ISEB

Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: NON-CALCULATOR PAPER

Monday 26 January 2015

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.

- You must show all your working or you may receive no marks.

- Answers given as fractions should be reduced to their lowest terms.

1. (a) Ann has £59.25 and Beth has £49.89

How much money do Ann and Beth have in total?

Answer: £ .... (2)

(b) Colin has £20.02 and then he buys a bag which costs £8.73

How much money does Colin have left?

Answer: £ .... (2)

(c) A box of pens costs £3.35

How much would it cost to buy 9 of these boxes of pens?

Answer: £ .... (2)

(d) 9 identical boxes of pencils cost £31.05 altogether.

How much does 1 box of these pencils cost?

Answer: £ .... (2)

2. Dan is 12 years old and Emma is 21 years old.

    (i) Write down the ratio of Dan's age to Emma's age in its simplest form.

Answer: .... (1)

Mother shares £132 between Dan and Emma in the ratio of their ages.

    (ii) How much does Dan receive?

Answer: £ .... (2)

3. Work out the value of

    (a)   (i) $^-4 + 8 \times {}^-5$

Answer: .... (2)

        (ii) $5 \times \sqrt{121} + 7$

Answer: .... (2)

    (b)   (i) Which number should be written in the box to complete the following calculation?

$$72 \div (9 \times \square) = 8^2 \div 4^2$$

Answer: .... (2)

        (ii) Which mathematical operation $(+, -, \times, \div)$ should be written in the box to complete the following calculation?

$$12 - 8 \square 2 = 2$$

Answer: .... (1)

4. (a) Jack scored 36 marks out of 80 in a test.

What is 36 out of 80 as a percentage?

Answer: ....% (2)

(b) Jessica's first throw of a javelin is 33 metres.
Her second throw is 11% longer.

How long is Jessica's second throw?

Answer: .... m (2)

(c) Write the following numbers in order of size, starting with the smallest.

$\frac{5}{9}$ 55%   0.505

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

5. (i) Write the number 32 as a product of its prime factors, using indices.

Answer: .... (2)

(ii) Write 320 as a product of its prime factors, using indices.

Answer: .... (1)

6. You are told that   654 × 32.5 = 21 255
Use this fact to work out

(i) 654 × 3.25

Answer: .... (1)

(ii) 655 × 32.5

Answer: .... (1)

(iii) 2125.5 ÷ 325

Answer: .... (1)

7. By first writing each number in the following calculation correct to 1 significant figure, estimate the value of

$$\frac{305 \times 6.123}{0.499}$$

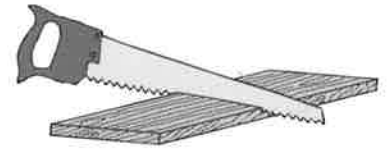Answer: .... (3)

8. Paul is building a bookcase.

All the shelves are $\frac{7}{8}$ of a metre long.

Paul has a piece of wood which is $2\frac{3}{20}$ metres long.

He cuts two shelves from this piece of wood.

(i) What is the length, in centimetres, of the piece of wood that remains?

Answer: .... cm (3)

Paul buys a piece of wood which is $4\frac{1}{2}$ metres long.

(ii) How many shelves can he cut from this piece?

Answer: .... (2)

9. (i) At 9 am the temperature in Alaska is ⁻12.7°C and in Washington it is ⁻2.9°C.

   (a) What is the difference between these two temperatures?

   Answer: ....°C (1)

   By noon, the temperature in Washington has risen by 4.5°C.

   (b) What is the temperature in Washington at noon?

   Answer: ....°C (1)

(ii) There are two different temperature scales: Celsius (°C) and Fahrenheit (°F). To convert Celsius to Fahrenheit, this formula can be used:

$$F = \frac{9}{5}C + 32$$

   Where F is the temperature in °F and C is the temperature in °C.

   (a) If the temperature is ⁻10°C, what is the temperature in Fahrenheit?

