Name: _____ _____ Class: _____

St George Girls High School

Year 9

Common Test 1

May 2006

Mathematics

Advanced Course
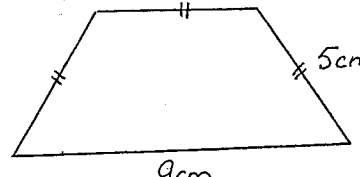
Time Allowed: 75 minutes

Instructions:
- Set out work clearly.
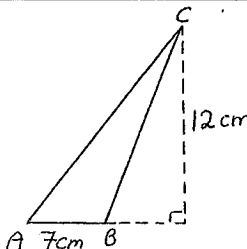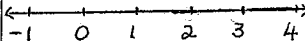- Show all working when required.
- Calculators may be used.

Section A	/15
Section B	**/77**
Question 1	/19
Question 2	/18
Question 3	/19
Question 4	/21
Total	**/92**

Part A

15 marks
Answers <u>only</u> in the Answer Column

Question	Answer
1. Expand and simplify $(5x+4)(5x-4)$	
2. Factorise $16x+12y$	
3. Simplify $5y^{\circ}$	
4. Find the value of $\left(\dfrac{8}{27}\right)^{\frac{1}{3}}$	
5. Write in scientific notation: a) 930000 b) 0.000572	
6. Change 99km/h to metres per second.	
7. Find the perimeter of:	

Part A (cont'd)

Question	Answer
8. The circumference of a circle is 25cm. Find the length of the diameter correct to the nearest millimetre.	
9. Find the area of $\triangle ABC$: $12\,cm$ A $7cm$ B	
10. If $m = -3$ evaluate $7 - 4m$	
11. The length of a parcel is given as 28.7cm correct to 1 decimal place. What is the lowest value that the actual width could have?	
12. How many metres in x centimetres?	
13. Graph $x > 2$ on the number line.	$-1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4$
14. How many mm^3 in 2.72cm^3 $\times 1000$	

Part B

Marks

<u>**Question 1**</u> (19 marks) – Show all working

4

a) Expand and simplify:

 (i) $(2x+5)(5x-2)$ (ii) $(3x-1)^2 - 4x(x-2)$

2

b) Find m and n given that $x^2 - 20x + m = (x-n)^2$

4

c) Factorise:

 (i) $-10x^3 - 15x^2$ (ii) $3x(x+7) + 6(x+7)$

Marks

Question 1 (cont'd)

6

d) Simplify:

(i) $\dfrac{3^{n+2}}{3^{n-3}}$

(ii) $\left(\dfrac{9}{x^{10}}\right)^{\frac{-1}{2}}$

(iii) $12x^5 y^{-4} \div \dfrac{\left(3x^2\right)^2}{4xy^5}$

3

e) Solve for x: $2^{x-1} \times 4^x \times 8^{-1} = 16$

Marks

Question 2 (18 marks) – Show all working

1

a) Arrange in ascending order:

$3.02 \times 10^2, \; 6.35 \times 10^{-2}, \; 6.1 \times 10^{-1}$

2

b) Write 0.003572 in scientific notation correct to 2 significant figures.

4

c) A leaking tap loses one drop of water every 8 seconds. If each drop contains 2mL of water

(i) Express the rate of water loss in L/h.

(ii) Calculate the number of kilolitres of water that will be lost in one year.

Question 2 (cont'd)

Marks

d) Georgie's car used 54L of petrol in travelling 570km. Helen's car used 41L of petrol for a journey of 413km. Whose car was the most economical in terms of petrol consumption? Give a reason for your decision.

2

e) Find the value of $\sqrt{\dfrac{2.43\times10^{-5}+3.21\times10^{-4}}{4.73\times10^{-2}}}$, giving your answer in scientific

notation, correct to 3 significant figures.

2

f) Ben drove 200km at an average speed of 80km/h and then drove 60km at an average speed of 90km/h.

4

(i) How long, in hours and minutes, did the whole trip take?

(ii) What was Ben's average speed for the whole trip?

