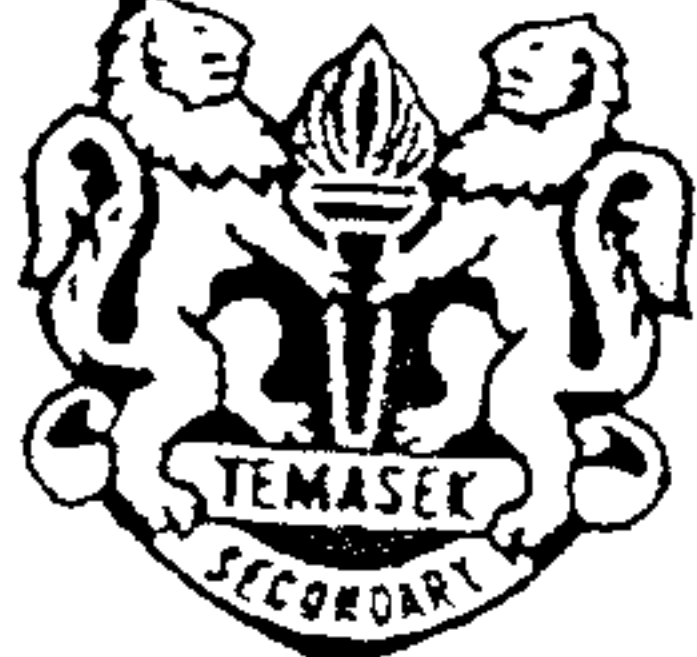


Class	Register Number	Name
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## TEMASEK SECONDARY SCHOOL

### MID YEAR EXAMINATION 2007

## MATHEMATICS

### Paper 1

10 May 2007

**1 hour**

Candidates answer on the Question Paper.

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## Secondary Two Express

### READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on all the work you hand in.  
 Write in dark blue or black pen.  
 You may use a pencil for any diagrams or graphs.  
 Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions.  
 If working is needed for any question it must be shown with the answer.  
 Omission of essential working will result in loss of marks.  
 You are expected to use a scientific calculator to evaluate explicit numerical expressions.  
 If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.  
 For  $\pi$ , use either your calculator value or 3.142, unless the question requires the answer in terms of  $\pi$ .

At the end of the examination, fasten all your work securely together.  
 The number of marks is given in brackets [ ] at the end of each question or part question.  
 The total number of marks for this paper is 40.

	For Examiner's Use

This document consists of 7 printed pages.

[Turn over

For  
Examiner's  
Use

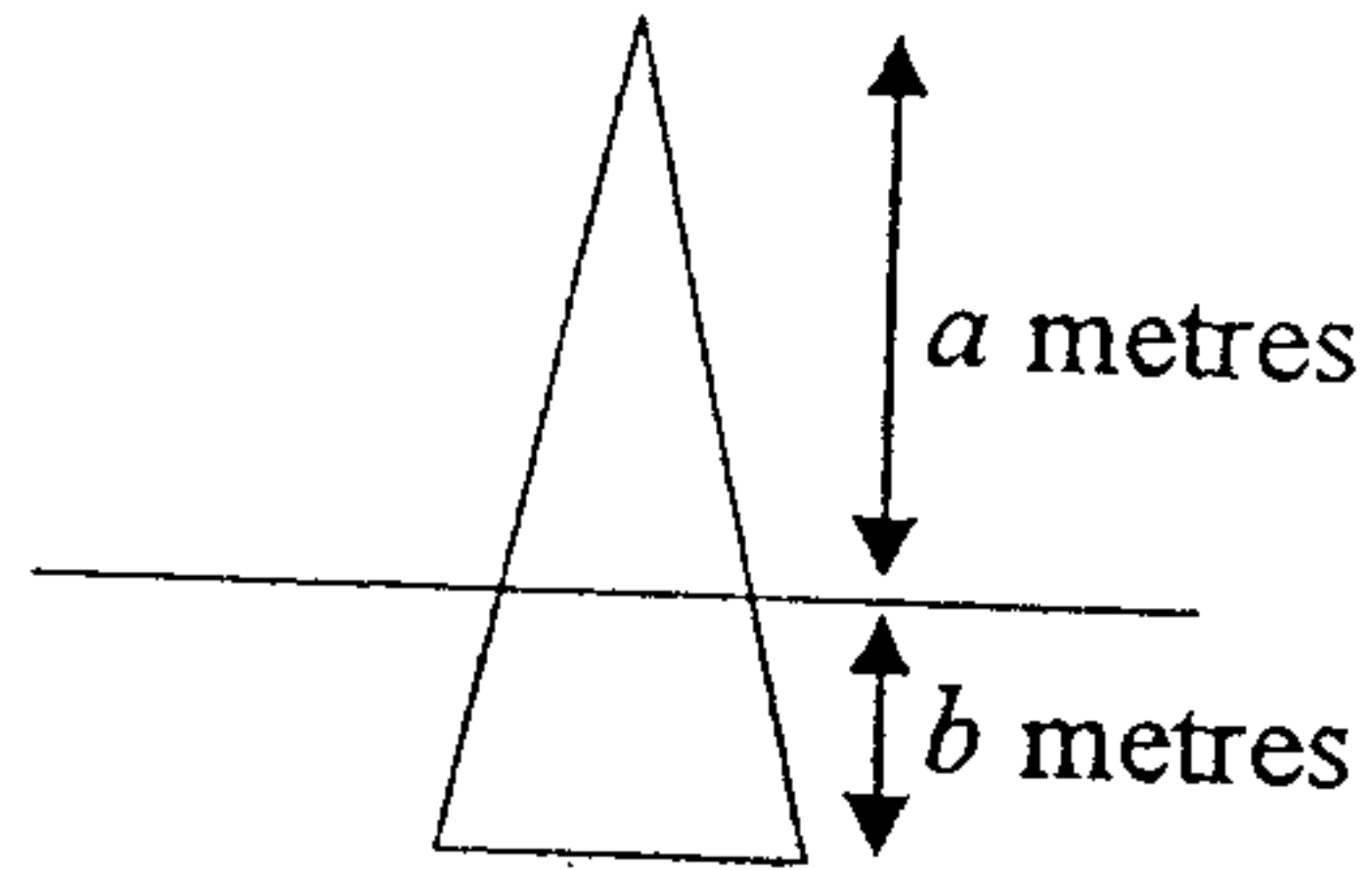
Answer all the questions.