   Answer: .... °F (2)

   (b) If the temperature is 50°F, what is the temperature in Celsius?

   Answer: ....°C (2)

10. If $x = 2$ $y = {}^-2$ and $z = {}^-6$ find the value of

(i) $7x - 4y$

Answer: .... (1)

(ii) $2xyz$

Answer: .... (2)

(iii) $z - y^3$

Answer: .... (2)

(iv) $\dfrac{2z^2}{3y}$

Answer: .... (2)

11. (i) Work out the size of each of the angles marked *a*, *b*, *c* and *d* in the diagram below.

not to scale
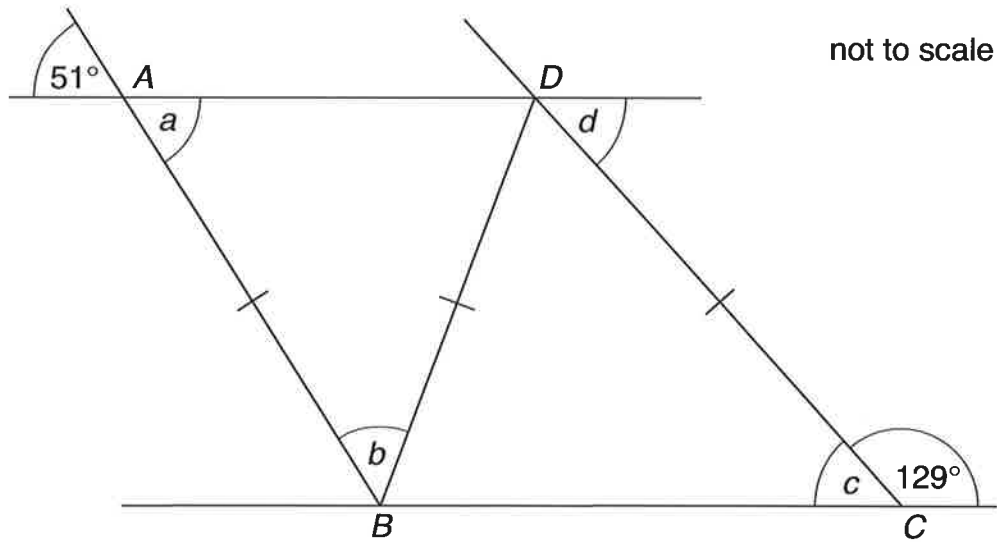
Answer: *a* = ... ° (1)

b = ... ° (2)

c = ... ° (1)

d = ... ° (1)

(ii) Is shape *ABCD* a parallelogram?
Give a reason for your answer.

Answer: Yes/No   reason: ....

.... (2)

12. The currency in the Czech Republic is the koruna (CZK).

£1 is worth 28 CZK.

