MATHEMATICS ENTRANCE EXAMINATION 2011

DURATION: 1 HOUR

Name:

Try to answer as many questions as possible.
Write the **answers** in the **spaces provided** and do not rub out any working.
If you get stuck on a question leave it and come back later if you have time.

Instructions

Answers

This means write down your answer or show your working and write down your answer.

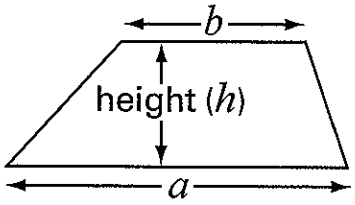
Calculators

You **must not** use a calculator to answer any question in this test.

Formulae

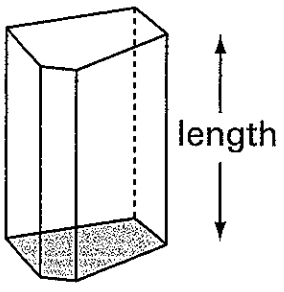
You might need to use these formulae

Trapezium



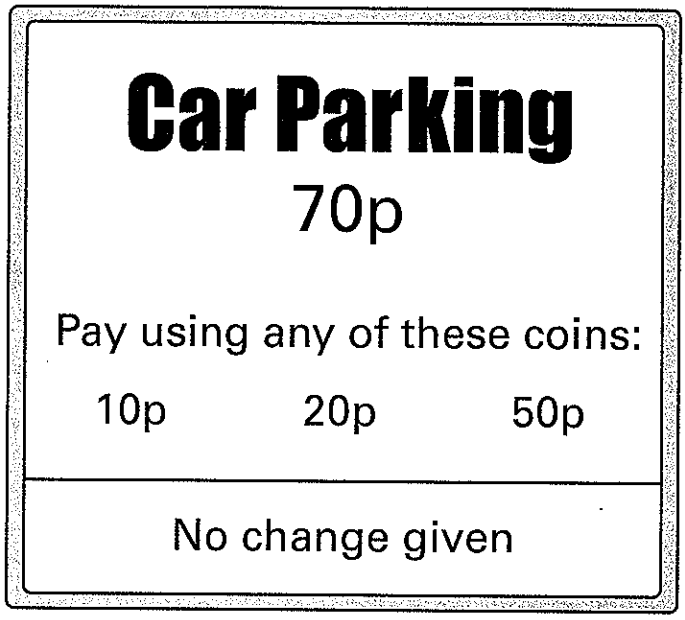
$$\text{Area} = \frac{1}{2}(a + b)h$$

Prism



Volume = area of cross-section × length

1. A car park shows this sign.



Complete the table to show all the **different ways** of paying **exactly 70p**.

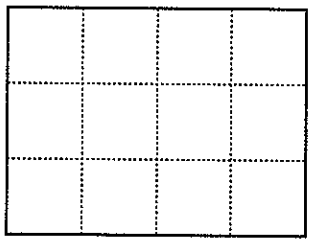
Number of **10p** coins	Number of **20p** coins	Number of **50p** coins
7	0	0

. . . .

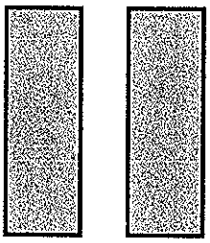
. . . .

2 marks

2. I have a square grid and two rectangles.

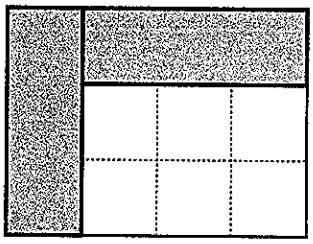


grid



two rectangles

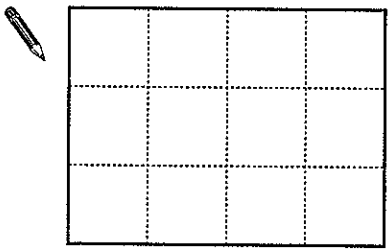
I make a pattern with the grid and the two rectangles:



The pattern has **no** lines of symmetry.

(a) Put both rectangles on the grid to make a pattern with **only one** line of symmetry.