For  
Examiner's  
Use

- 1 The diagram shows a floating buoy which has its highest point  $a$  metres above sea level and its lowest point is  $b$  metres below sea level, where  $0 < b < a$ .

Write down an expression for

- (a) the difference between  $a$  and  $b$ ,  
 (b) the height of the buoy.



Answer (a)..... [1]  
 (b)..... metres [1]

- 2 A number  $p$  has 3 decimal places and rounds off to 2.4. Write down the maximum and minimum possible value of  $p$ .

Answer Maximum  $p =$  ..... [2]  
 Minimum  $p =$  .....

- 3 Two numbers  $A$  and  $B$  are expressed as follows:

$$A = 2 \times 3^2 \times 5^3 \times 7^4 \times 11^5$$

$$B = 2^4 \times 3^3 \times 5^2 \times 7$$

Write down, in similar form, the

- (a) Highest Common Factor of  $A$  and  $B$ ,  
 (b) Lowest Common Multiple of  $A$  and  $B$ .

Answer (a) H.C.F. = ..... [1]  
 (b) L.C.M. = ..... [1]

3

*For  
Examiner's  
Use*

- 4 A thermometer shows an initial reading of  $20^{\circ}\text{C}$ . The thermometer is then placed in a freezer and the temperature drops by  $2^{\circ}\text{C}$  per minute. Find the reading of the thermometer after  $\frac{1}{2}$  hour?

*For  
Examiner's  
Use*

*Answer* .....  $^{\circ}\text{C}$  [2]

- 5 Solve the equation  $6x^2 - 12x - 48 = 0$ .

*Answer*  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [3]

For  
Examiner's  
Use

6 Solve the equation  $\frac{x-3}{3} - \frac{x-4}{4} = \frac{x-6}{6}$ .

For  
Examiner's  
Use

Answer  $x = \dots\dots\dots$  [3]

7 A car is originally priced at \$64 000. There is a 5% discount on the original price of the car.

- (a) Find the discounted price of the car.  
 (b) Mr Lim buys the car at the discounted price and pays an additional 5% of the discounted price for goods and service tax. Calculate the percentage of the original price that Mr Lim actually pays.

Answer (a)..... [1]  
 (b)..... [3]

For  
Examiner's  
Use

- 8 Given that  $y$  is inversely proportional to  $x$ , and  $y = 12$  when  $x = 3$ , calculate
- (a)  $y$  when  $x$  increases 4 times,
  - (b) the positive value  $a$  if  $y = a$  when  $x = a$ .

For  
Examiner's  
Use

Answer (a)  $y = \dots\dots\dots$  [2]

(b)  $a = \dots\dots\dots$  [2]

- 9 For a regular polygon with 12 sides, calculate
- (a) the sum of the interior angles of the polygon,
  - (b) the size of each exterior angle of the polygon.

Answer (a) ..... [2]  
 (b) ..... [2]

For  
Examiner's  
Use

10 (a) The polygon  $ABCDEFGH$  is shown in Figure 1 and it is congruent to polygon  $PQRSTUUVW$ . In Figure 2, complete the drawing and label the points to show polygon  $PQRSTUUVW$ .

