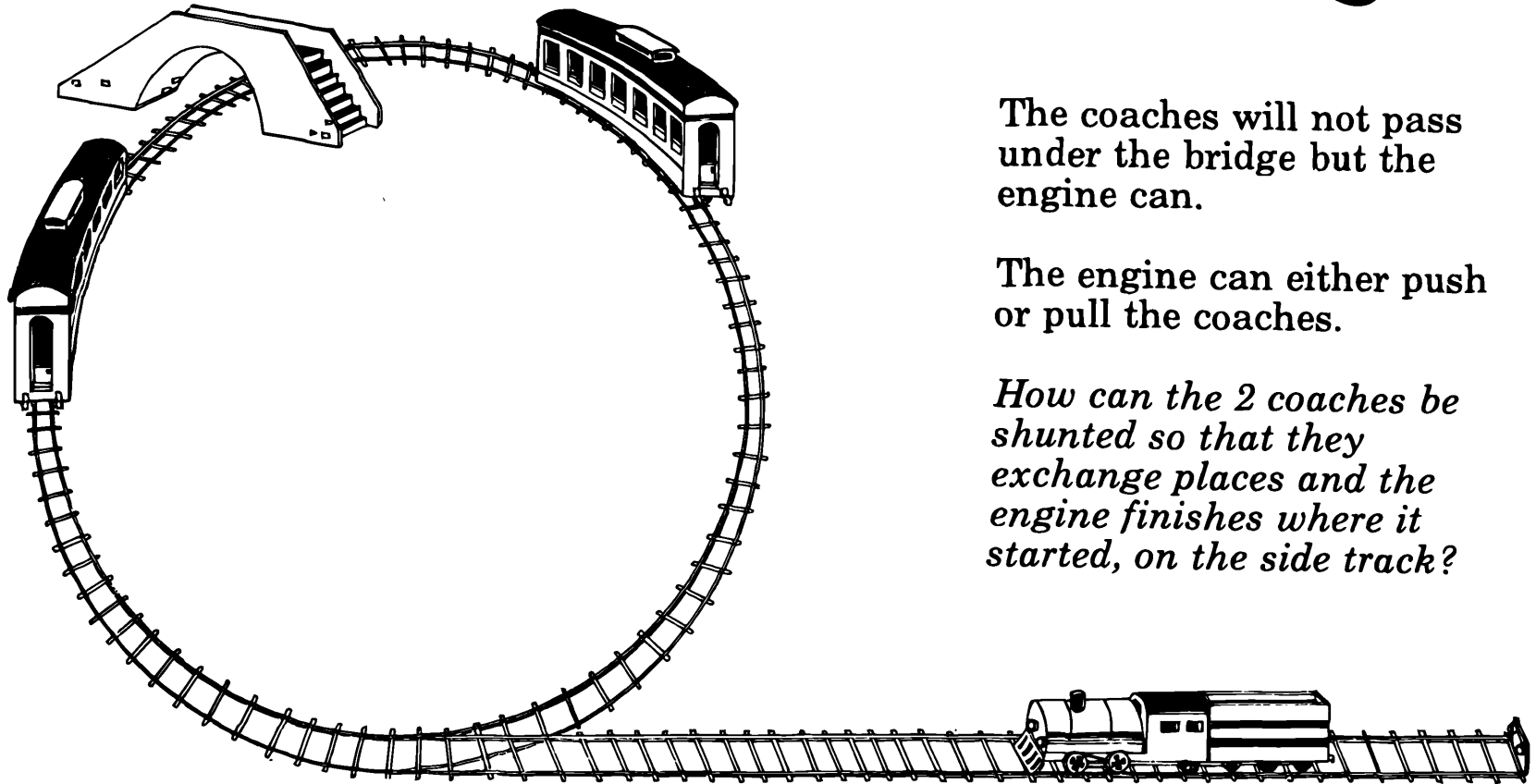


# Mapping

<p>1)</p> <p>4</p> <p><b>x 3</b></p> <p>○</p>	<p>2)</p> <p>30</p> <p>10</p> <p><b>÷ 5</b></p> <p>○ □</p>	<p>3)</p> <p>○ △ 5</p> <p><b>+ 9</b></p> <p>23 △</p>	<p>4)</p> <p>○ △ 4</p> <p><b>x 2</b></p> <p>8 ○ △ 6 □</p>
<p>5)</p> <p>○ 14 △ 23</p> <p><b>- 4</b></p> <p>28 ○ △ 24 □</p>	<p>6)</p> <p>7 ○ △ 4 □</p> <p><b>x 8</b></p> <p>○ 48 △ 16</p>	<p>7)</p> <p>21 ○ △ 9 □</p> <p><b>÷ 3</b></p> <p>○ 9 △ 6</p>	<p>8)</p> <p>2 17 △ 5 □</p> <p><b>x 3 then + 1</b></p> <p>○ ○ △ 10</p>
<p>9)</p> <p>○ 11 △ 7 <math>\frac{1}{2}</math></p> <p><b>Square</b></p> <p>81 ○ △ □</p>	<p>10)</p> <p>9 2 △ □</p> <p><b>Subtract from 10</b></p> <p>○ ○ △ 6 <math>3\frac{1}{2}</math></p>	<p>11)</p> <p>○ 23 △ 8</p> <p><b>+ 4 then ÷ 3</b></p> <p>7 ○ △ 2 □</p>	<p>12)</p> <p>5 10 △ 2 4</p> <p><b></b></p> <p>21 41 △ 9 17</p>

Smile 0477

# Shunting



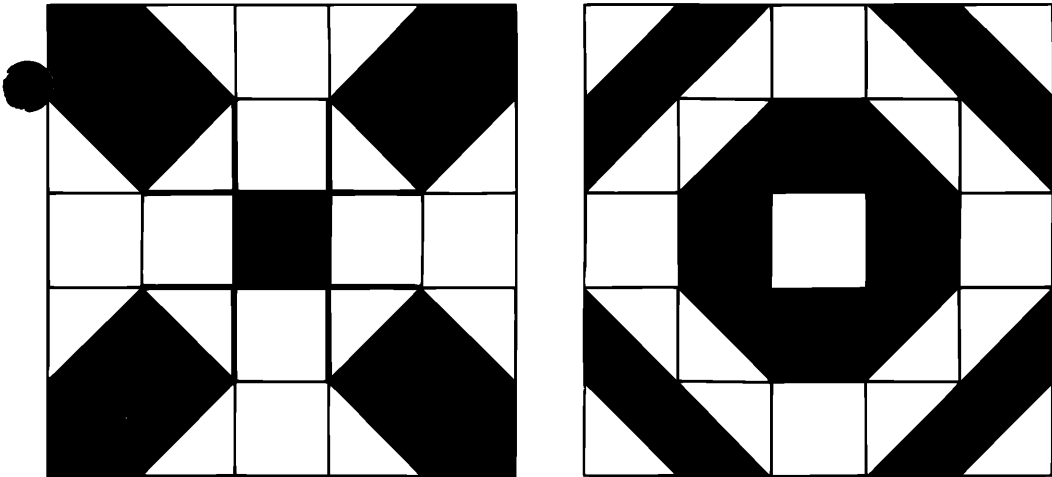
The coaches will not pass under the bridge but the engine can.

The engine can either push or pull the coaches.

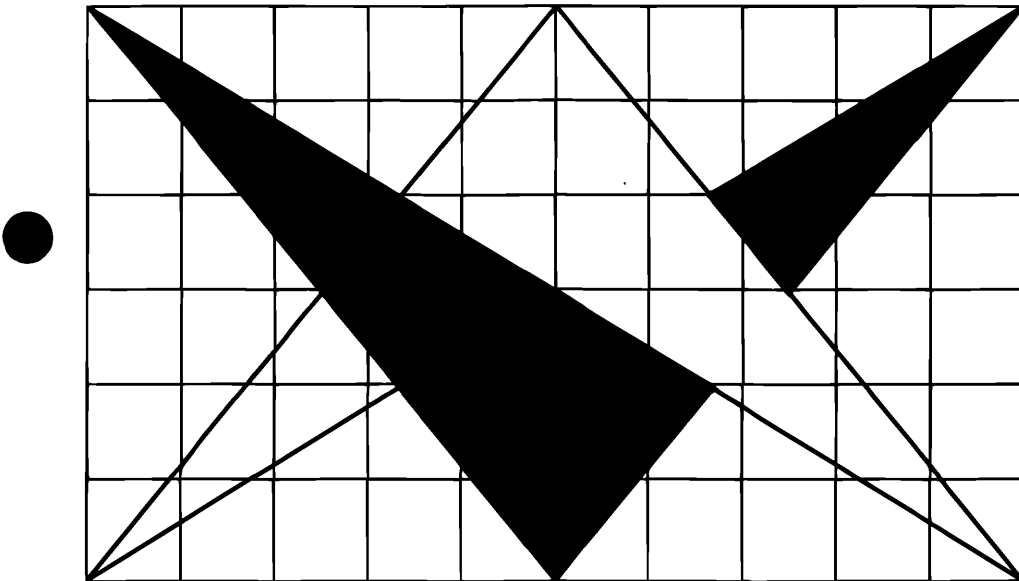
*How can the 2 coaches be shunted so that they exchange places and the engine finishes where it started, on the side track?*

# Patterns with Squares

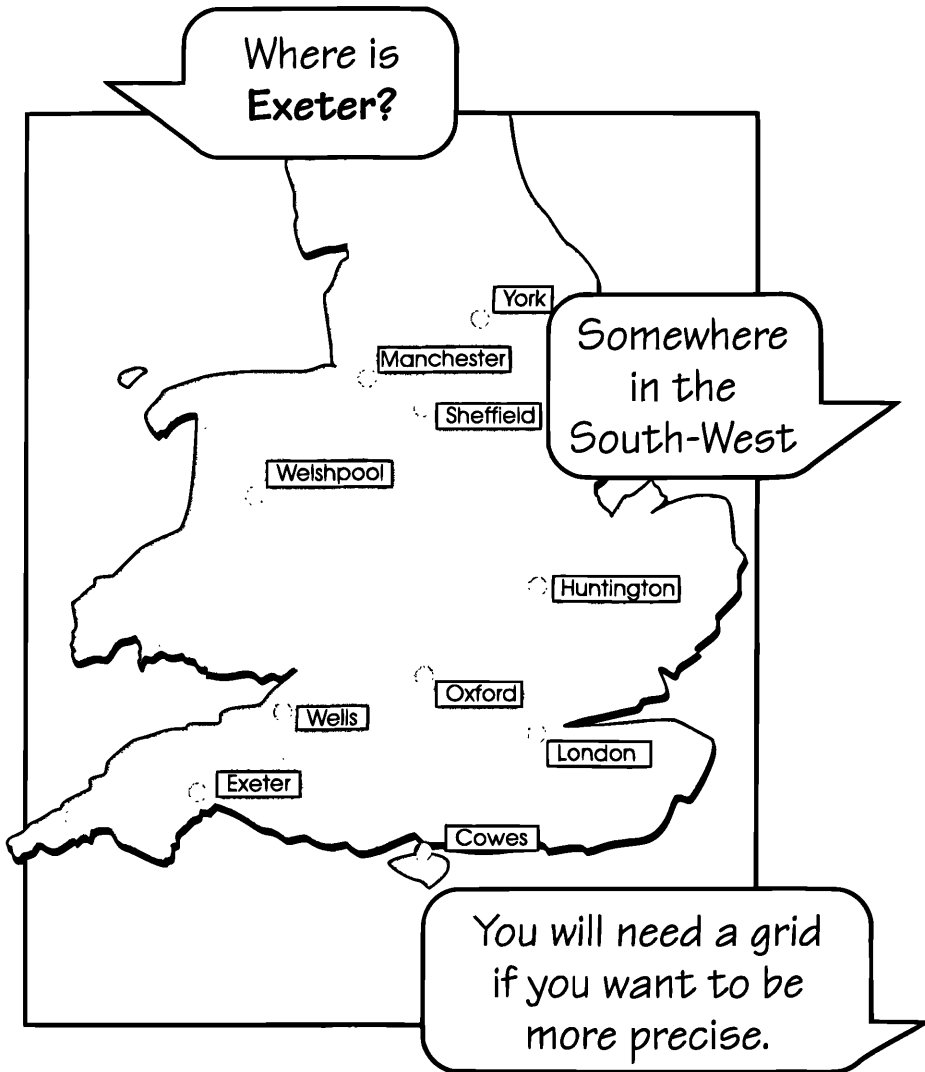
You will need: *centimetre squared paper, colours*

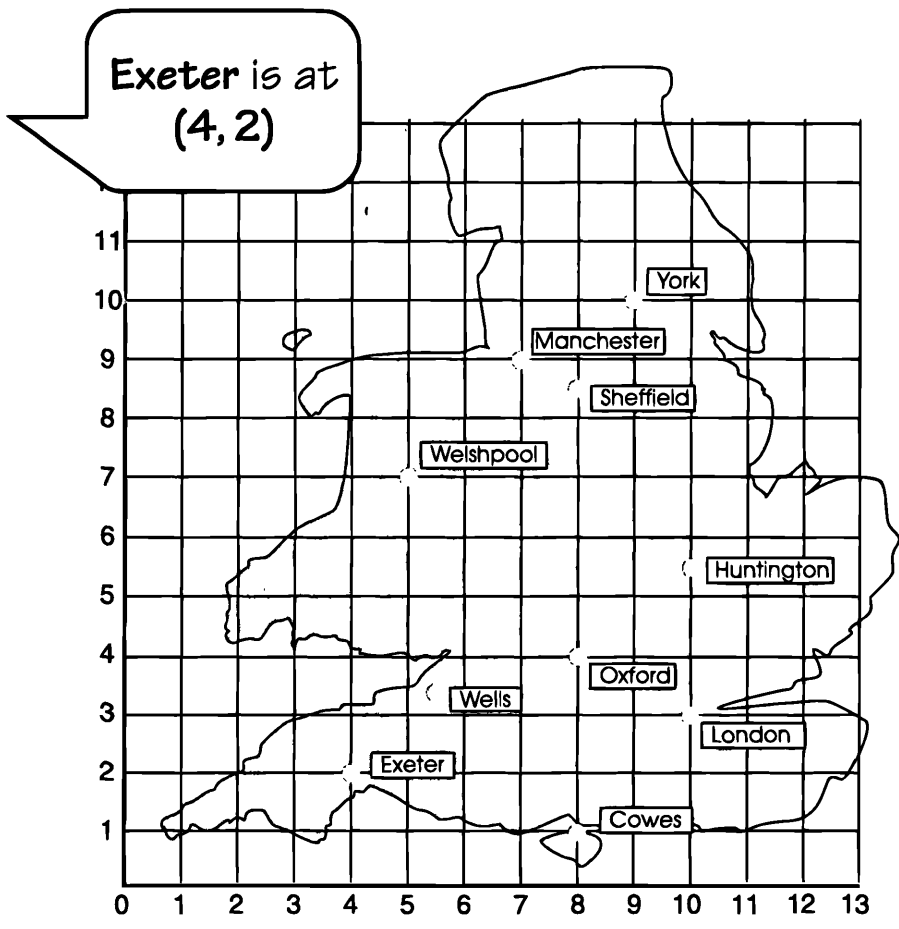


● Copy these or try some of your own.