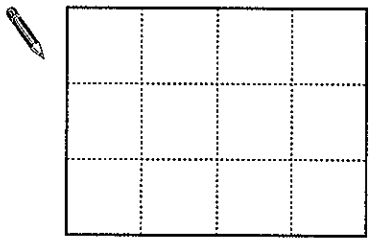
You must **shade** the rectangles.



1 mark

(b) Put both rectangles on the grid to make a pattern with **rotation** symmetry of **order 2**

You must **shade** the rectangles.



1 mark

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3. Simplify these expressions.

$5k + 7 + 3k =$ .....

1 mark

$k + 1 + k + 4 =$ .....

1 mark

4. Fill in the missing numbers.

$\frac{1}{2}$ of 20 = $\frac{1}{4}$ of ....

1 mark

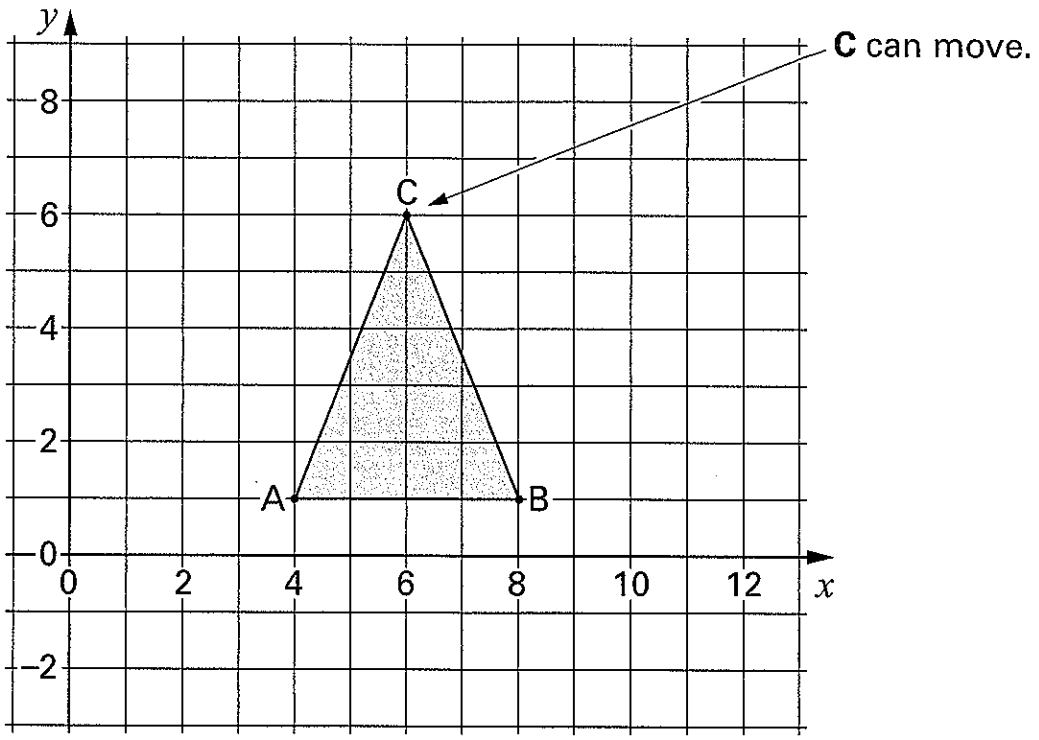
$\frac{3}{4}$ of 100 = $\frac{1}{2}$ of ....

1 mark

$\frac{1}{3}$ of 60 = $\frac{2}{3}$ of ....

1 mark

5. On this square grid, **A and B must not move.**



When C is at (6, 6), triangle ABC is **isosceles**.

(a) C moves so that triangle ABC is still **isosceles**.

Where could C have moved to?

Write the coordinates of its new position.

(.....,.....) .....

1 mark

(b) Then C moves so that triangle ABC is **isosceles and right-angled**.

Where could C have moved to?

Write the coordinates of its new position.

(.....,.....) .....

1 mark

6. (a) There are four people in Sita's family.

Their shoe sizes are 4, 5, 7 and 10

What is the **median** shoe size in Sita's family?

.....

1 mark

(b) There are **three** people in John's family.