For  
Examiner's  
Use

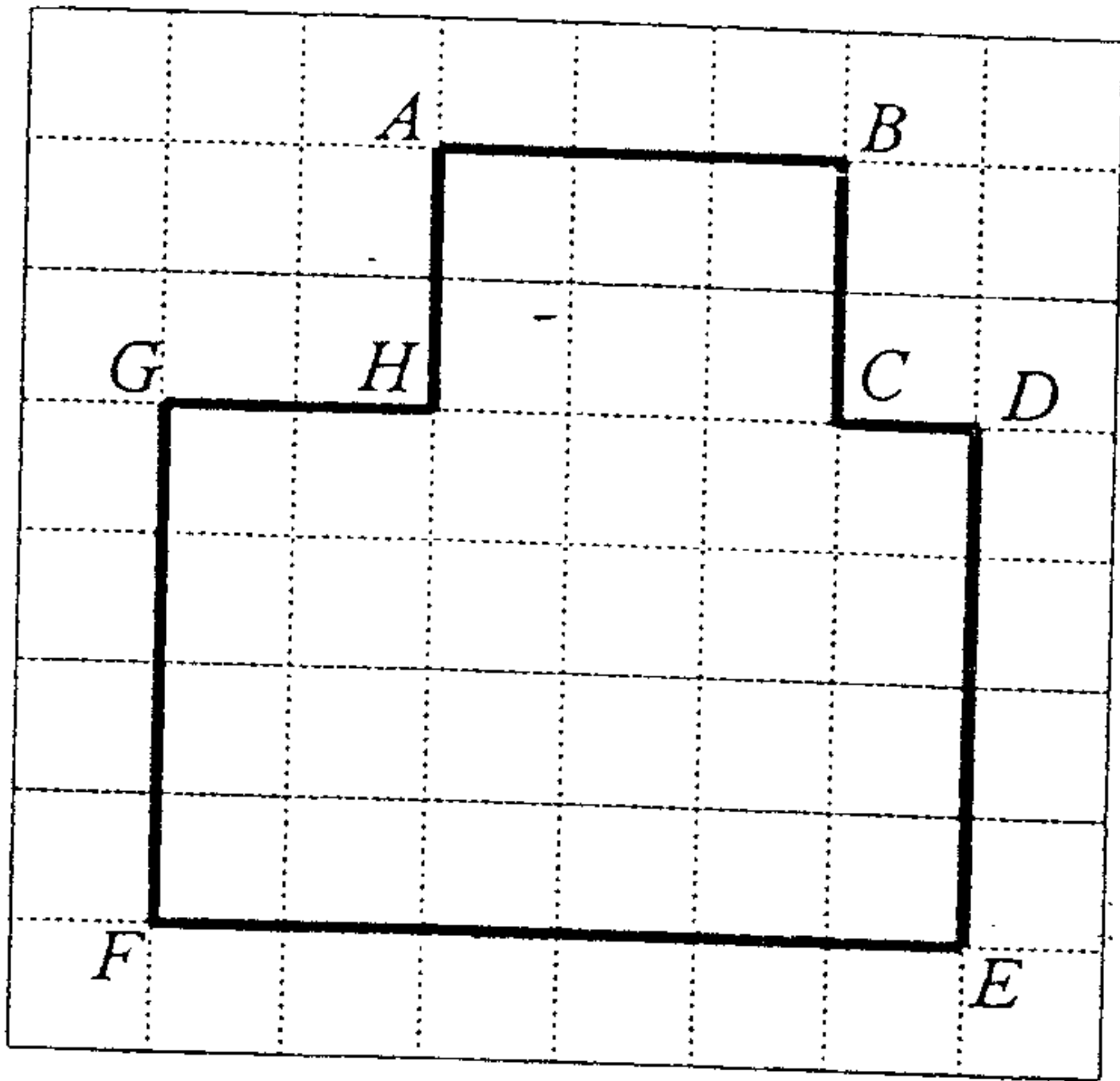


Figure 1

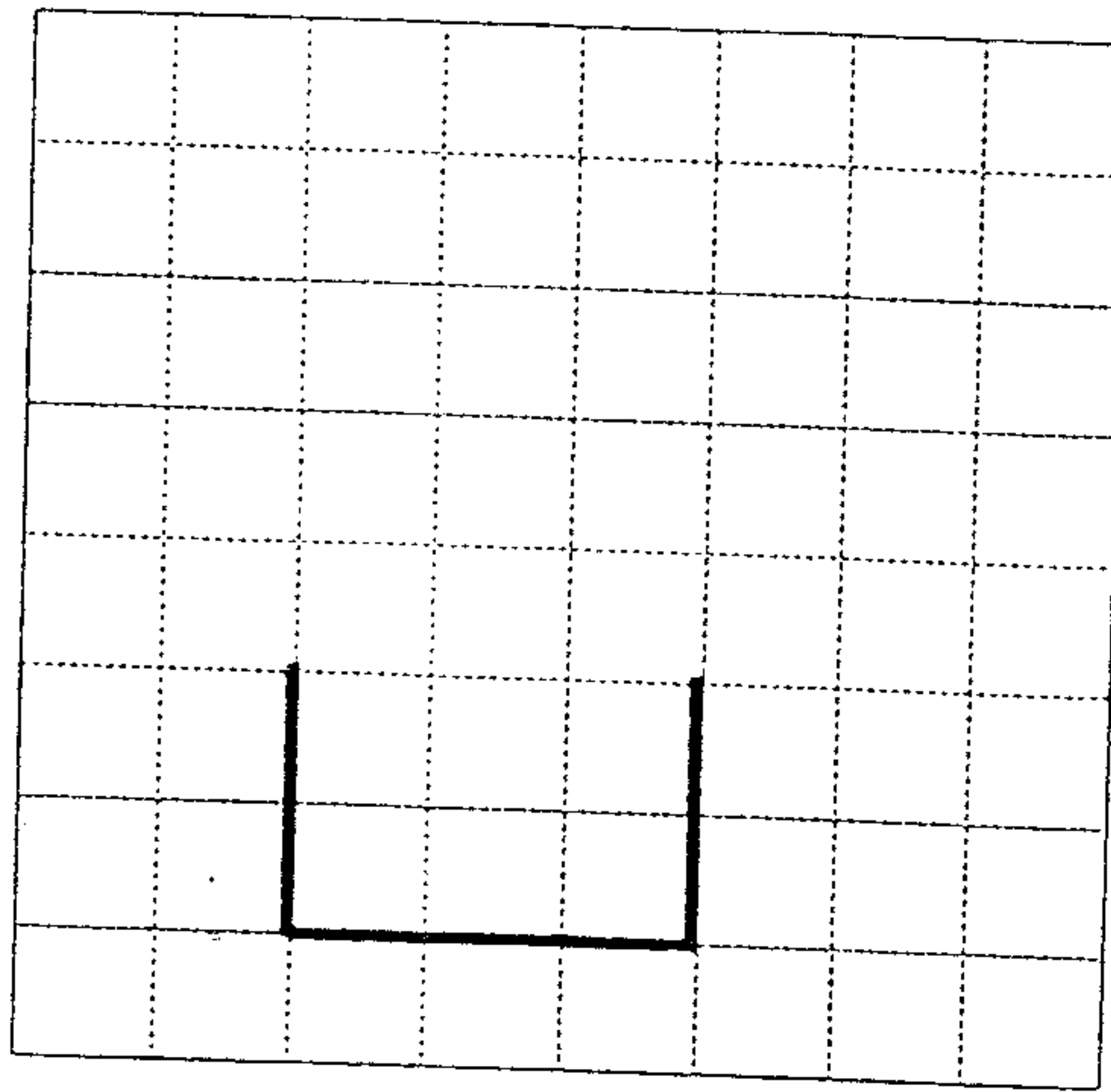
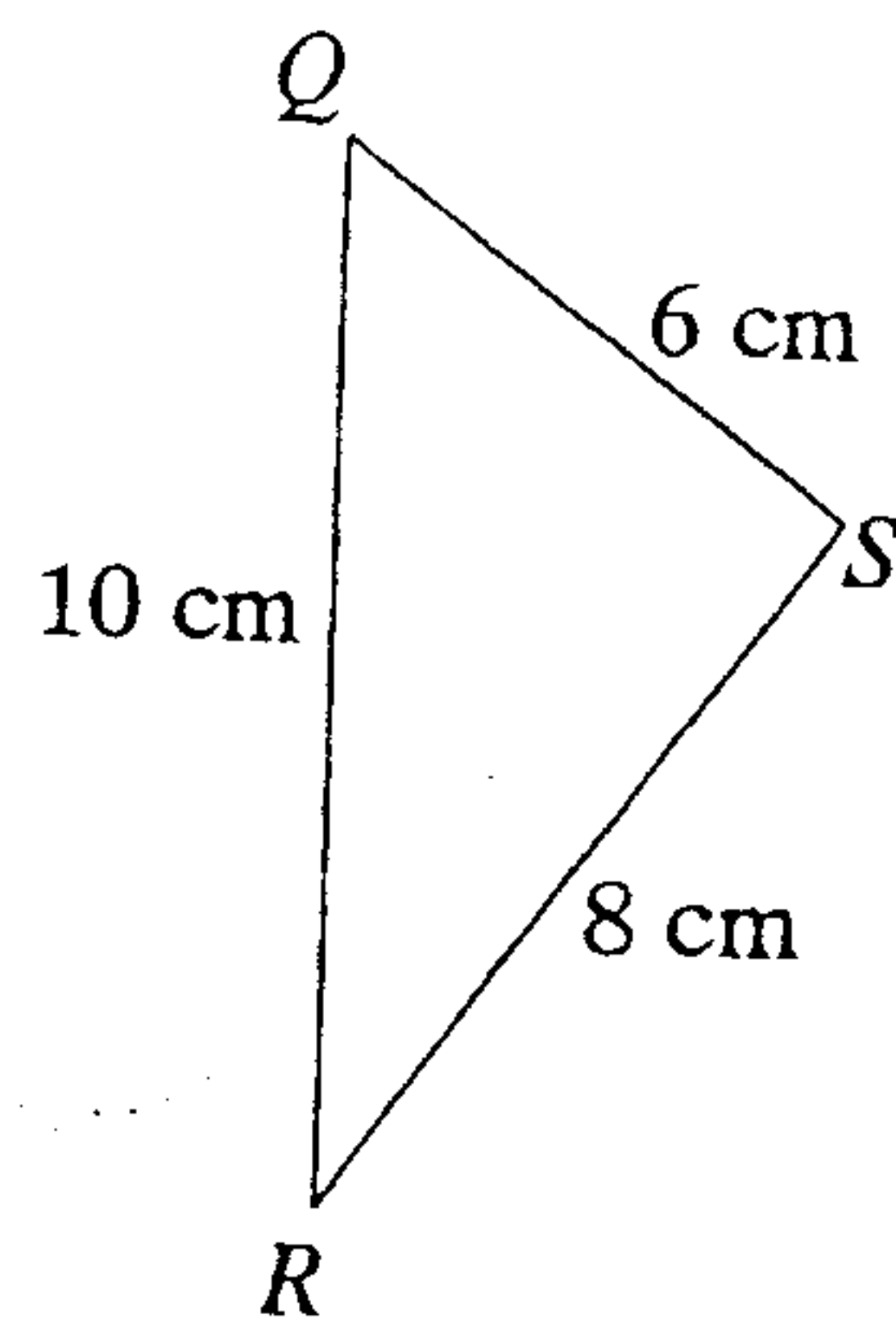
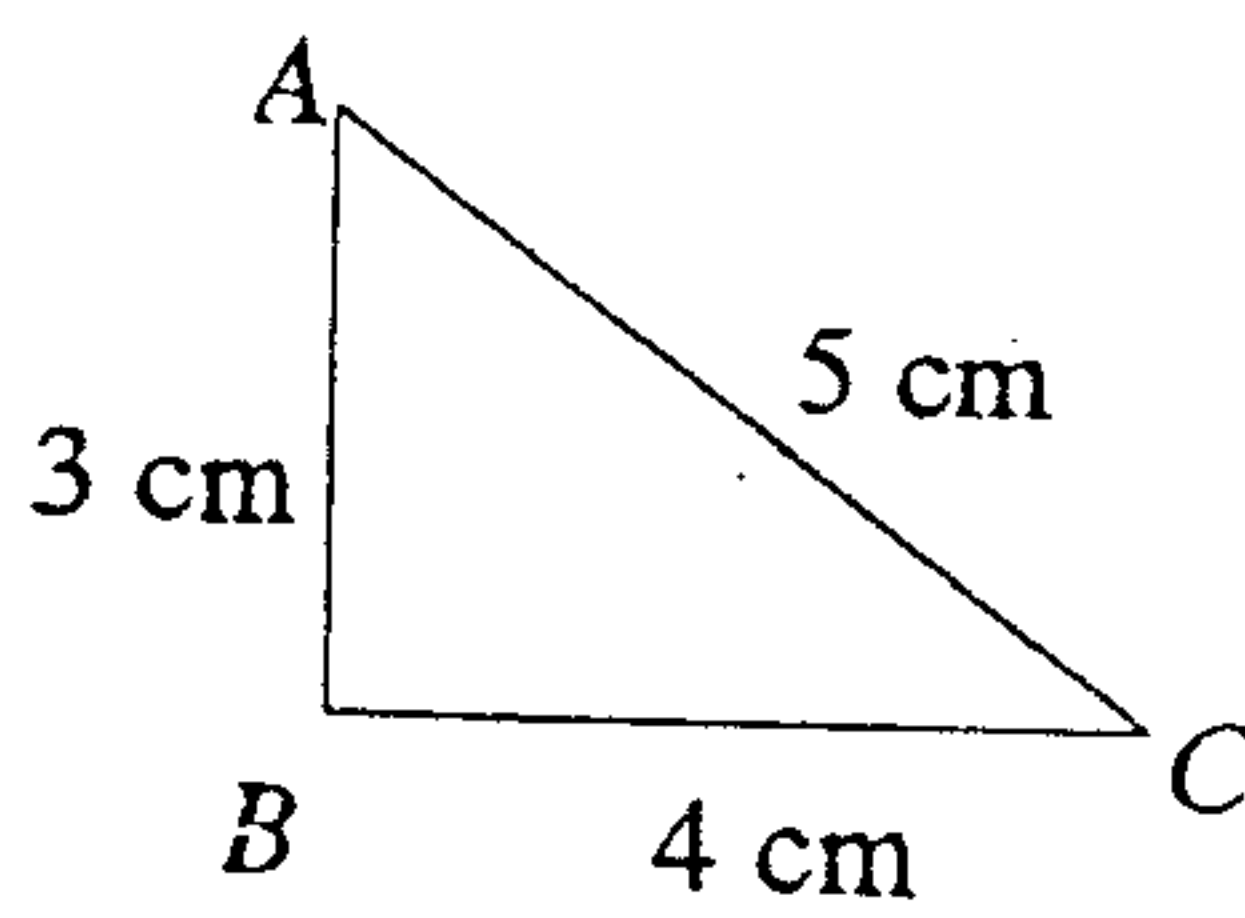


Figure 2

[2]

(b) In  $\triangle ABC$ ,  $AB = 3$  cm,  $BC = 4$  cm and  $AC = 5$  cm.  $\triangle ABC$  is similar to another triangle with points  $Q$ ,  $R$  and  $S$  such that  $QR = 10$  cm,  $RS = 8$  cm and  $QS = 6$  cm. Write down (in correct ordering of the letters  $Q$ ,  $R$  and  $S$ ) the triangle which  $\triangle ABC$  is similar to. The diagram below illustrates the triangles, but is not drawn to scale.