(i) Draw a straight line on the grid below to convert CZK to £.
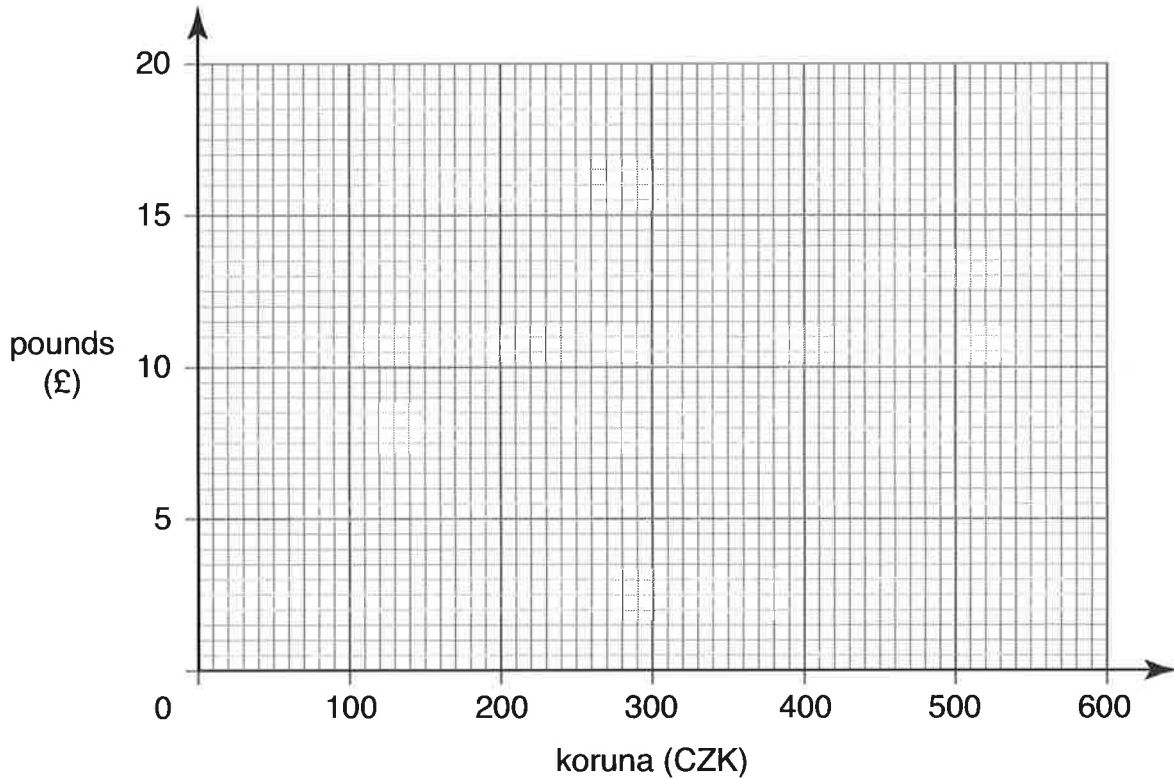
koruna (CZK)　　　　　　　　　　　　　　(2)

(ii) **Showing clearly where you take your readings**, use your graph to help you answer the following questions:

(a) How many CZK are worth £17.50?

Answer: ....CZK　(2)

(b) How many pounds are worth 420 CZK?

Answer: £ ....　(2)

(c) Tomas has 350 CZK.

James has £14

Who has more money and by how many pounds?

Answer: ....by £ ....　(2)

13. (i) Explain why the triangle *PQR* with sides of length 5 cm, 12 cm and 13 cm contains a right angle.

Answer: ....

.... (2)

(ii) Using ruler and compasses, construct this triangle and label it *PQR*.
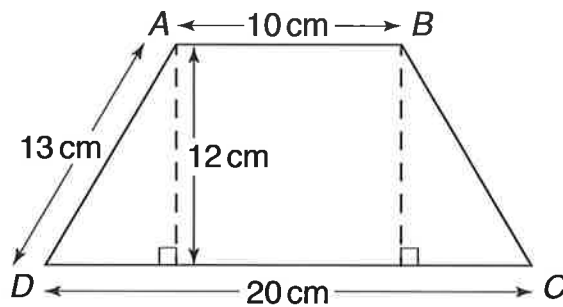
(One side, *QR*, has already been drawn for you.)

Q ⊢————————————————————————————————————⊣ *R*

(2)

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

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

Look at the trapezium *ABCD*.

(iv) (a) What is the area of *ABCD*?

not to scale

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

(b) What is the perimeter of *ABCD*?

Answer: .... cm   (1)

14. (i) A straight line has the equation $y = 1 - 2x$

    (a) Complete the table of values below for the line $y = 1 - 2x$

x	$^-2$	0	2
y			$^-3$

(1)

    (b) Draw and label the line $y = 1 - 2x$ on the grid opposite. (1)

