

Name: \_\_\_\_\_ ( )

Class: Sec 2 / ( )



南 华 中 学  
NAN HUA HIGH SCHOOL  
END OF YEAR EXAMINATION 2007

**Subject** : Mathematics Part I  
**Level** : Secondary Two  
**Date** : 5 October 2007  
**Duration** : 1 hour

**INSTRUCTIONS TO CANDIDATES**

Write your name, index number and class in the spaces at the top of this page.

**Answer all questions.**

Write your answers in the spaces provided on the question paper.

All essential working must be shown in the spaces provided.

Omission of essential working may result in loss of marks.

**ELECTRONIC CALCULATORS MAY NOT BE USED FOR THIS PAPER.**

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of marks for this paper is 40.

If the degree of accuracy is not specified in the question, and the answer is not exact, give the answer correct to three significant figures. Give answers in degrees to one decimal place.

1. Evaluate, expressing your answers in standard form,

(a)  $(727 \times 10^{-5}) - (12.2 \times 10^{-4})$  [2]

(b)  $\frac{(3 \times 10^4)^2}{(6 \times 10 \times 2 \times 10^{-3})}$  [2]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

2. (a) Factorise the following

(i)  $8x^2 + 24xy + 18y^2$

(ii)  $3xy + 6y - 5x - 10$

[4]

(b) Expand  $(2x-1)(2x^3 + x^2 + 6x + 3)$

[2]

Answer

(a) (i) \_\_\_\_\_

(ii) \_\_\_\_\_

(b) \_\_\_\_\_

(c) Simplify  $\frac{6a}{4b-6} - \frac{4a}{2b-3} + \frac{a-2ab}{2(3-2b)}$  [3]

Answer (c) \_\_\_\_\_

3. Express  $x$  in terms of  $a$ ,  $b$  and  $c$ , given that  $\frac{2x+c}{x} = b+a$  [2]

Answer \_\_\_\_\_

4. Solve the simultaneous equations

[3]

$$2x + 5y = -27$$

$$x - 3y = 25$$

Answer  $x =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

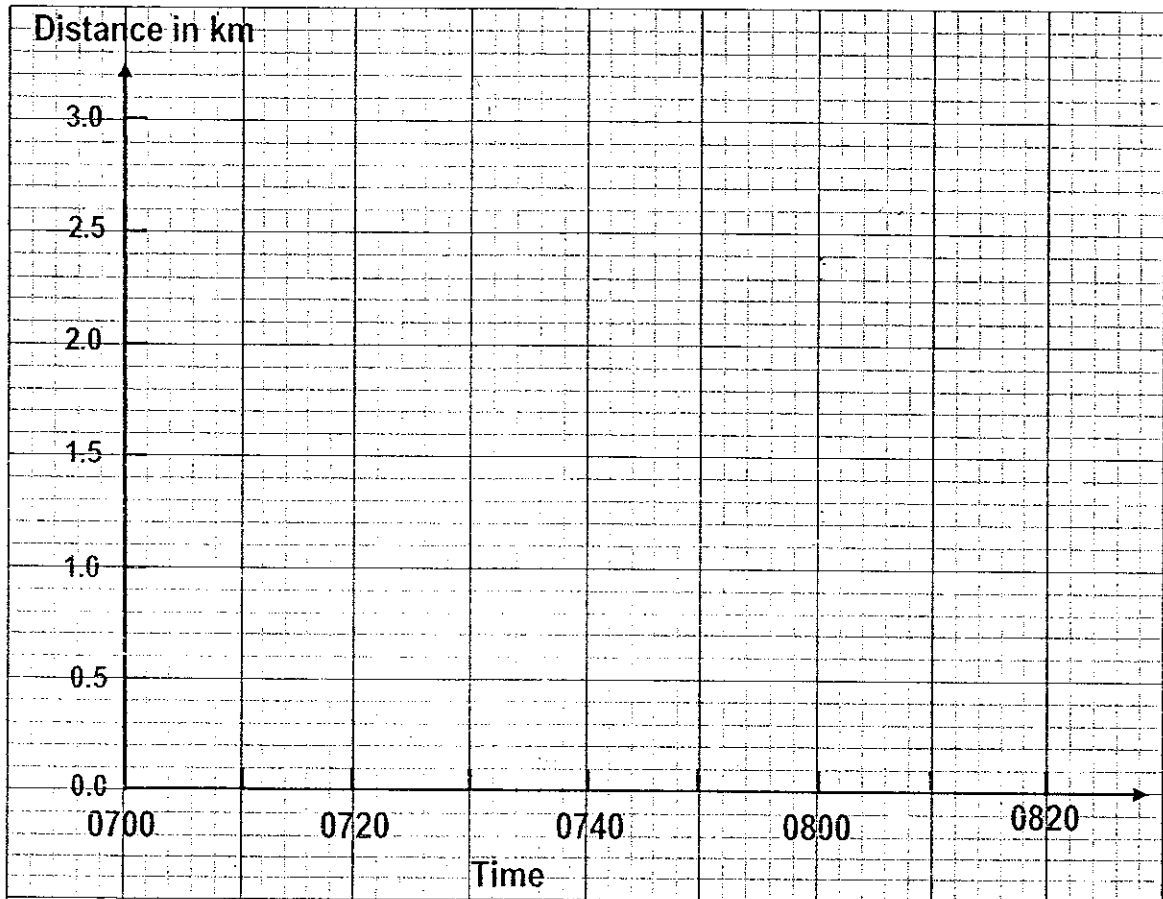
5. A model aeroplane was built using a scale of 1:500.
- (a) If the actual length of the aeroplane is 45 metres, find in centimetres, the length of the model aeroplane. [1]
- (b) Given that the area on the wing span of the model is  $30 \text{ cm}^2$ , calculate the actual area of the wing span of the aeroplane. Give your answers in square metres. [2]