7

Answer  $\Delta$  ..... [2]

For  
Examiner's  
Use**11** Expand and simplify

(a)  $2\left(2a + \frac{3b}{a}\right)^2,$

(b)  $-y(y-x) - (x+y)(x-2y).$

For  
Examiner's  
Use

Answer (a)..... [2]

(b)..... [3]

**12** Simplify

(a)  $\frac{12a^3b}{7a} \div \frac{2(3ab)^2}{14b},$

(b)  $\frac{\frac{y-x}{1-x}}{\frac{x}{y^2}}$

Answer (a)..... [2]

(b)..... [3]

**END OF PAPER**





Answer all the questions..

- 1 (a) Given that  $-5 \leq a \leq 2$  and  $-4 \leq b \leq 0$ , find the greatest and least possible calculations of the expression  $a^2 - b^2$ . [2]
- (b) The burning duration of a particular type of candle is directly proportional to the **square** of the length of the candle. If the candle is 5 cm long, it burns for 75 hours.
- (i) Calculate, in hours, the burning duration of a candle that is 12 cm long. [3]
- (ii) Calculate, in cm, the length of a candle if it burns for 192 hours. [2]
- 
- 2 (a) Express 25 200 as a product of prime factors.  
Hence, find the least value of  $a$  such that  $(25200 \times a)$  is a perfect cube. (A "perfect cube" is the cube of a whole number.) [4]
- (b) On a table are 192 coins showing Heads and a certain number of coins showing Tails such that the ratio of Heads to Tails is 12: 5.
- (i) Find the total number of coins on the table. [1]
- (ii) Find the number of coins showing Heads that will need to be flipped over in order for the ratio of Heads to Tails to be 1: 3. [3]
- 
- 3 The exchange rate for English Pound (£) in January 2000 was  $\text{£}1 = \text{S\$}x$ . In January 2006, the exchange rate had become  $\text{£}1 = \text{S\$}(x + 1)$ . A gold bracelet costs S\$360.
- (a) Write down an expression, in terms of  $x$ , for the cost of the bracelet in English Pound (£) in January 2000. [1]
- (b) Write down an expression, in terms of  $x$ , for the cost of the bracelet in English Pound (£) in January 2006. [1]
- The bracelet cost £60 more in January 2000, than in January 2006.
- (c) Write down an equation in  $x$ , and show that it reduces to  $x^2 + x - 6 = 0$ . [3]
- (d) Solve the equation  $x^2 + x - 6 = 0$ . [2]
- (e) Find the cost of the bracelet in English Pound (£) in January 2006. [1]
-

- 4 On a map, 2 cm represents 5 km on actual ground.
- (a) Express the scale of the map in the form  $1 : n$ . [1]
- (b) Calculate, in km, the distance between two buildings which are 5.8 cm apart on the map. [1]
- (c) A pathway is 650 m long. Calculate, in mm, the length of the pathway on the map. [2]
- (d) A pond has an area of  $30 \text{ km}^2$ . Calculate, in  $\text{cm}^2$ , the area of the pond on the map. [2]
- (e) On the map, a rectangle field has breadth  $2x$  cm and length  $4x$  cm. Express, in  $\text{km}^2$ , the actual area of the field. [2]
- 
- 5 (a) Factorise completely
- (i)  $3a^2 - 9a$ , [1]
- (ii)  $12mn - 18m^2n^2 + 15mn^3$ , [2]
- (iii)  $3p^2 - 4q + 2p - 6pq$ . [2]
- (b) (i) Factorise  $a^2 - 1$ . [2]
- (ii) Hence use your result in (b)(i) to factorise completely  $y^2(x^2 - 1) - (x^2 - 1)$ . [2]
-

