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

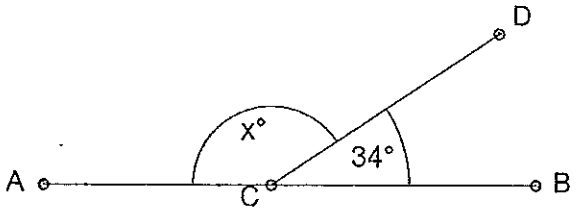
(b) Given that $x = \frac{2}{3}$ and $y = \frac{1}{4}$, evaluate the following:

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

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

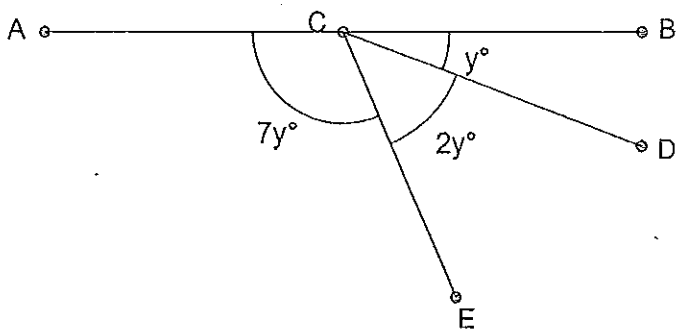
4 (a) ACB is a straight line. 2

Calculate the value of x.



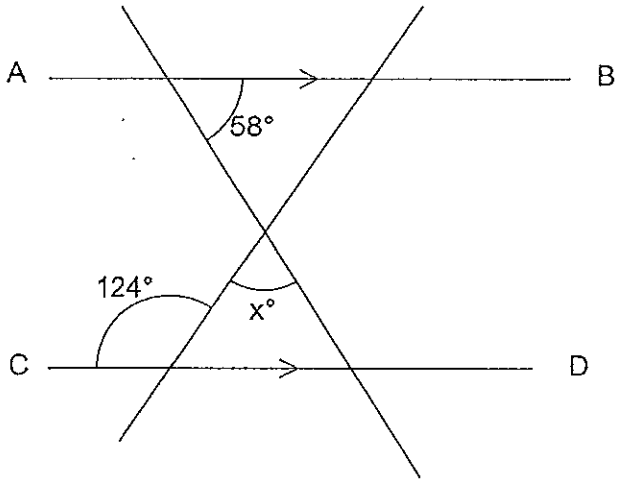
(b) ACB is a straight line. 3

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 $340^\circ$.

C is 24 km from B. The bearing of C from B is $070^\circ$.

(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 = $16^\circ$ . 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

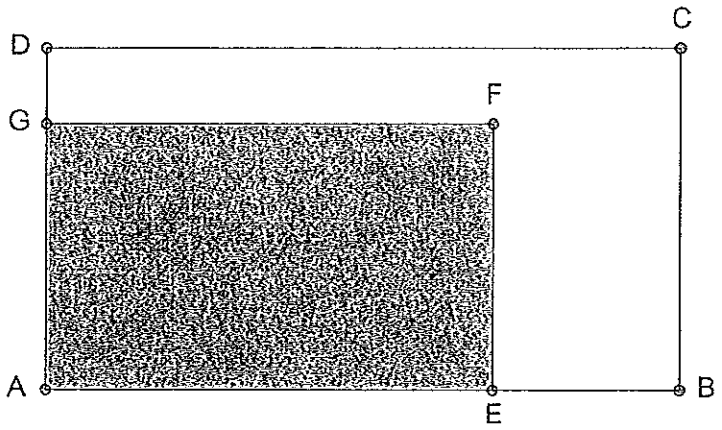
How many sweets does Andrew get?

(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.**