SURNAME ..... FIRST NAME .....

JUNIOR SCHOOL ..... SENIOR SCHOOL .....

Independent Schools Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: NON-CALCULATOR PAPER

Monday 1 November 2010

Please read this information before the examination starts.

- This examination is 60 minutes long.
- **All** questions should be attempted.
- A row of dots ..... denotes a space for your answer.
- A completely correct answer may receive no marks unless you show all your working.
- Answers given as fractions should be reduced to their lowest terms.

28310126

© Independent Schools Examinations Board

1. Work out

(i) 15.4 + 8.79

Answer: ..... (1)

(ii) 15.4 − 8.79

Answer: ..... (1)

(iii) 1.38 × 0.6

Answer: ..... (2)

(iv) 1.38 ÷ 0.6

Answer: ..... (2)

2. (a) (i) Write $\frac{17}{25}$ as a percentage.

Answer: .....% (2)

(ii) Write 7.5% as a decimal.

Answer: ..... (1)

(b) Calculate $\frac{5}{8}$ of 2 metres, giving your answer in centimetres.

Answer: ..... cm (2)

(c) Write 450 grams as a percentage of 3 kilograms.

Answer: .....% (2)

3. Calculate

(i) $5 - \sqrt{36 \div 3^2}$

Answer: ..... (2)

(ii) $8 + 20 \div 2 - 5 \times 3$

Answer: ..... (2)

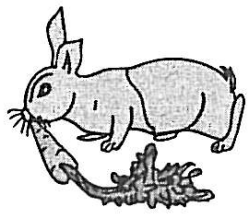
4. (i) Write the number 252 as the product of its prime factors, using indices.

Answer: ..... (3)

(ii) Given that $168 = 2^3 \times 3 \times 7$, what is the largest whole number which divides exactly into 252 and 168?

Answer: ..... (1)

5. Robbie the rabbit eats $\frac{2}{3}$ of a carrot each day.



(i) How many days will it take Robbie to eat 12 carrots?

Answer: ..... (2)

Harry the hare eats $\frac{5}{8}$ of a carrot each day.

(ii) (a) How many carrots do Robbie and Harry together eat in one day?

Answer: ..... (2)

(b) How many carrots will Robbie and Harry eat altogether in 48 days?

Answer: ..... (1)

6. (a) Given that $c = 4$ $d = 6$ and $e = -3$ find the value of

(i) $d + 2e$

Answer: ..... (1)

(ii) $c^2 - e^2$

Answer: ..... (2)

(iii) $\frac{3c - de}{6}$

Answer: ..... (2)

(iv) $\frac{1}{c} + \frac{1}{d}$

Answer: ..... (2)

(b) $v^2 = u^2 + 2as$ is a formula used in physics.
Work out the value of u when $v = 10$ $a = 6$ and $s = 7$

Answer: $u =$ ..... (2)

7. (a) Solve the following equations:

(i) $\frac{w}{4} + 6 = 10$

Answer: $w =$ ..... (1)

(ii) $3(2x + 5) = 3$

Answer: $x =$ ..... (2)

(iii) $3y + 4 = 8 - 2y$

Answer: $y =$ ..... (2)

(b) (i) Solve the inequalities

(a) $3z - 2 \leqslant 19$

Answer: ..... (2)