The **range** of their shoe sizes is **4**

Two people in the family wear shoe size 6

John's shoe size is **not 6** and it is **not 10**

What is John's shoe size?

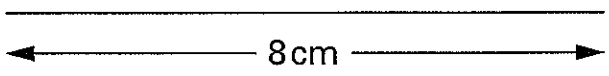
.....

1 mark

7. **Use compasses** to construct a triangle that has sides **8cm**, **6cm** and **7cm**.

Leave in your construction lines.

One side of the triangle is drawn for you.



2 marks

8. (a) I pay **£16.20** to travel to work each week.

I work for **45 weeks** each year.

How much do I pay to travel to work each year?

Show your working.

£ .....

2 marks

(b) I could buy one season ticket that would let me travel for **all 45 weeks.**

It would cost **£630**

How much is that per week?

£ .....

1 mark

9. Solve these equations.

Show your working.

$8k - 1 = 15$

$k =$ .....

1 mark

$2m + 5 = 10$

$m =$ .....

1 mark

$3t + 4 = t + 13$

$t =$ .....

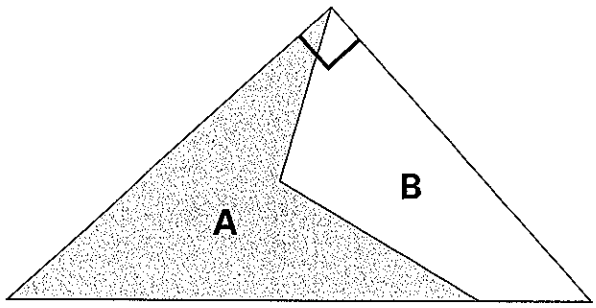
2 marks

$2(3n + 7) = 8$

$n =$ .....

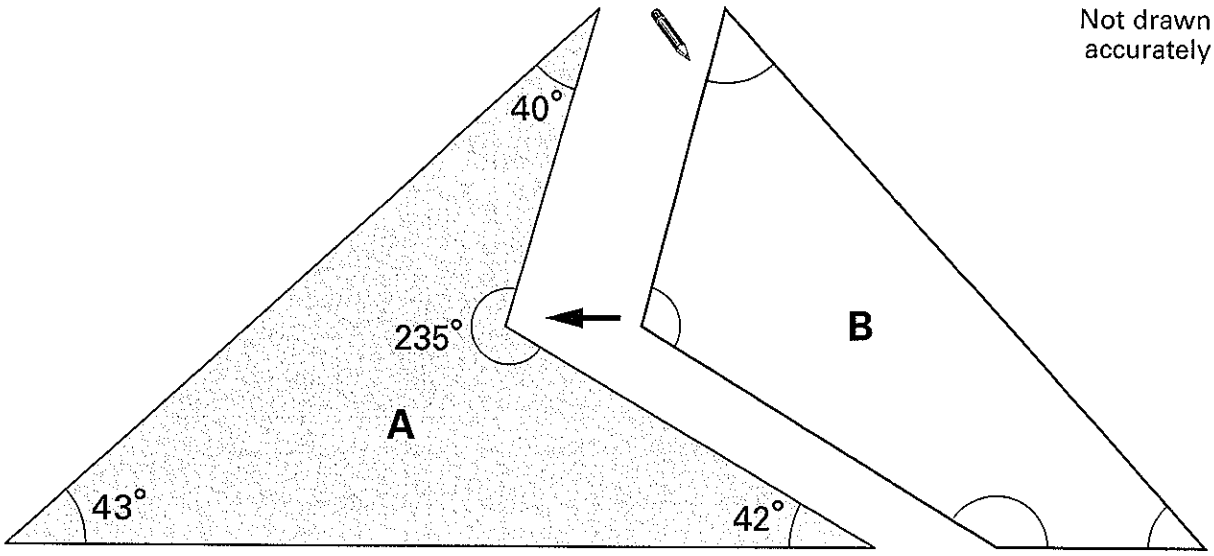
1 mark

10. The drawing shows how shapes A and B fit together to make a **right-angled** triangle.



Work out the size of each of the angles in shape B.

Write them in the correct place in shape B below.



Not drawn accurately

. . . .