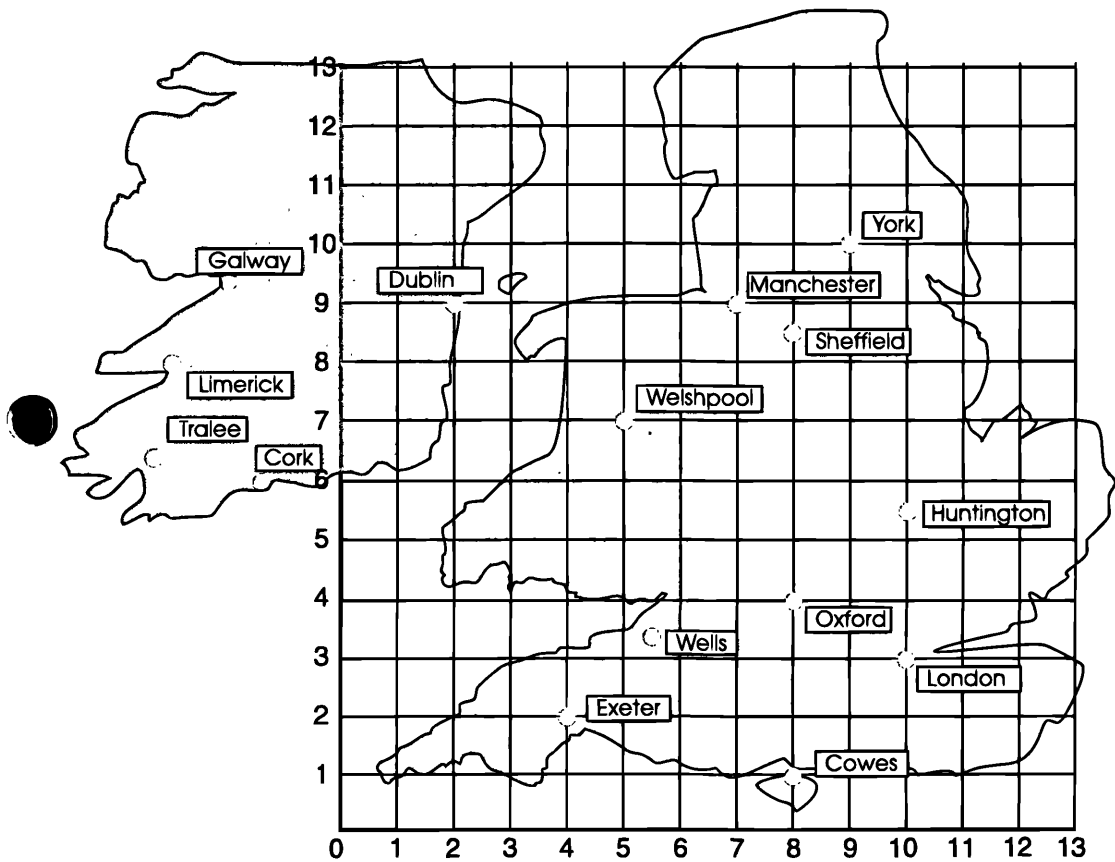


# Where's that town?





1. Use the grid to give the positions of other towns in England and Wales.

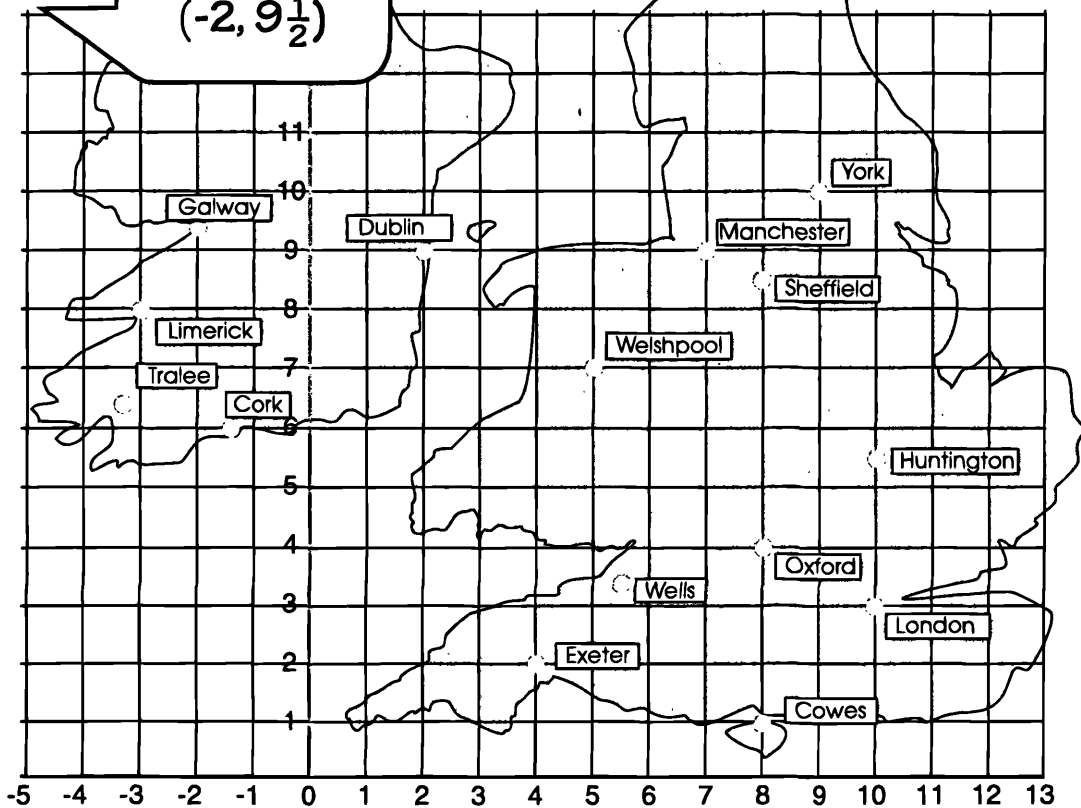


2. Give the position of Dublin.

But what about **Galway**?  
There's not enough grid.

Extend the grid and use  
negative numbers.

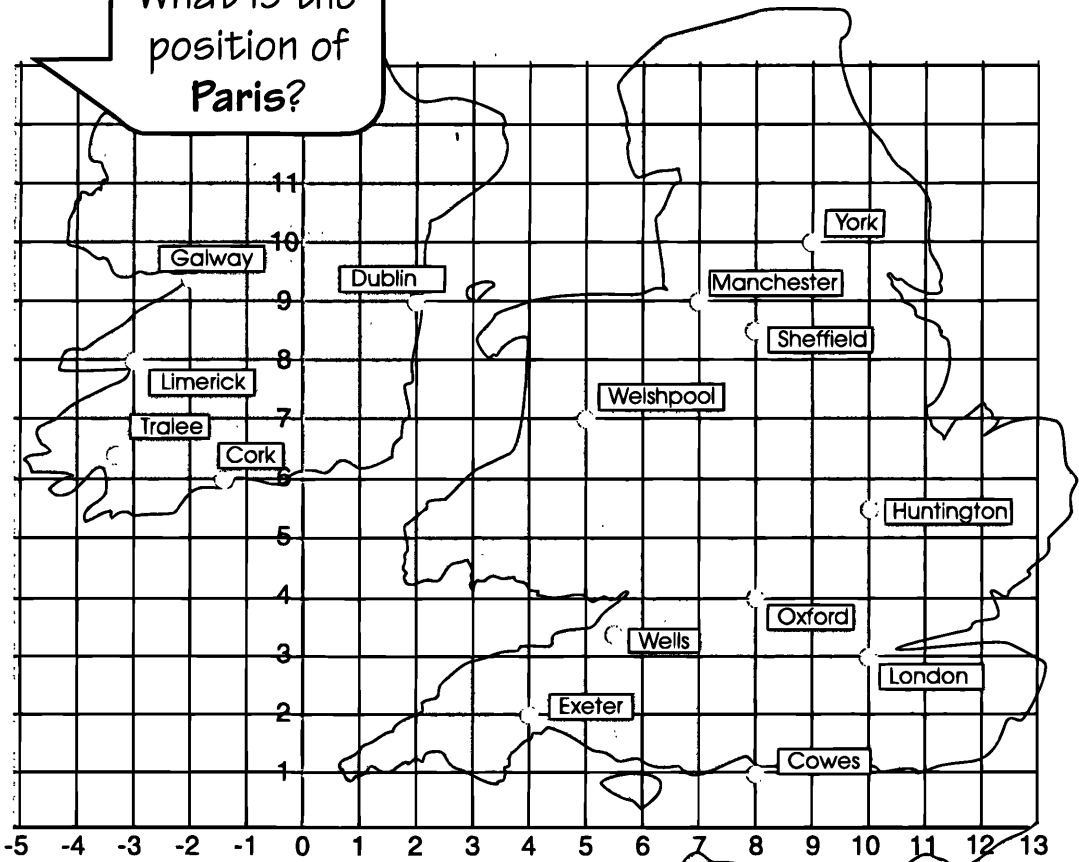
Galway is at  
 $(-2, 9\frac{1}{2})$



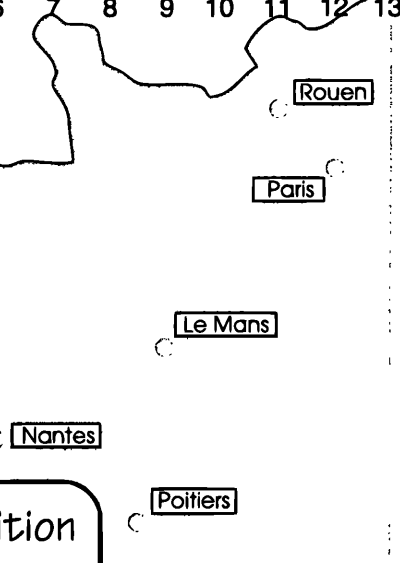
3. Give the positions of other towns in Ireland.



What is the position of Paris?

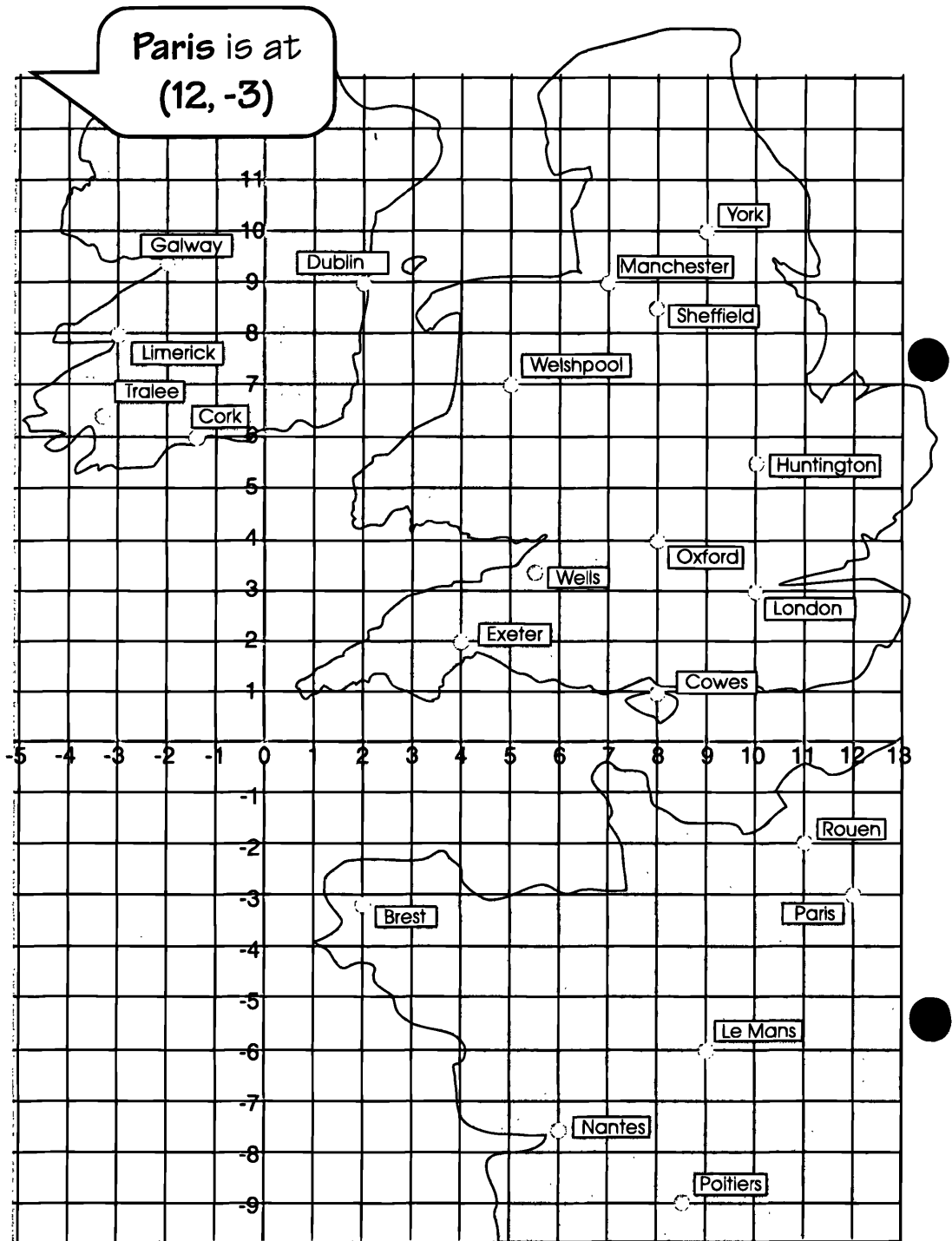


I know, extend the grid southwards.



Correct! You can position any town, however far south it is.





4. Give the positions of other towns in France.

# Star Puzzles

You will need: 7 counters

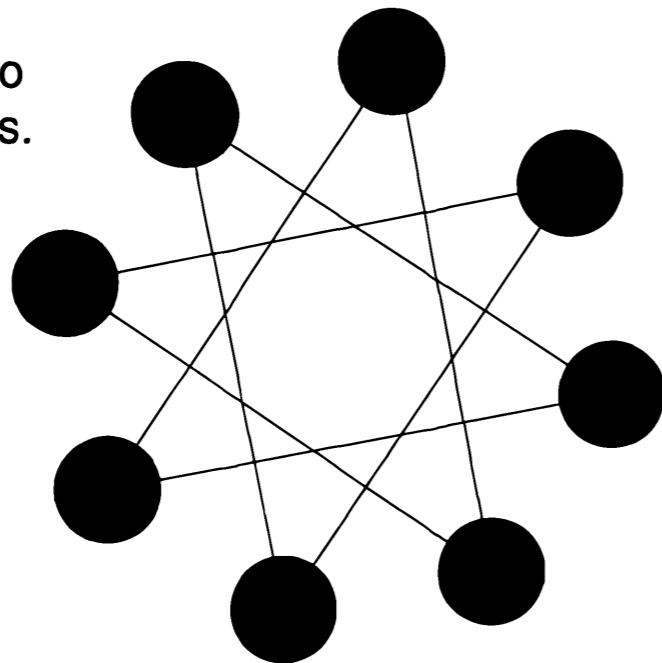
Smile 0483

## Rules

- Put a counter on any circle and slide it along a line to another circle.
- Put a second counter on a free circle and slide it along a line to another free circle.
- Repeat until you cannot place and move any more counters

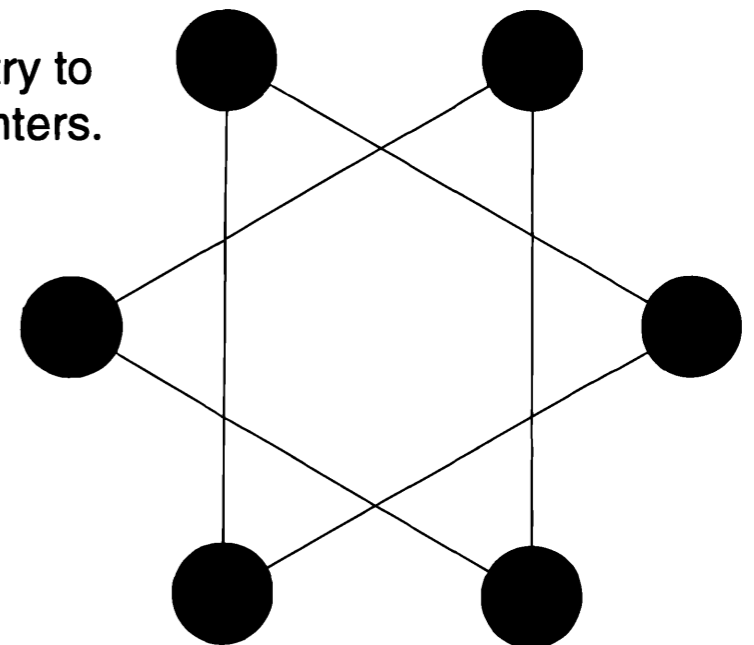
### 8 Star Puzzle

You should try to place 7 counters.



### 6 Star Puzzle

You should try to place 5 counters.



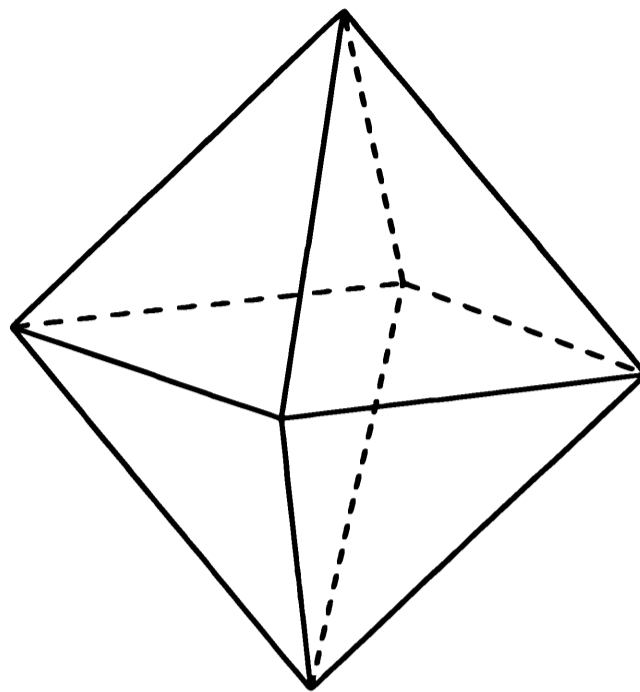
1. One of these puzzles is impossible. Which one?
2. Explain why one puzzle can be done and the other cannot.

# Octahedron Nets

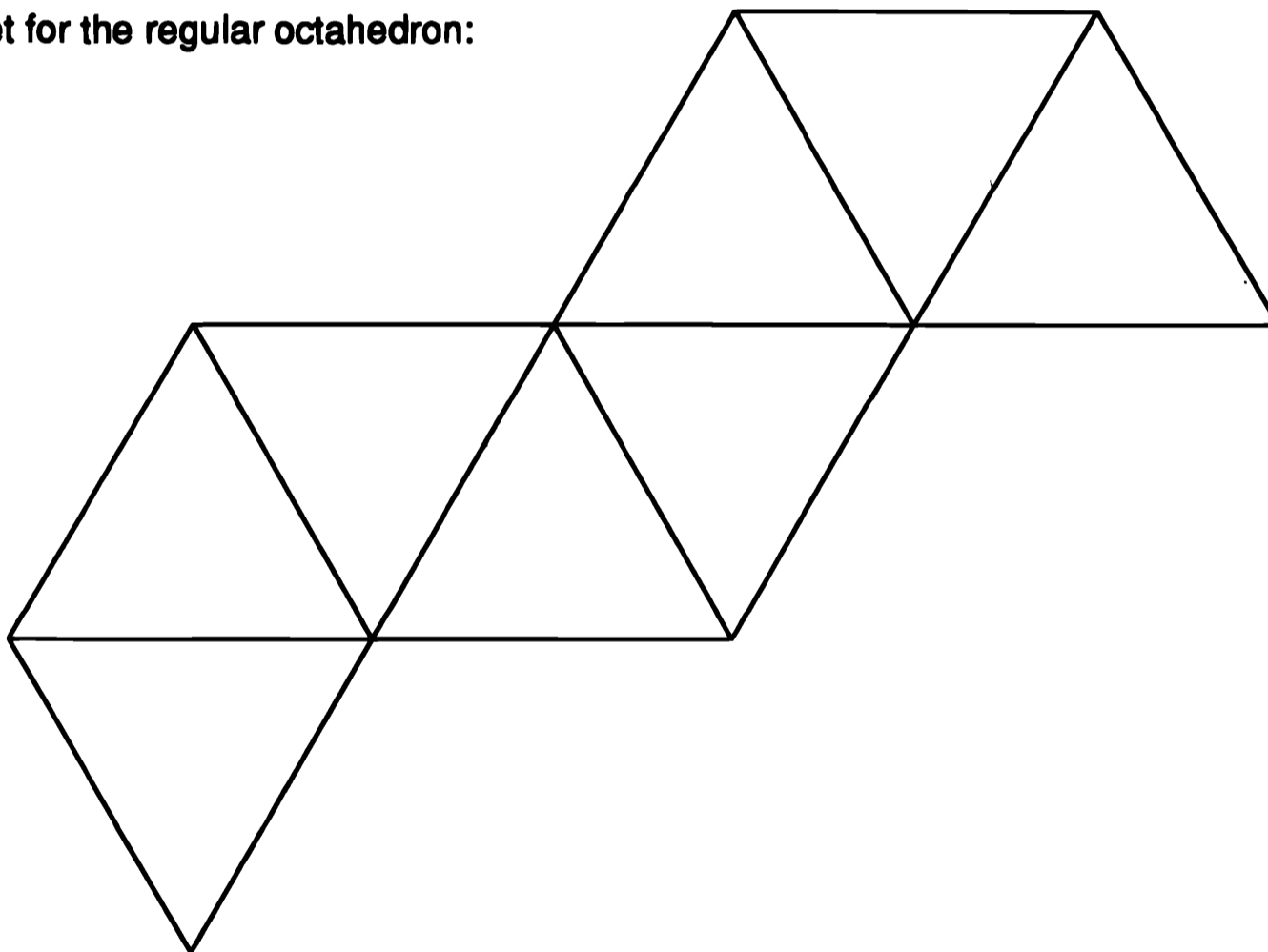
You will need isometric paper or compasses and glue.