Question 2 (cont'd)

Marks

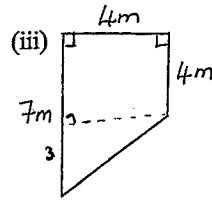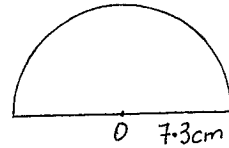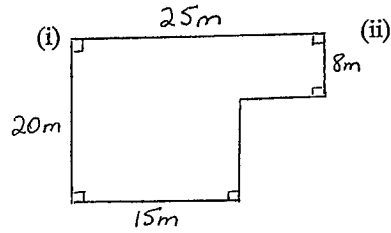g) If the exchange rate between US and Australian currency is $US0.75/$A1.00.

3

(i) How much US currency will Tara get when she exchanges $A450?

(ii) How much Australian currency will Adam get when he exchanges $US600?
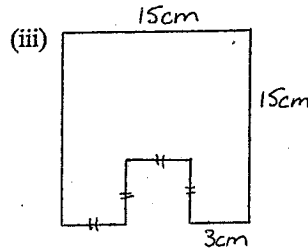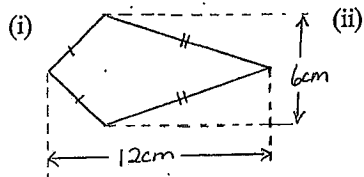
Marks

Question 3 (19 marks) - Show all working

a) Find the perimeter of the following shapes:

6

(i)

25m

8m

20m

15m

(ii)

O   7·3cm

(iii)

4m

4m

7m

b) Calculate the area of each of the following shapes:

7

(i)

6cm

12cm

(ii)

45°   10cm

(iii)

15cm

15cm

3cm

Marks

Question 3 (cont'd)

c)

3

A   P   B

Y

D   Q   C

X
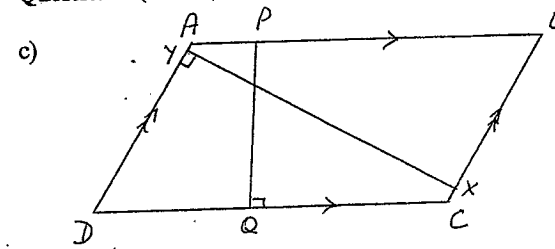
ABCD is a parallelogram $AB = 12$cm, $BC = 7$cm, $PQ \perp DC$, $XY \perp AD$.
If $XY = 10$cm find the length of PQ.

d) A circle has an area of 100cm². Find the length of its circumference, in centimetres, correct to 2 decimal places.

3

Marks

Question 4 (24 marks) – Show all working

7

a)   Solve the following equations:

(i) $\dfrac{x+1}{3} + \dfrac{x-2}{5} = 3$

(ii) $x^2 + 19 = 100$

(iii) $5y - 2(3y - 3) = 4(y + 7)$

4

b)   Make x the subject of the formula.

(i) $y = 7 - 3x$

(ii) $y = \dfrac{x}{x+3}$

Marks

Question 4 (cont'd)

c)   Solve and graph the solution on a number line $5x + 14 > 9$

3

d)   Find all positive integers which satisfy $13 - 2x \geq 3$

e)   A rectangle is 5cm longer than it is wide. Its perimeter is 86cm. <u>Write an equation</u> and solve it to find the dimensions of the rectangle.

4

End of Paper

Name: __SOLUTIONS._____ Class: _____

St George Girls High School

Year 9

Common Test 1

May 2006

Mathematics

Advanced Course

Time Allowed: 75 minutes

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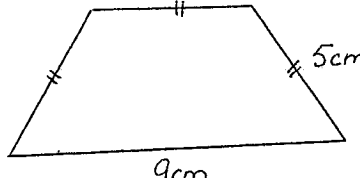
Section A	/15
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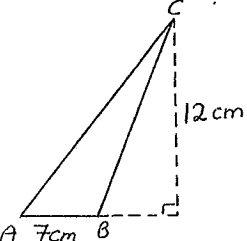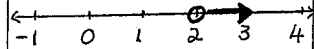
Part A

