

# KCS Mathematics Department



## 4<sup>th</sup> Form Paper 2 (Calculator)

June 2011

1½ hours

### Instructions

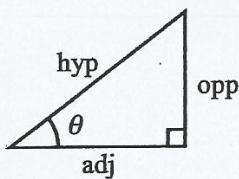
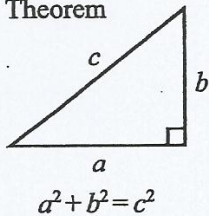
- Write your name in the space below and circle the initials of your teacher
- Answer ALL Questions
- Show all necessary working
- Write your answers in the spaces provided
- Where appropriate give answers to three significant figures
- Calculators may be used
- There are 80 marks in total

Name: .....

Teacher:	EBB	SMB	BJD	KNH
	TPH	KRI	GDK	GMG
	SJN	MPS	CJT	SUW

**IGCSE MATHEMATICS 4400  
FORMULA SHEET – HIGHER TIER**

Pythagoras' Theorem

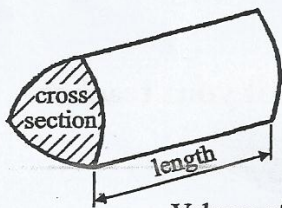


adj = hyp  $\times$  cos  $\theta$   
opp = hyp  $\times$  sin  $\theta$   
opp = adj  $\times$  tan  $\theta$

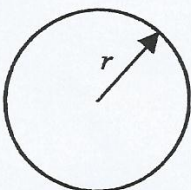
or  $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

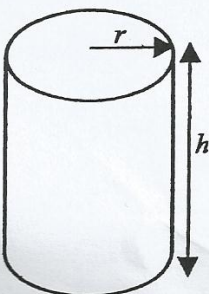


Volume of prism = area of cross section  $\times$  length



Circumference of circle =  $2\pi r$

Area of circle =  $\pi r^2$

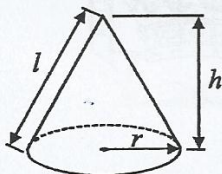


Volume of cylinder =  $\pi r^2 h$

Curved surface area of cylinder =  $2\pi r h$

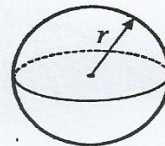
Volume of cone =  $\frac{1}{3} \pi r^2 h$

Curved surface area of cone =  $\pi r l$

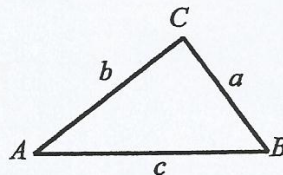


Volume of sphere =  $\frac{4}{3} \pi r^3$

Surface area of sphere =  $4\pi r^2$



In any triangle ABC

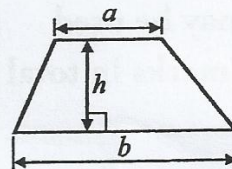


Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle =  $\frac{1}{2} ab \sin C$

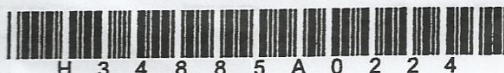
Area of a trapezium =  $\frac{1}{2} (a + b) h$