Answer (a) \_\_\_\_\_ cm

(b) \_\_\_\_\_  $\text{m}^2$

6. Paul started jogging from his house to the park at 0700. The park is 3 km from his house and he took 30 minutes to reach the park. At the park, he rested for 10 minutes before jogging back at an average speed of 6 km/h.

(a) Draw the distance-time graph to illustrate the above information on the axes provided below. [2]



(b) What was the total distance jogged? [1]

(c) What was Paul's average speed in km/h for the whole journey? [1]

Answer (b) \_\_\_\_\_ km

(c) \_\_\_\_\_ km/h

7. Joe and Mary started to walk together at the same constant speed of  $x$  km/h on a 9 km journey. After 3 km, Joe decided to run and increased his speed by 2 km/h, travelling at this speed for the remaining 6 km. Mary continued to walk at the constant speed of  $x$  km/h till the end.
- (a) Write down, in terms of  $x$ , the time taken by Mary to complete the whole journey. [1]
- (b) Write down, in terms of  $x$ , the time taken by Joe to complete the whole journey. [1]
- (c) Given that Joe finished the journey half an hour earlier than Mary, form an equation in  $x$  and show that it reduces to  $x^2 + 2x - 24 = 0$ . Hence, find the speed  $x$  in km/h [3]

Answer (a) \_\_\_\_\_ h

(b) \_\_\_\_\_ h

(c)  $x =$  \_\_\_\_\_ km/h

8. Given that the universal set  $\varepsilon = \{x: x \text{ is an integer and } 2 < x < 14\}$ ,  
 $A = \{x: 3x+1 < 28\}$  and  $B = \{x: x \text{ is a multiple of } 4\}$
- (a) List the elements of  $A$  [1]  
(b) Find  $n(A \cap B)$  [1]  
(c) Represent the given sets using a Venn diagram [2]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

9. Given that  $P = \begin{pmatrix} 5 & 2 \\ -1 & 3 \end{pmatrix}$  and  $Q = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

- (a) Express  $3P - Q$  as a single matrix. [1]  
(b) Find  $P^2$  [1]  
(c) Find  $PQ$  [1]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

(c) \_\_\_\_\_

10. Given that  $y$  is directly proportional to  $(x^2 - 1)$ , and that  $y = 1$  when  $x = 2$ .
- (a) Find the value of  $y$  when  $x = 4$  [2]
- (b) Find the values of  $x$  when  $y = 33$  [1]

Answer (a)  $y =$  \_\_\_\_\_

(c)  $x =$  \_\_\_\_\_ or \_\_\_\_\_

Answers to Mathematics Part I

1. (a)  $6.05 \times 10^{-3}$   
(b)  $7.5 \times 10^9$
2. (a) (i)  $2(2x+3y)^2$   
(ii)  $(3y-5)(x+2)$   
(b)  $4x^4 + 11x^2 - 3$   
(c)  $\frac{a}{2}$
3.  $x = \frac{c}{b+c-2}$
4.  $x=4, y=-7$
5. (a) 9 cm,  
(b)  $750 \text{ m}^2$
6. (b) 6 km  
(c)  $5\frac{1}{7} \text{ km/h}$
7. (a)  $\frac{9}{x}$ ,  
(b)  $\frac{3}{x} + \frac{6}{x+2}$   
(c) 4 km/h
8. (a)  $A = \{3, 4, 5, 6, 7, 8\}$   
(b) 2
9. (a)  $\begin{pmatrix} 14 & 6 \\ -3 & 8 \end{pmatrix}$   
(b)  $\begin{pmatrix} 23 & 16 \\ -8 & 7 \end{pmatrix}$   
(c)  $\begin{pmatrix} 5 & 2 \\ -1 & 3 \end{pmatrix}$
10. (a) 5  
(b)  $\pm 10$

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Class: Sec 2 / (       )



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**END OF YEAR EXAMINATION 2007**

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**Subject : Mathematics Part II**  
**Level : Secondary Two**  
**Date : 5 October 2007**  
**Duration : 1 hour 30 min**

**INSTRUCTIONS TO CANDIDATES**

Write your name, index number and class in the spaces at the top of this page.