15 marks
Answers only in the Answer Column

Question	Answer
1. Expand and simplify $(5x+4)(5x-4)$	$25x^2 - 16$
2. Factorise $16x+12y$	$4(4x+3y)$
3. Simplify $5y^\circ$ $\qquad 5\times 1$	5
4. Find the value of $\left(\dfrac{8}{27}\right)^{\frac{1}{3}} = \left(\dfrac{2^3}{3^3}\right)^{\frac{1}{3}}$	$\dfrac{2}{3}$
5. Write in scientific notation: a) 930000 $\qquad$ b) 0.000572	a) 9.3×10^5 b) 5.72×10^{-4}
6. Change 99km/h to metres per second. $\dfrac{99\times 1000}{1\times 3600}$	27.5 m/s
7. Find the perimeter of: $\qquad 3\times 5+9$ 5cm 9cm	24 cm

Part A (cont'd)

Question	Answer
8. The circumference of a circle is 25cm. Find the length of the diameter correct to the nearest millimetre. $25 = \pi \cdot D$ $D = 7.95$	8.0 cm $= 80$ mm
9. Find the area of $\triangle ABC$: $\frac{1}{2} \times 7 \times 12$	42 cm^2
10. If $m = -3$ evaluate $7 - 4m$ $7 - 4 \times -3$ $= 7 + 12$	19
11. The length of a parcel is given as 28.7cm correct to 1 decimal place. What is the lowest value that the actual width could have?	28.65 cm
12. How many metres in x centimetres?	$\dfrac{x}{100}$
13. Graph $x > 2$ on the number line.	
14. How many mm^3 in 2.72cm^3 $\times$ 1000	2720 mm^3

Part B

Question 1 (19 marks) – Show all working   Marks

4

a)   Expand and simplify:

   (i) $(2x+5)(5x-2)$

   $= 10x^2 - 4x + 25x - 10$

   $= 10x^2 + 21x - 10$

   (ii) $(3x-1)^2 - 4x(x-2)$

   $= (9x^2 - 6x + 1) - 4x^2 + 8x$

   $= 5x^2 + 2x + 1$

2

b)   Find m and n given that $x^2 - 20x + m = (x-n)^2$

   $x^2 - 20x + m = x^2 - 2nx + n^2$

   $\therefore 2n = 20 \qquad \text{\&} \quad 10^2 = m$

   $n = 10 \qquad\qquad m = 100$

4

c)   Factorise:

   (i) $-10x^3 - 15x^2$

   $= -5x^2(2x + 3)$

   (ii) $3x(x+7) + 6(x+7)$

   $= (x+7)(3x + 6)$

   $= 3(x+7)(x+2)$

Marks

Question 1 (cont'd)

6

d) Simplify:

(i) $\dfrac{3^{n+2}}{3^{n-3}}$

$= 3^{(n+2)-(n-3)}$

$= 3^5$

(ii) $\left(\dfrac{9}{x^{10}}\right)^{\frac{-1}{2}}$

$= \left(\dfrac{x^{10}}{3^2}\right)^{\frac{1}{2}}$

$= \dfrac{x^5}{3}$

(iii) $12x^5 y^{-4} \div \dfrac{(3x^2)^2}{4xy^5}$

$= 12x^5 y^{-4} \times \dfrac{4xy^5}{3^2 x^4}$

$= \dfrac{16}{3} \times x^{5+1-4} \times y^{-4+5}$

$= \dfrac{16x^2 y}{3}$

3

e) Solve for x: $2^{x-1} \times 4^x \times 8^{-1} = 16$

$2^{x-1} \times (2^2)^x \times (2^3)^{-1} = 2^4$

$2^{x-1+2x-3} = 2^4$

$\therefore \quad 3x - 4 = 4$ [equate indices]

$3x = 8$

$x = \dfrac{8}{3}$

Marks

Question 2 (18 marks) – Show all working

1

a) Arrange in ascending order:

$3.02 \times 10^2, \ 6.35 \times 10^{-2}, \ 6.1 \times 10^{-1}$

$6.35 \times 10^{-2}, \ 6.1 \times 10^{-1}, \ 3.02 \times 10^2$

2

b) Write 0.003572 in scientific notation correct to 2 significant figures.