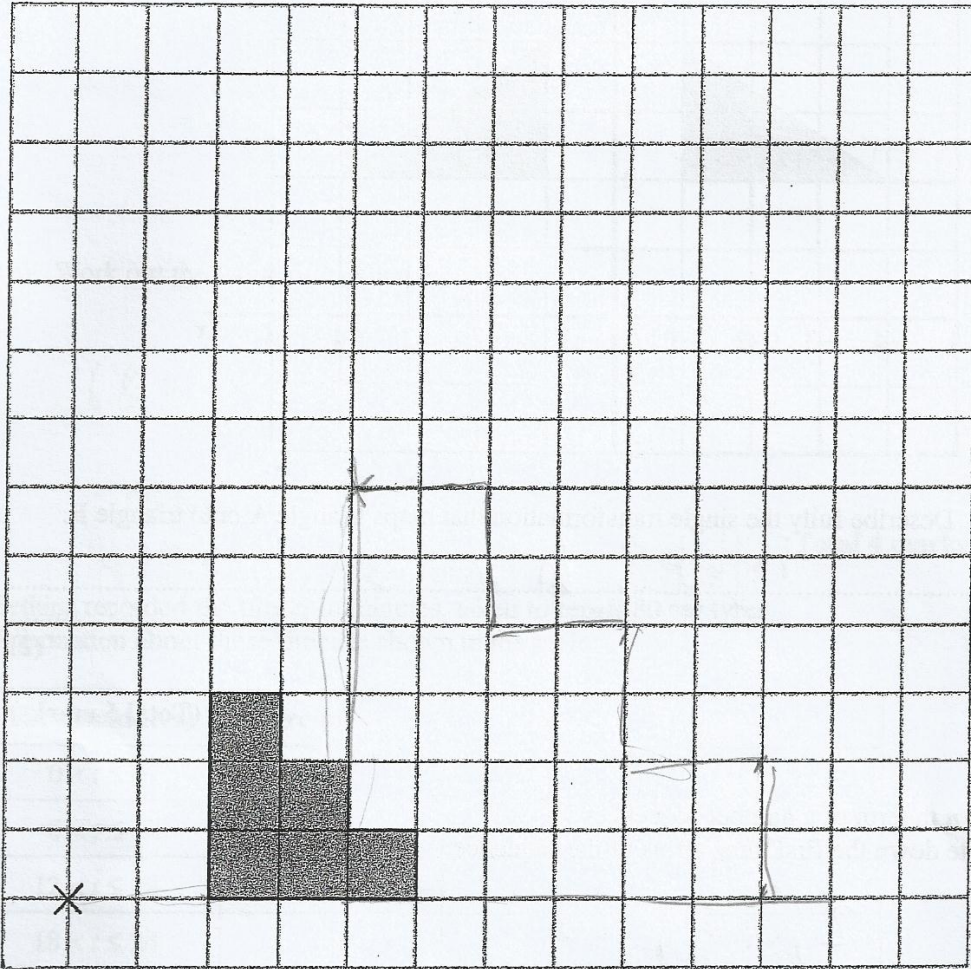
The Quadratic Equation

The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

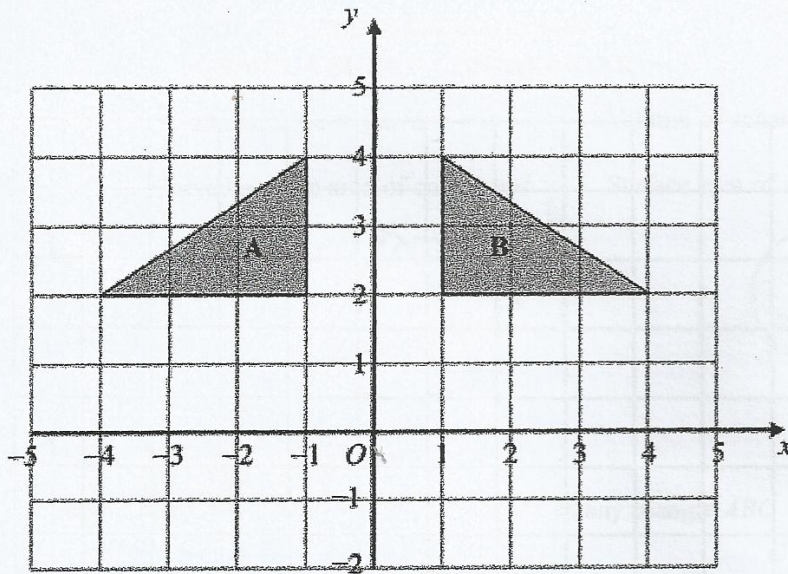


1.



(a) On the grid, draw an enlargement, scale factor 2, of the shaded shape about the point marked with a cross

(3)



(b) Describe fully the single transformation that maps triangle A onto triangle B.

reflection in  $x = 0$

(2)

(Total 5 marks)

2. The  $n$ th term of a number sequence is  $n^2 + 1$   
Write down the first three terms of the sequence.

2, 5, 10

(Total 2 marks)

3.  $F = 1.8C + 32$

(a) Work out the value of  $F$  when  $C = -8$

.....17.6.....  
(2)

(b) Work out the value of  $C$  when  $F = 68$

$68 = 1.8C + 32$

$36 = 1.8C$

$36 \div 1.8 = 20 \quad C = 20$

.....  
(2) **(Total 4 marks)**

4. Sethina recorded the times, in minutes, taken to repair 80 car tyres. Information about these times is shown in the table.

Time( $t$ minutes)	Frequency	Midpoint	$xy$
$0 < t \leq 6$	15	3	45
$6 < t \leq 12$	25	9	225
$12 < t \leq 18$	20	15	300
$18 < t \leq 24$	12	21	252
$24 < t \leq 30$	8	27	216

Calculate an estimate for the mean time taken to repair each car tyre.