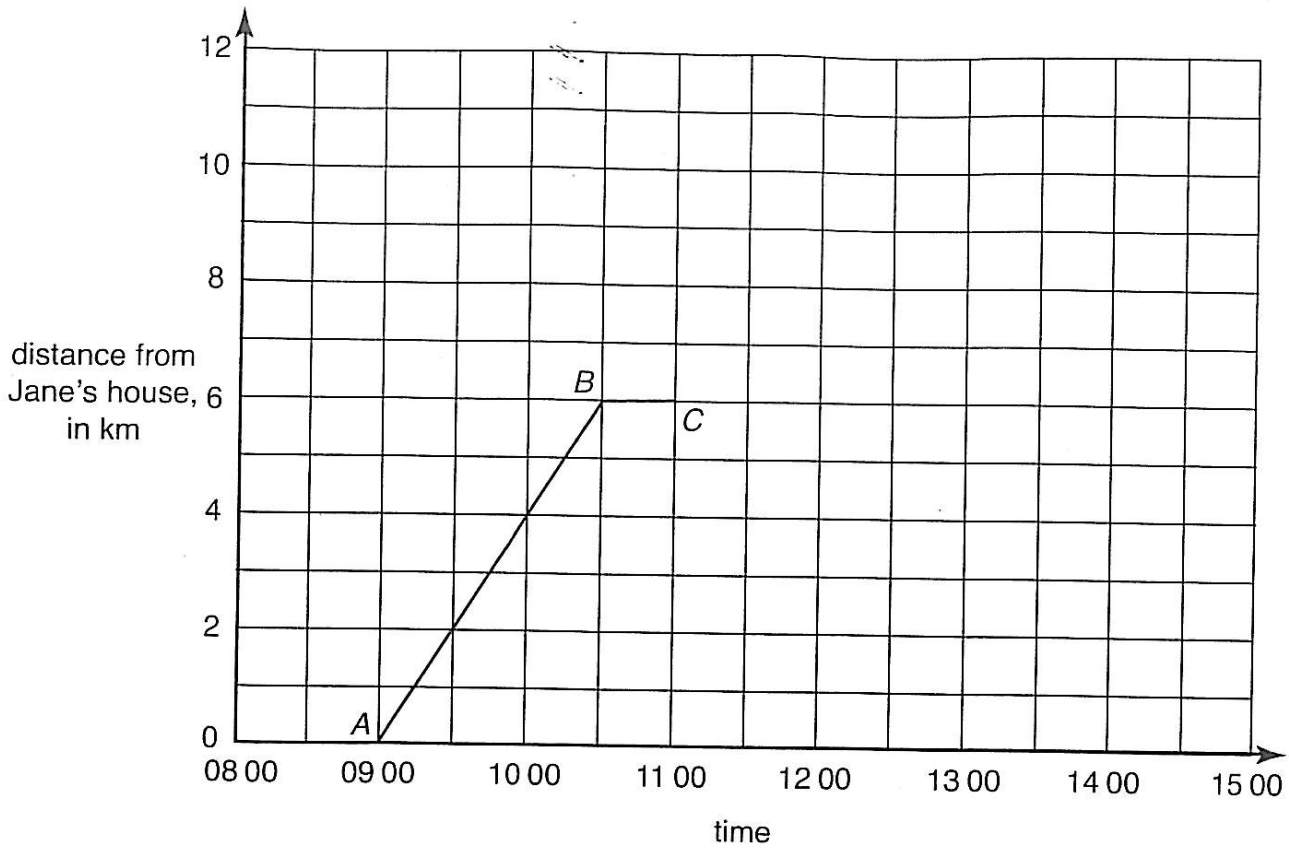
(b) $9 - 2z < 3$

Answer: ..... (2)

(ii) Write down all the prime numbers which satisfy both inequalities in part (b) (i).

Answer: ..... (1)

8. Jane sets out from home at 09 00 to walk to Sally's house, which is 12 kilometres away.
The graph below shows part of her journey.



(i) Write down what happens between points *B* and *C* on the graph.

Answer: ..... (1)

From point *C*, Jane walks at a speed of 3 km/h towards Sally's house.
Sally leaves her house at 11 30 and walks at a speed of 6 km/h to meet Jane.

(ii) Draw both journeys on the graph and mark point *D* where Jane and Sally meet. (2)

Jane and Sally then walk together to Sally's house.
They walk at the same speed at which Jane had been walking from *C* to *D*.

(iii) At what time do they reach Sally's house?

Answer: ..... (1)

(iv) What is Sally's average speed for her complete journey?

Answer: ..... km/h (2)

9. (i) When $y = x^2 - 2x$ complete the table of values below.

x	-2	-1	0	1	2	3	4
y		3			0		8

(2)

(ii) On the grid opposite, draw and label the curve $y = x^2 - 2x$ (2)

(iii) When $y = 1 - 2x$ complete the table of values below.