3.6×10^{-3}

4

c) A leaking tap loses one drop of water every 8 seconds. If each drop contains 2mL of water

(i) Express the rate of water loss in L/h.

2mL per 8 seconds.
1mL per 4 seconds.
15mL per 1 minute
900mL per 1 hour $\Rightarrow .9$ L/h

(ii) Calculate the number of kilolitres of water that will be lost in one year.

$\dfrac{.9 \times 24 \times 365}{1000}$ $[\times 365.25]$

$= 7.884$ KL lost per year. ≈ 7.8894

Question 2 (cont'd)

Marks

d) Georgie's car used 54L of petrol in travelling 570km. Helen's car used 41L of petrol for a journey of 413km. Whose car was the most economical in terms of petrol consumption? Give a reason for your decision.

2

Georgie

54 L per 570 km (÷5.7)

9.474 L per 100 km

Helen

41 L per 413 km (÷4.13)

9.927 L per 100 km

* Georgie's car more economical by appr 0.45 L/100 km.

e) Find the value of $\sqrt{\dfrac{2.43 \times 10^{-5} + 3.21 \times 10^{-4}}{4.73 \times 10^{-2}}}$, giving your answer in scientific notation, correct to 3 significant figures.

2

8.54×10^{-2}

f) Ben drove 200km at an average speed of 80km/h and then drove 60km at an average speed of 90km/h.

4

(i) How long, in hours and minutes, did the whole trip take?

$T = \dfrac{200}{80} + \dfrac{60}{90}$

$= 2\frac{1}{2} + \frac{2}{3}$

$= 3 h \ 10 min$

(ii) What was Ben's average speed for the whole trip?

$S = \dfrac{260}{3h 10 min}$

$= 82.1 \ km/h$

Question 2 (cont'd)

Marks

g) If the exchange rate between US and Australian currency is $US0.75/$A1.00.

3

(i) How much US currency will Tara get when she exchanges $A450?

$450 \times 0.75 = \$US \ 337.50$

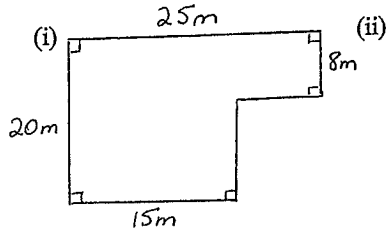(ii) How much Australian currency will Adam get when he exchanges $US600?

$600 \div 0.75 = \$A \ 800$
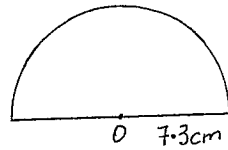
Marks

Question 3 (19 marks) - Show all working
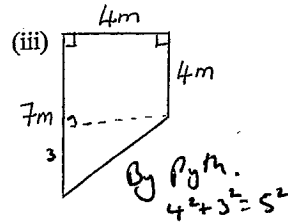
6

a) Find the perimeter of the following shapes:

(i)

25m

8m

20m

15m

$P = 2(25 + 20)$

$= 90m$

(ii)

O 7.3cm

$P = 2 \times 7.3 + \pi \times 2 \times 7.3$

$= 60.5cm$

(1 dec. pl.)

(iii)

4m

4m

7m

By Pyth.

