

St George Girls High School

Year 9

Yearly Examination

October 2015



Mathematics

Instructions

1. Write in blue or black pen
2. Show all working
3. Marks will be deducted for careless or badly arranged work
4. Calculators may be used
5. Diagrams are not to scale

Time Allowed: 70 minutes
Marks: 80

Section	Marks	Total
A – Chapters 1 – 6	15	
B – Probability	15	
C – Property of Geometric Figures	25	
D – Quadratic Expressions and Algebraic Fractions	25	
Total	80	
		%

Section A

Chapters 1 – 6
(15 marks)

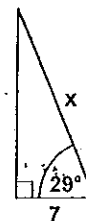
Marks

Show all necessary working in the space provided.
For Questions 1 – 5 Multiple Choice – circle the correct answer.

1. The solution to $\frac{x}{3} - 5 = 4$ is:

- (A) $x = -3$
- (B) $x = 19$
- (C) $x = 27$
- (D) $x = 17$
- (E) $x = -11$

2. The correct expression for the triangle shown is:



- (A) $x = 7 \sin 29^\circ$
- (B) $x = 7 \cos 29^\circ$
- (C) $x = 7 \tan 29^\circ$
- (D) $x = \frac{7}{\sin 29^\circ}$
- (E) $x = \frac{7}{\cos 29^\circ}$

3. If the point $(-1, 2)$ is on the line $y = 3x + b$, the value of b is:

- (A) $b = 5$
- (B) $b = -7$
- (C) $b = 1$
- (D) $b = -1$
- (E) $b = -5$

Section A (continued)

Marks

4. $5x^{-3}$ written with a positive index is:

(A) $-5x^3$

(B) $\frac{1}{5x^3}$

(C) $\frac{-5}{x^3}$

(D) $\frac{1}{5x^{-3}}$

(E) $\frac{5}{x^3}$

5. The area of the curved surface only of a half-cylinder with radius 10 mm and height 24 mm is closest to ?

(A) 377.0 mm²

(B) 1580.0 mm²

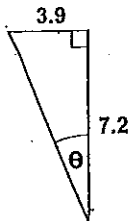
(C) 1822.1 mm²

(D) 754.0 mm²

(E) 911.1 mm²

6. Peta is investing her \$59 000 in an account that compounds annually at 3.2% p.a. How much does she have after 4 years to the nearest cent?

7. Find the value of the pronumeral, θ , correct to the nearest degree.



Section A (continued)

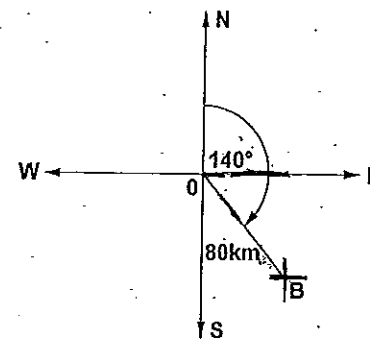
Marks

B. Fully simplify.

$$\sqrt{49x^4y^6} \times (x^2y^5)^2$$

9. Find the equation of the line which has a gradient of 3 and passing through the point (0,-4).

10. A fishing boat starts on a journey from point O and sails 80 km on a bearing of 140° to point B.



a) How far east (to the nearest kilometre) of its starting point is the boat?

b) What is the bearing of O from B?

Section B

Probability
(15 marks)

Marks

Show all necessary working in the space provided.

For Questions 1 – 5 Multiple Choice – circle the correct answer.

1. A letter is randomly chosen from the word ENCYCLOPEDIA. The probability that it is an E is:

- (A) $\frac{1}{12}$
 (B) $\frac{1}{6}$
 (C) $\frac{1}{5}$
 (D) $\frac{1}{10}$
 (E) $\frac{2}{9}$

2. The value of x and y in the two-way table are:

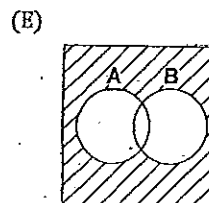
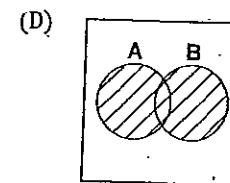
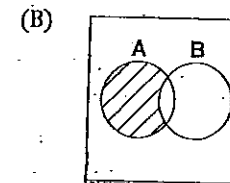
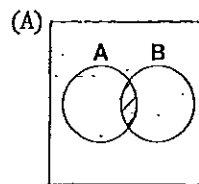
	P	NOT P	Total
Q		6	11
NOT Q	5	y	
Total	x		31

