WINCHESTER
COLLEGE

NAME_____

Entrance Examination

Mathematics 1

Tuesday 8 May 2012

Time allowed: 1 hour

CALCULATORS ARE NOT ALLOWED.

Write your answers in this booklet. If you need additional space please write on A4 paper and attach it to this booklet with a treasury tag.

You may use pencil for diagrams.

Attempt as many questions as you can. Work carefully and do not be discouraged if you do not finish.

Show your working so that credit may be given for partly correct answers.

1 Calculate the following.

(i) $12 \times 7 =$ 1

(ii) $132 - 43 =$ 1

(iii) $93 + 100 + 107 =$ 1

(iv) $108 \div 12 =$ 1

(v) $4 \times 17 =$ 2

(vi) $625 \div 25 =$ 2

(vii) $5 \times 13^2 \times 2 =$ 2

2 Solve the following equations:

(i) $13x + 8 = 21$ 2

(ii) $3 - 13x = 29$ 2

(iii) $4x - 5 = 22 - 5x$ 3

(iv) $x^2 = 64$ 2

(v) $(x-1)^2 = 25$ 3

3 (a) Given that $a = 12,\ b = 5,\ c = -2$, evaluate the following:

(i) $a + 2b + 3c =$ 2

(ii) $(a-b)(a+b) =$ 2

(iii) $\sqrt{a^2 + b^2} =$ 2

(iv) $a - c^3 =$ 2

(v) $\sqrt[3]{2c^4 - b}$ 3

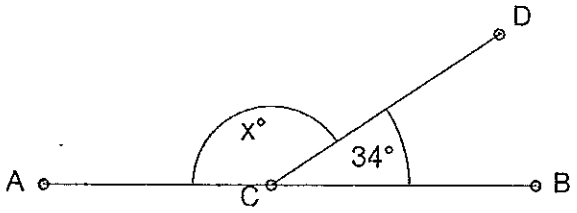
(b) Given that $x = \frac{2}{3}$ and $y = \frac{1}{4}$, evaluate the following:

(i) $\frac{1}{y} =$ 1

(ii) $15x + \frac{5}{y} =$ 3

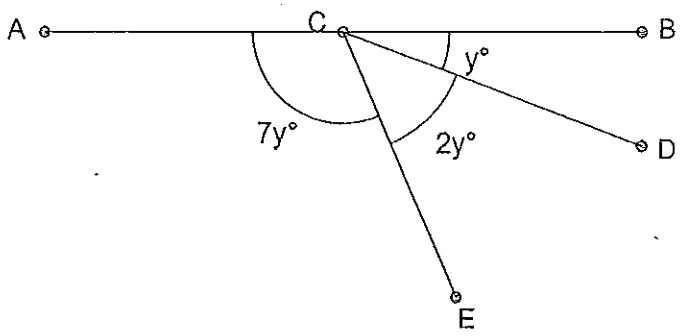
4 (a) ACB is a straight line. 2

Calculate the value of x.



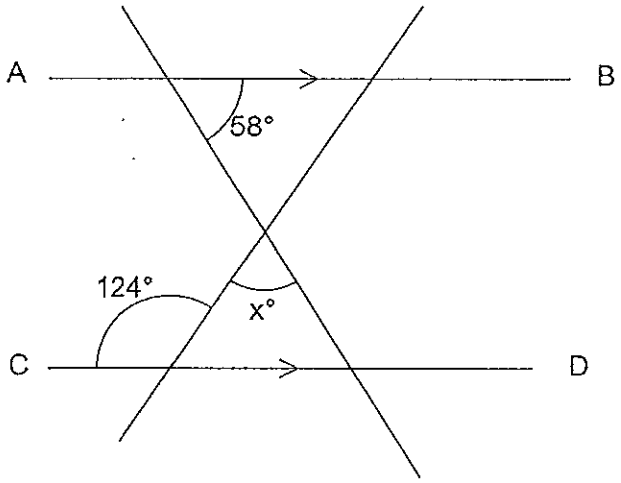
(b) ACB is a straight line. 3

Calculate angle ACE.