. . . .

. . . .

3 marks

11. (a) Add $\frac{6}{10}$ and $\frac{6}{5}$

.....

1 mark

Now use an arrow (↓) to show the result on the number line.

1 mark

(b) How many **sixths** are there in $3\frac{1}{3}$?

.....

1 mark

(c) Work out $3\frac{1}{3} \div \frac{5}{6}$

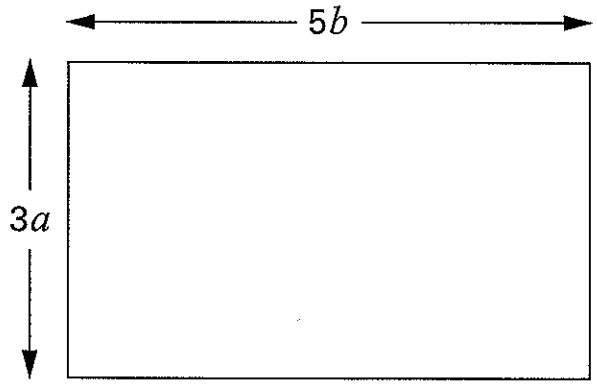
Show your working.

.....

2 marks

12. (a) The diagram shows a rectangle.

Its dimensions are $3a$ by $5b$



Write **simplified expressions** for the area and the perimeter of this rectangle.

Area: .....

1 mark

Perimeter: .....

1 mark

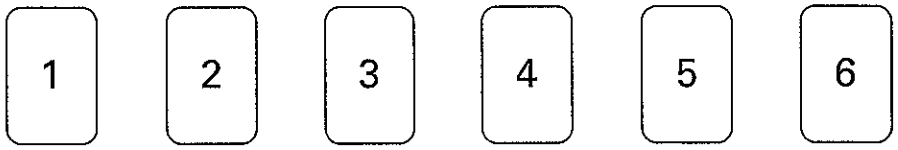
(b) A different rectangle has **area** $12a^2$ and **perimeter** $14a$

What are the dimensions of this rectangle?

Dimensions: ..... by .....

1 mark

13. Here are six number cards.



(a) Arrange these six cards to make the calculations below.

The first one is done for you.

939 = 4 2 3 + 5 1 6

1164 = ☐ ☐ ☐ + ☐ ☐ ☐

1 mark

750 = ☐ ☐ ☐ + ☐ ☐ ☐

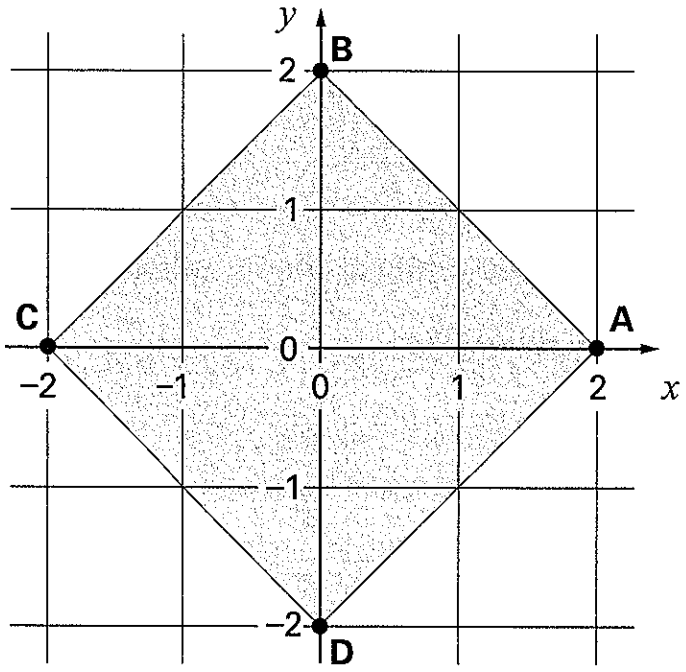
1 mark

(b) Now arrange the six cards to make a **difference** of 115

115 = ☐ ☐ ☐ − ☐ ☐ ☐

1 mark

14. The diagram shows a square drawn on a square grid.



(a) The points A, B, C and D are at the vertices of the square.