- (A) $x = 9$ $y = 15$
 (B) $x = 5$ $y = 6$
 (C) $x = 10$ $y = 15$
 (D) $x = 10$ $y = 20$
 (E) $x = 10$ $y = 12$

Section B (continued)

Marks

3. Which shaded region represents A or B ?



4. A bag contains 5 pink balls and 2 green balls. Two balls are randomly selected without replacement. The probability of selecting one of each colour is:

- (A) $\frac{5}{7}$
 (B) $\frac{11}{21}$
 (C) $\frac{10}{21}$
 (D) $\frac{10}{49}$
 (E) $\frac{5}{21}$

Section B (continued)

Marks

5. From rolling a biased die, a class finds an experimental probability of 0.28 of rolling a 3. From 300 rolls of the die the expected number of 3's would be:

- (A) 168
- (B) 72
- (C) 84
- (D) 150
- (E) 216

6. From a survey of 100 people, 70 have dogs, 35 have cats, 15 have both dogs and cats and 10 have neither.

5

a) Construct a venn diagram for the survey results.

b) How many people have dogs only?

c) If one of the 100 people were randomly selected, find:

(i) P (have both dogs and cats).

(ii) P (don't have dogs).

(iii) P (only have cats).

Section B (continued)

Marks

7. Two letters are chosen from the word MEET without replacement:

4

a) List the possible outcomes in a table.

	M	E	E	T
M				
E				
E				
T				

b) Find the probability that the two letters chosen are both E.

c) Find the probability that at least one of the letters is an E.

8. The region A only could be thought of as the intersection of A and the complement of B so A only = $A \cap B'$.

1

Use set notation to describe the region 'B only'.

Section C

Property of Geometric Figures
(25 marks)

Marks

Show all necessary working in the space provided.
For Questions 1 – 10 circle the correct answer.

1. The angle that is supplementary to the angle of 75° is:

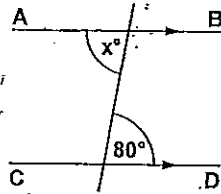
1

- (A) 15°
- (B) 75°
- (C) 115°
- (D) 105°
- (E) 285°

2. What is the value of x if AB is parallel to CD ?

1

- (A) 80°
- (B) 10°
- (C) 100°
- (D) 160°
- (E) 110°



3. A quadrilateral with all four sides equal and opposite sides parallel is best described by a:

1

- (A) parallelogram
- (B) rhombus
- (C) rectangle
- (D) trapezium
- (E) kite

4. The sum of the interior angles in a heptagon is:

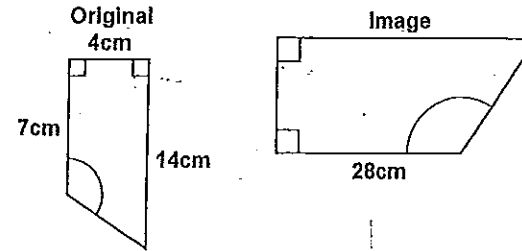
1

- (A) 1260°
- (B) 900°
- (C) 1080°
- (D) 360°
- (E) 630°

Section C (continued)

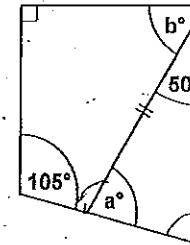
Marks

5. The scale factor in the two similar figures that enlarges the original figure to its image is:



- (A) 7
- (B) 4
- (C) 2
- (D) 1.5
- (E) $\frac{2}{3}$

6. The value of a and b in the diagram are:

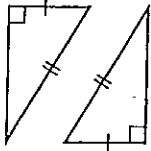


- (A) $a = 40$ $b = 50$
- (B) $a = 65$ $b = 50$
- (C) $a = 65$ $b = 75$
- (D) $a = 85$ $b = 60$
- (E) $a = 50$ $b = 35$

