Name: _____

SCEGGS Darlinghurst

2009
Year 9
Semester 2 Examination

Mathematics (Pathway 5.3E)

General Instructions

- Time allowed – 1½ hours
- **Carefully** read the instructions
- Attempt **all** questions
- Write your name at the top of each page
- Write using blue or black pen
- No diagram is drawn to scale
- Show all your working in the spaces provided in the examination paper
- Marks may be deducted for careless or badly arranged work
- Calculators may be used

Question		Possible Mark	Mark Awarded
1	Algebra	14	
2	Indices	13	
3	Geometry	15	
4	Area and Volume	10	
5	Co-ordinate Geometry	8	
6	Trigonometry	10	
TOTAL		70	

70 marks
Attempt Questions 1 – 6

Write your answers in the spaces provided in the examination paper.
Write your name at the top of each page.

Marks

Question 1 (14 marks) **Algebra**

(a) Simplify:

(i) $6y - 2x + 5 + x - 2y - 7$ 1

(ii) $\frac{2x+3}{2} - \frac{x+1}{3}$ 2

(iii) $\frac{6n}{5} \times \frac{10}{7n} \div \frac{3}{2n}$ 2

Question 1 continues on the next page

Name: .. ..

Marks

Question 1 (continued)

(b) Expand and simplify:

(i) $(2y+5)^2$ **1**

(ii) $2a(a+b)-a(3a-4b)$ **2**

(c) Factorise:

(i) x^2-9 **1**

(ii) $a^2-10a+25$ **1**

(iii) $5x^2-7x-6$ **2**

Question 1 continues on the next page

Name: .....

Marks

Question 1 (continued)

(d) Make v the subject of this formula: **2**

$$u=\frac{v+w-1}{v-w+1}$$

Name: .....

Question 2 (13 marks) **Indices** **Marks**

(a) Simplify:

(i) $12y^6 \div 3y^2$ **1**

(ii) $(2x^2)^3$ **1**

(iii) $\dfrac{m^7 \times m^6}{m^{15}}$ **1**

(iv) $5x^{\frac{1}{2}} \times 10x^{\frac{1}{2}} \times (2x^2)^0$ **1**

Question 2 continues on the next page

Name: .....

Question 2 (continued) **Marks**

(b) Find the value of n if $3^n = 243$. **1**

(c) Solve the following equations:

(i) $6(x-3) + 4x = 8$ **2**

(ii) $\dfrac{x+1}{2} - \dfrac{x-1}{3} = \dfrac{x+1}{3} - \dfrac{x-1}{2}$ **2**

(d) Solve and show solution on number line: **2**

$$\frac{4-2a}{3} > 4$$

Question 2 continues on the next page

Name: .....

Marks

Question 2 (continued)

(e) Divide the product of $\left(-3x^7y^5\right)$ and $\left(-2xy^6\right)^3$ by $\left(-6x^3y^8\right)^2$. **2**

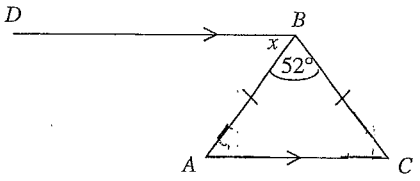
Name: .....

Marks

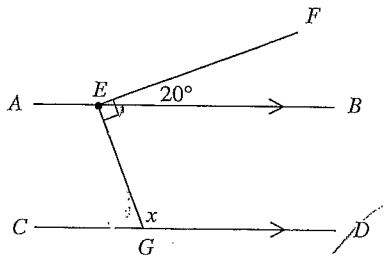
Question 3 (15 marks) **Geometry**

(a) Find the value of x.

(i) **1**



(ii) **1**



Question 3 continues on the next page

Name: .....

Marks

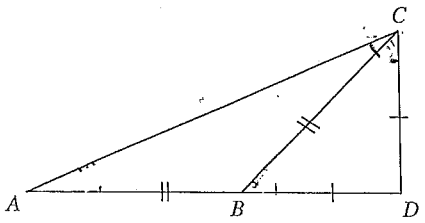
Question 3 (continued)

(b) If a polygon has 20 sides, find:

(i) the sum of the exterior angles **1**

(ii) the sum of the interior angles. **1**

(c) Prove that in the diagram below $\angle ACD = 3 \times \angle CAD$, **3**



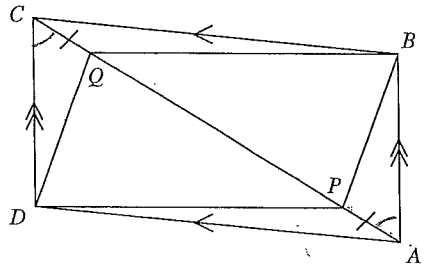
Question 3 continues on the next page

Name: .....