x	-2	0	2
y			-3

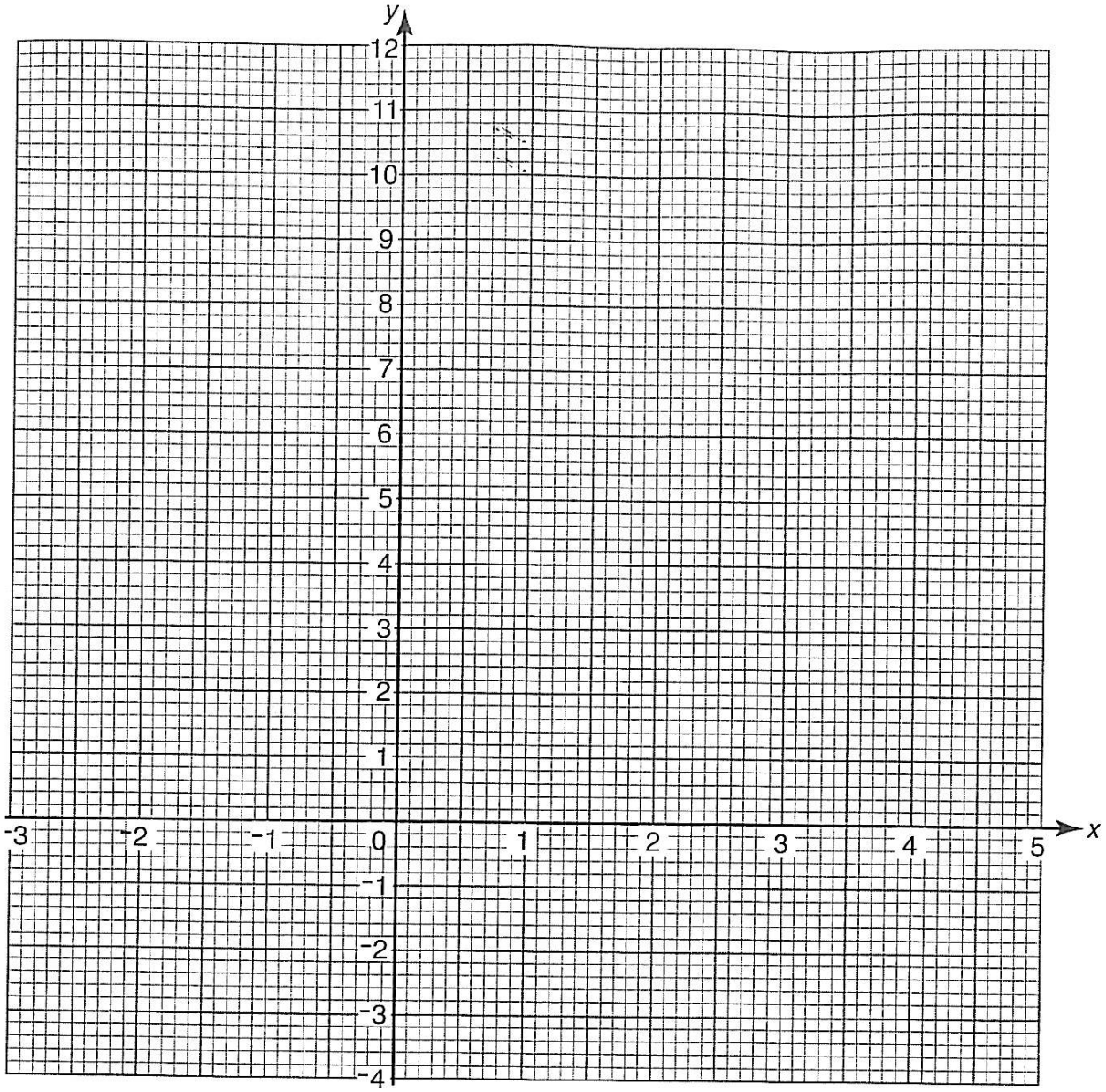
(1)

(iv) On the grid opposite, draw and label the line $y = 1 - 2x$ (1)

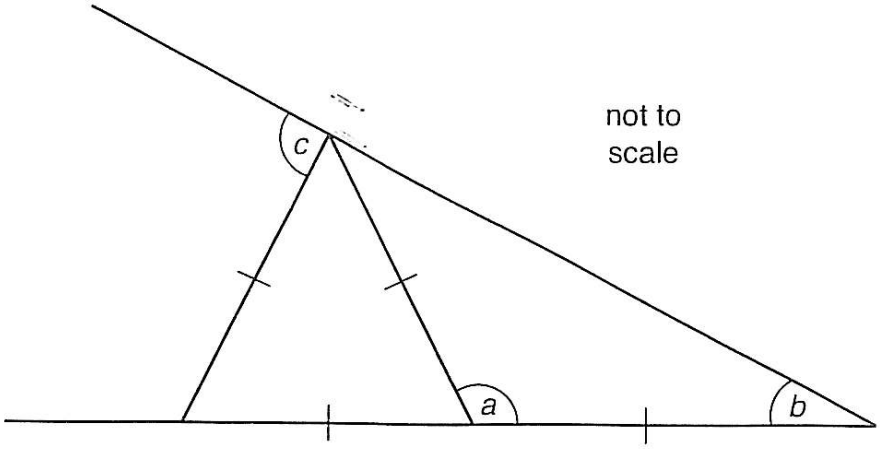
(v) Draw a straight line parallel to the line $y = 1 - 2x$ which passes through the point (0, 3). (2)