Section C (continued)

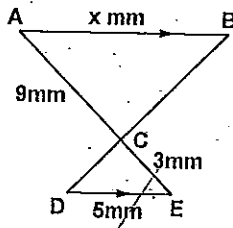
Marks

7. The test that proves these two triangles are congruent is:



- (A) SAS
- (B) RHS
- (C) SSS
- (D) AAA
- (E) AAS

8. The value of x in these similar triangles is:

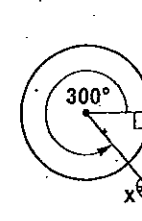


- (A) $x = 1\frac{2}{3}$
- (B) $x = 5.4$
- (C) $x = 15$
- (D) $x = 0.6$
- (E) $x = \frac{3}{5}$

Section C (continued)

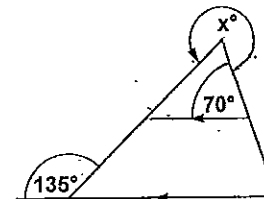
Marks

9. The value of x is:



- (A) $x = 60$
- (B) $x = 100$
- (C) $x = 150$
- (D) $x = 160$
- (E) $x = 120$

10. The value of x is:

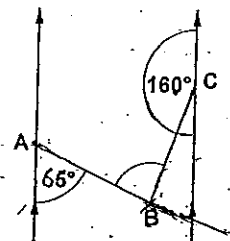


- (A) 205
- (B) 190
- (C) 295
- (D) 275
- (E) 230

Section C (continued)

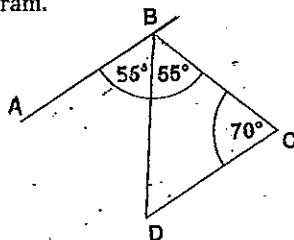
Marks

11. a) Determine the value of $\angle ABC$.



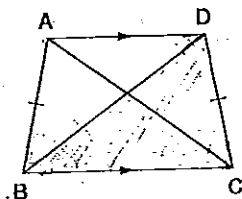
3

b) Give reasons why $AB \parallel DC$ in this diagram.



2

12. Given $AB = DC$ and $\angle ABC = \angle DCB$



a) Prove that $\triangle ABC \cong \triangle DCB$.

3

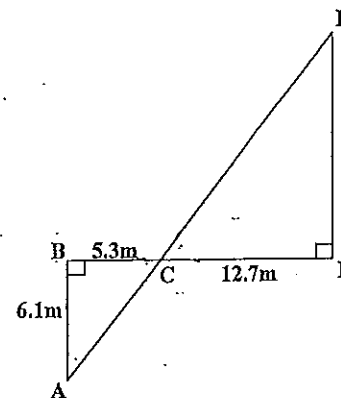
b) Hence prove that $AC = DB$.

1

Section C (continued)

Marks

13.



a) Name the angle that is vertically opposite to $\angle ACB$.

1

b) Prove that $\triangle ABC \parallel \triangle EDC$.

3

c) Find the length of ED to one decimal place.

2

Section D

Quadratic Expressions and Algebraic Fractions
(25 marks)

Marks

Show all necessary working in the space provided.
For Questions 1 – 10 circle the correct answer.

1. $(3x - 1)(x + 2)$ in expanded and simplified form is:

- (A) $3x^2 + 7x - 2$
- (B) $3x^2 + 5x - 2$
- (C) $3x^2 - 7x - 2$
- (D) $3x^2 + 5x + 2$
- (E) $3x^2 - 7x + 2$

2. $(5x - 1)^2$ in expanded and simplified form is:

- (A) $25x^2 + 1$
- (B) $25x^2 - 1$
- (C) $25x^2 - 5x + 1$
- (D) $25x^2 - 10x + 1$
- (E) $25x^2 - 10x - 1$

3. If $(x - 3)$ is a factor of $x^2 + 4x - 21$, the other factor is:

- (A) x
- (B) $x + 7$
- (C) $x - 7$
- (D) $x - 18$
- (E) $x + 4$

4. Factorise completely $3(x - y) - x(y - x)$.

- (A) $(x - y)(3 - x)$
- (B) $(x - y)(x - 3)$
- (C) $(y - x)(3 - x)$
- (D) $(x + 3)(x - y)$
- (E) $(x - 3)(x + y)$