An **octahedron** is a solid with 8 faces.  
A regular solid has faces which are regular polygons.

- Explain why this solid is a regular octahedron.



Here is a net for the regular octahedron:

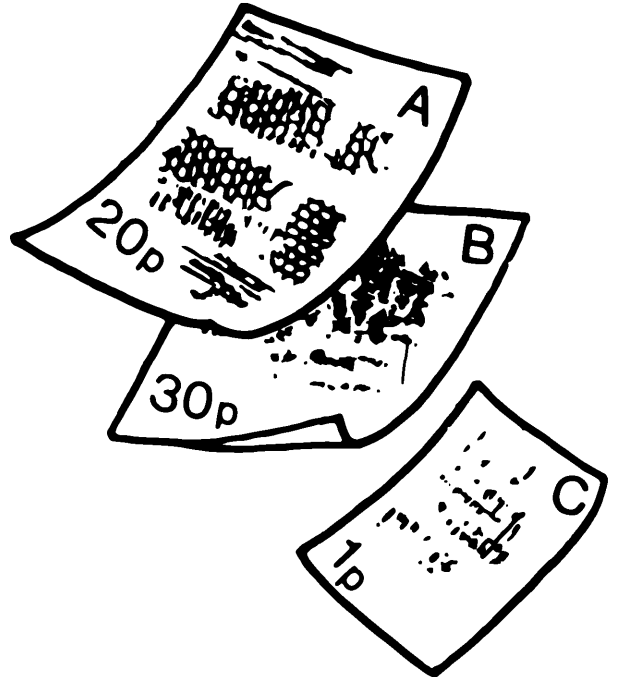


- Draw the net on isometric paper or use compasses to construct the equilateral triangles.
- Cut it out.
- Fold along the lines to make the octahedron.

**There are ten different nets for a regular octahedron. How many of them can you find?**

## PAMPHLETS

● 100 pamphlets  
are sold.



TYPE A COSTS 20p
TYPE B COSTS 30p
TYPE C COSTS 1p

● The total receipts are £10.

Find the number sold  
at each price.

*You may find it helpful to use a spreadsheet*

You will need an underground map.



● Sometimes it is useful to know how long an underground journey takes. It is impossible to work out the exact journey time in advance (why?) but you can make a good estimate.



AN UNDERGROUND JOURNEY TAKE?

DEPENDS HOW FAR YOU WANT TO GO



FROM MARBLE ARCH TO TOTTENHAM COURT ROAD

HOW FAR IS THAT?



WELL, IT'S 3 STOPS

THEN ALLOW 6 MINUTES FOR THE JOURNEY (2 MINUTES BETWEEN STATIONS). YOU NEED 4 MINUTES TO GET ON AND 4 MINUTES TO GET OFF. SO THAT'S 14 MINUTES ALTOGETHER



MARBLE ARCH TO PICCADILLY CIRCUS IS ALSO 3 STOPS - IS THAT THE SAME?

NO, BECAUSE YOU HAVE TO ALLOW AN EXTRA 4 MINUTES TO CHANGE LINES





SO HOW LONG DOES IT TAKE?



MARBLE ARCH TO PICCADILLY CIRCUS

● GET ON	_____	4 MINS
MARBLE ARCH TO		
OXFORD CIRCUS	_____	4 MINS
CHANGE	_____	4 MINS
OXFORD CIRCUS TO		
PICCADILLY CIRCUS	_____	2 MINS
GET OFF	_____	4 MINS
		<hr/>
		18 MINS

ALLOW 18 MINUTES FROM MARBLE ARCH TO PICCADILLY CIRCUS

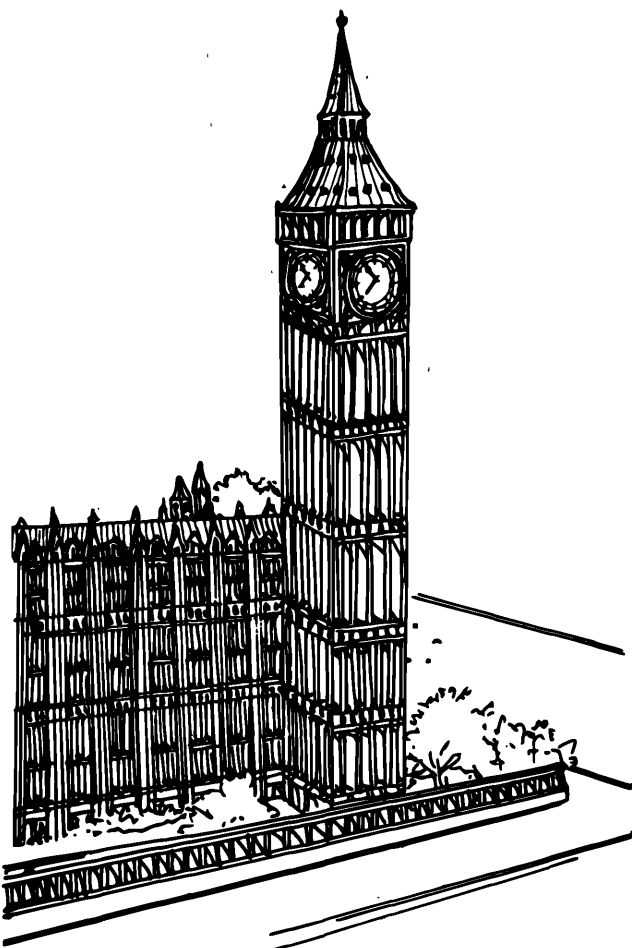


- 1) Use the underground map to check the journey time from Marble Arch to Piccadilly Circus.

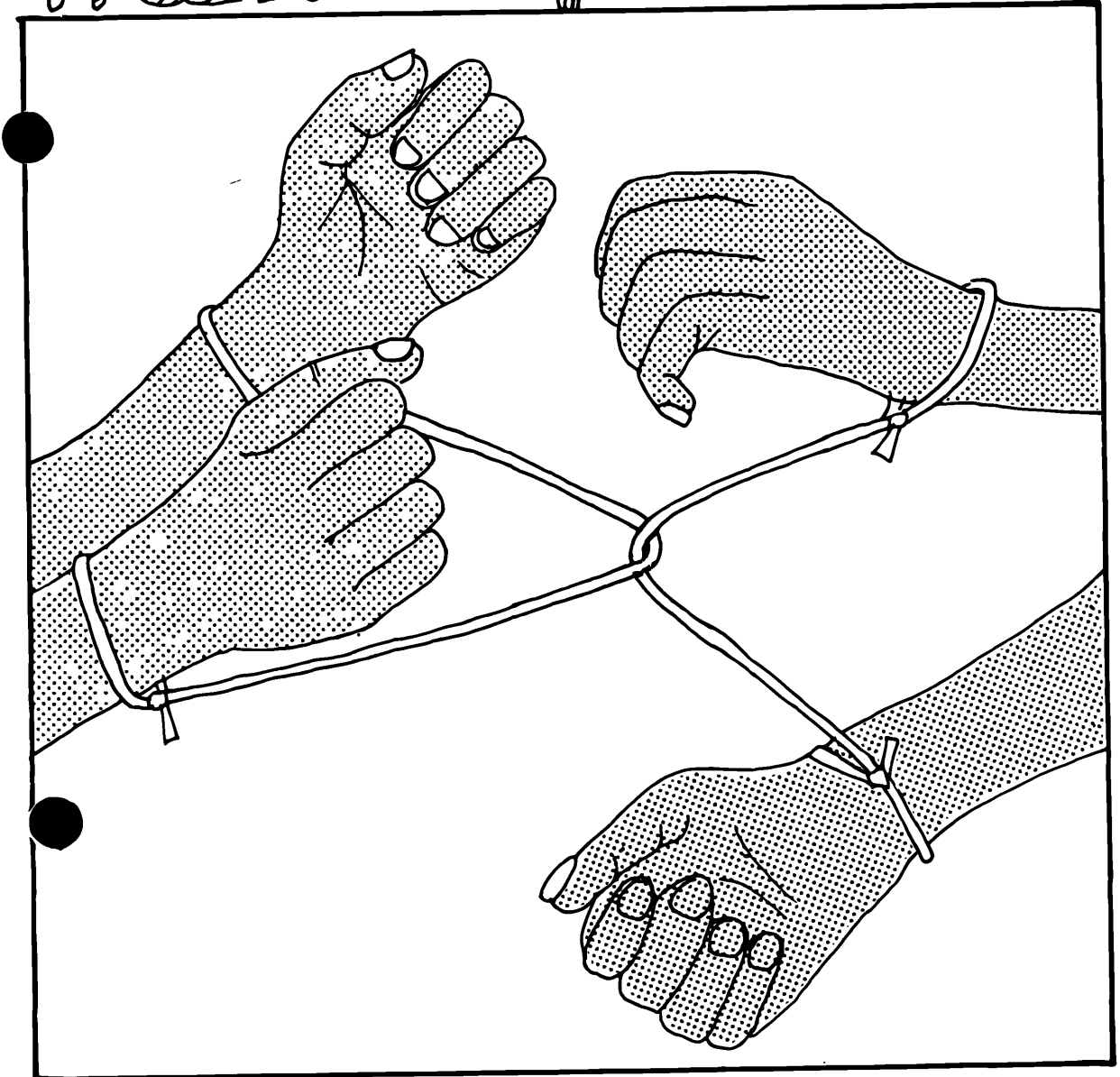
Get on _____	4 minutes
Get off _____	4 minutes
Change _____	4 minutes
Between stations _____ (including stopping)	2 minutes

Work out these journey times:

- 2) Lancaster Gate to Oxford Circus
- 3) Victoria to Tottenham Court Road
- 4) Knightsbridge to Tottenham Court Road
- 5) Lancaster Gate to Leicester Square
- 6) Describe 2 routes from Notting Hill Gate to Charing Cross.  
*Work out which is quicker.*
- 7) Describe 2 routes from West Ham to Liverpool Street.  
*Work out which is quicker.*
- 8) What do you think is the best route from Highbury and Islington to Stockwell? Why?
- 9) If you are at Big Ben, where could you get to in 20 minutes?



# The inseparables



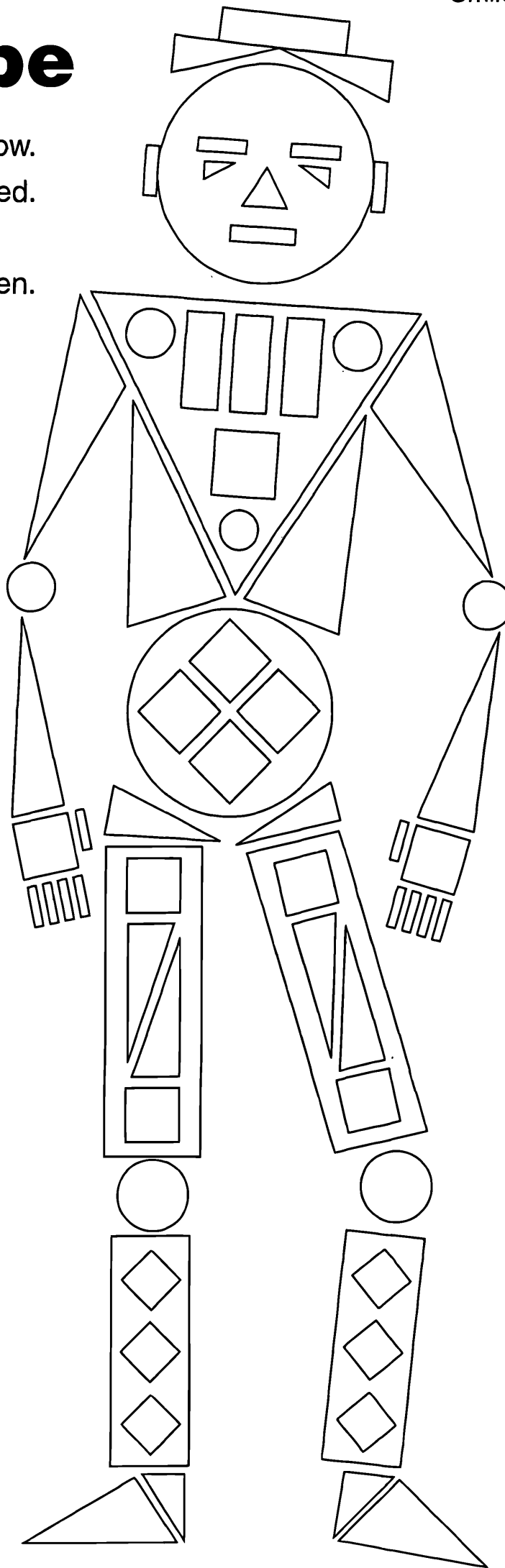
How can they  
escape ?

No cutting !

No untying !

# Sam Shape

1. Shade all the **squares** yellow.
2. Shade all the **rectangles** red.
3. Shade the **triangles** blue.
4. Now shade the **circles** green.



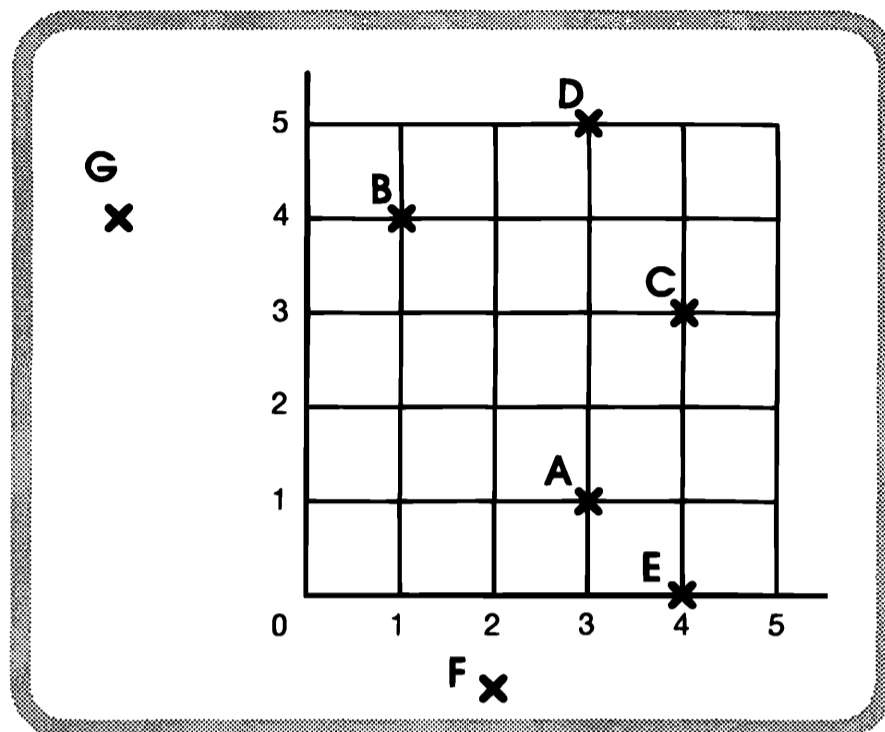
# All Co-ordinates

You will need cm squared paper.