Match the correct line to each equation.

One is done for you.

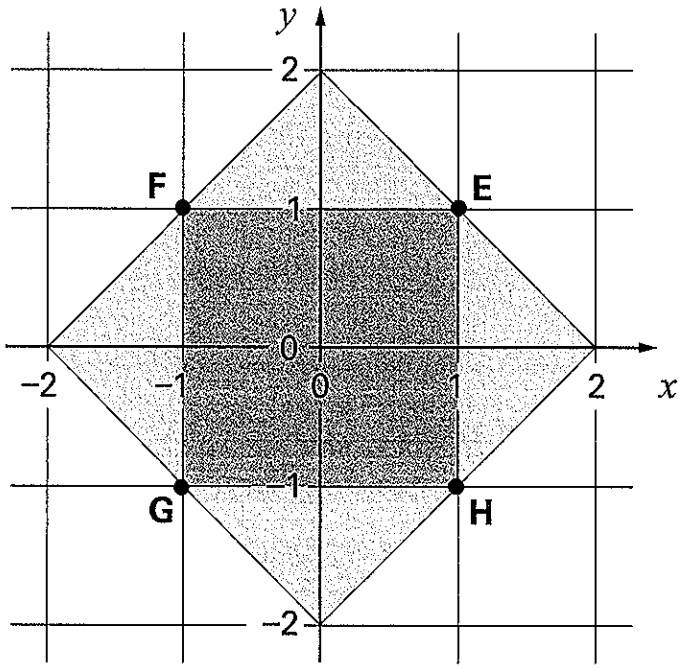
$y = 0$	Line through A and C
$x = 0$	Line through A and D
$x + y = 2$	Line through B and D
$x + y = -2$	Line through B and C
	Line through A and B

. . .

. . .

2 marks

The mid-points of each side, E, F, G and H, join to make a different square.



(b) Write the equation of the straight line through **E** and **H**.

1 mark

(c) Is $y = -x$ the equation of the straight line through **E** and **G**?

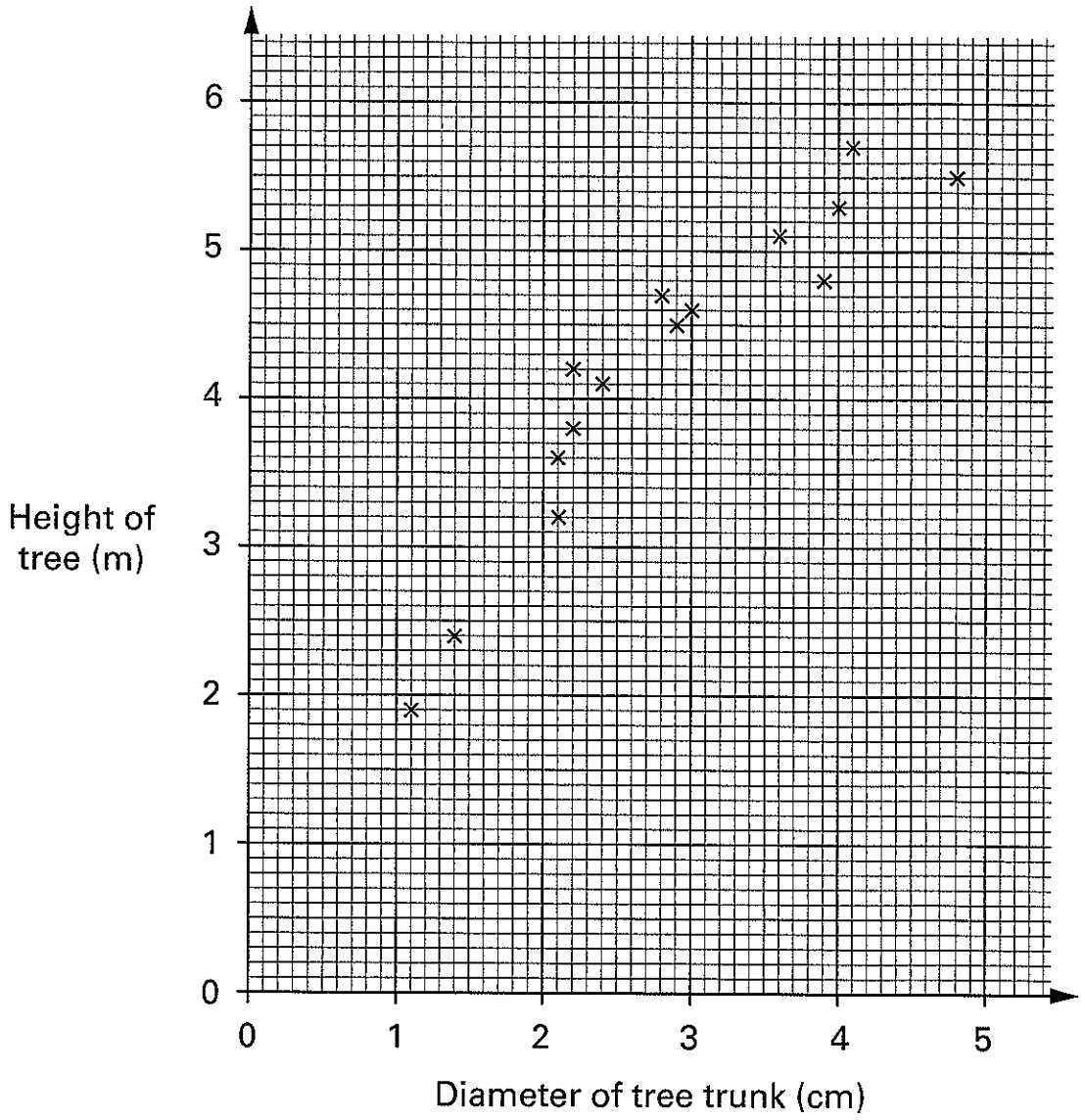
Tick (✓) Yes or No.