$\frac{1038}{80} = 13.0$

..... minutes  
**(Total 4 marks)**

5. Here is a tile in the shape of a semicircle.

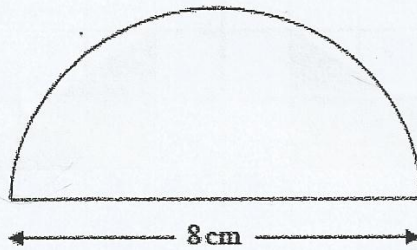


Diagram NOT  
accurately drawn

The diameter of the semicircle is 8 cm.

Work out the perimeter of the tile.  
Give your answer correct to 2 decimal places.

$$2 \times 4 \times \pi = 25.12 + 8$$

..... 20.57 ..... cm  
(Total 3 marks)

6. (a) Simplify  $a \times a \times a$

$$a^3$$

.....  
(1)

- (b) Expand  $5(3x - 2)$

$$15x - 10$$

.....  
(2)

- (c) Expand  $3y(y + 4)$

$$3y^2 + 12y$$

.....  
(2)

- (d) Expand and simplify  $2(x - 4) + 3(x + 2)$

$$2x - 8 + 3x + 6$$

$$5x - 2$$

.....  
(2)

(e) Expand and simplify  $(x+4)(x-3)$

$$x^2 - 3x - 12 + 4x = x^2 - 3x - 12 + 4x$$

$$x^2 - 12 + 4x$$

$$x^2 + 4x - 12$$

.....  
(2)

(Total 9 marks)

7. (a) Simplify  $t^6 \times t^2$

$$t^8$$

.....  
(1)

(b) Simplify  $\frac{m^8}{m^3}$

$$m^5$$

.....  
(1)

(c) Simplify  $(2x)^3$

$$8x^3$$

.....  
(2)

(d) Simplify  $3a^2h \times 4a^5h^4$

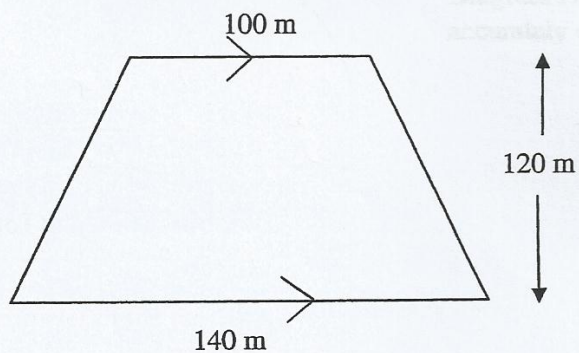
$$12a^7h^5$$

.....  
(2)

(Total 6 marks)

8.

Diagram NOT  
accurately drawn



The diagram shows a field in the shape of a trapezium.

Kevin is going to sell the field.

He is going to ask for £1.50 for each square metre of the field.

Work out how much he is going to charge for the whole field.

$$\frac{1}{2} (a + b)h$$

$$\frac{1}{2} (100 + 140)120$$

$$\frac{1}{2} (240)120 = 14400 \times 1.50$$

£21600

(Total 4 marks)



9.

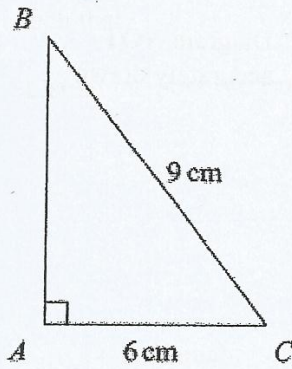


Diagram NOT  
accurately drawn

$ABC$  is a right-angled triangle.

$AC = 6$  cm.

$BC = 9$  cm.

Work out the length of  $AB$ .

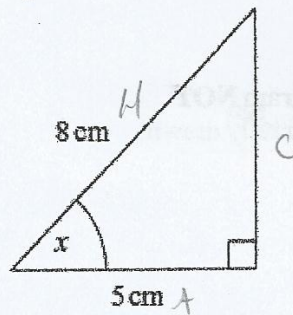
Give your answer correct to 3 significant figures.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ a^2 + 36 &= 81 \\ a^2 &= 45 \\ a &= 6.71 \end{aligned}$$

..... cm

(Total 3 marks)

10. Here is a right-angled triangle.



SOM CAM TOA

Diagram NOT accurately drawn

- (a) Calculate the size of the angle marked  $x$ .  
Give your answer correct to 1 decimal place.

$$\cos x = \frac{5}{8}$$

$$x = \cos^{-1}\left(\frac{5}{8}\right)$$

$$x = 51.3 \dots \dots \dots^\circ$$

(3)

Here is another right-angled triangle.