- 6 (a) (i) Make  $x$  the subject of the formula

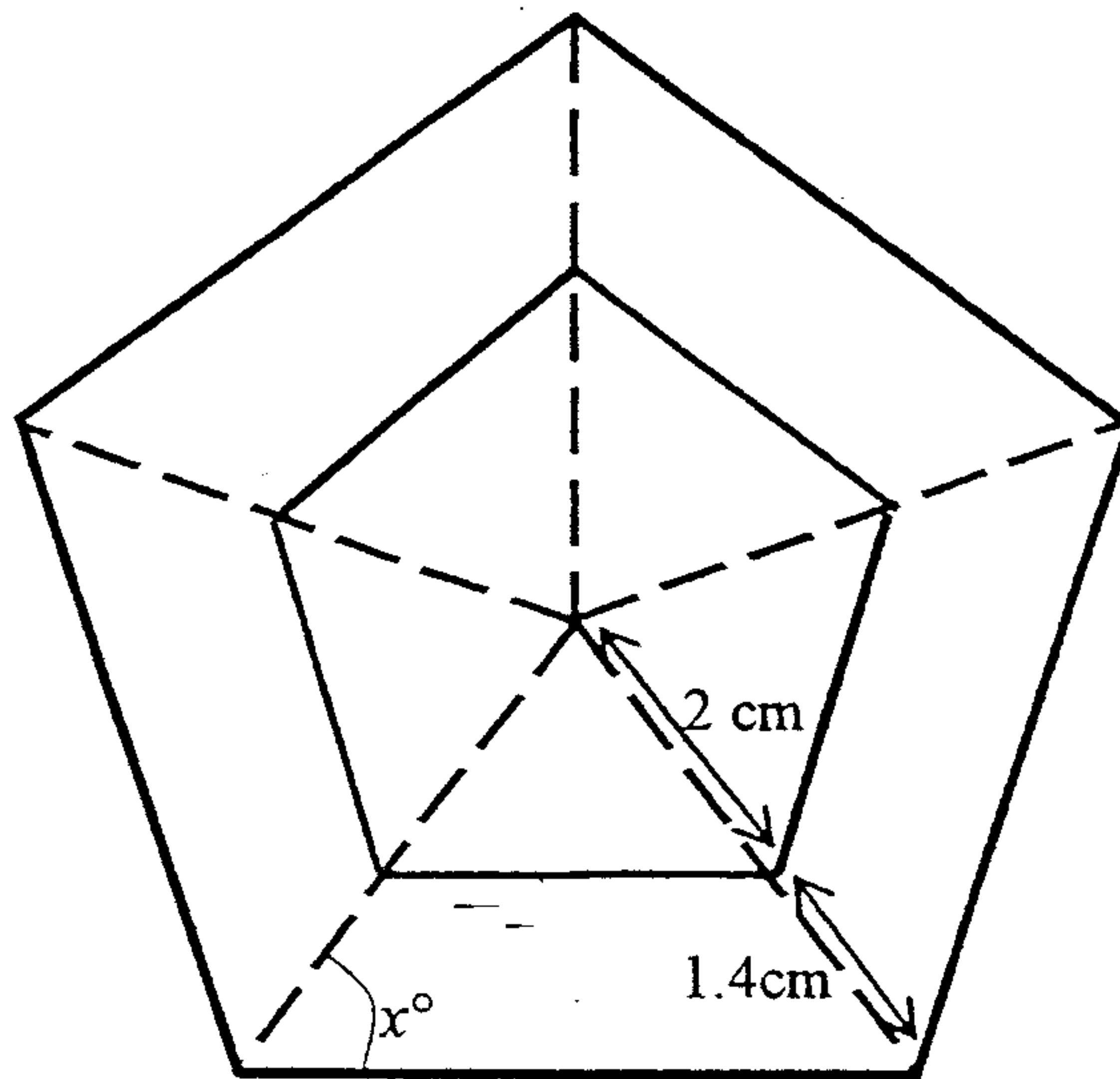
$$a - b = \frac{cx}{a + x} \quad [3]$$

- (ii) Hence, or otherwise, calculate  $x$  if  $a = -2$ ,  $b = 0$  and  $c = 1\frac{1}{2}$ . [2]

- (b) The diagram below shows two geometrically similar, regular polygons with corresponding points joined by dotted lines and measurements labelled.

- (i) Calculate  $x$ . [2]

- (ii) If the perimeter of the larger pentagon is 20 cm, calculate the perimeter of the smaller pentagon. [3]



**TEMASEK SECONDARY SCHOOL  
MID YEAR EXAMINATION 2007  
SEC 2 EXPRESS  
WORKED SOLUTION – PAPER 1**

1. (a)  $a - b$   
(b)  $a + b$  metres

2. Maximum  $p = 2.449$   
Minimum  $p = 2.350$

3.  $A = 2 \times 3^3 \times 5^3 \times 7^4 \times 11^5$   
 $B = 2^4 \times 3^3 \times 5^2 \times 7$   
(a) HCF =  $2 \times 3^2 \times 5^2 \times 7$   
(b) LCM =  $2^4 \times 3^3 \times 5^3 \times 7^4 \times 11^5$

4.  $20 - 30 \times 2$   
 $= -40^\circ\text{C}$

5.  $6x^2 - 12x - 48 = 0$   
 $x^2 - 2x - 8 = 0$   
 $(x - 4)(x + 2) = 0$   
 $x - 4 = 0$  or  $x + 2 = 0$   
 $x = 4$  or  $x = -2$

6.  $\frac{x-3}{3} - \frac{x-4}{4} = \frac{x-6}{6}$   
 $\frac{4(x-3) - 3(x-4)}{12} = \frac{x-6}{6}$

$$\frac{x}{12} = \frac{x-6}{6}$$

$$x = 2(x-6)$$

$$x = 12$$

7. (a) 95% of \$64 000  
 $= \$ \frac{95}{100} \times 64000$   
 $= \$60800$
- (b) 105% of \$60800  
 $= \$ \frac{105}{100} \times 60800$   
 $= \$63840$

$$\frac{63840}{64000} \times 100\% = 99.75\%$$

8. (a) If  $x$  increases 4 times, then  $y$  is quartered.