The co-ordinates of **A** are (3, 1)

1. What are the co-ordinates of **B**, **C**, **D**, **E**, **F** and **G**?

**F** and **G** are difficult unless you extend the axes...



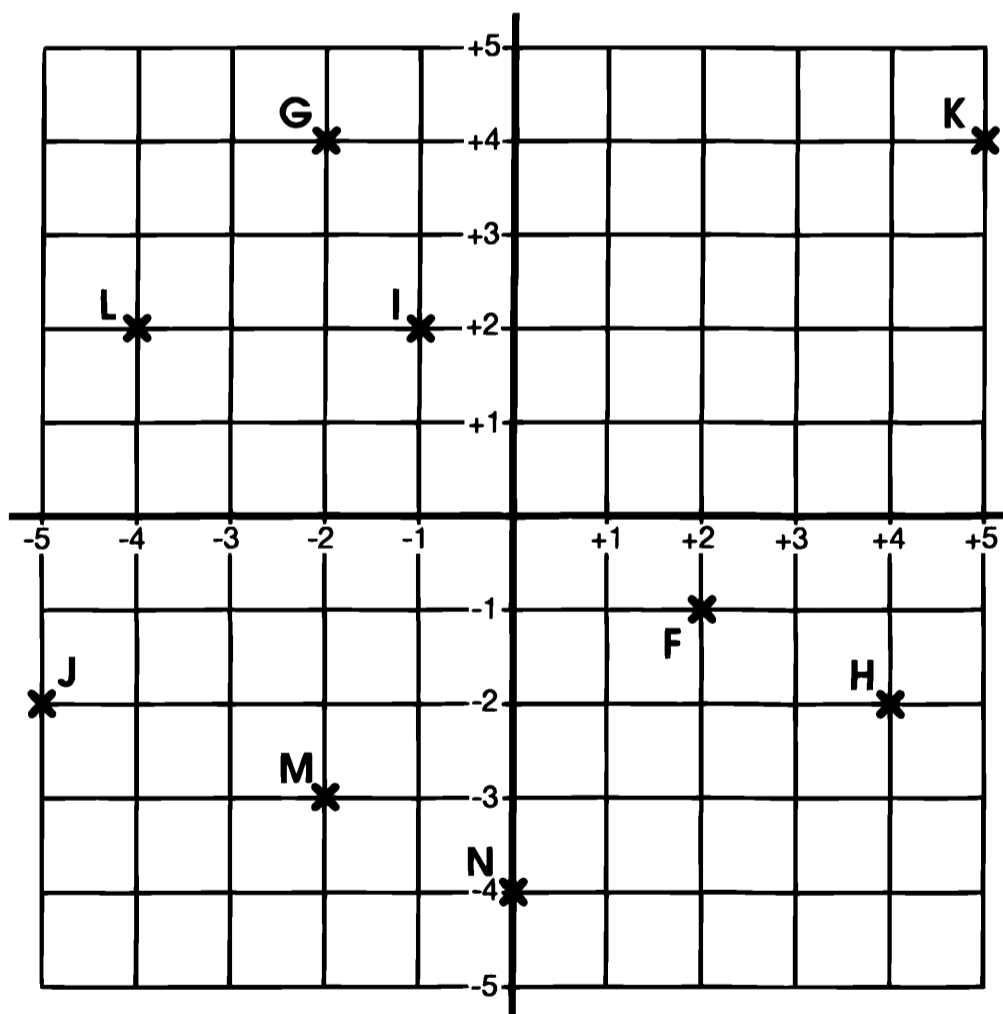
Using directed numbers

**F** is at (+2, -1) and

**G** is at (-2, +4).

Just as before, the rule is:

**Go across first,  
then up or down.**



2. What are the co-ordinates of **H**, **I**, **J**, **K**, **L**, **M** and **N**?
3. Draw axes on squared paper. Mark on these points:

**P** at (+3, -3)

**Q** at (-4, +3)

**R** at (-5, -4)

**S** at (-3, +5)

**T** at (+4, +2)

**U** at (+5, -4)

**V** at (-3, 0)

**W** at (-4, -1)

**X** at (0, -3)

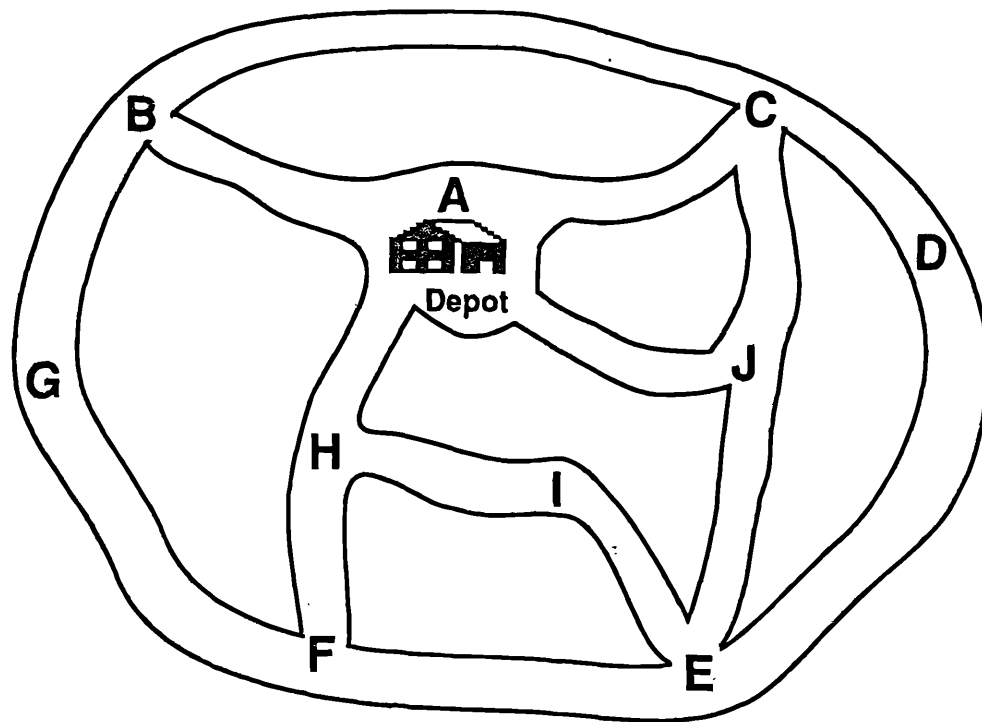
**Z** at (+5, 0)

**Z** at (-2, +1)

# Routey

School meals are delivered by van.  
The driver leaves the depot (A) to  
visit each school.

She does not want to travel down  
any road twice, nor visit a school  
twice.



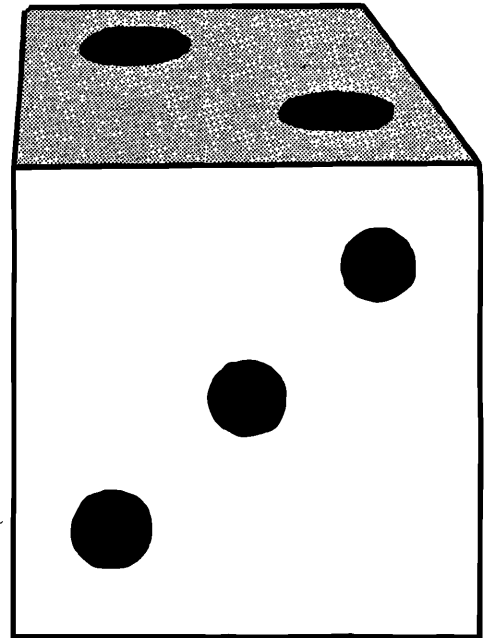
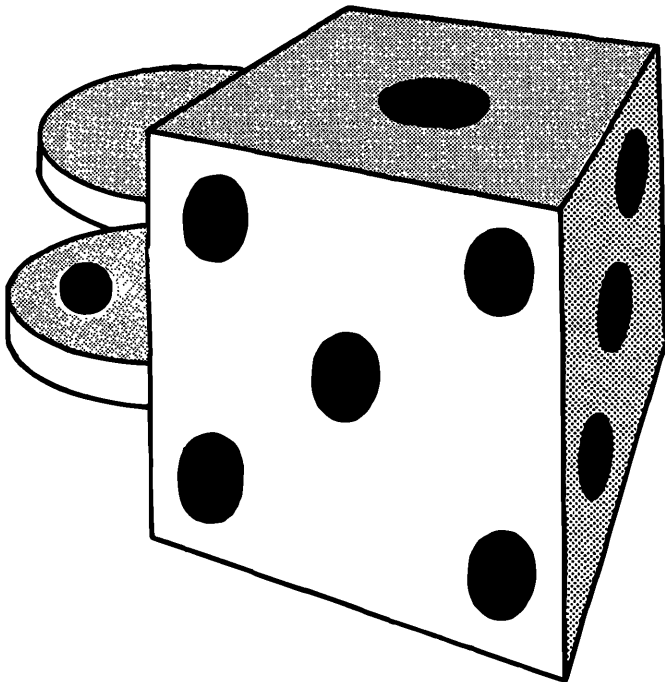
In what order could she visit the schools?

You will need counters and 2 dice

Smile 0496

# junior contig

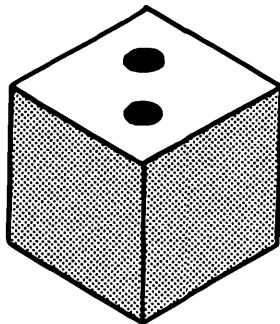
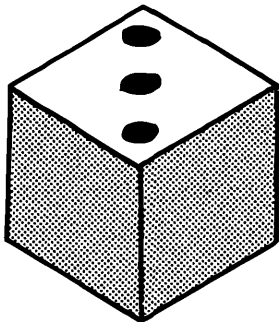
A game for 2 to 5 players



# rules

1. Take turns to roll the 2 dice.
2. Add, subtract, multiply or divide the numbers.
3. Cover an answer with a counter — if you can.
4. You cannot put 2 counters on the same square.
5. If you put your counter
  - ... beside 1 counter, score 1 point
  - ... beside 2 counters, score 2 points
  - ... beside 3 counters, score 3 points
  - ... and so on.

# example



$$3 + 2 = 5$$

$$3 - 2 = 1$$

$$3 \times 2 = 6$$

$$3 \div 2 = 1\frac{1}{2}$$

You could choose to put your counter on 1, 5 or 6.

In this game, you can't go on 1 because it's taken.

If you go on 5 you score 1 point.

A better choice would be 6 to score 3 points.

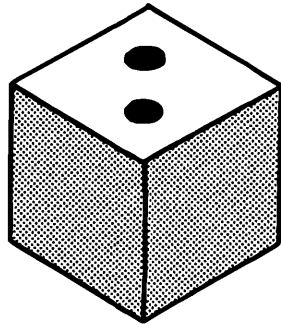
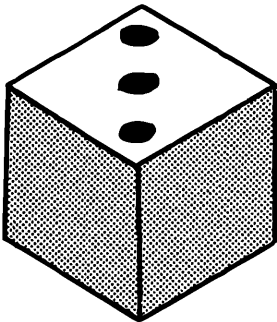
●	2	●	4
5	6	●	8
9	10	11	12
15	16	18	20
24	25	30	36

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>15</b>	<b>16</b>	<b>18</b>	<b>20</b>
<b>24</b>	<b>25</b>	<b>30</b>	<b>36</b>

# rules

1. Take turns to roll the 2 dice.
2. Add, subtract, multiply or divide the numbers.
3. Cover an answer with a counter — if you can.
4. You cannot put 2 counters on the same square.
5. If you put your counter
  - ... beside 1 counter, score 1 point
  - ... beside 2 counters, score 2 points
  - ... beside 3 counters, score 3 points
  - ... and so on.

# example



$$3 + 2 = 5$$

$$3 - 2 = 1$$

$$3 \times 2 = 6$$

$$3 \div 2 = 1\frac{1}{2}$$

You could choose to put your counter on 1, 5 or 6.

In this game, you can't go on 1 because it's taken.

If you go on 5 you score 1 point.

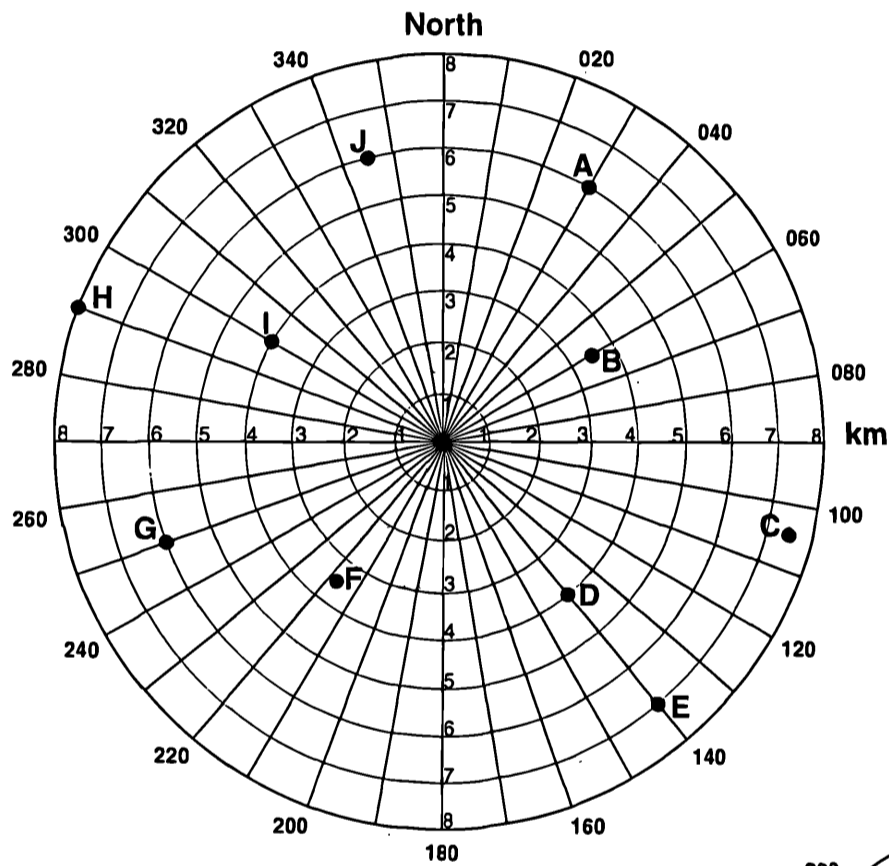
A better choice would be 6 to score 3 points.

●	2	●	4
5	6	●	8
9	10	11	12
15	16	18	20
24	25	30	36

# Radar

Radar uses high-powered radio pulses for locating objects from a central point.  
 A radar screen is made up of radii at 10° intervals and concentric circles.  
 Objects on a radar screen can be located by **polar co-ordinates**.  
 The first number of a polar co-ordinate represents the distance from the centre.  
 The second number represents the direction given as a 3 figure bearing.

1. The objects **A** to **J** are located on this radar screen.  
 Complete the table of polar co-ordinates for each object.

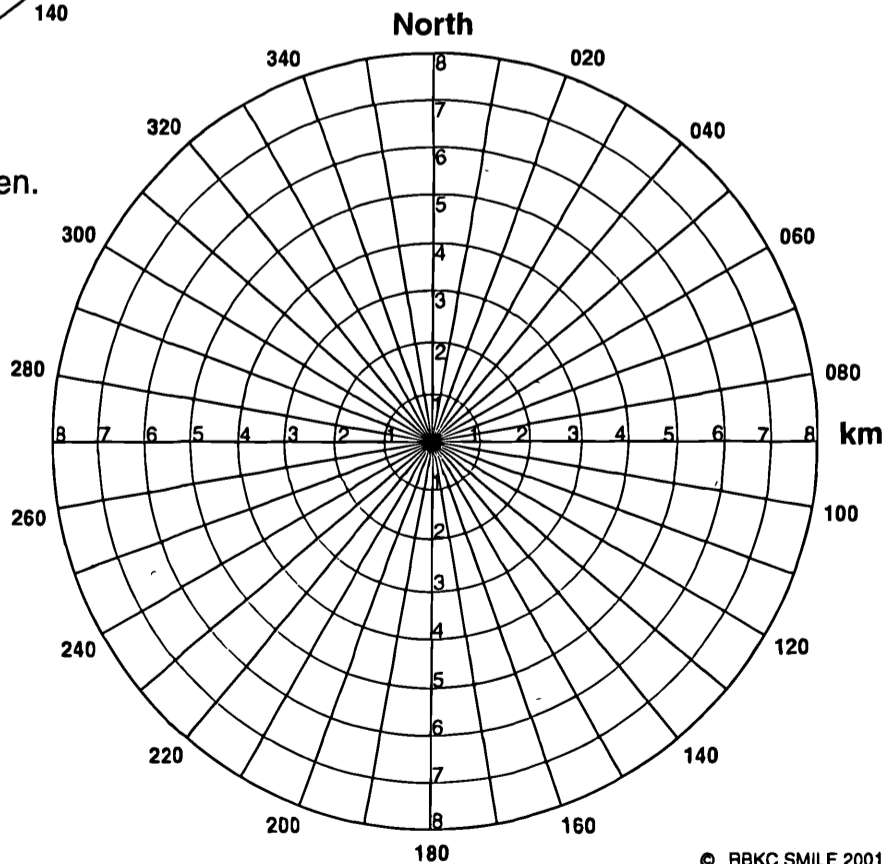


Object **A** is 6 kilometres away from the centre, on a bearing of **030°**.  
 The **polar co-ordinates** of object **A** are **(6, 030)**.

Object	Polar co-ordinates
<b>A</b>	(6, 030)
<b>B</b>	
<b>C</b>	
<b>D</b>	
<b>E</b>	
<b>F</b>	
<b>G</b>	
<b>H</b>	
<b>I</b>	
<b>J</b>	

2. Plot these nine objects on the radar screen.

Object	Polar co-ordinates
<b>a</b>	(4, 025)
<b>b</b>	(6.5, 070)
<b>c</b>	(2, 105)
<b>d</b>	(8, 150)
<b>e</b>	(8, 215)
<b>f</b>	(5, 260)
<b>g</b>	(7.5, 260)
<b>h</b>	(1, 300)
<b>i</b>	(3, 345)



# Adding Directed Numbers

What is  
6 minus 12?