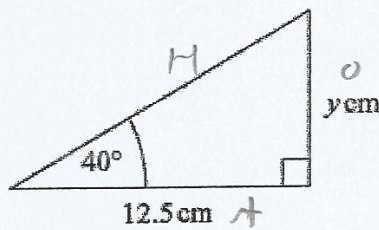


Diagram NOT accurately drawn

SOM CAM TOA

- (b) Calculate the value of  $y$ .  
Give your answer correct to 1 decimal place.

$$\tan 40^\circ \times 12.5 = 10.5$$

$$y = 10.5 \dots \dots \dots$$

(3)

(Total 6 marks)

11.  $x$  is an integer such that  $-3 < 2x \leq 6$

(a) List all the possible values of  $x$ .

$-2, -1, 0, 1, 2, 3, 4, 5, 6$

.....  
(3)

(b) Solve the inequality  $5 + 2y > 6y - 9$

$$2y > 6y - 14$$

$$14 > 4y$$

$$3.5 > y$$

$$y < 3.5$$

.....  
(2)

(Total 5 marks)

12.

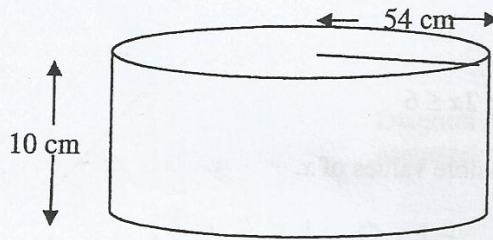


Diagram NOT  
accurately drawn

The diagram shows a solid cylinder.  
The radius of the cylinder is 54 cm.  
The height of the cylinder is 10 cm.

Calculate the curved surface area of the cylinder.  
Give your answer correct to three significant figures.

$$2\pi rh$$

$$2\pi 54 \times 10$$

3390

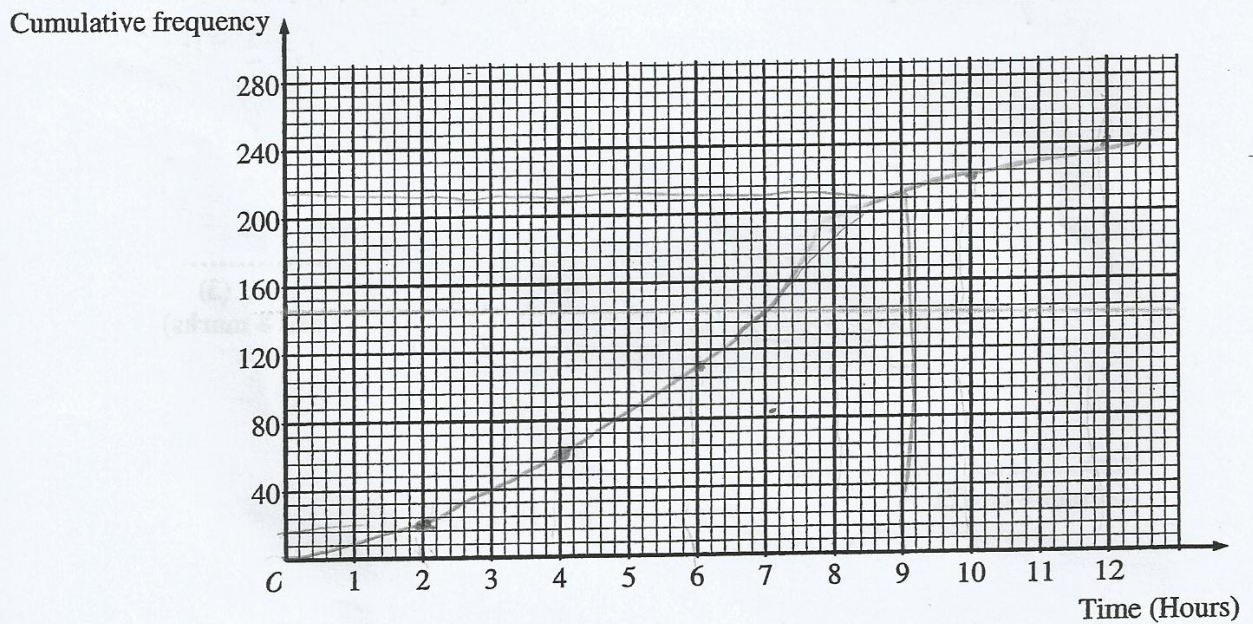
..... cm<sup>2</sup>  
(Total 3  
marks)

13. The cumulative frequency table gives information about the number of hours 240 children played computer games last week.

Number of hours (h)	Cumulative frequency
$0 < h \leq 2$	20
$0 < h \leq 4$	60
$0 < h \leq 6$	110
$0 < h \leq 8$	190
$0 < h \leq 10$	220
$0 < h \leq 12$	240

(a) On the grid, draw a cumulative frequency graph for the table.