Section D (continued)

Marks

5. $(5x - 3y)(5x + 3y)$ in expanded and simplified form is:

- (A) $25x^2 - 6y - 9y^2$
- (B) $25x^2 + 9y^2$
- (C) $10x^2 - 6y^2$
- (D) $25x^2 - 9y^2$
- (E) $10x^2 - 3y + 9y^2$

6. Factorise completely by grouping $2pq - 9 - 18q + p$.

- (A) $(2q - 1)(p + 9)$
- (B) $(p + 9)(2q + 1)$
- (C) $(2q + 1)(p - q)$
- (D) $(2q + 9)(p - 1)$
- (E) $(2q - 9)(p + 1)$

7. Factorise $4x^2 - 81$.

- (A) $(2x - 9)^2$
- (B) $(4x + 81)(4x - 81)$
- (C) $(x - 9)(4x + 9)$
- (D) $(2x + 9)(2x - 9)$
- (E) $2(2x^2 - 81)$

8. Simplify the following completely $\frac{4}{3x} + \frac{2}{9x}$.

- (A) $\frac{1}{2x}$
- (B) $\frac{14}{9x^2}$
- (C) $\frac{41}{27x}$
- (D) $\frac{14}{9x}$
- (E) $\frac{42x}{27x^2}$

Section D (continued)

Marks

9. Simplify $\frac{5x+5}{x^2+5x+6} \times \frac{x+3}{x+1}$

- (A) $5(x+2)$
- (B) $\frac{5}{x+1}$
- (C) $x+2$
- (D) $\frac{5}{x+2}$
- (E) $5(x+3)$

10. The solution to $\frac{5}{2-x} = \frac{3}{4x+1}$ is:

- (A) $-\frac{1}{23}$
- (B) $\frac{11}{17}$
- (C) $\frac{11}{23}$
- (D) $\frac{1}{23}$
- (E) $-\frac{1}{17}$

11. a) Simplify $\frac{3}{2x} \times \frac{x}{6}$

4

b) Factorise $1 - a^2$

c) Simplify $\frac{2x-16}{3x-24}$

Section D (continued)

Marks

12. Simplify $\frac{1}{(x+3)(x+4)} + \frac{2}{(x+4)(x+5)}$

3

13. Solve $\frac{4}{x} - \frac{2}{3x} = 20$

2

14. Simplify by factoring first

6

$$\frac{2x^2-18x+40}{x^2-x-12} \times \frac{3x+15}{4x^2-100}$$

Multiple choice
SECTION A

1. C
2. E
3. A
4. E
5. D

6. $59000 \times (1.032)^4$
 $= \$66922.29$

7. $\frac{3.9}{7.2} = \tan \theta$

$\theta = \tan^{-1}\left(\frac{3.9}{7.2}\right)$
 $\approx 28^\circ$

8. $\sqrt{49x^4y^6} \times (x^2y^5)^2$
 $= 7x^2y^3 \times x^4y^{10}$
 $= 7x^6y^{13}$

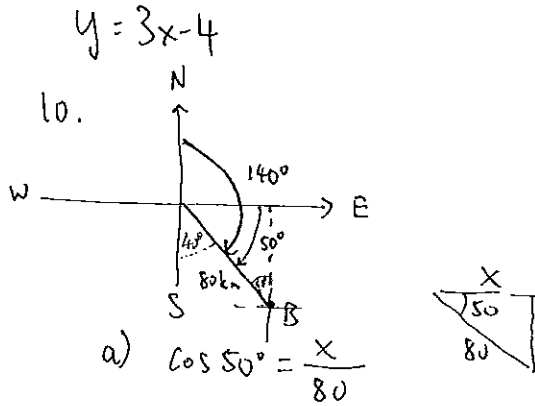
9. $m=3$ (0, -4)

use $y - y_1 = m(x - x_1)$ → point gradient formula.