*It's impossible!*

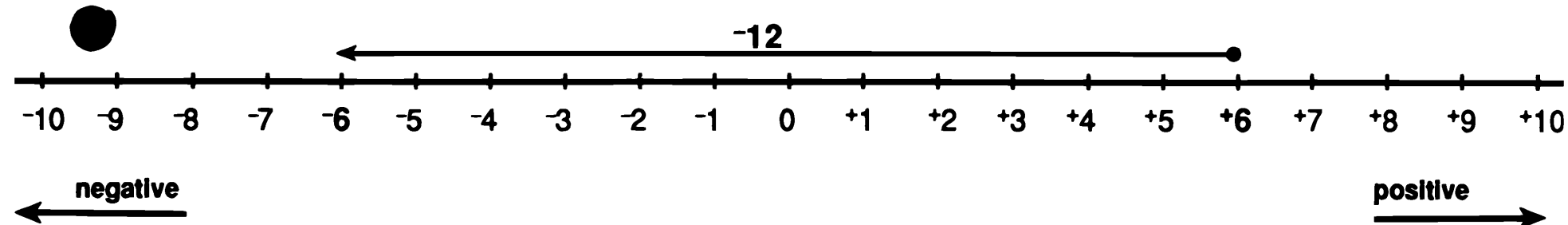
*No, it isn't. The number  
line extends below zero.*

*Start at plus 6 and  
move 12 in the negative  
direction.*

*This can be written as*

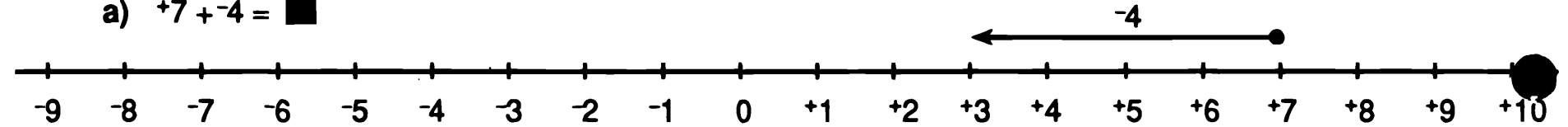
$$+6 + -12 = -6$$

SMILE MATHEMATICS  
Isaac Newton Centre for  
Professional Development  
108A Lancaster Road  
London W11 1QS  
Tel 0171-221 8966

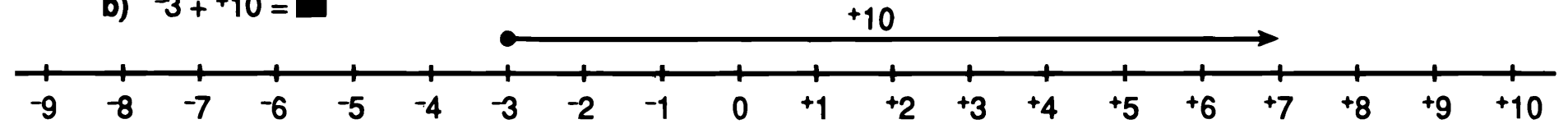


Use the number lines to answer these additions:

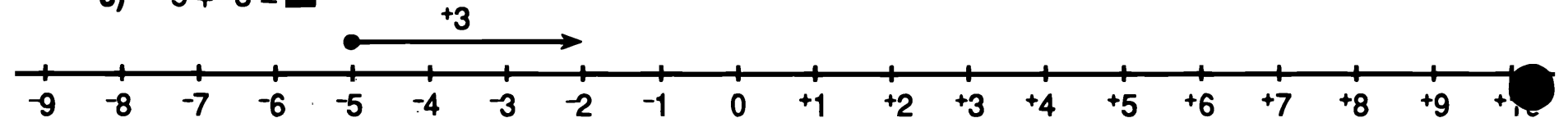
a)  $+7 + -4 =$



b)  $-3 + +10 =$

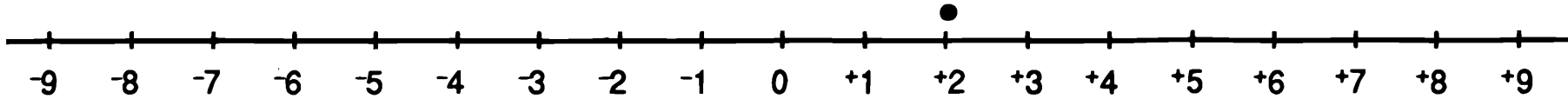


c)  $-5 + +3 =$



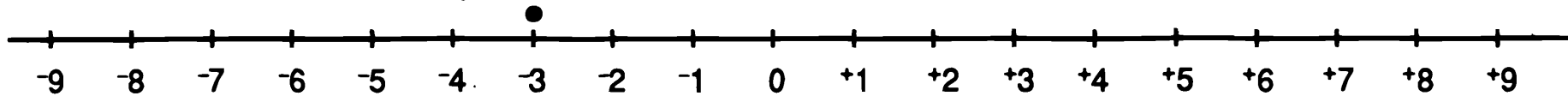
1. Use a number line, starting at +2, to answer these additions:

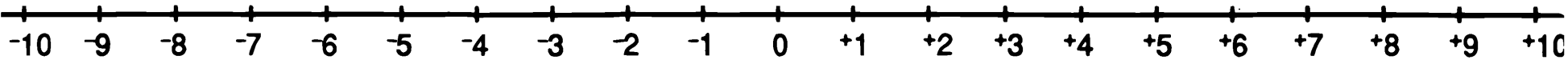
a)  $+2 + +3 = \blacksquare$     b)  $+2 + -3 = \blacksquare$     c)  $+2 + -5 = \blacksquare$     d)  $+2 + +6 = \blacksquare$     e)  $+2 + -4 = \blacksquare$



2. Use a number line, starting at -3, to answer these additions:

a)  $-3 + +5 = \blacksquare$     b)  $-3 + -2 = \blacksquare$     c)  $-3 + +2 = \blacksquare$     d)  $-3 + -4 = \blacksquare$     e)  $-3 + +3 = \blacksquare$





3. Use a number line to help you answer these additions:

a)  $0 + +3 = \blacksquare$     b)  $+3 + +3 = \blacksquare$     c)  $-4 + +3 = \blacksquare$     d)  $+5 + +3 = \blacksquare$     e)  $-2 + +3 = \blacksquare$

4. Use a number line to help you answer these additions:

a)  $+4 + -2 = \blacksquare$     b)  $-3 + -2 = \blacksquare$     c)  $-5 + -2 = \blacksquare$     d)  $+2 + -2 = \blacksquare$     e)  $+6 + -2 = \blacksquare$

5. Copy and complete the following additions by finding the missing number in each.  
Use number lines to help if you wish.

a)  $+2 + +3 = \blacksquare$     b)  $+3 + \blacksquare = +7$     c)  $+5 + -3 = \blacksquare$     d)  $+4 + -5 = \blacksquare$     e)  $+3 + \blacksquare = 0$

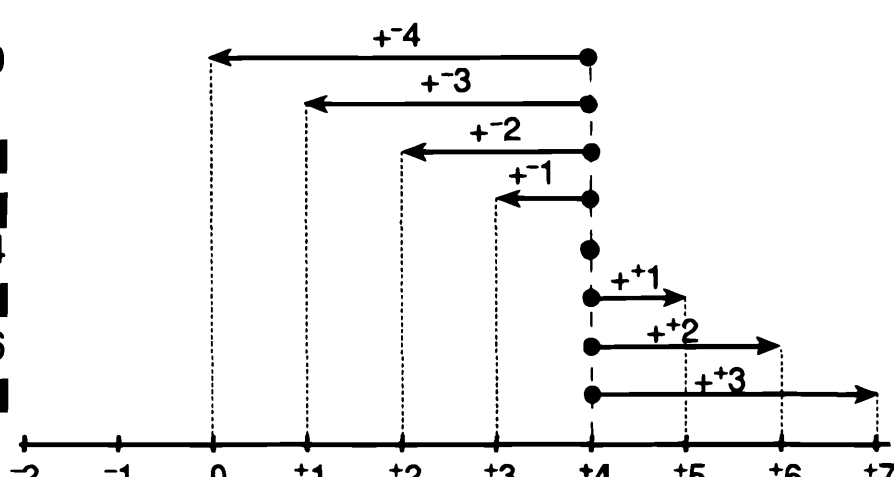
f)  $-4 + \blacksquare = +2$     g)  $\blacksquare + -4 = +2$     h)  $\blacksquare + +2 = -5$     i)  $\blacksquare + -7 = -5$     j)  $-4 + \blacksquare = 0$

k)  $-3 + \blacksquare = -7$     l)  $+5 + +2 + -6 = \blacksquare$     m)  $\blacksquare + +2 + -5 = -7$

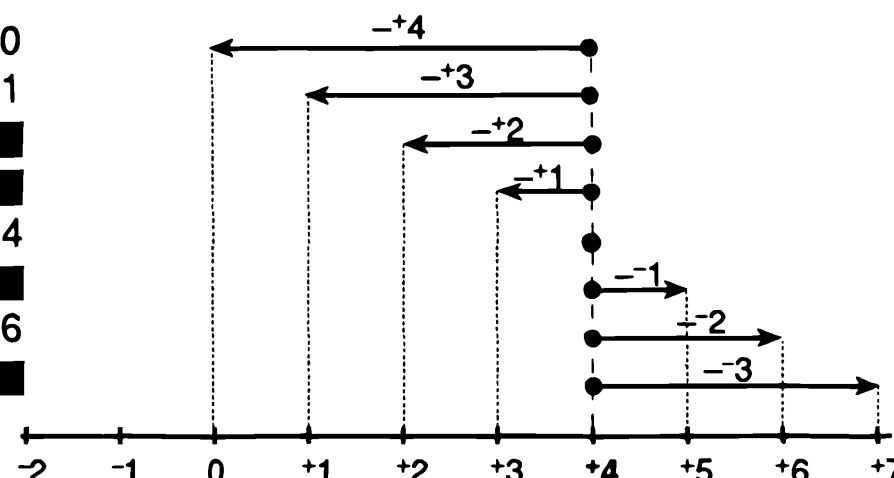
# Subtracting Directed Numbers

Copy and complete the following patterns:

**Pattern 1**      **Adding to +4**

$$\begin{aligned}
 +4 + -4 &= 0 \\
 +4 + -3 &= +1 \\
 +4 + -2 &= \blacksquare \\
 +4 + -1 &= \blacksquare \\
 +4 + 0 &= +4 \\
 +4 + +1 &= \blacksquare \\
 +4 + +2 &= +6 \\
 +4 + +3 &= \blacksquare
 \end{aligned}$$


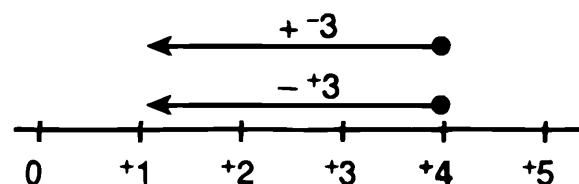
**Pattern 2**      **Subtracting from +4**

$$\begin{aligned}
 +4 - +4 &= 0 \\
 +4 - +3 &= +1 \\
 +4 - +2 &= \blacksquare \\
 +4 - +1 &= \blacksquare \\
 +4 - 0 &= +4 \\
 +4 - -1 &= \blacksquare \\
 +4 - -2 &= +6 \\
 +4 - -3 &= \blacksquare
 \end{aligned}$$


From **Pattern 1**       $+4 + -3 = +1$

From **Pattern 2**       $+4 - +3 = +1$

**Adding -3 is the same as subtracting +3.**



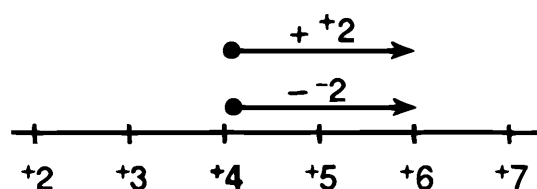
Give an example to show adding -4 is the same as subtracting +4.

**Summary**      For any numbers  $n$  and  $m$ ,  $n + -m$  is the same as  $n - +m$ .

From **Pattern 1**       $+4 + +2 = +6$

From **Pattern 2**       $+4 - -2 = +6$

**Adding +2 is the same as subtracting -2.**



Give an example to show adding +3 is the same as subtracting -3.

**Summary**      For any numbers  $n$  and  $m$ ,  $n + +m$  is the same as  $n - -m$ .



1. Answer these:

a)  $+6 - +4 = \blacksquare$

b)  $+5 - -7 = \blacksquare$

c)  $+8 - +4 = \blacksquare$

d)  $+3 - +8 = \blacksquare$

e)  $-5 - +4 = \blacksquare$

f)  $-6 - -5 = \blacksquare$

g)  $-3 - -9 = \blacksquare$

h)  $-5 - +5 = \blacksquare$

i)  $+8 - +8 = \blacksquare$

j)  $+5 - +3 = \blacksquare$

k)  $-2 - -4 = \blacksquare$

l)  $+3 - -5 = \blacksquare$

m)  $-4 - +1 = \blacksquare$

n)  $-12 - -20 = \blacksquare$

2. Copy and complete these:

a)  $\blacksquare - -3 = +5$   
 $\blacksquare + +3 = +5$

$-3$  is the same as  $+3$  so

$+2 - -3 = +5$   
 $+2 + +3 = +5$

b)  $\blacksquare - -5 = +7$

c)  $\blacksquare - +5 = +2$

d)  $\blacksquare - -2 = -2$

e)  $\blacksquare - +3 = +1$

f)  $\blacksquare - -4 = +3$

g)  $\blacksquare - +1 = -4$

h)  $\blacksquare - -2 = +6$

i)  $\blacksquare - +2 = -2$

j)  $\blacksquare - +5 = -1$

k)  $\blacksquare - -5 = -2$

3. Find the missing numbers to make these true:

a)  $+5 + +8 = \blacksquare$

b)  $+3 + \blacksquare = +10$

c)  $+2 - \blacksquare = +9$

d)  $\blacksquare + +3 = 0$

e)  $\blacksquare - -2 = -3$

f)  $-8 + -6 = \blacksquare$

g)  $-13 - -4 + -1 = \blacksquare$

4. For each of these expressions, find three pairs of numbers that make the expression true:

$+ \blacktriangle + + \bullet = +12$

$- \blacktriangle - + \bullet = -17$

$+ \blacktriangle - - \bullet = +21$

$- \blacktriangle - - \bullet = +7$

# (Do It First)

Brackets mean "do the operation in brackets first".

The two expressions  $(5 + 3) + 2$  and  $5 + (3 + 2)$  have the same numbers and operations, the only thing that differs is the position of the brackets.

$$\begin{array}{rcl} (5 + 3) + 2 & & 5 + (3 + 2) \\ = 8 + 2 & & = 5 + 1.5 \\ = 4 & & = 6.5 \end{array}$$

The answers are *different*, so the position of the brackets is important.

- 1** In each of these pairs of expressions, the numbers and operations are the same, but the position of the brackets is different.

Work out the value of each expression:

- |                       |                        |
|-----------------------|------------------------|
| a) $(5 \times 4) + 7$ | b) $(6 \times 11) - 3$ |
| $5 \times (4 + 7)$    | $6 \times (11 - 3)$    |
| c) $(18 + 2) + 4$     | d) $(24 + 6) - 3$      |
| $18 + (2 + 4)$        | $24 + (6 - 3)$         |
| e) $(7 + 3) \times 5$ | f) $(8 - 2) \times 3$  |
| $7 + (3 \times 5)$    | $8 - (2 \times 3)$     |
| g) $(4 + 8) + 2$      | h) $(12 - 9) + 3$      |
| $4 + (8 + 2)$         | $12 - (9 + 3)$         |
| i) $(5 \times 6) + 3$ | j) $(12 + 3) \times 2$ |
| $5 \times (6 + 3)$    | $12 + (3 \times 2)$    |

For which pairs of expressions are your answers the same?

- 2** Make up other pairs of expressions with the same numbers and operations, but with brackets in different positions. Work out the value of each expression. Continue until you find *at least* two pairs of expressions which give the same answer.

- 3** Copy the following expressions. Put in brackets to make the expressions correct.

- |                           |                           |
|---------------------------|---------------------------|
| a) $3 \times 5 + 7 = 36$  | b) $3 \times 5 + 7 = 22$  |
| c) $1 + 4 \times 8 = 40$  | d) $1 + 4 \times 8 = 33$  |
| e) $6 - 2 \times 2 = 2$   | f) $6 - 2 \times 2 = 8$   |
| g) $11 + 9 \times 3 = 38$ | h) $11 + 9 \times 3 = 60$ |
| i) $15 - 2 \times 7 = 1$  | j) $16 + 4 + 4 = 2$       |
| k) $18 - 6 + 3 = 4$       | l) $17 - 7 + 1 = 9$       |
| m) $5 - 3 - 2 = 0$        | n) $20 + 2 \times 5 = 50$ |
| o) $14 + 8 + 2 = 11$      | p) $16 - 2 \times 6 = 4$  |



0										
0	1									
0	2	2								
0	3	6	3							
0	4	8	12	4						
0	5	10	15	20	5					
0	6	12	18	24	30	6				
0	7	14	21	28	35	42	7			
0	8	16	24	32	40	48	56	8		
0	9	18	27	36	45	54	63	72	9	
0	10	20	30	40	50	60	70	80	90	10

(1) Check that you can use the multiplication table to find the value of:

- (a)  $7 \times 6$       (b)  $9 \times 8$       (c)  $4 \times 9$       (d)  $8 \times 6$   
 (e)  $9 \times 7$       (f)  $7 \times 9$       (g)  $8 \times 7$       (h)  $7 \times 8$

There are several ways to use this table to multiply larger numbers. This way is probably the easiest!

*For example  $15 \times 7$*

Do  $10 \times 7$

70

and  $5 \times 7$

35

Then add

105

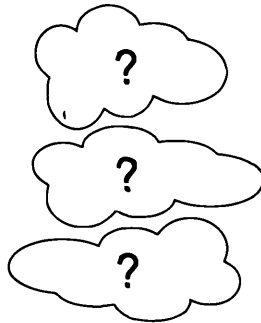
**(2)** Try this one:

$17 \times 5$

Do  $10 \times 5$

and  $7 \times 5$

Then add



**(3)** Use the same method to find the value of:



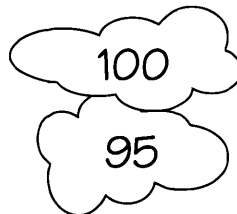
- |                   |                   |                   |
|-------------------|-------------------|-------------------|
| (a) $13 \times 7$ | (b) $15 \times 6$ | (c) $18 \times 4$ |
| (d) $19 \times 5$ | (e) $14 \times 7$ | (f) $15 \times 5$ |
| (g) $17 \times 8$ | (h) $18 \times 9$ | (i) $19 \times 7$ |

Sometimes it is possible to take short-cuts.

