = 6 \)
7 \( m = \frac{1}{2}, c = 1 \)  8 \( m = -\frac{1}{2}, c = 4 \)

Exercise 6.4 (page 109)
1 \( y = 3x + 1 \)  2 \( y = x + 2 \)
3 \( y = -2x + 6 \)  4 \( y = \frac{1}{3}x + 1 \)
5 \( y = \frac{1}{3}x + 2 \)  6 \( y = -\frac{2}{3}x + 6 \)
7 \( y = \frac{1}{3}x + 1 \)  8 \( y = -\frac{1}{2}x + 4 \)
9 a) \( P (2, 2), Q (8, 5) \)  
  b) \( m = \frac{1}{2}, c = 1 \)
  c) \( y = \frac{1}{2}x + 1 \)
10 a) \( m = -\frac{1}{2}, c = 5 \)  
  b) \( y = -\frac{1}{2}x + 5 \)

Exercise 6.5 (page 112)
1 a) \( y = x - 6 \)  b) \( y = -2x - 5 \)
  c) \( y = \frac{1}{2}x + 1 \)  d) \( y = \frac{1}{2}x + 2 \)
  Lines c) and d) are parallel.
2 a) \( a = 5 \)
  b) \( b = -5 \), so the line has equation \( y = 5x - 5 \)
3 a) \( m = 4, c = 3 \), so the line has equation \( y = 4x + 3 \)
  b) \( p = 15 \)
4 a) \( y = 3x + 2 \)  b) \( y = 3x - 5 \)
5 \( -2 \)
6 \( y = 4 - x \)
7 \( x + 3y + x + 6 = 0 \)

Review Exercise 6 (page 113)
1
| \( x \) | -5 | 0 | 2 |
| \( y \) | -1 | 4 | 6 |

\( y = x + 4 \)
### Internet Challenge 6 (page 116)

1. Parallelogram
2. Trapezium
3. A prism whose faces are all parallelograms.
4. Blondie
5. Border between USA and Canada.
6. When any decision arises, all the possible outcomes occur, each in a separate ‘parallel universe’ hidden from the others.
7. ‘If a straight line crossing two straight lines makes the interior angles on the same side less than two right angles, the two straight lines, if extended indefinitely, meet on that side on which are the angles less than two right angles.’
   
   There are many other statements which are logically equivalent to the parallel postulate, including:
   
   ‘Through a point not on a given line, exactly one line can be drawn in the plane parallel to the given line.’

8. On a (rather old) computer.
9. On a ski slope.
10. True
11. Yes (consider railway tracks going round a bend).
12. An electrician
13. a) All of them.
   b) Bristol, Dr Richard Gregory

### Answers

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<th></th>
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<td>8</td>
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</tr>
<tr>
<td>y</td>
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<td>12</td>
<td>0</td>
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</table>

\[ x + y = 20 \]

5. a) \( m = \frac{1}{2}, c = 4 \) \( y = \frac{1}{2}x + 4 \)
   
   b) \( m = -1, c = 7 \) \( y = -x + 7 \)

6. \( y = 4x + 7 \)
7. \( y = 3x + 2 \)

8. Gradients are \( \frac{2}{3} \) and \( -\frac{3}{2} \); \( -\frac{3}{2} \times \frac{2}{3} = -1 \); product of gradients of perpendicular lines is \(-1\)

9. a) 2
   
   b) \( 2y + x - 12 = 0 \)
10. \( y = -2x + 5 \)

11. a) 8
   
   b) Any line of the form \( y = \frac{1}{2}x + k \)
   
   c) \( x = 2y - 2 \)

12. a) \( y = -\frac{1}{2}x + 3 \)
    
    b) Gradient is \(-\frac{1}{2}\)
    
    c) \( x + 2y = 14 \) or \( y = -\frac{1}{2}x + 7 \)

13. \( y = 2x + 6 \)