Marks

Question 3 (continued)

(d) $ABCD$ is a parallelogram. Choose P and Q on the diagonal AC such that $AP = CQ$.



(i) Prove that $\Delta ABP \equiv \Delta CDQ$. **3**

(ii) In a similar manner it can be proved that $\Delta ADP \equiv \Delta CBQ$. **2**
Prove that $BQDP$ is a parallelogram.

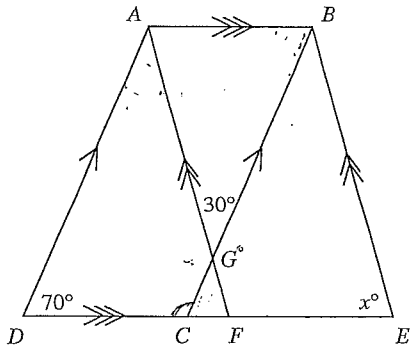
Question 3 continues on the next page

Name: .....

Marks

Question 3 (continued)

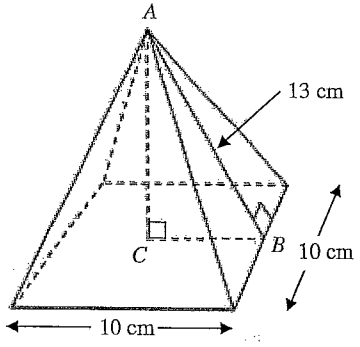
(e) Find x giving reasons for your answer. 3



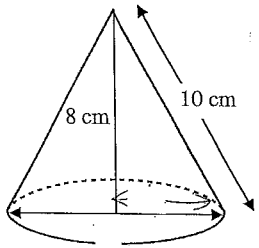
Marks

Question 4 (10 marks) **Area and Volume**

(a) (i) This solid is a square pyramid. Find its volume. 2



(ii) This solid is a cone. Find its surface area in square metres correct to 4 significant figures. 3



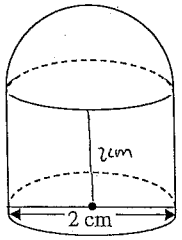
Question 4 continues on the next page

Marks

Question 4 (continued)

(b) Ram Flour Mills in Hobart has two cylindrical silos. Each silo has a diameter of 5 m and a height of 20 m. What is the total capacity of the two silos to the nearest kilolitre? **2**

(c) A hemisphere is mounted on a cylinder. The height of the cylinder is the same as its diameter.

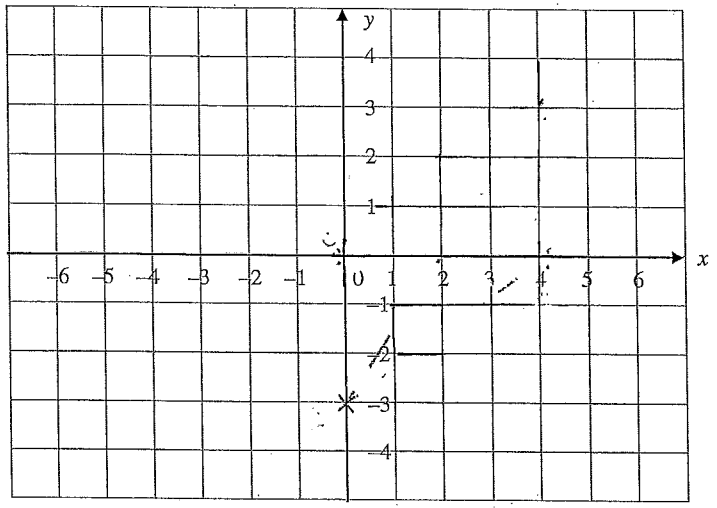


What fraction of the total surface area is the surface area of the hemisphere. **3**

Marks

Question 5 (8 marks) **Co-ordinate Geometry**

(a) Plot on a number plane the point $A(4, 3)$ and draw the interval AO where O is the origin. Plot the points $B(0, -3)$ and $C(4, 0)$ on your diagram. **1**



(b) Show that the line BC has the equation $3x - 4y - 12 = 0$. **2**

(c) Find the length of the interval AB. **1**

Question 5 continues on the next page

Question 5 (continued)

Marks

(d) Find the midpoint of AB. **1**

(e) Show that $OACB$ is a parallelogram. **2**

(f) Find the area of $OACB$. **1**

Name: .....