*For example  $19 \times 5$*

Do  $20 \times 5$

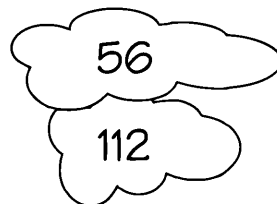
Then take 5 away



*For example  $16 \times 7$*

Do  $8 \times 7$

Then double it

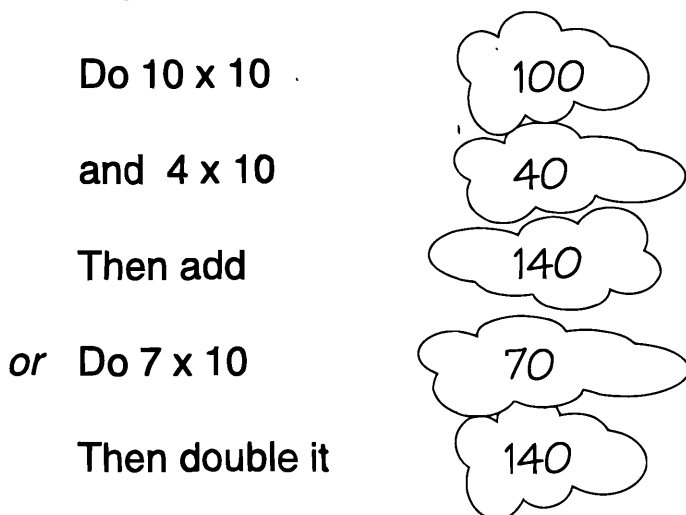


**(4)** Find short-cuts for these:

- |                   |                   |                   |
|-------------------|-------------------|-------------------|
| (a) $19 \times 4$ | (b) $16 \times 5$ | (c) $5 \times 14$ |
| (d) $16 \times 3$ | (e) $6 \times 30$ | (f) $9 \times 40$ |

Multiplying by 10 is probably easiest of all.

For example  $14 \times 10$



(5) Try these:

- (a)  $6 \times 10$    (b)  $16 \times 10$    (c)  $17 \times 10$    (d)  $18 \times 10$   
(e)  $21 \times 10$    (f)  $30 \times 10$    (g)  $10 \times 10$    (h)  $99 \times 10$

(6) Can you find short-cuts for these?

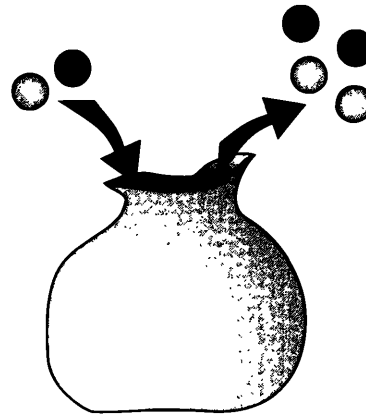
- (a)  $4 \times 20$    (b)  $8 \times 40$    (c)  $6 \times 20$    (d)  $5 \times 50$   
(e)  $9 \times 30$    (f)  $7 \times 60$    (g)  $10 \times 70$    (h)  $8 \times 80$

(7) You may have found a very quick short-cut for multiplying by 10.  
What is it?

# Marbles

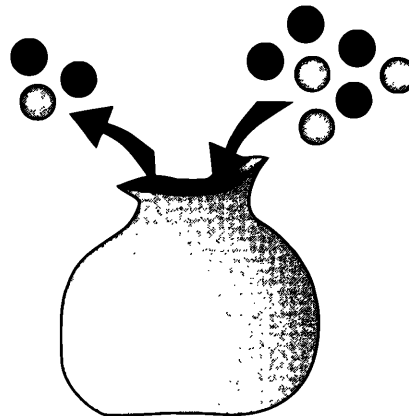
Two children are playing a game with bags of marbles.

I've won 2 marbles,  
but I've lost 4 marbles.  
I now have 2 less.



Result: 2 less

I've lost 3 marbles,  
but I've won 7.  
I now have 4 more.



Result: 4 more

Here are the results of several games.

● Copy and complete the table.

Number won	6	2	3	7	2	4	4	8	0	18	21	10	12	4
Number lost	2	6	7	3	4	2	4	3	5	20	25	15	7	19
Change in number	4 more	4 less												

turn over

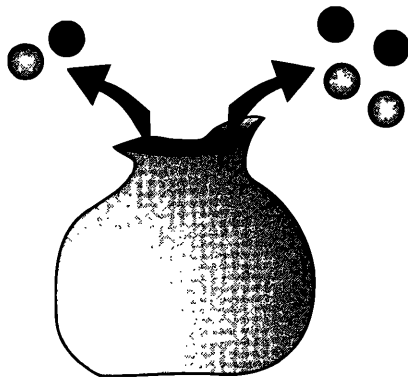
Denise has a bag of marbles.  
She takes out 2 marbles...

I've taken out 2,  
I'll write down -2.

and then she takes out 4 marbles.

I've taken out 4,  
I'll write down -4.

Altogether she has taken out 6 marbles.



There must be 6 less  
than before.

That's -6. So I'll write  
 $-2 + -4 = -6$

● Using Denise's method, copy and complete the following:

1)  $-2 + -4 = -6$

2)  $3 + -2 = \blacksquare$

3)  $7 + -5 = \blacksquare$

4)  $6 + -5 = \blacksquare$

5)  $-4 + 3 = \blacksquare$

6)  $3 + -4 = \blacksquare$

7)  $-2 + -7 = \blacksquare$

8)  $-7 + -2 = \blacksquare$

9)  $-6 + 5 = \blacksquare$

10)  $5 + -6 = \blacksquare$

11)  $-6 + -7 = \blacksquare$

12)  $2 + -2 = \blacksquare$

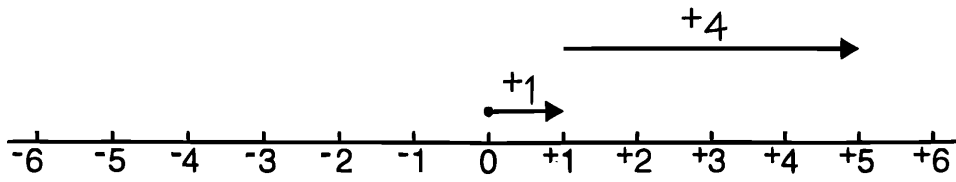
13)  $-2 + 2 = \blacksquare$

14)  $-5 + -5 = \blacksquare$

# Adding Shifts

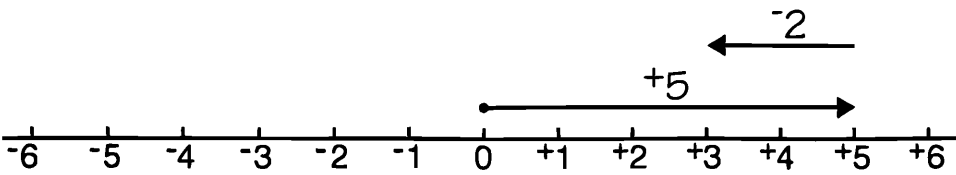
Add these shifts (the first one is done for you).

1.



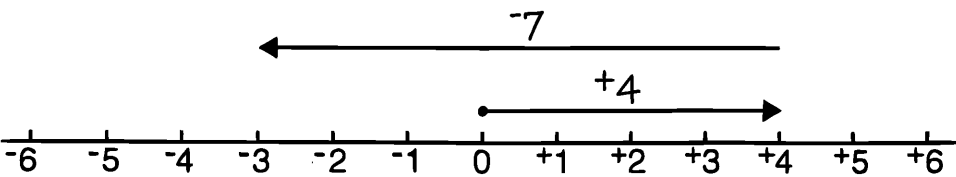
$$\boxed{+1} + \boxed{+4} = \boxed{+5}$$

2.



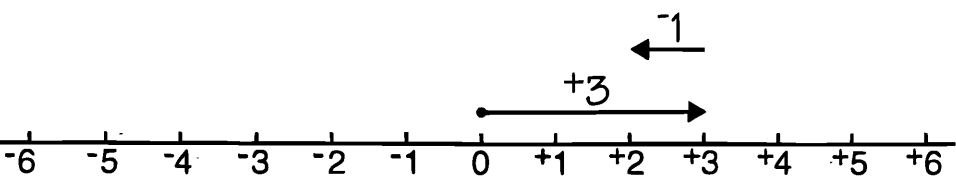
$$\boxed{+5} + \boxed{-2} = \boxed{\phantom{00}}$$

3.



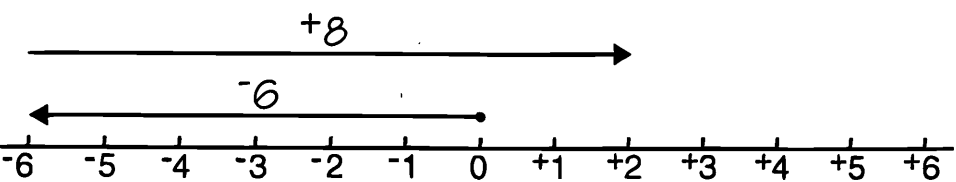
$$\boxed{\phantom{00}} + \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

4.



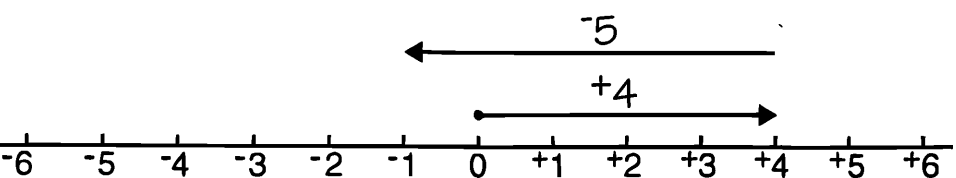
$$\boxed{\phantom{00}} + \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

5.



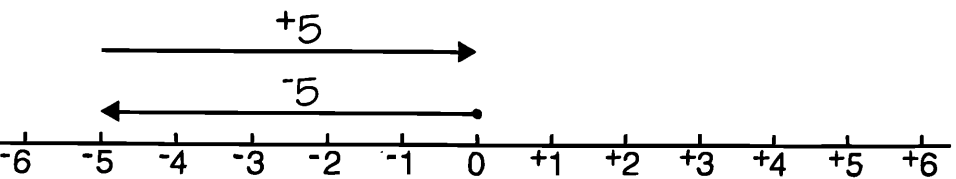
$$\boxed{\phantom{00}} + \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

6.



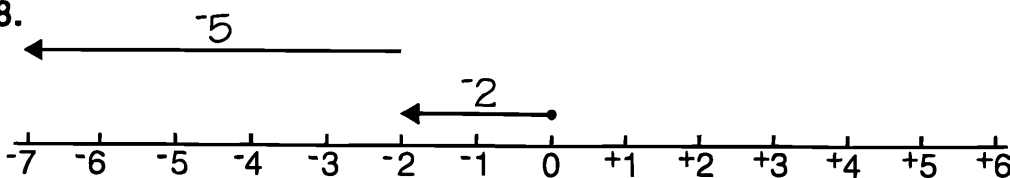
$$\boxed{\phantom{00}} + \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

7.



$$\boxed{\phantom{00}} + \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

8.

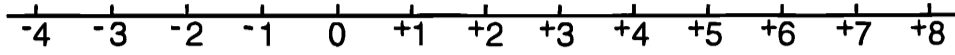


$$\boxed{\phantom{00}} + \boxed{\phantom{00}} = \boxed{\phantom{00}}$$

turn over

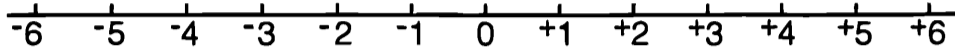
Put on the shifts and complete the sums.

9.



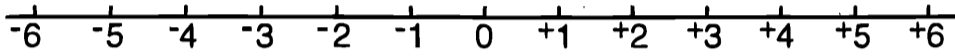
$$+2 + +6 = \boxed{+8}$$

10.



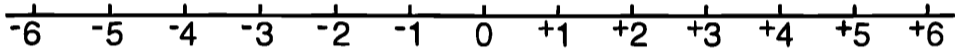
$$+2 + -5 = \boxed{-3}$$

11.



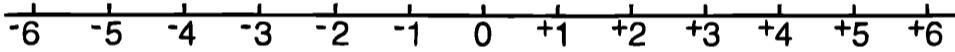
$$-4 + +3 = \boxed{\phantom{0}}$$

12.



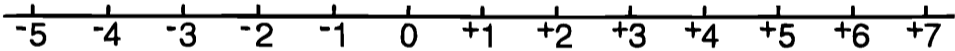
$$-4 + -2 = \boxed{\phantom{0}}$$

13.



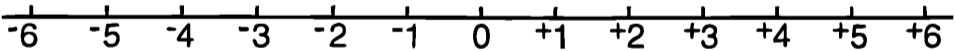
$$-1 + +7 = \boxed{\phantom{0}}$$

14.



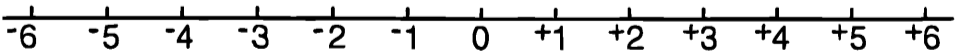
$$+7 + -1 = \boxed{\phantom{0}}$$

15.



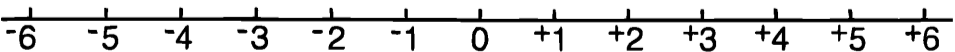
$$-3 + +3 = \boxed{\phantom{0}}$$

16.



$$-3 + +4 + -5 = \boxed{\phantom{0}}$$

17.



$$-2 + +6 + -3 = \boxed{\phantom{0}}$$

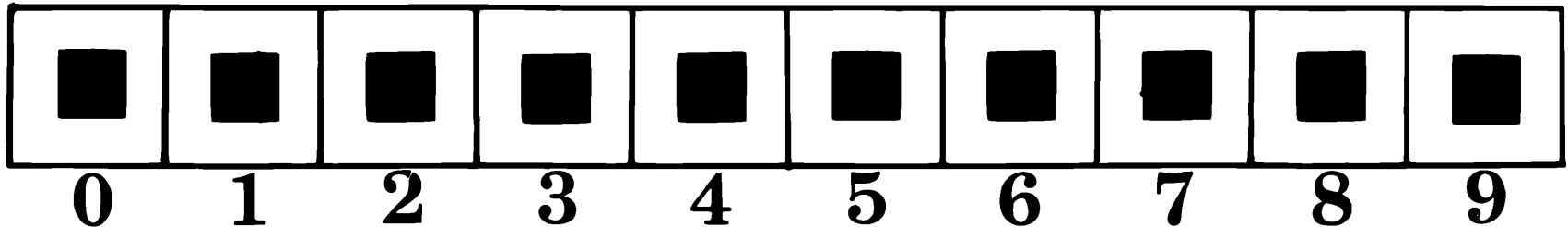
## ● A SPECIAL NUMBER

Find a 10 - digit number to fit in these cells.

The digit in the '0' cell must show the total number of 0's in the entire number.

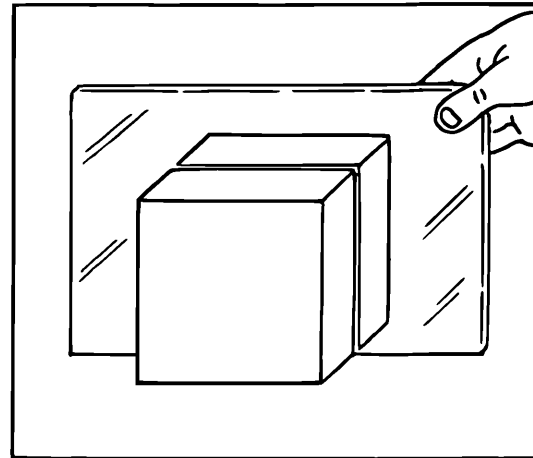
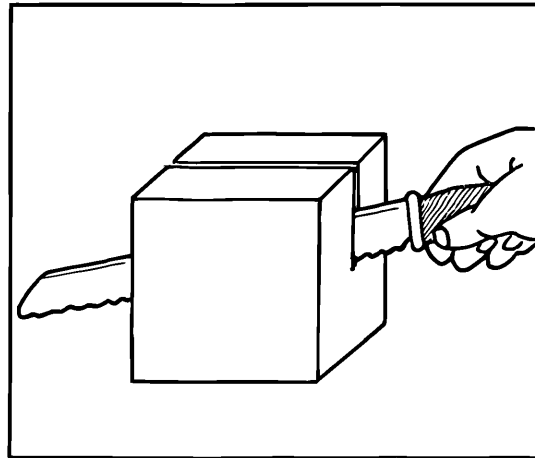
The digit in the '1' cell must show the total number of 1's .....

And so on.