Yes ☐ No ☐

Explain how you know.

1 mark

15. The scatter graph shows information about trees called poplars.



(a) What does the scatter graph show about the **relationship** between the diameter of the tree trunk and the height of the tree?

. . .

1 mark

(b) The height of a different tree is 3m. The diameter of its trunk is 5cm.

Use the graph to explain why this tree is **not** likely to be a poplar.

1 mark

(c) Another tree **is** a poplar. The diameter of its trunk is 3.2cm.

Estimate the height of this tree.

..... m

1 mark

(d) Below are some statements about drawing lines of best fit on scatter graphs.

For each statement, tick (✓) to show whether the statement is True or False.

Lines of best fit must **always** ...

go through the origin.	☐ True	☐ False
have a positive gradient.	☐ True	☐ False
join the smallest and the largest values.	☐ True	☐ False
pass through every point on the graph.	☐ True	☐ False

2 marks

18. (a) Pupils started to solve the equation $6x + 8 = 4x + 11$ in different ways.

For each statement below, tick (✓) True or False.

$6x + 8 = 4x + 11$

so $14x = 15x$

☐ True ☐ False

$6x + 8 = 4x + 11$

so $6x + 4x = 11 + 8$

☐ True ☐ False

$6x + 8 = 4x + 11$

so $6x = 4x + 3$

☐ True ☐ False

$6x + 8 = 4x + 11$

so $2x + 8 = 11$

☐ True ☐ False

$6x + 8 = 4x + 11$

so $2x = 3$

☐ True ☐ False

$6x + 8 = 4x + 11$

so $-3 = -2x$

☐ True ☐ False

. . .

. . .

. . .

3 marks

(b) A different pupil used trial and improvement to solve the equation $6x + 8 = 4x + 11$