(vi) Write down the co-ordinates of the points where the line you have drawn in part (v) crosses the curve $y = x^2 - 2x$

Answer: (..... , ...) and (..... , ...) (2)


y
12
11
10
9
8
7
6
5
4
3
2
1
-3
-2
-1
0
1
2
3
4
5
x
-1
-2
-3
-4

10. (i) Calculate the size of each of the angles marked *a*, *b* and *c*.

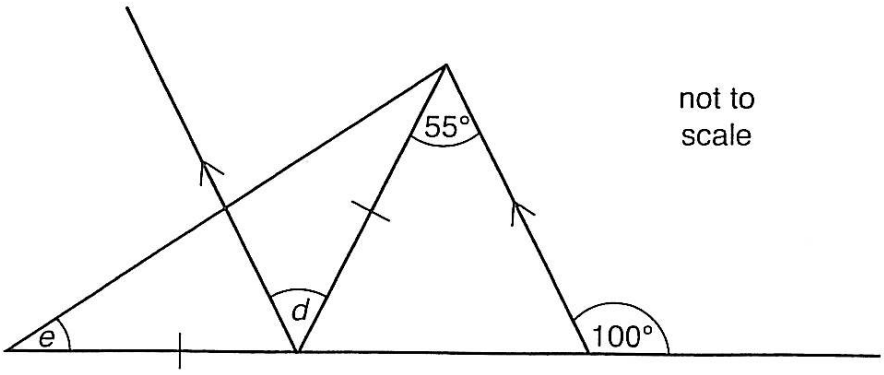


Answer: a = ... ° (1)

Answer: b = ... ° (1)

Answer: c = ... ° (1)

(ii) Calculate the size of each of the angles marked *d* and *e*.



Answer: d = ... ° (1)

Answer: e = ... ° (2)

11. Mr Watt is charged 20 pence for each of the first 200 units of electricity he uses.

(i) How much will he have to pay, in pounds, if he uses 200 units?

Answer: £ ..... (1)

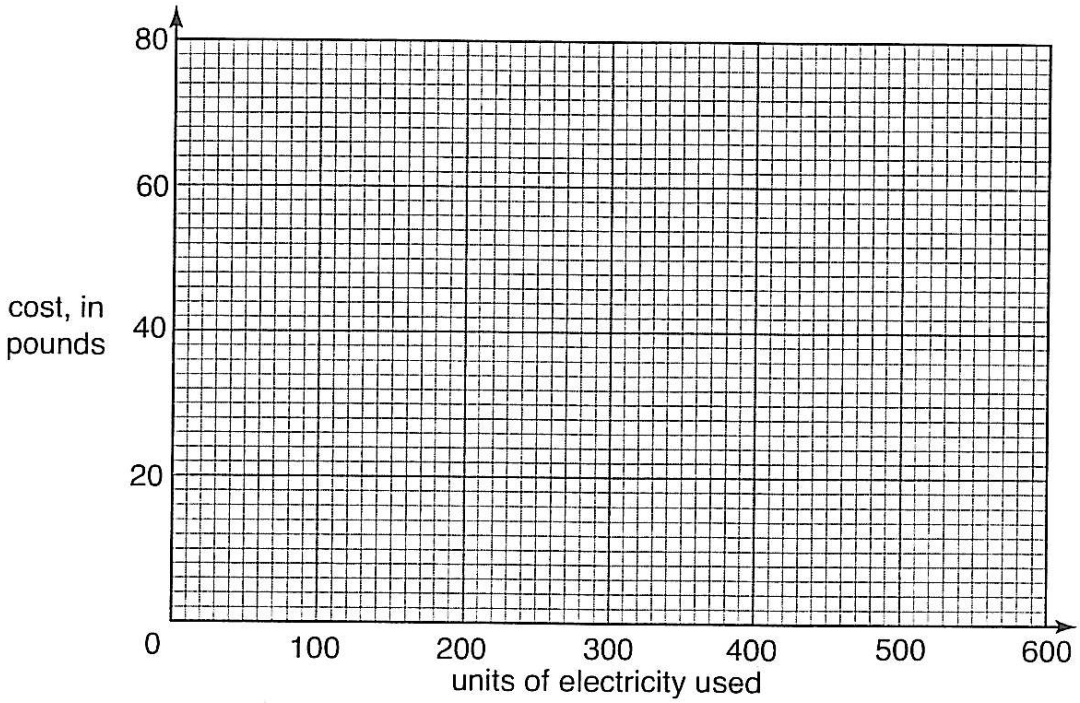
(ii) On the grid below, draw a graph to show the cost, in pounds, for amounts up to 200 units of electricity. (1)