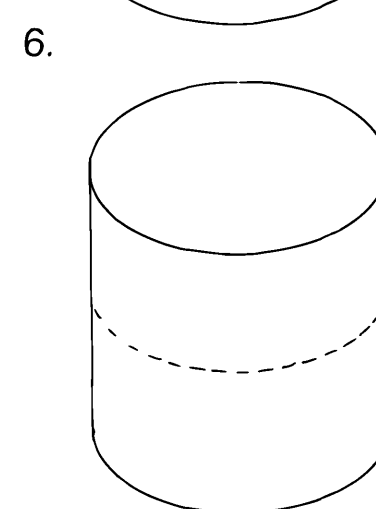
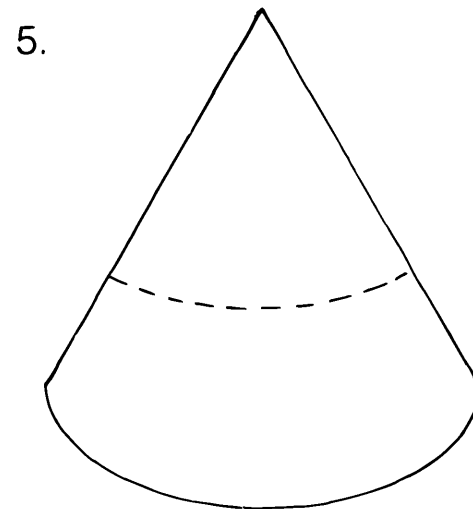
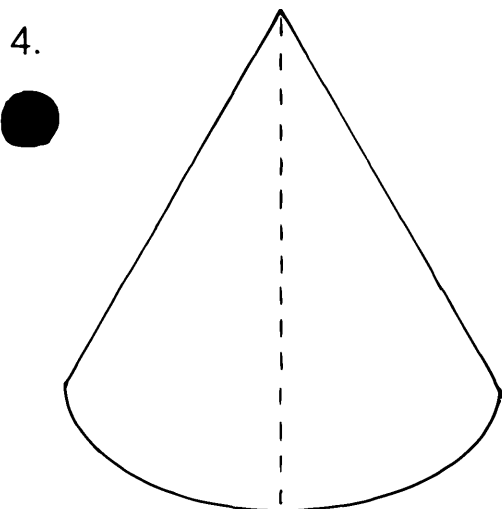
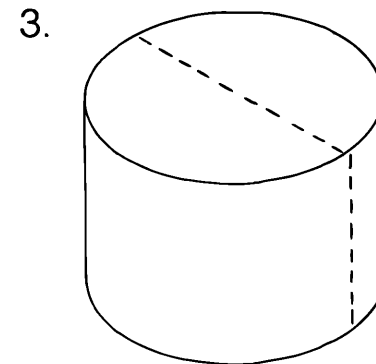
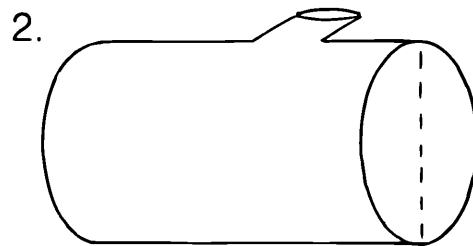
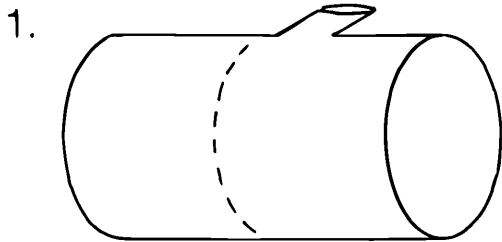


# Symmetrical Cross Cut

It is possible to cut some shapes symmetrically so that one half is the reflection of the other.



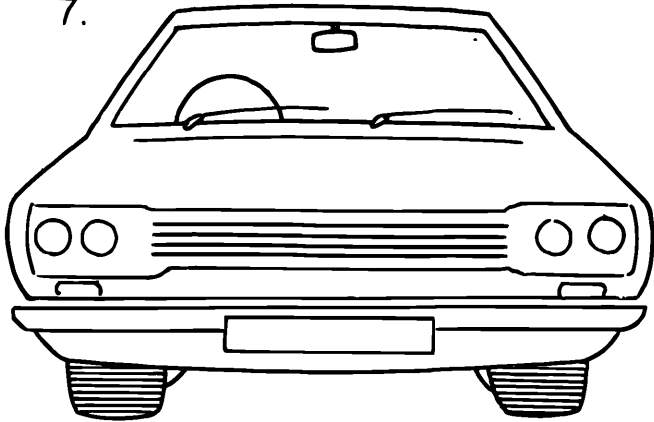
Which of the following cross-cuts would give symmetrical halves?



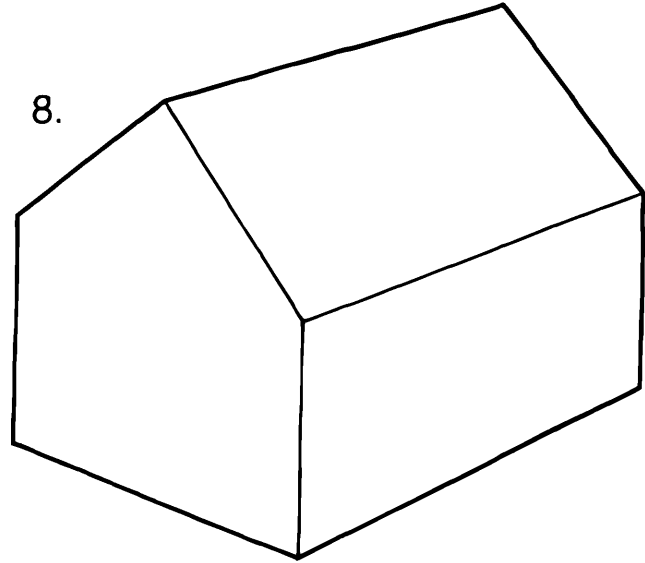
A cut which separates two halves symmetrically is called a **plane of symmetry**.

Which of these could be cut with a plane of symmetry?

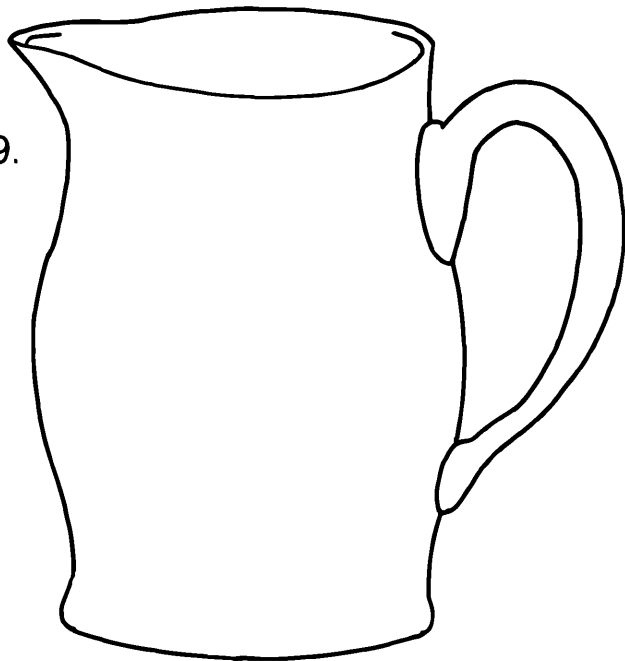
7.



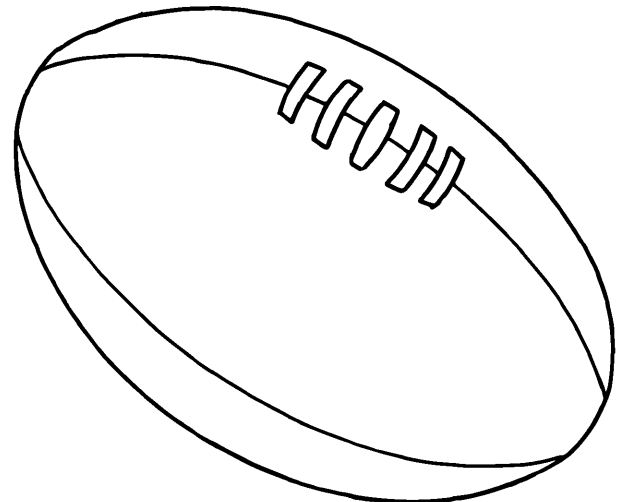
8.



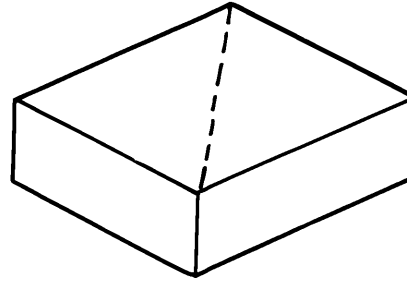
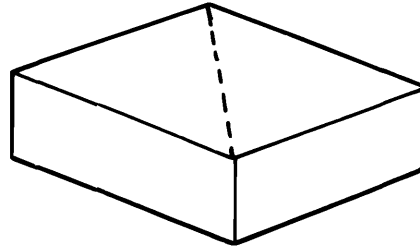
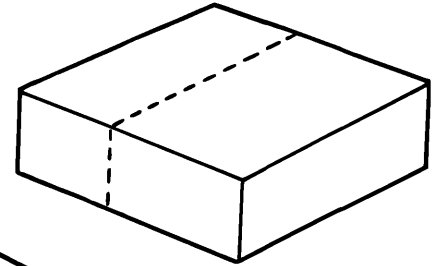
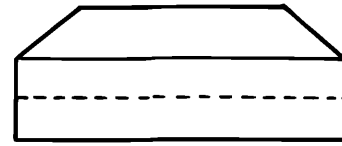
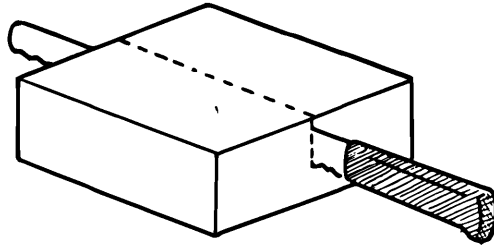
9.



10.

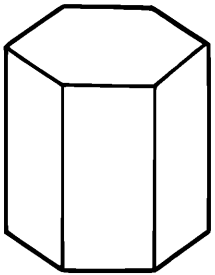


Some solids can be cut by more than one plane of symmetry:

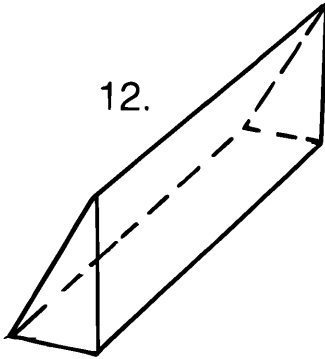


How many planes of symmetry can you find for each of these?

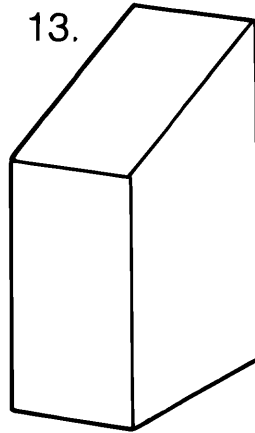
11.



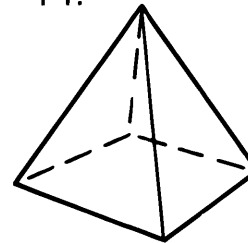
12.



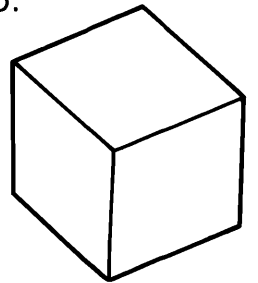
13.



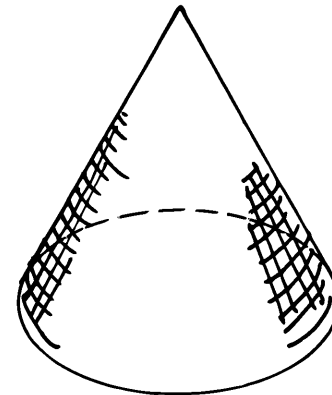
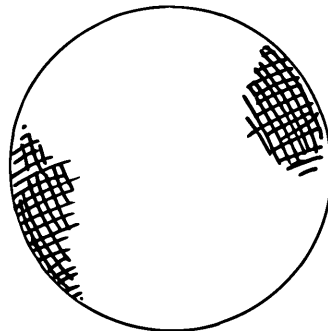
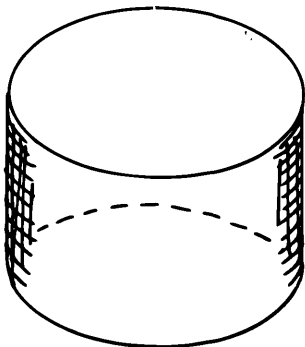
14.



15.

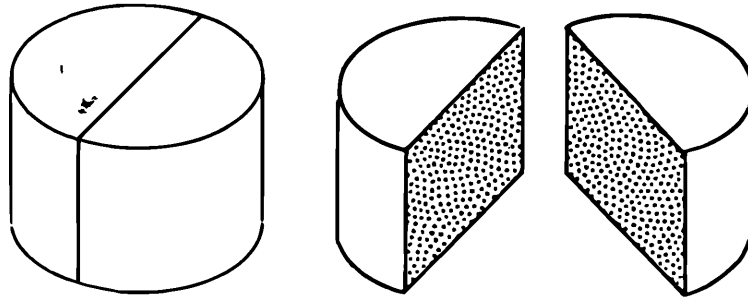


16. What is special about these three solids?



Find the number of planes of symmetry for some objects in the room.

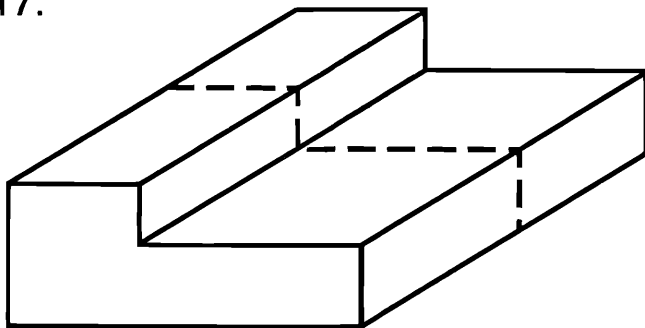
A symmetrical cross-cut exposes 2 new surfaces.  
In the case of this cylinder...



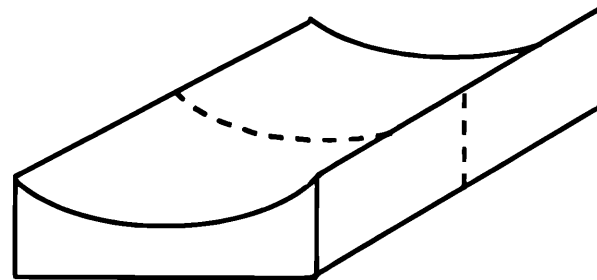
...the cross-section of both surfaces is a rectangle.

Sketch the cross-section that would be made by a cut through the plane of symmetry of these four solids;

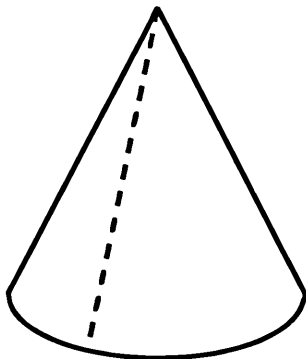
17.



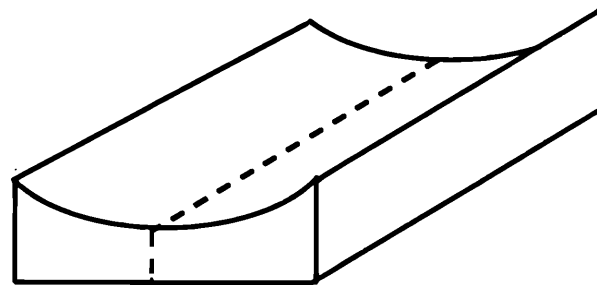
18.



19.



20.



# DIGIT SUM

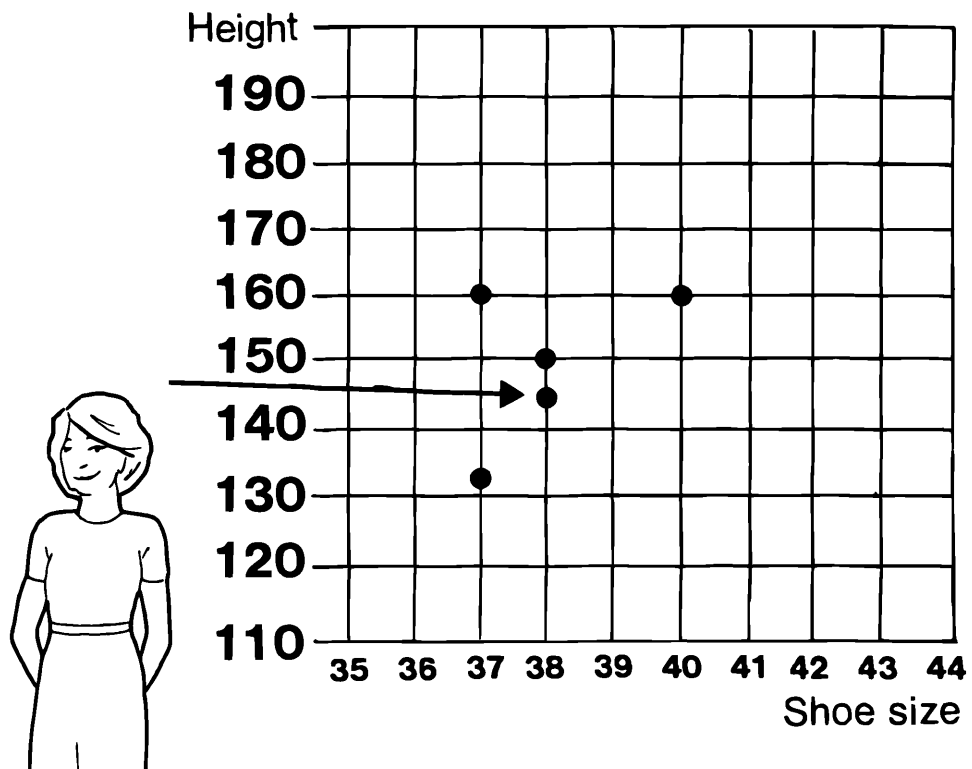
What is the sum  
of all the digits  
in all the numbers  
from 1 to 10000?