$$y = \frac{12}{4} = 3$$

(b)  $y = \frac{12 \times 3}{x}$

$$a = \frac{36}{a}$$

$$a^2 = 36$$

$$a = 6$$

9. (a) Sum of interior angles =  $(n - 2) \times 180^\circ$

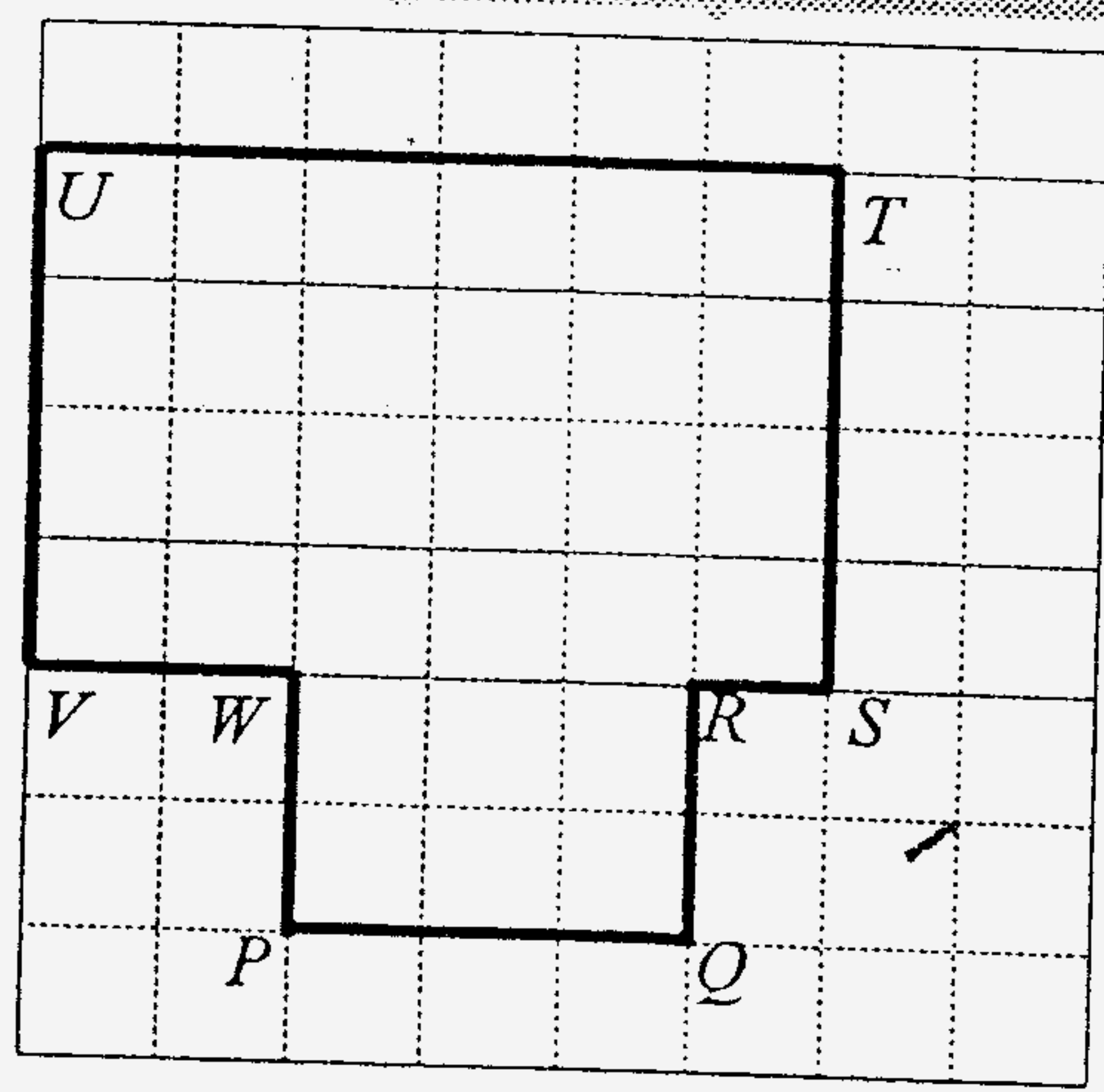
$$= (12 - 2) \times 180^\circ$$

$$= 1800^\circ$$

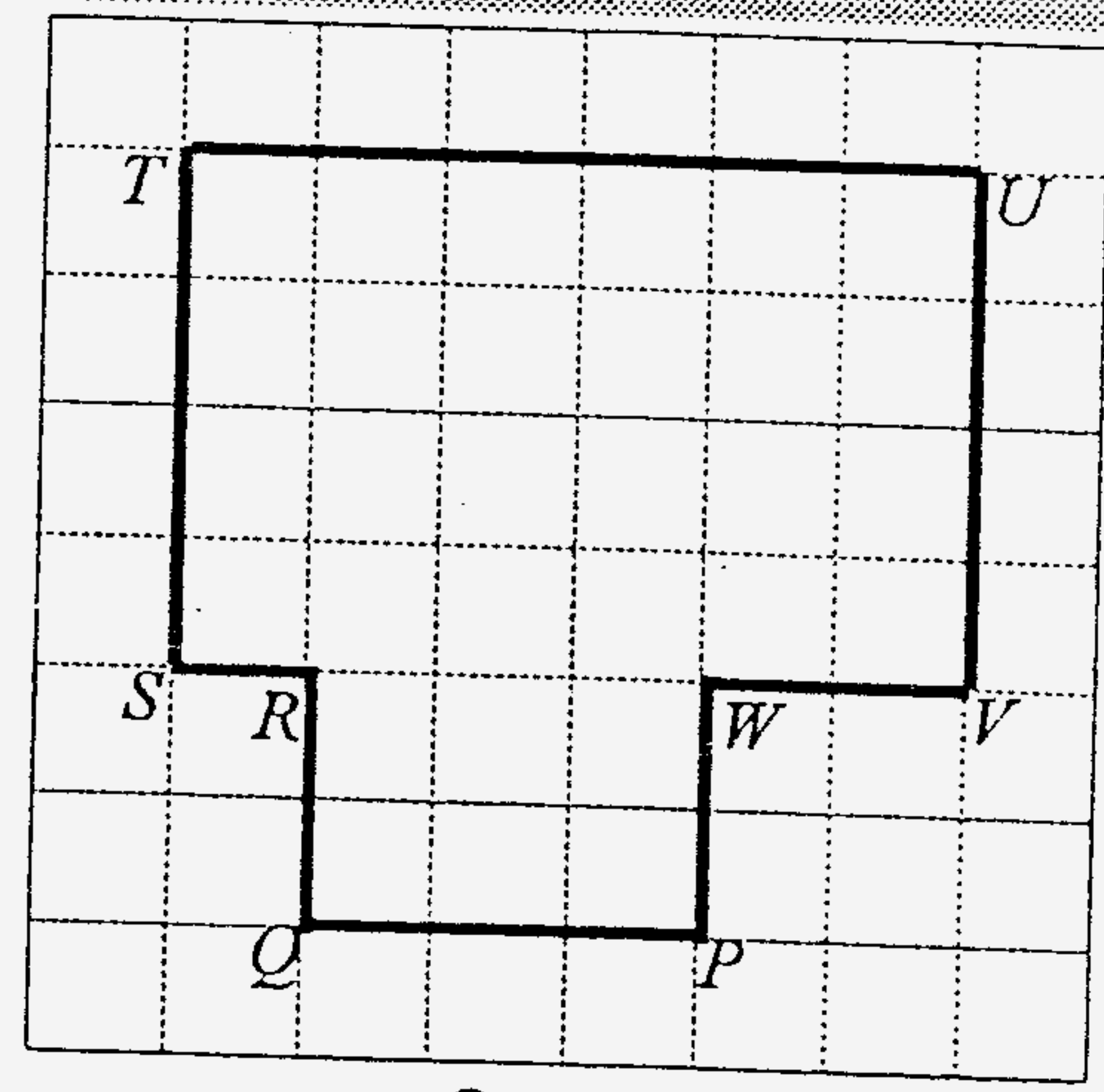
(b) Exterior angle =  $\frac{360^\circ}{12}$

$$= 30^\circ$$

10. (a)



Either



Or

(b)  $\frac{3}{6} = \frac{4}{8} = \frac{5}{10}$

$$\frac{AB}{QS} = \frac{BC}{RS} = \frac{AC}{QR}$$

$$\frac{AB}{QS} = \frac{BC}{SR} = \frac{AC}{QR}$$

$\triangle ABC$  is similar to  $\triangle QSR$ .