(c) In the diagram below AB is parallel to CD. 4

Calculate the value of x.



5 Give your answers to the following as fractions in their lowest terms.

(a) (i) $\frac{2}{7} + \frac{3}{28} =$ 2

(ii) $4\frac{1}{5} - 3\frac{7}{10} + 1\frac{1}{20} =$ 3

(iii) $11\frac{1}{3} \times \frac{9}{17} =$ 2

(iv) $3\frac{1}{9} \div \frac{7}{9} =$ 2

6 In this question it will be useful to know that $7^2 + 24^2 = 25^2$.

B is 7 km from A. The bearing of B from A is 340°.

C is 24 km from B. The bearing of C from B is 070°.

(a) (i) Draw a diagram to represent this information. (Your diagram should be clear, and include the given angles and distances marked in appropriate places. Do not attempt to give a scale drawing.) 4

(ii) Explain why ABC is a right-angle. 2

(iii) Calculate the distance AC. 2

(b) You are given that, correct to the nearest degree, angle BCA = 16° . 4

Use this to calculate, correct to the nearest degree, the bearing of A from C.

7 (a) Find the prime factorisation of 165. 2

(b) If $x = 10$ calculate:

(i) $x^2 + 6x + 5 =$ 1

(ii) $(x + 1)(x + 5) =$ 1

(c) You are given that, for all values of x, $x^2 + 6x + 5 = (x + 1)(x + 5)$. 3

By substituting a suitable value of x into this given expression - which you should state – find the prime factorisation of 10,605.

8 (a) Andrew and Benjamin divide 56 sweets in the ratio 3:4. Benjamin has the larger share. 2

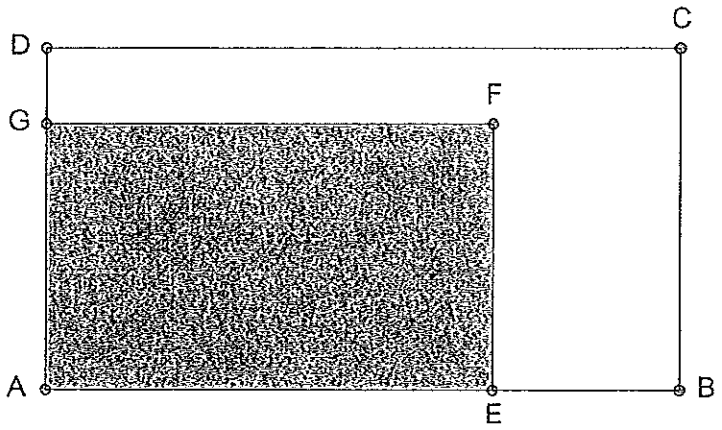
How many sweets does Andrew get?

(b) In the diagram below, ABCD and AEFG are rectangles. 4

The area of ABCD is 140 cm^2.

E divides AB in the ratio 5:2; and G divides AD in the ratio 4:1.

What is the area of the rectangle AEFG?



9 If I rotate the point A = (2,5) 90° clockwise about the point C = (2,1), I get the point Q = (6,1).

In answering the following questions you may find it helpful to draw a simple diagram.

(a) (i) I rotate the point (1,7) anti-clockwise by 90° about the point (1,1)? 2

What point do I get?

(ii) What point do I get if I reflect the point (3,4) in the x-axis? 2

(iii) What point do I get if I reflect the point (4,1)in the line y = x? 2

(b) (i) What point do I get if I rotate the point (a, b) 90° anti-clockwise about (0, 0)? 2

(ii) What point do I get if I reflect the point (a,b)in the line y =x ? 2

10 There are five *digits* in the number 34,781.

There are three *digits* in the number 11 x 12 (because 11 x 12 = 132).

(i) What is the prime factorisation of the number 8? 1

(ii) Find the prime factorisation of the number 8^3 2

(iii) How many digits are there in the number $6^3 \times 10^9$? 3

(iv) How many digits are there in the number $8^7 \times 5^{11}$? 4

END OF PAPER.