(2)



(b) Use your graph to find an estimate for the number of children that played computer games for more than 9 hours last week.

..... 264 .....  
(2)  
(Total 4 marks)

14. For each of the following find the equation of the line in the form  $y = mx + c$ .

a) The line with intercept 3 and gradient 2.

$$y = 2x + 3$$

.....  
(2)

b) The line with gradient 3 and passing through the point (1, 2).

$$y = 3x + c$$

$$y = 3x - 1$$

.....  
(3)

$$2 = 3 + c$$

$$c = -1$$

c) Find the equation of the line passing through the points A(2, 1) and B(4, 5).

$$4, 2 = 2$$

$$\frac{y_2 - y_1}{x_2 - x_1}$$



.....  
(3)

(Total 8 marks)

$$y = 2x + c \quad (2, 1)$$

$$1 = 4 + c$$

$$-3 = c$$

$$y = 2x - 3$$

15.

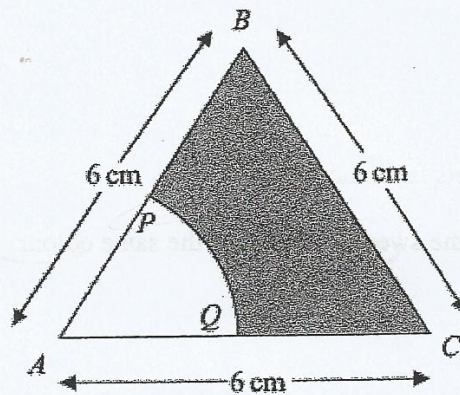


Diagram NOT  
accurately drawn

The diagram shows an equilateral triangle  $ABC$  with sides of length 6 cm.

$P$  is the midpoint of  $AB$ .

$Q$  is the midpoint of  $AC$ .

$APQ$  is a sector of a circle, centre  $A$ .

Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

$$\begin{aligned} \text{Area} &= \frac{1}{2} ab \sin C \\ &= \frac{1}{2} (6)(6) \sin 60 \\ &= 15.588 \end{aligned}$$

$$\frac{60}{360} \times \pi r^2 = 4.71 = 10.875$$

.....  $\text{cm}^2$   
(Total 4 marks)

16. Phil has 20 sweets in a bag.

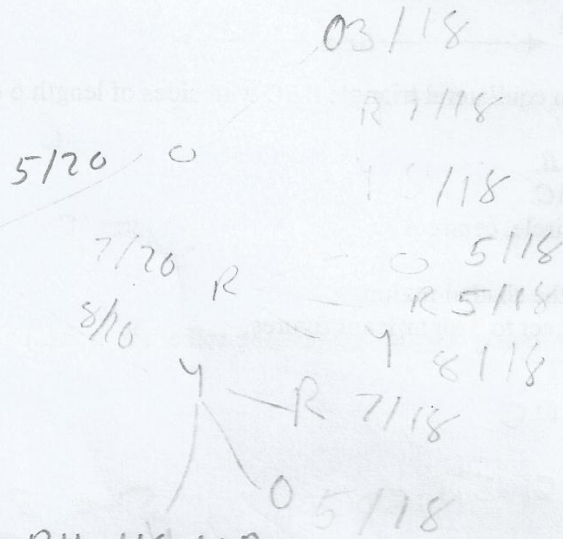
5 of the sweets are orange.

7 of the sweets are red.

8 of the sweets are yellow.

Phil takes at random **two** sweets from the bag.

Work out the probability that the sweets will **not** be the same colour.



OR, OY, RO, RY, YO, YR

$$5/20 \times 7/19 + 5/20 \times 8/19$$

$$+ 7/20 \times 5/19 + 7/20 \times 7/19$$

$$+ 8/20 \times 3/19 + 8/20 \times 8/19$$

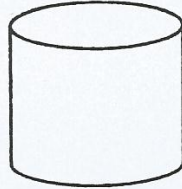
.....  
(Total 4 marks)



17.



A



B

Diagram NOT  
accurately drawn

The diagram shows two cylinders.  
Cylinder A is mathematically similar to cylinder B.

The volume of cylinder A is  $216 \text{ cm}^3$ .

The volume of cylinder B is  $3375 \text{ cm}^3$ .

The total surface area of cylinder A is  $144 \text{ cm}^2$ .

Work out the total surface area of cylinder B.

$$VSF = 15.625$$

$$LSF = 2.5$$

$$A \text{ SF} = 6.25$$

$$144 \times 6.25 = 900$$

.....9.00.....  
.....cm<sup>2</sup>  
(Total 3 marks)