Mr Watt is charged 8 pence for each additional unit he uses.

(iii) How much will he have to pay, in pounds, if he uses 600 units altogether?

Answer: £ ..... (1)

(iv) On the grid below, draw a graph to show the cost, in pounds, for amounts between 200 and 600 units of electricity. (1)



Mr Watt's bill is for the use of 550 units.

(v) **Showing clearly where you take your reading**, use the graph to find out how much he has to pay.

Answer: £ ..... (1)

Mr Ohm is on a different tariff, and pays 14 pence for each unit of electricity he uses.

(vi) On the grid above, draw a graph to convert the number of units into the cost, using this tariff. (2)

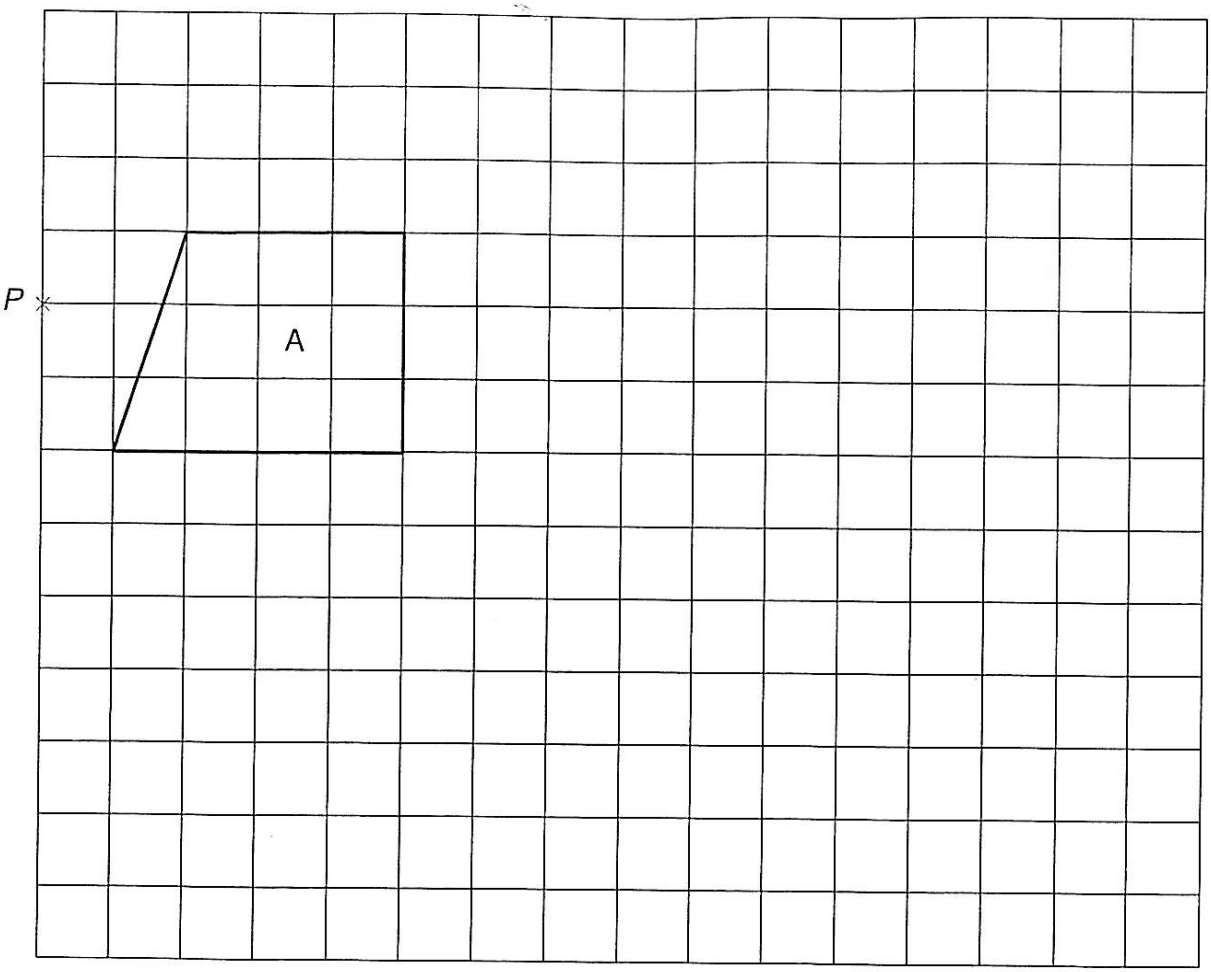
(vii) For how many units is the cost the same, using either tariff?

