

Name:



Oundle School

Academic Scholarship 2010
Preliminary Examination

Mathematics

Time Allowed: 1½ hours

No calculating aids may be used.

There are two sections on this paper.

Section A is multiple choice and you should spend no more than 45 minutes on this section. You should circle your answers clearly on this question paper.

Section B consists of long answer questions. You should write your answers on lined paper and make sure to show as much working as possible. Isolated answers will gain little credit.

Candidates should avoid spending too long on a single question.

If a candidate is having difficulty with a particular question they should move on and return to it at the end.

Candidates should not be concerned if they cannot answer all of the questions.

At the end of the exam, both the question paper and your answers on lined paper should be handed in, with your name clearly indicated on all sheets.

Section A: This section is multiple choice. For each question, you must circle the single correct answer.
You can do rough workings on lined paper, but this should not be handed in.

1. (i) Calculate 384×19

- A** 7086 **B** 7126 **C** 7296 **D** 7686 **E** 7646

(ii) Calculate $8208 \div 19$

- A** 410.4 **B** 432 **C** 402 **D** 464 **E** 448

(iii) Calculate $1 - (-1) - (-1 - (-1) - 1) - (-1 - (-1))$

- A** -1 **B** 0 **C** 1 **D** 2 **E** 3

(iv) Calculate $10 \times 20766 - 20766 \times 8$

- A** 20766 **B** 41532 **C** 10383 **D** 2 **E** 0

(v) Calculate 9999×9999

- A** 99 999 981 **B** 99 999 801 **C** 99 998 001 **D** 99 980 001 **E** 99 800 001

(vi) Write $1 + \frac{1}{2 + \frac{2}{3}}$ as a decimal.

- A** 0.8 **B** 1 **C** 1.375 **D** 1.5 **E** 1.875

(vii) Correct to 1 d.p, what is the square root of 18?

- A** 2.6 **B** 3.0 **C** 3.6 **D** 4.2 **E** 9.0

(viii) Which expression is equivalent to $x \times x \times x$?

- A** x^3 **B** $x + x + x$ **C** $3 + x$ **D** $3x$ **E** 3^x

(ix) How many zeros are there at the end of $8 \times 15 \times 16 \times 25 \times 48 \times 125$?