Marks

Question 6 (10 marks) **Trigonometry**

(a) A 12m ladder standing on level ground makes an angle of $60°$ with the ground.

(i) Draw a diagram to represent this information. **1**

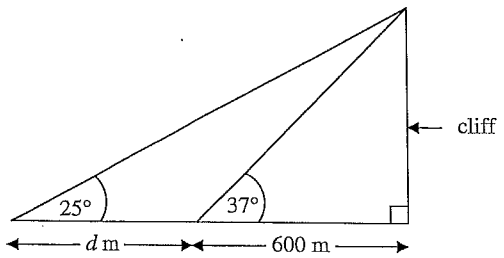
(ii) Find how far up the wall the ladder reaches. Give your answer correct to 2 significant figures. **2**

Question 6 continues on the next page

Marks

Question 6 (continued)

(b) The angle of elevation of the top of a cliff from a boat 600m out to sea is 37°. If the boat then travels a further d metres out to sea, the angle of elevation changes to 25°.



Find:

(i) The height of the cliff above sea level to two decimal places. **1**

(ii) The value of d to the nearest metre. **3**

Question 6 continues on the next page

Marks

Question 6 (continued)

(c) A ship is 5 nautical miles from a wharf on a bearing of 321°, and a lighthouse is 11.5 nautical miles from the wharf on a bearing of 231°. Find the bearing of the ship from the lighthouse. (Answer correct to the nearest minute.) **3**

End of paper

SOLUTIONS to 5.3E, Semester 2, 2009

Note Title 28/10/2009

Question 1

(a) (i) $4y - x - 2$ ✓

(ii) $\frac{4x+7}{6}$ ✓ ✓

(iii) $\frac{8n}{7}$ ✓ ✓

(b) (i) $4y^2 + 20y + 25$ ✓

(ii) $-a + 6ab$ ✓✓

(c) (i) $(x+3)(x-3)$ ✓

(ii) $(a-5)^2$ ✓

(iii) $(5x+3)(x-2)$ ✓✓

(d) $v = \frac{uw - u + w - 1}{u-1}$

or $= \frac{(u+1)(w-1)}{(u-1)}$ ✓✓

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I'm #1

Question 2

(a) (i) $4y^4$ ✓

(ii) $8x^6$ ✓

(iii) $m^{-2} = \frac{1}{m^2}$ ✓

(iv) $50x$ ✓

(b) $n = 5$ ✓

(c) (i) $x = 2.6$ ✓✓

(ii) $x = 0$ ✓✓

(d) $a < -4$ ✓

(e) $\frac{2x^4y^7}{3}$ ✓✓

13

Question 3

(a) (i) $x = 64°$ ✓

(ii) $x = 110°$ ✓

(b) (i) $360°$ ✓

(ii) $3240°$ ✓

(c) FORMAL PROOF ✓✓✓

(d) (i) SAS Formality ✓✓

(ii) FORMAL PROOF ✓✓

(e) FORMAL PROOF ✓✓✓

15

Question 4

(a) (i) $V = 400\ cm^3$ ✓✓

(ii) $0.0302\ m^2$ ✓✓✓

(b) 785 kL ✓✓

(c) $\frac{2}{7}$ ✓✓✓

10

Question 5

(a) Plotting ✓

(b) $m = \frac{3}{4}$ $b = -3$ ✓

$3x - 4y - 12 = 0$ ✓

(c) $d = \sqrt{52}$ ✓

(d) MP = (2, 0) ✓

(e) 2 pairs of opposite sides parallel ✓✓

(f) Area $= 3 \times 4$

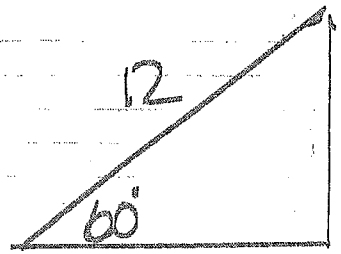
$= 12$ units ✓

8

Question 6

10

(a) (i)



✓

(ii) $\sin 60 = \frac{h}{12}$

$h = 12 \sin 60$ ✓

$= 10.39$ ✓

$= 10$ (2 sig fig)

(b) (i) $h = 452.13$ ✓

(ii) $d = 370$ ✓✓

(c) $\theta = \tan^{-1}\left(\frac{5}{11.5}\right)$ ✓✓

Bearing $= 27°30'$ ✓