Answer: ..... (1)

12. (a) Shape A is drawn on the centimetre-square grid below.

Enlarge shape A with centre *P* and scale factor 3

Label the image B.



(2)

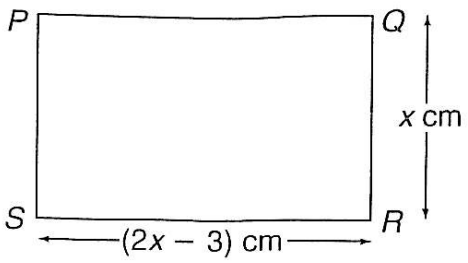
(b) Shape C, which has area 16 cm^2, is enlarged to make shape D.

Shape D has area 64 cm^2.

What is the enlargement scale factor?

Answer: ..... (2)

13. The diagram shows rectangle *PQRS*.



not to scale

(i) Show that the area, A, of the rectangle can be given by the formula $A = 2x^2 - 3x$

(1)

The area of the rectangle is 135 cm^2.

(ii) Use a trial and improvement method to find the value of x.

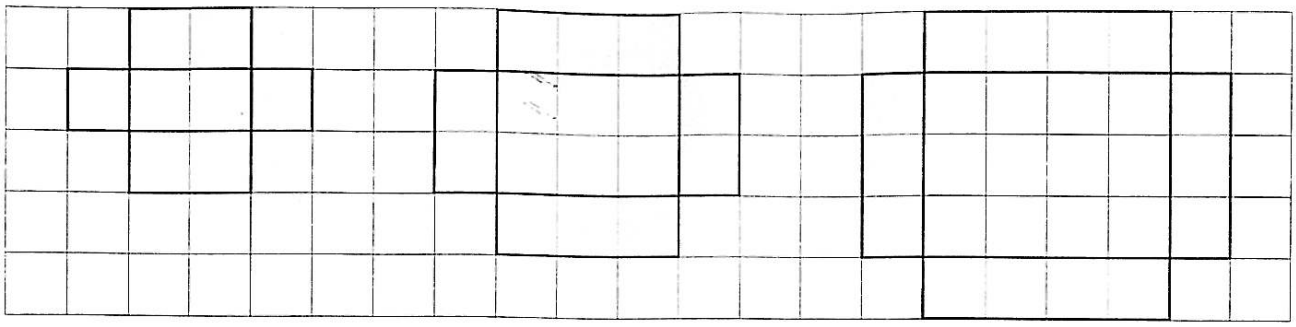
x	$2x^2$	$3x$	$2x^2 - 3x$

Answer: $x =$ ..... (3)

(iii) What is the length of the perimeter of the rectangle?