$y + 4 = 3(x - 0)$

$y + 4 = 3x$

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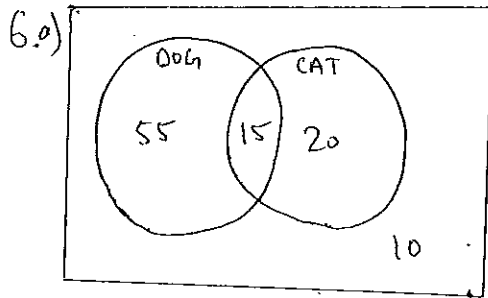
a) $\cos 50^\circ = \frac{x}{80}$

$x = 51 \text{ km (nearest km)}$

b) Bearing of O from B
 $= 360^\circ - 40^\circ = 320^\circ \text{ NW}$

SECTION B.

1. B
2. C
3. D
4. C
5. C



b) 55

c) i) 0.15

ii) 0.3

iii) 0.2

7. a)

	M	E	E	T
M	MM	ME	ME	MT
E	EM	EE	EE	ET
E	EM	EE	EE	ET
T	TM	TE	TE	TT

b) 0.25

c) 0.75

8. $B = A \cap B$

SECTION C

1. D
2. A
3. B
4. B
5. B
6. B
7. B
8. C
9. C
10. C

11. a) $\angle ABC = 85^\circ$

b) $\angle BDC = 55^\circ$ (Angle Sum of triangle)

$\therefore \angle ABD = \angle BDC$

which is, alternate angles on parallel lines are equal

$\therefore AB \parallel DC$

12. a) $\triangle ABC$ and $\triangle DCB$.

$AB = DC$ (given)

BC is common

$\angle ABC = \angle DCB$ (given)

$\therefore \triangle ABC \cong \triangle DCB$ (SAS)

b) $AC = DB$ (corresponding sides on congruent triangles are equal)

13. a) $\angle ECD$

b) $\angle ACB = \angle ECD$ (vert. cally opp.)

$\angle EDC = \angle CBA$ (given)

$\therefore \triangle ABC \cong \triangle EDC$ (equiangular)

c) $12.7/5.3 = 2.396$

$6.1 \times 2.396 = 14.6156$

$= 14.6$ (1 d.p) cm.

SECTION D

1. B

2. D

3. B

4. D

5. D

6. C

7. D

8. D

9. D

10. D

11 a) $\frac{3}{2x} \times \frac{x}{6} = \frac{3x}{12x} = \frac{1}{4}$

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

c) $\frac{2x-16}{3x-24} = \frac{2(x-8)}{3(x-8)}$

$= \frac{2}{3}$

12. $\frac{1}{(x+3)(x+4)} + \frac{2}{(x+4)(x+5)}$
Put under a common denominator.

$$\frac{(x+5)}{(x+3)(x+4)(x+5)} + \frac{2(x+3)}{(x+3)(x+4)(x+5)}$$

$$= \frac{(x+5) + 2(x+3)}{(x+3)(x+4)(x+5)}$$

$$= \frac{x+5+2x+6}{(x+3)(x+4)(x+5)}$$

$$= \frac{3x+11}{(x+3)(x+4)(x+5)}$$

$$= \frac{3x+11}{(x+3)(x+4)(x+5)}$$

13. $\frac{4}{x} - \frac{2}{3x} = 20$

$$\frac{4(3)}{x(3)} - \frac{2}{3x} = 20$$

$$\frac{12}{3x} - \frac{2}{3x} = 20$$

$$\frac{10}{3x} = 20$$

$$10 = 20 \times 3x = 60x$$

$$10 = 60x$$

$$x = \frac{10}{60} = \frac{1}{6}$$

14. $\frac{2x^2-18x+40}{x^2-x-12} \times \frac{3x+15}{4x^2-100}$

$$= \frac{2(x-4)(x-5)}{(x+3)(x-4)} \times \frac{3(x+5)}{4(x+5)(x-5)}$$

$$= \frac{2(x-4)(x-5)3(x+5)}{4(x+3)(x-4)(x+5)(x-5)}$$

$$= \frac{2 \times 3}{4(x+3)} = \frac{6}{4(x+3)}$$

$$= \frac{3}{2(x+3)}$$