- A** 6 **B** 7 **C** 8 **D** 9 **E** 10

2. (i) Evaluate $\frac{5}{8} - \frac{3}{10}$

A $\frac{3}{16}$

B $\frac{9}{20}$

C $\frac{13}{40}$

D -1

E $\frac{1}{40}$

(ii) Evaluate $1\frac{5}{7} \times \frac{2}{3}$

A $1\frac{10}{21}$

B $1\frac{1}{7}$

C $1\frac{7}{10}$

D $1\frac{7}{8}$

E $3\frac{3}{7}$

(iii) Evaluate $\frac{8}{15} \div 3\frac{1}{5}$

A $\frac{2}{3}$

B $\frac{8}{9}$

C $\frac{17}{45}$

D $\frac{1}{6}$

E $\frac{1}{5}$

(iv) Evaluate $\frac{36}{175} \times \frac{1925}{156}$

A $\frac{66}{25}$

B $\frac{33}{13}$

C $\frac{333}{130}$

D $\frac{13}{33}$

E $\frac{69}{27}$

3. Substitute $a = -1$, $b = 3$, $c = 0$ and $d = 4$ into the following expressions and work them out.

(i) $ac - ba$

A 0

B 1

C 2

D 3

E 4

(ii) $b^2(ad - c^2)$

A 36

B -36

C 24

D -24

E -54

(iii) $(c - a)^d$

A 1

B 2

C 3

D 4

E 5

(iv) $d(a + b)^c$

A 3

B 4

C 5

D 6

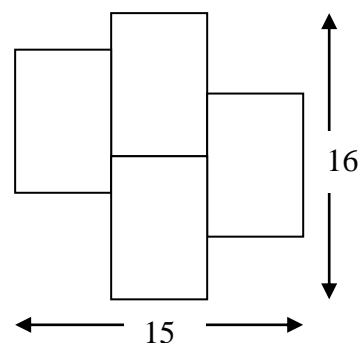
E 7

4. (i) It takes 2 men 3 hours to dig a hole. How long would it take 12 men to dig 7 similar holes, working at the same rate?
- A** 2 hours **B** 2.5 hours **C** 3 hours **D** 3.5 hours **E** 4 hours
- (ii) You have three discount vouchers A, B and C which give discounts of 10%, 20% and 30% respectively. If you are allowed to use all of them, in which order should you use them to obtain the greatest overall discount?
- A** ABC **B** CBA **C** BAC **D** CAB **E** Doesn't matter
- (iii) Granny told her grandchildren: "If I bake 2 pies for each of you, I'll have enough pastry left for 3 more pies. But I won't be able to bake 3 pies for each of you, as I'll have no pastry left for the last two pies." How many grandchildren does Granny have?
- A** 2 **B** 3 **C** 4 **D** 5 **E** 6
- (iv) A father and son are out for a walk. Each of the father's paces is 91cm long. Each of the son's paces is 63cm long (The son's pace rate is quicker so that he keeps up with his Dad). If they start exactly together, how far will they walk before they are exactly in step again?
- A** 0.91m **B** 1.17m **C** 1.54m **D** 8.19m **E** 57.33m
- (v) How many different words (real or not) can be made by re-ordering the letters in the word ALGEBRA?
- A** 14 **B** 28 **C** 2520 **D** 5040 **E** 10 080

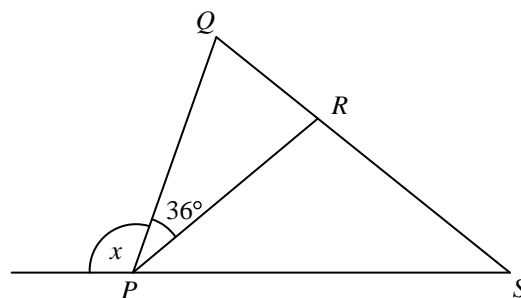
Section B: This section consists of questions to which full written solutions are expected. You should answer the questions on the lined paper provided, making sure to clearly indicate the question number at the start of each of your solutions.

1. In this question you should explain clearly what approximations you are using and how you arrive at your answer.
 - (i) If I travel 1500 times around a 400m running track, what approximate distance, in inches, is travelled?
 - (ii) Approximately how many pints of water are there in a public swimming pool?
 - (iii) If a book is overdue for 74 years, and the fine is 60p per week, approximately how big is the fine in pounds?
 - (iv) If a supply of 30cm rulers are melted, approximately how many would it take to fill your shoe?

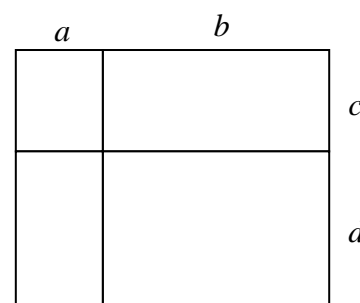
2. Find the perimeter and area of this figure (made from four identical rectangles). Explain your working carefully.



3. In the diagram to the right, $PQ = PR = RS$. Explaining your reasoning carefully, calculate the size of angle x .



4. (i) Expand $a(b + c)$
- (ii) By considering the areas of the rectangles which make up the diagram shown, expand $(a + b)(c + d)$
- (iii) By replacing c and d in your result, write down the expansion of $(a + b)(a - b)$
- (iv) Calculate $510347^2 - 510342^2$



5. Some statements have the interesting property that they describe themselves. For example:

“This sentence contains thirty six letters”

- (i) Find a list of four whole numbers n_0, n_1, n_2, n_3 which obeys the following rules

n_0 = the number of times 0 occurs in your list

n_1 = the number of times 1 occurs in your list

n_2 = the number of times 2 occurs in your list

n_3 = the number of times 3 occurs in your list

Explain carefully how you obtained your list.

- (ii) Find another list of four, different from your answer in part (i)

- (iii) Is it possible to form a similar list with only two numbers n_0, n_1 ? Explain carefully.

- (iv) Is it possible to form a similar list with only three numbers n_0, n_1, n_2 ? Explain carefully.

- (v) In a list with eight numbers $n_0, n_1, n_2, n_3, n_4, n_5, n_6, n_7$ could n_4, n_5, n_6, n_7 all be zero? Explain.

6. (i) Between 5:00am and 6:15am, through what angles do the hour hand and minute hand move?
- (ii) The time is approximately 18 minutes past 8. If the hour hand and the minute hand make the same angle with the 6 hour mark, what is the exact time?

ONLY ATTEMPT THIS QUESTION IF YOU HAVE COMPLETED THE REST OF THE PAPER TO THE BEST OF YOUR ABILITY.

7. A group of walkers set off for a hike along a cross-country trail, returning by the same route. They start at 10.00am and get back at 4.00pm, having been up and down hills and along some flat ground too. Their speed along the flat is 4 km/hr; they can manage 3 km/hr up hills, and 6 km/hr down hills.

How far have they walked altogether?

END