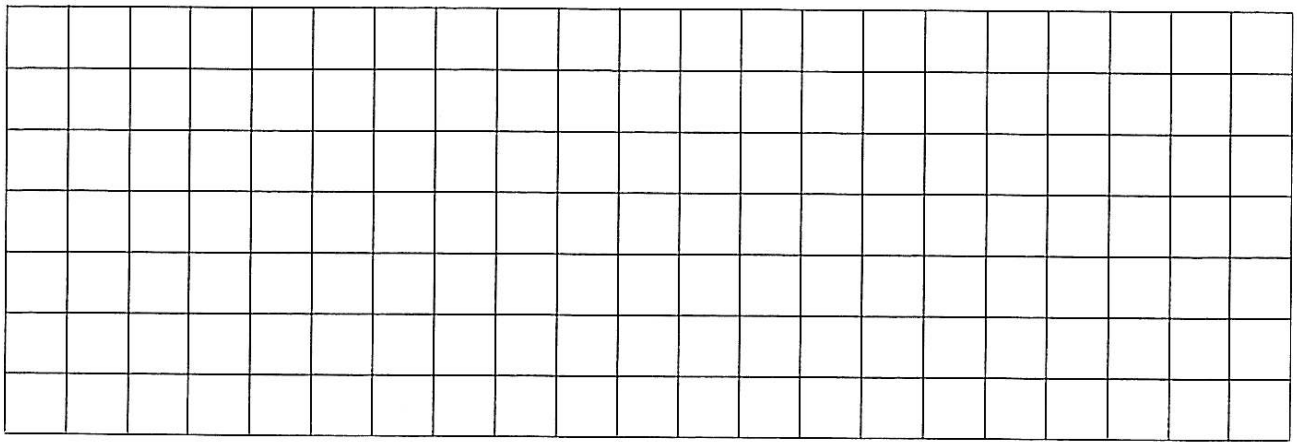
Answer: ..... cm (2)

14. A sequence of patterns with shaded squares surrounding a block of unshaded squares is drawn below.



pattern 1 pattern 2 pattern 3

(i) Draw the next pattern in the sequence.



(1)

(ii) Complete the table to show the number of shaded and unshaded squares in each pattern.

	pattern 1	pattern 2	pattern 3	pattern 4	pattern 5
shaded squares	6	10	14		
unshaded squares	2	6	12		
total	8	16	26		

(2)

(iii) How many unshaded squares will there be in pattern 7?

Answer: ..... (1)

(iv) A pattern has 90 unshaded squares.

How many shaded squares does it have?

Answer: ..... (2)

(v) The formula for the total number of squares, T, in pattern n is $T = n^2 + 5n + 2$

How many shaded squares are there in the first pattern which has a total of more than 200 squares?

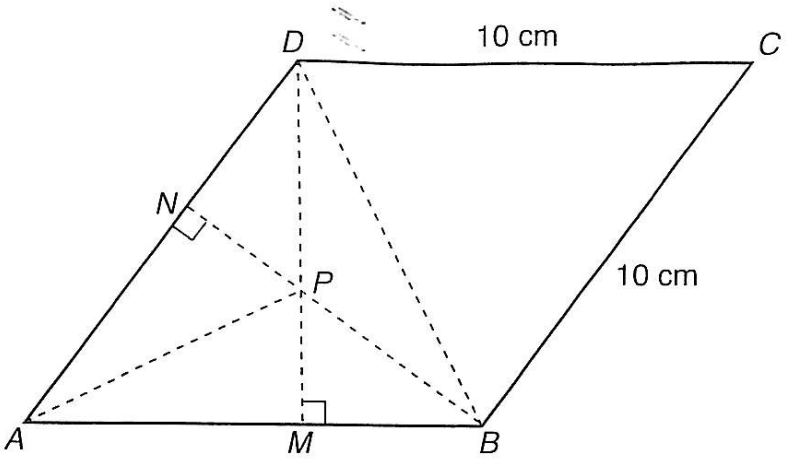
Answer: ..... (3)

TURN OVER FOR QUESTION 15

15. *ABCD* is a rhombus with sides of length 10 centimetres.

DM is the perpendicular from *D* to *AB*.

BN is the perpendicular from *B* to *AD*.



not to scale

The area of the rhombus is 80 cm^2.

(i) Calculate the height, *DM*, of the rhombus.

Answer: *DM* = ... cm (1)

(ii) Calculate the length *AM*.

Answer: *AM* = ... cm (2)

The length *PM* is 3 cm.

(iii) Calculate the area of triangle *ABP*.

Answer: ..... cm^2 (1)

(iv) Work out the area of triangle *BDP*.

Answer: ..... cm^2 (2)

(Total marks: 100)