(ii) A curve has the equation $y = 2x^2 - 2$

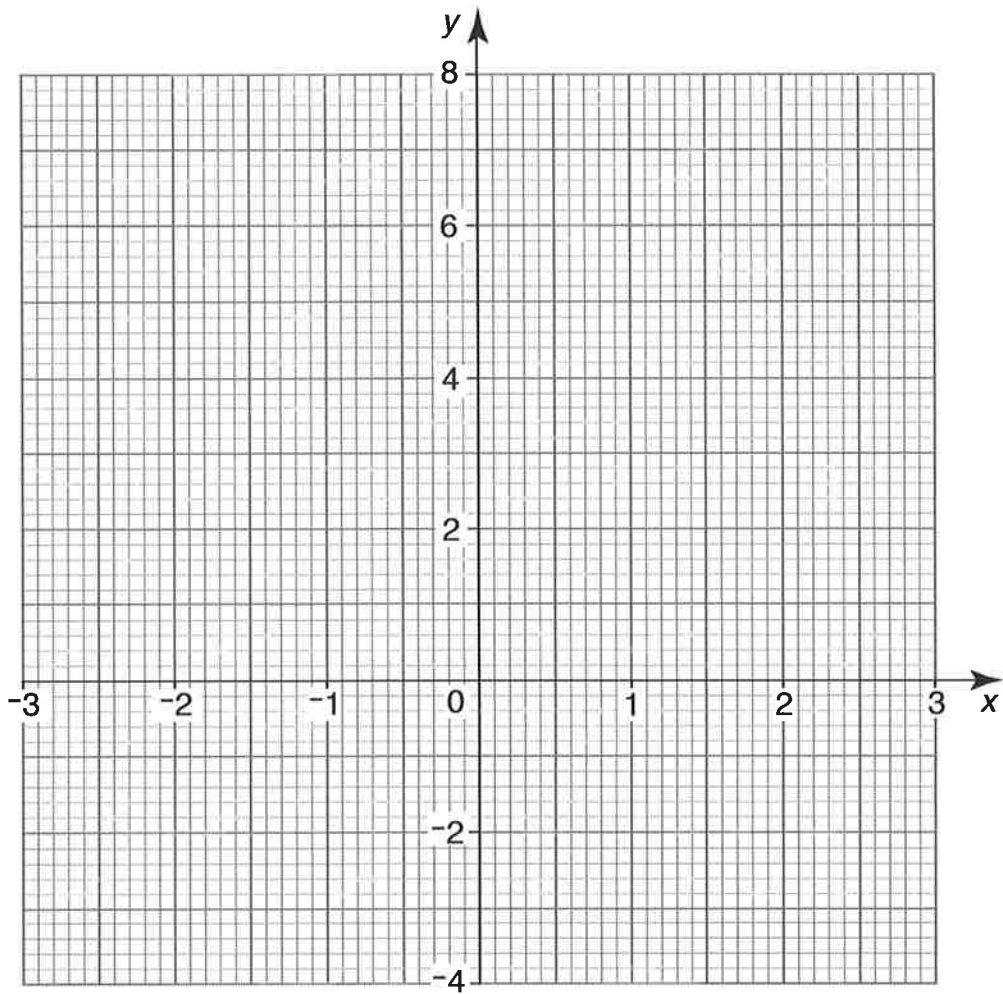   (a) Complete the table of values below for the curve $y = 2x^2 - 2$

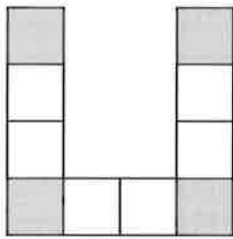| x	$^-2$	$^-1$	0	1	2
y		0			6

(2)

    (b) Draw and label the curve $y = 2x^2 - 2$ on the grid opposite. (2)

(iii) Use your graph to find the positive x-value which satisfies the equation
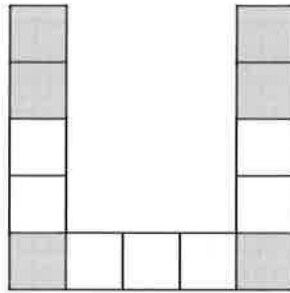
$$1 - 2x = 2x^2 - 2$$

Answer: $x = $ .... (1)
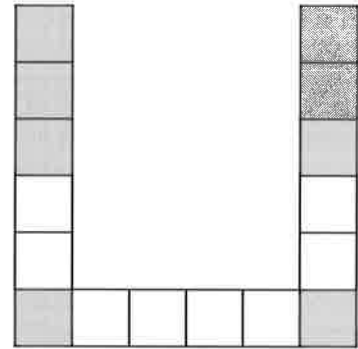
15. (a) The patterns below are made up of grey and white squares.