11. (a)  $2\left(2a + \frac{3b}{a}\right)^2$   
 $= 2\left(4a^2 + 12b + \frac{9b^2}{a^2}\right)$   
 $= 8a^2 + 24b + \frac{18b^2}{a^2}$

(b)  $-y(y-x) - (x+y)(x-2y)$   
 $= -y^2 + xy - (x^2 - xy - 2y^2)$   
 $= -y^2 + xy - x^2 + xy + 2y^2$   
 $= y^2 + 2xy - x^2$

12. (a)  $\frac{12a^3b}{7a} \div \frac{2(3ab)^2}{14b}$   
 $= \frac{12a^3b}{7a} \times \frac{14b}{18a^2b^2}$   
 $= 1 \frac{1}{3}$

(b)  $\frac{y-x}{1 - \frac{x}{y^2}}$   
 $= (y-x) \div \frac{y^2 - x^2}{xy^2}$   
 $= (y-x) \times \frac{xy^2}{y^2 - x^2}$   
 $= (y-x) \times \frac{xy^2}{(y-x)(y+x)}$   
 $= \frac{xy^2}{x+y}$

**TEMASEK SECONDARY SCHOOL  
MID YEAR EXAMINATION 2007  
SEC 2 EXPRESS  
WORKED SOLUTION – PAPER 2**

- 1 (a) Greatest = 25  
Least = -16

(b) (i)  $T = kL^2$   
 $75 = k5^2 \Rightarrow k = 3$

$\therefore T = 3L^2$   
 $T = 3(12)^2 = 432$  hours

(ii)  $192 = 3L^2$   
 $L = 8$  cm

- 2 (a)

2	25 200
2	12 600
2	6 300
2	3 150
3	1 575
3	525
5	175
5	35
7	7

$25200 = 2^4 \times 3^3 \times 5^2 \times 7$   
 $25200a = 2^6 \times 3^3 \times 5^3 \times 7^3$   
 $a = 2^2 \times 3 \times 5 \times 7^2 = 2940$

(b) (i) Total number of coins =  $\frac{12+5}{12} \times 192 = 272$

(ii) New number of Heads =  $\frac{1}{4} \times 272$   
 $= 68$

Number of Heads to flip =  $192 - 68 = 124$

3 (a)  $\frac{360}{x}$

(b)  $\frac{360}{x+1}$

(c)  $\frac{360}{x} - \frac{360}{x+1} = 60$

$360(x+1) - 360x = 60x(x+1)$



$$6(x+1) - 6x = x(x+1)$$

$$x^2 + x - 6 = 0$$

$$(d) (x-2)(x+3) = 0$$

$$x = 2, \text{ reject } x = -3$$

$$(e) \frac{360}{2+1} = \text{£}120$$

- 4 (a) 1 250 000  
 (b) 14.5 km  
 (c) 1 mm : 250 m  
 2.6 mm : 650 m  
 Answer = 2.6 mm  
 (d) 4 cm<sup>2</sup> : 25 km<sup>2</sup>  
 4.8 cm<sup>2</sup> : 30 km<sup>2</sup>  
 Answer = 4.8 cm<sup>2</sup>

(e) Area of field on map = 8x<sup>2</sup> cm<sup>2</sup>  
 4 cm<sup>2</sup> : 25 km<sup>2</sup>  
 8x<sup>2</sup> cm<sup>2</sup> : 50x<sup>2</sup> km<sup>2</sup>  
 Answer = 50x<sup>2</sup> km<sup>2</sup>

5 (a) (i)  $3a^2 - 9a = 3a(a-3)$

(ii)  $12mn - 18m^2n^2 + 15mn^3 = 3mn(4 - 6mn + 5n^2)$

(iii)  $3p^2 - 4q + 2p - 6pq$   
 $= p(3p+2) - 2q(3p+2)$   
 $= (p-2q)(3p+2)$

(b) (i)  $a^2 - 1$   
 $= a^2 - 1^2$   
 $= (a-1)(a+1)$

(ii)  $y^2(x^2 - 1) - (x^2 - 1)$   
 $= (y^2 - 1)(x^2 - 1)$   
 $= (y-1)(y+1)(x-1)(x+1)$

6 (a) (i)  $a - b = \frac{cx}{a+x}$

$$(a-b)(a+x) = cx$$

$$a^2 + ax - ab - bx = cx$$

$$ax - bx - cx = ab - a^2$$

$$x(a-b-c) = ab - a^2$$

$$x = \frac{ab - a^2}{a - b - c}$$

$$(ii) \quad x = \frac{(-2)(0) - (-2)^2}{-2 - \frac{3}{2}}$$

$$x = 1\frac{1}{7}$$

6

$$(b) \quad (i) \quad x = \frac{1}{2} \left[ \frac{(5-2) \times 180}{5} \right]$$

$$x = 54$$

$$(ii) \quad \text{Length of side of larger pentagon} = \frac{20}{5} = 4 \text{ cm}$$

By similar triangles,

$$\frac{y}{4} = \frac{2}{2+1.4}$$

$$y = 2.353 \text{ (to 4 sig fig)}$$

$$\begin{aligned} \text{Perimeter of smaller pentagon} &= 5 \times 2.353 \\ &= 11.8 \text{ cm (to 3 sig fig)} \end{aligned}$$