

St George Girls High School

Year 11

Common Test – 1

2009



# Mathematics

## Instructions

1. Reading time – 5 minutes
2. Working time – 70 minutes
3. All questions should be attempted.
4. Show all working.
5. **Start each question on a new page.**
6. Marks will be deducted for careless work or poorly presented solutions.
7. On the cover sheet of the answer booklet clearly show:
  - a) your name
  - b) your mathematics class and teacher

**Question 1: (9 Marks) – Start A New Page**

**Marks**

- a) Simplify:  $\frac{(5x^3)^2 \times 2x}{10x^4}$   $\frac{25x^6 \times 2x}{10x^4}$  2
- b) Evaluate:  $\frac{3.07 \times 10^{-2}}{\sqrt{2.5 \times 10^2}}$  correct to 2 significant figures.  $= \frac{5.50x^7 x^3}{10x^4}$  1
- c) Solve:  $\frac{2x-1}{5} + 2 = \frac{1}{2}$  2
- d) Solve:  $5 - 2x < 3$  2
- e) Simplify:  $(2a - b)(2a + b) - (2a - b)^2$   $4ab - 2b^2$  2  
 $2b(2a - b)$

**Question 2: (9 Marks) – Start A New Page**

**Marks**

- a) Change the subject of these equations to the pronumeral given in the brackets.
- (i)  $S = \frac{n}{2}(a + l)$  [a]  $v = \frac{t-u}{t+u}$  2
- (ii)  $V = \frac{t-u}{t+u}$  [u]  $v(t+u) = t-u$  2  
 $vt + vu = t - u$   
 $vt + vu + tu = t$
- b) Arrange in ascending order of size: Smallest  $\rightarrow$  big 1
- $\{0.251, 25\%, 0.2\dot{5}, \frac{26}{99}\}$   $vu + u = t - vt$
- $u(v+1) = t(1-v)$
- c) Solve for x:  $u = \frac{t(1-v)}{(v+1)}$
- (i)  $x^2 = 3x$  2
- (ii)  $4x^2 - 9x + 5 = 0$  2

**Question 3: (9 Marks) – Start A New Page**

**Marks**

- a) Simplify:  $\sqrt{32} - 3\sqrt{18} + 2\sqrt{8}$  2
- $$= \sqrt{8 \times 4} - 3\sqrt{9 \times 2} + 2\sqrt{4 \times 2}$$
- $$= \sqrt{4 \times 4 \times 2} - 9\sqrt{2} + 4\sqrt{2}$$
- $$= 4\sqrt{2} - 9\sqrt{2} + 4\sqrt{2}$$
- b) Find the value of  $p$  if:  $\sqrt{45} - \sqrt{5} = \sqrt{p}$  2
- c) Rationalise the denominator and write in simplest form  $\frac{2\sqrt{7}+7}{3\sqrt{14}}$  2
- $$\frac{2\sqrt{7}+7}{3\sqrt{14}} \times \frac{\sqrt{14}}{\sqrt{14}} = \frac{2\sqrt{7 \times 2} + 7\sqrt{14}}{3 \times 14}$$
- $$= \frac{2\sqrt{14} + 7\sqrt{14}}{42}$$
- $$= \frac{9\sqrt{14}}{42} = \frac{3\sqrt{14}}{14}$$
- d) Find the values of  $a$  and  $b$  if  $\frac{1-\sqrt{3}}{1+\sqrt{3}} = a + b\sqrt{3}$ ;  $a, b$  rational. 3

**Question 4: (9 Marks) – Start A New Page**

**Marks**

- a) Factorise fully:
- (i)  $x^2 - 10x + 25$  1
- (ii)  $3q - 15 + 5p - pq$  2
- (iii)  $4a^2 - 36b^2$  2
- $$4(a^2 - 9b^2)$$
- $$= 4(a - 3b)(a + 3b)$$
- (iv)  $8x^3 + 27$  2
- b) Express  $0.5\dot{7}$  as a fraction in its simplest form. 2

**Question 5: (9 Marks) – Start A New Page**

**Marks**

- a) Is  $\sqrt{6\frac{1}{4}}$  rational or irrational? Give a reason. 1
- b) Solve:  $\frac{2+3x}{2} = \frac{1-x}{x}$  [Give your answer correct to 2 decimal places] 3
- c) Simplify:  $\frac{2}{x-3} - \frac{8}{x^2-2x-3}$  2
- d) Solve for  $a$  and  $b$ :  $a + \sqrt{b} = (2 + \sqrt{3})^2$  ;  $a, b$  rational 3

**Question 6: (9 Marks) – Start A New Page**

**Marks**

- a) Without the use of a calculator show that  $6\sqrt{3}$  is greater than  $4\sqrt{6}$  1
- b) Simplify:
- (i)  $\frac{p^2-3p-10}{2p+4} \div \frac{p-5}{2}$  2
- (ii)  $\frac{\frac{x-y}{y-x}}{x-y}$  3
- c) Solve for  $x$  by completing the square:  
 $x^2 - x - 5 = 0$ , give answers in exact simplified form. 3

**Question 7: (9 Marks) – Start A New Page**

**Marks**

a) Solve these equations simultaneously  $y = \frac{3}{x}$  and  $x - y = 2$  3

b) Write the following in simplest form (do not use negative indices)

(i)  $3^{-1} \times \frac{1}{3^{-2}}$  1

(ii)  $\left(a + \frac{1}{a}\right)^{-1}$  2

c) Simplify

(i)  $\frac{7^{n+1} + 7^n}{8}$  1

(ii)  $\left(x^{\frac{1}{3}} - y^{\frac{1}{3}}\right)\left(x^{\frac{2}{3}} + x^{\frac{1}{3}}y^{\frac{1}{3}} + y^{\frac{2}{3}}\right)$  2