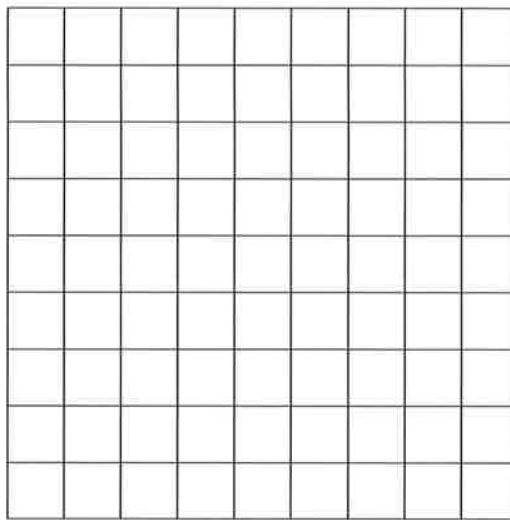pattern 1   pattern 2   pattern 3

(i) Draw pattern 4 in the grid below.

(1)

(ii) Complete the table below to show the number of grey and white squares in each pattern.

pattern	1	2	3	4	n
grey squares	4		8		
white squares	6		8		

(2)

(iii) In which pattern are there 20 grey squares?

Answer: .... (1)

(iv) In which pattern is the number of grey squares 15 more than the number of white squares?

Answer: .... (2)

(b) A sequence of numbers is generated using the following formula for the nth term:

$$(n + 1)^2 + 3$$

The first term of this sequence is 7

(i) Write down the next three terms of the sequence.

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

(ii) Explain why the number 68 is not a number in this sequence.

Answer: ....

.... (1)
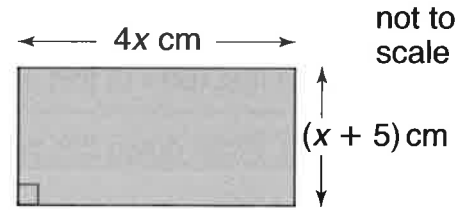
(iii) Which term in the sequence is 147?

Answer: term .... (1)

TURN OVER FOR QUESTION 16

16. (a) Chris is building a patio using the rectangular paving blocks shown below.

(i) In terms of x, what is the perimeter of the block? Simplify your answer.

4x cm

(x + 5) cm

not to scale

Answer: .... cm   (2)

(ii) Find the value of x if the perimeter of the block is 1.2 metres.

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

(b) Matt is building a rectangular swimming pool and has drawn the plan of it below.

(i) (a) By considering the height of this rectangle, write down an equation in terms of y and z

2y m

y m

$(4z + 1)$ m

$(3z + 12)$ m

not to scale
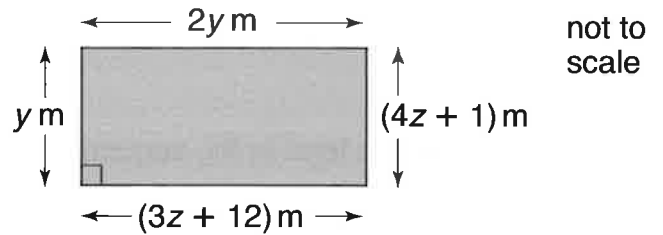
Answer: ....   (1)

(b) By considering the width of this rectangle, write down an equation in terms of y and z

Answer: ....   (1)

(ii) Using your answers to part (b) (i), solve simultaneous equations to find the value of y and the value of z

Answer: $y =$ .... $z =$ ....   (3)

(Total marks: 100)