$4^2 + 3^2 = 5^2$

$P = 2 \times 4 + 7 + 5$

$= 20m$

7

b) Calculate the area of each of the following shapes:

(i)

6cm

12cm

$A = \frac{1}{2}(6 \times 12)$

$= 36cm^2$

(ii)

45° 10cm
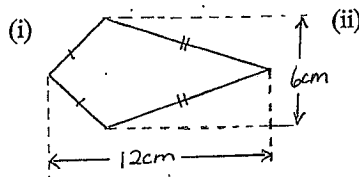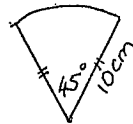
$A = \frac{45}{360} \times \pi \times 10^2$

$= \boxed{686.3 \, cm^2}$

(iii)

15cm

15cm

3cm
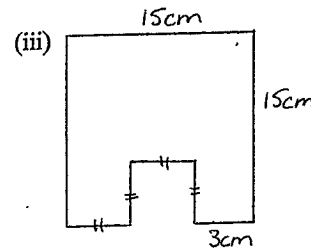
$A = 15 \times 15$

$- 6 \times 6$

$= 189 cm^2$

SOLUTIONS

Marks

Question 3 (cont'd)

3

c)

A P B

Y

D Q C

X
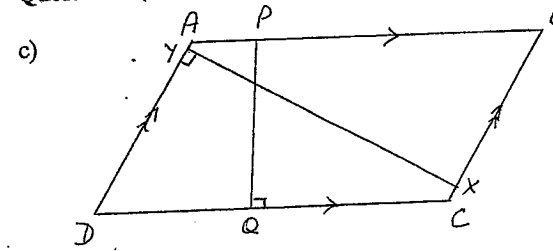
ABCD is a parallelogram $AB = 12cm$, $BC = 7cm$, $PQ \perp DC$, $XY \perp AD$.
If $XY = 10cm$ find the length of PQ.

$Area_{ABCD} = 7 \times 10$

$= 70cm^2$

$\therefore \quad DC \times PQ = 70$

$PQ = \frac{70}{12}$

$PQ = 5\frac{5}{6}cm \quad (5.8 \, cm)$

3

d) A circle has an area of 100cm². Find the length of its circumference, in centimetres, correct to 2 decimal places.

$100 = \pi \times r^2$

$\therefore \quad r^2 = \frac{100}{\pi}$

$r = \sqrt{\frac{100}{\pi}}$

$\Nu r \quad C = \pi D$

$C = \pi \times 2 \times \sqrt{\frac{100}{\pi}}$

$= 20\sqrt{\pi}$

$= 35.45 \, cm$.

Marks

<u>Question 4</u> (24 marks) – Show all working

7

a) Solve the following equations:

(i) $\dfrac{x+1}{3} + \dfrac{x-2}{5} = 3$

$5(x+1) + 3(x-2) = 15 \times 3$

$5x + 5 + 3x - 6 = 45$

$8x = 46$

$x = \dfrac{23}{4}$

(ii) $x^2 + 19 = 100$

$x^2 - 81 = 0$

$(x-9)(x+9) = 0$

$x = -9, 9$

(iii) $5y - 2(3y-3) = 4(y+7)$

$5y - 6y + 6 = 4y + 28$

$-y + 6 = 4y + 28$

$-5y = 22$

$y = -\dfrac{22}{5}$

b) Make x the subject of the formula.

4

(i) $y = 7 - 3x$

$\therefore 3x = 7 - y$

$x = \dfrac{7-y}{3}$

(ii) $y = \dfrac{x}{x+3}$

$yx + 3y = x$

$xy - x = -3y$

$x(y-1) = -3y$
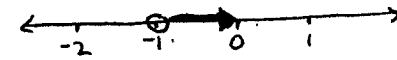
$x = \dfrac{-3y}{y-1}$

Marks

Question 4 (cont'd)

c) Solve and graph the solution on a number line $5x + 14 > 9$

3

$5x > -5$

$x > -1$

d) Find all positive integers which satisfy $13 - 2x \geq 3$

$13 - 2x \geq 3$

$-2x \geq -10$

$\underline{x \leq 5}$

or

$13 \geq 2x + 3$

$10 \geq 2x$

$5 \geq x$

e) A rectangle is 5cm longer than it is wide. Its perimeter is 86cm. <u>Write an equation</u> and solve it to find the dimensions of the rectangle.

4

Let width be w

then length is $w + 5$

$\therefore P = 2[w+5 + w]$

$P = 4w + 10$

then $4w + 10 = 86$

$4w = 76$

$w = 19$ cm

Dimension: width 19cm

length 24cm

End of Paper