# Line of best fit

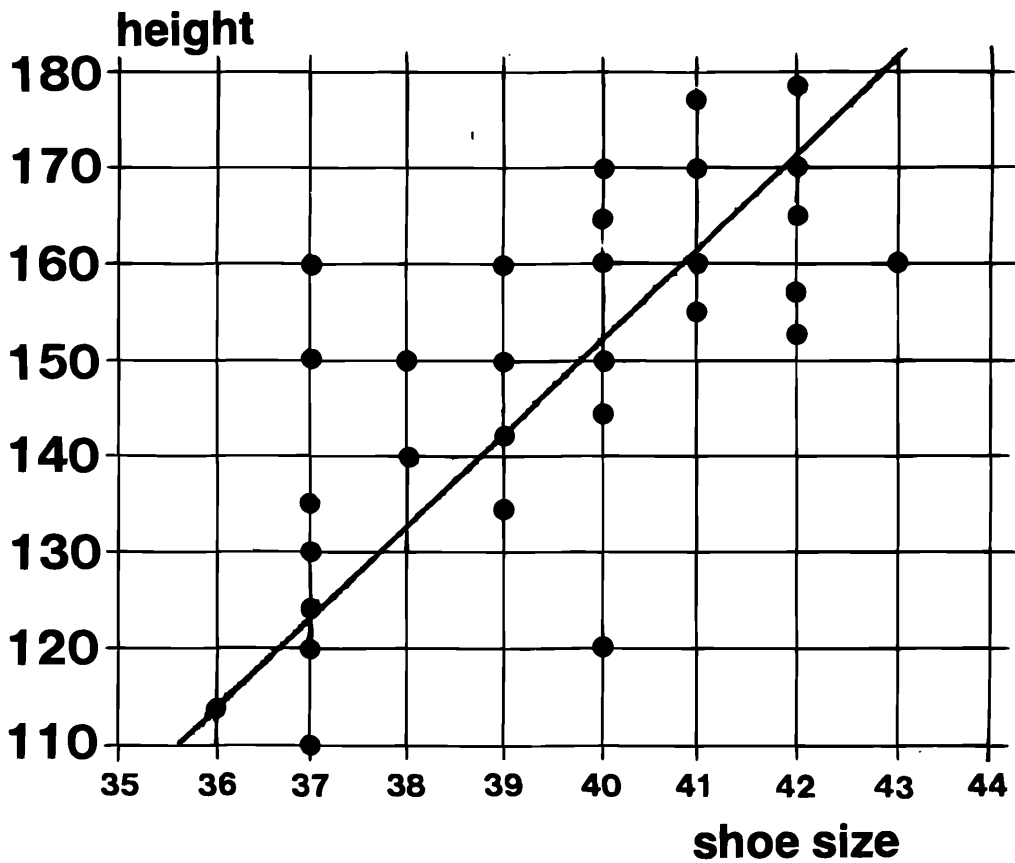
A woman conducted a survey, one day in Oxford Street – she measured some people's HEIGHTS and their SHOE SIZES.



She put her results on a scattergram.



When she had measured enough people, she drew in a LINE OF BEST FIT on this scattergram.



1. Why do you think the line is called the LINE OF BEST FIT?

Why does it slope upwards?

2. A passing man takes size 43 shoes.  
Use the line of best fit to estimate how tall he is.

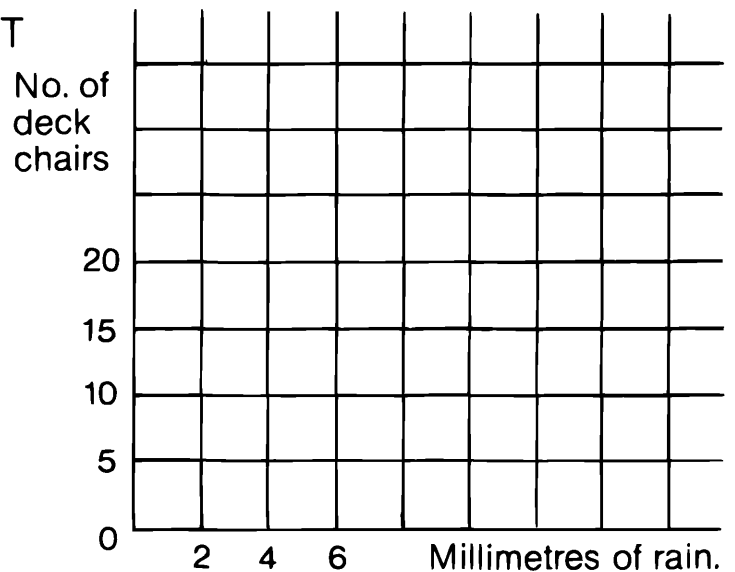
3. The woman herself was about 150 cm tall. Estimate her shoe size.

In Hyde Park a deck-chair attendant recorded how the rain affected his trade.

<b>Rain in mm</b>	14	10	4	2.5	5.5	2	20	21.5	18	11.5	0	7.5
<b>Deckchairs Hired</b>	22	30	40	45	35	46	7	7	14	22	48	32

4. Draw a scattergram to show these results.

Draw the LINE OF BEST FIT



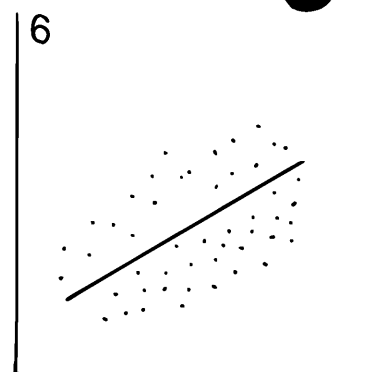
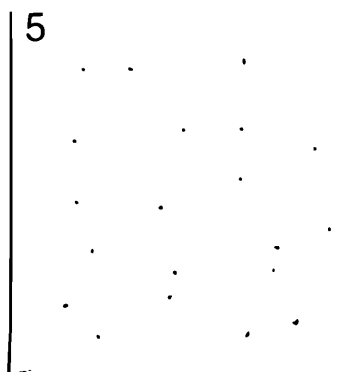
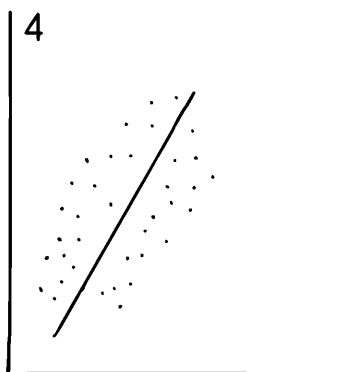
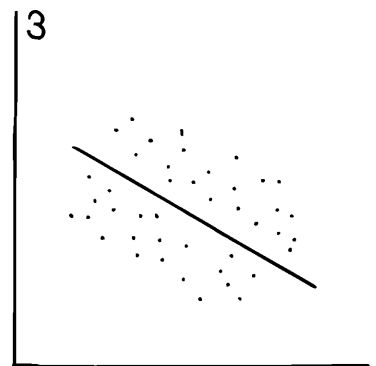
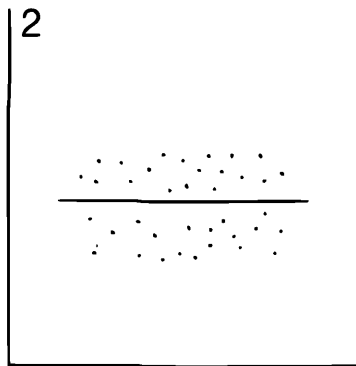
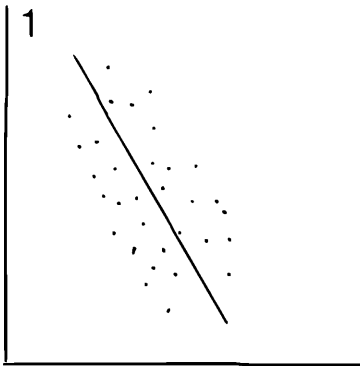
5. The weather forecast for the next day predicted 10 mm of rain.  
 How many deck-chairs should the attendant get out?
6. How much rain do you think fell if the attendant put out 23 deck-chairs?
7. One day, 50 deck-chairs were put out.  
 Do you think that it rained?
8. Why does the line of best fit slope downwards?

TURN OVER

The slope of the line of best fit will depend upon the two things being compared.

Which of the scattergrams below would you expect to describe:

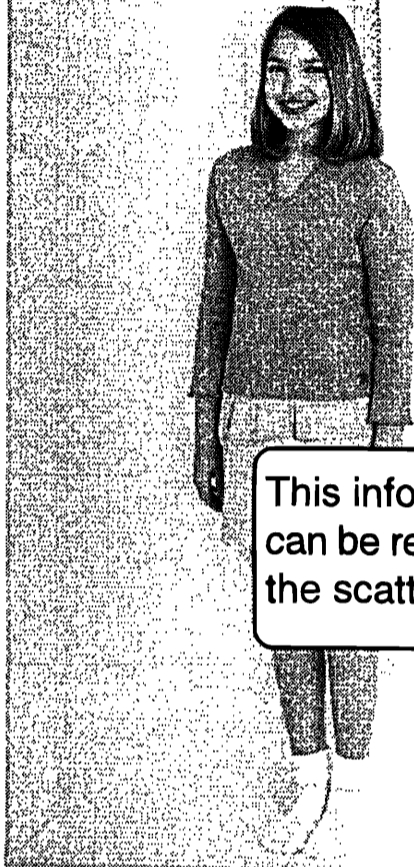
- A. *Age of Car* compared with *its cost*?
- B. *Length of journey* compared with *amount of petrol used*?
- C. *Heights of adults* compared with *ages of adults*?
- D. *Heights of children* compared with *ages of children*?
- E. *Numbers of sweets in a packet* compared with *price of packet*?



# Line of Best Fit

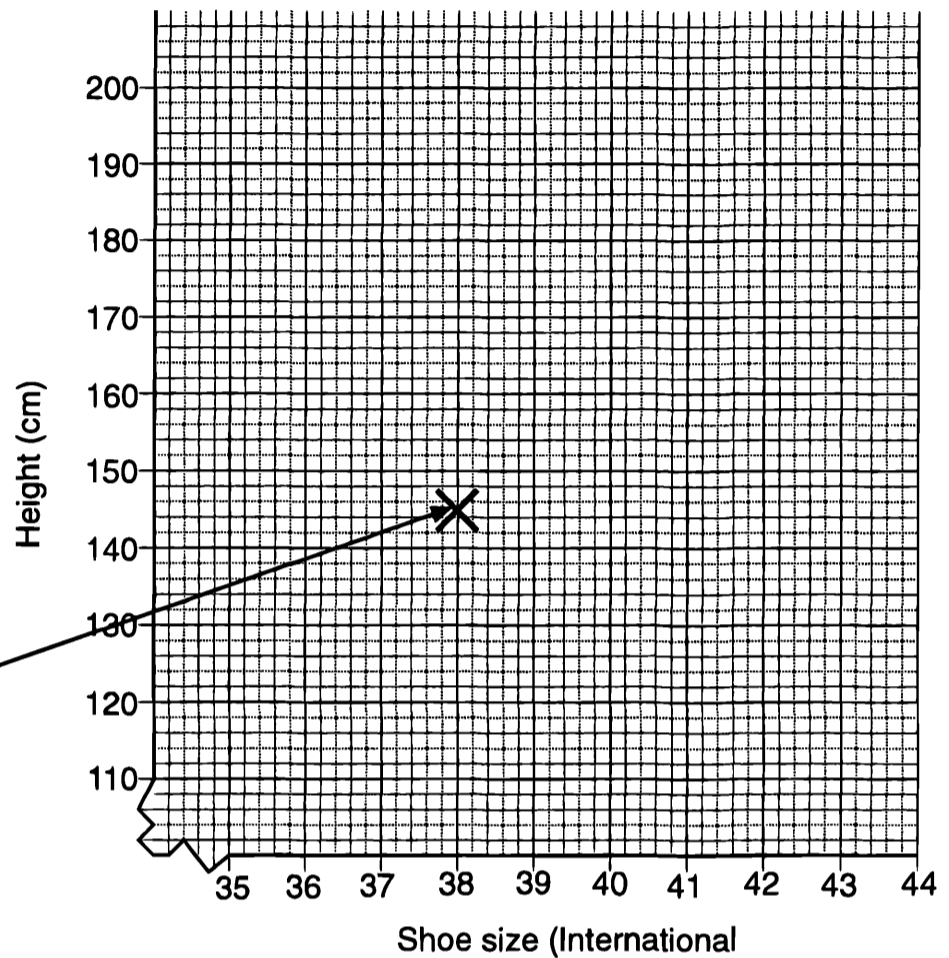
You will need graph paper.

Tessa's height is 145cm and her shoe size is 38.



This information can be recorded on the scattergraph.

Scattergraph to show height and shoe size



Other students' height and shoe size were recorded on the scattergraph and a 'line of best fit' was drawn.

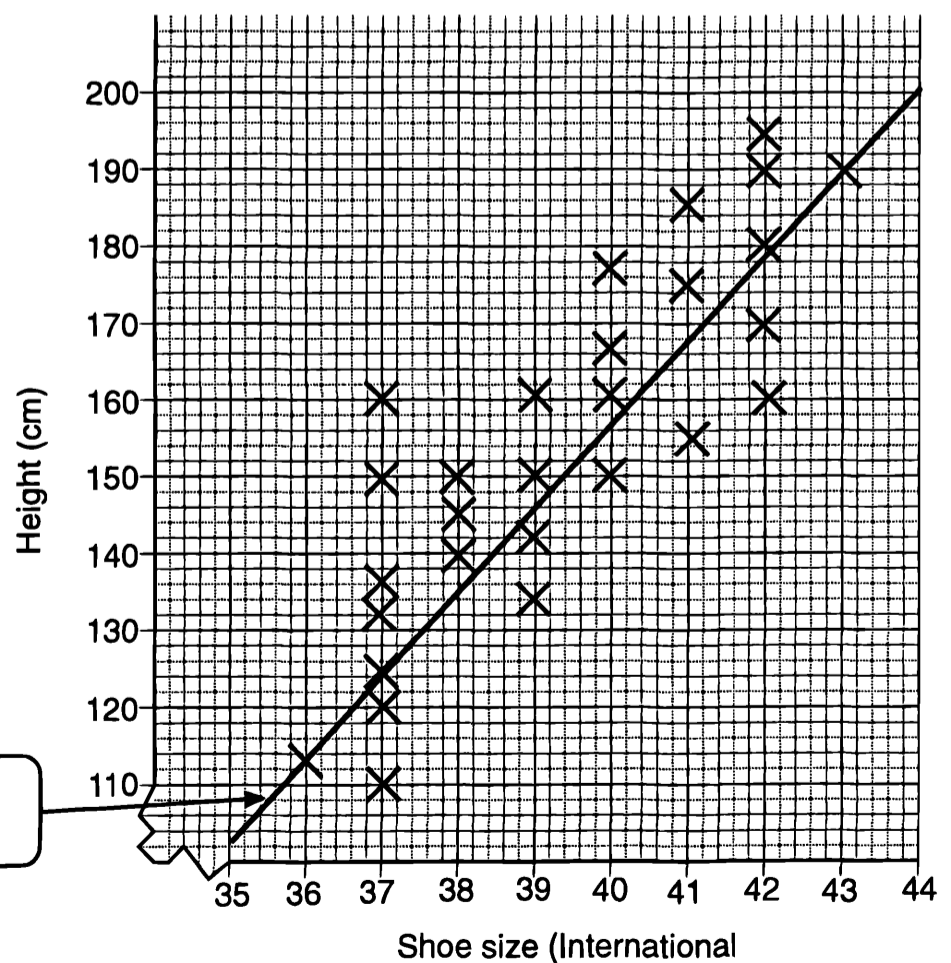
1. Why do you think the line is called the 'line of best fit'?

Why does it slope upwards?

2. Another student joins the class. His shoe size is 43. Use the line of best fit to estimate how tall he is.

3. Another student was 150cm tall. Estimate her shoe size.

Scattergraph to show height and shoe size

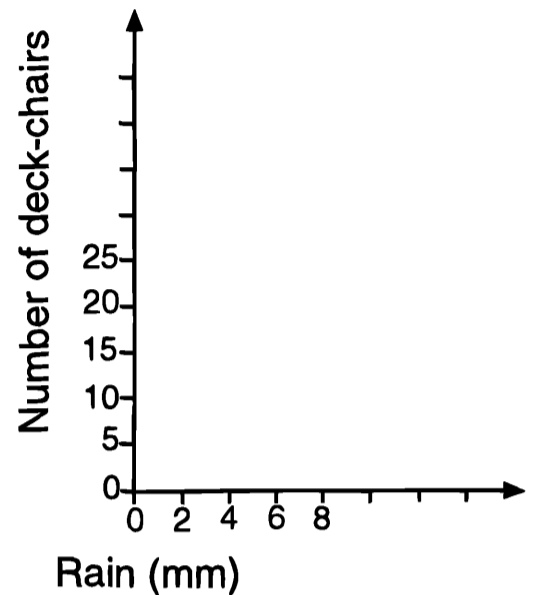


Line of best fit

In Hyde Park a deck-chair attendant recorded how the rain affected his trade.

<b>Rain (mm)</b>	<b>14</b>	<b>10</b>	<b>4</b>	<b>2.5</b>	<b>5.5</b>	<b>2</b>	<b>20</b>	<b>21.5</b>	<b>18</b>	<b>11.5</b>	<b>0</b>	<b>7.5</b>
<b>Deck-chairs hired</b>	<b>22</b>	<b>30</b>	<b>40</b>	<b>45</b>	<b>35</b>	<b>46</b>	<b>7</b>	<b>7</b>	<b>14</b>	<b>22</b>	<b>48</b>	<b>32</b>

- Draw a scattergraph to show these results.  
Draw the 'line of best fit'.
- The weather forecast for the next day predicted 10mm of rain. How many deck-chairs should the attendant get out?
- How much rain do you think fell if the attendant put out 23 deck-chairs?
- One day, 50 deck-chairs were put out.  
Do you think that it rained?
- Why does the line of best fit slope downwards?



The slope of the line of best fit will depend upon the two things being compared.

Which of the following scattergraphs below could you expect to describe:

- Age of car compared with the its cost?
- Length of journey compared with amount of petrol used?
- Height of adults compared with ages of adults?
- Height of children compared with ages of children?
- Number of sweets in a packet compared with price of packet?