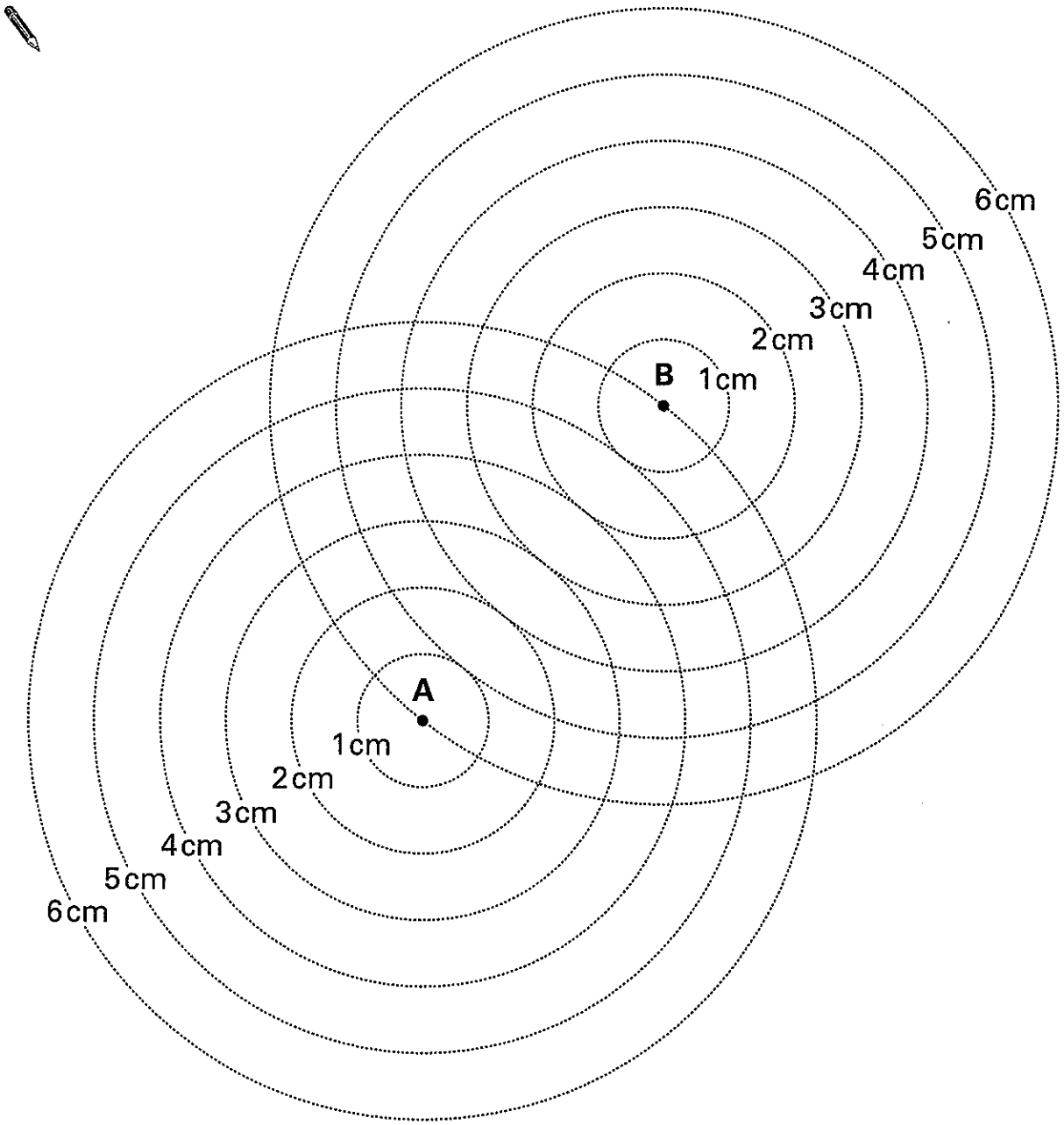
Explain why trial and improvement is not a good method to use.

. . .

1 mark

19. The diagram below shows two points A and B that are 6cm apart.

Around each point are six circles of radius 1cm, 2cm, 3cm, 4cm, 5cm and 6cm. Each circle has either A or B as its centre.



(a) On the diagram, mark with a cross any points that are 4cm away from A **and** 4cm away from B.

1 mark

(b) Now draw the locus of **all** points that are the **same distance** from A as they are from B.

1 mark

20. For each part of the question, tick (✓) the statement that is true.

(a)

When x is even, $(x-2)^2$ is even	When x is even, $(x-2)^2$ is odd
☐	☐

Show how you know it is true for **all** even values of x

1 mark

(b)

When x is even, $(x-1)(x+1)$ is even	When x is even, $(x-1)(x+1)$ is odd
☐	☐

Show how you know it is true for **all** even values of x

1 mark