**Answer all questions.**

Write your answers in the spaces provided on the question paper.

All essential working must be shown in the spaces provided.

Omission of essential working may result in loss of marks.

You are expected to use an electronic calculator to evaluate explicit numerical expressions

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [    ] at the end of each question or part question.

The total of the marks for this paper is 60.

If the degree of accuracy is not specified in the question, and the answer is not exact, give the answer correct to three significant figures. Give answers in degrees to one decimal place.

1. (a) Simplify  $\left(\frac{c^2}{2a^3}\right) \times \left(\frac{-a^2}{bc}\right)^2 \div \left(\frac{ac}{b}\right)$  [2]

(b) Given that  $x^2 + y^2 = 16$  and  $xy = 6.25$ , calculate the value of  $4(x+y)^2 + 3(x-y)^2$  [2]

Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_

2. Mr Lee and Mr Tan each decided to buy a new plasma TV which was priced in the showroom at \$6 880.
- (a) Mr Lee paid for his new TV in cash and was given a discount. Given that he paid \$6 020 for his new TV, calculate the percentage discount he received. [2]
- (b) Mr Tan agreed to pay 40% of the showroom price of the TV as a deposit and the balance in equal instalments over a period of two years at zero interest. Calculate the amount of each monthly instalment [2]
- (c) If the salesman had sold the TV at the showroom price of \$6 880, he would have made a profit of 25% on the cost price. Calculate the cost price of each new TV. [2]

Answer (a) \_\_\_\_\_ %

(b) \$ \_\_\_\_\_

(c) \$ \_\_\_\_\_

3. 3 men, working at the same rate, can renovate a house in 42 days.
- (a) How many days are required to renovate the same house if 1 extra man was employed? [2]
- (b) If each man is paid \$63 a day, how much does it cost to complete the renovation in 14 days? [2]

Answer (a) \_\_\_\_\_ days

(b) \$ \_\_\_\_\_

4. (a) Solve the inequality  $2x - 1 < x + 3 \leq 6x - 2$ . [2]
- (b) Given that  $x$  and  $y$  are integers such that  $-2 \leq x \leq 4$  and  $1 \leq y \leq 5$ . Find
- (i) the greatest possible value of  $(y + x)(y - x)$  [2]
- (ii) the least value of  $xy$  [1]

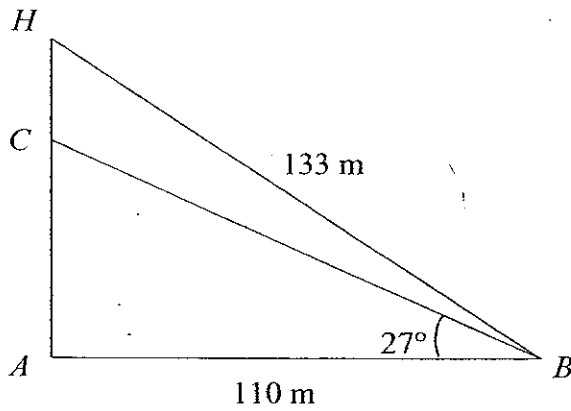
Answer (a) \_\_\_\_\_

(b) (i) \_\_\_\_\_

(ii) \_\_\_\_\_

5. A boat at  $B$  observes that the angle of elevation of the cliff at  $C$  is  $27^\circ$ . A lighthouse stands on the edge of the cliff. The boat is 110 m from  $A$ , the foot of the cliff. Given that  $BH = 133$  m, calculate

- (a) the angle of elevation of the top of the lighthouse  $H$  from  $B$  [2]  
(b) the height of the lighthouse  $CH$  [2]



Answer (a) \_\_\_\_\_

(b) \_\_\_\_\_ m

6. Two models of handphone, a Noka model and a Samsu model, are sold in shop *M-Two* and shop *S-One*. Both shops sold the handphones at \$ $x$  each for the Noka model and \$ $y$  each for the Samsu model. The number of handphones for each model sold in one week is given in the following table.

	Noka Model	Samsu Model
Shop <i>M-Two</i>	12	10
Shop <i>S-One</i>	8	15

Shop *M-Two* and *S-One* collected \$4 200 and \$4 300 respectively from the sales of these handphones.

It is given that  $H = \begin{pmatrix} 12 & 10 \\ 8 & 15 \end{pmatrix}$ ,  $P = \begin{pmatrix} x \\ y \end{pmatrix}$  and  $R = \begin{pmatrix} 4200 \\ 4300 \end{pmatrix}$ .

- (a) Write down an equation relating  $H$ ,  $P$  and  $R$ . [1]  
 (b) Find  $H^{-1}$ . [2]  
 (c) Calculate  $H^{-1}R$ . [2]  
 (d) Explain the significance of the answer in part (c) [1]

Answer

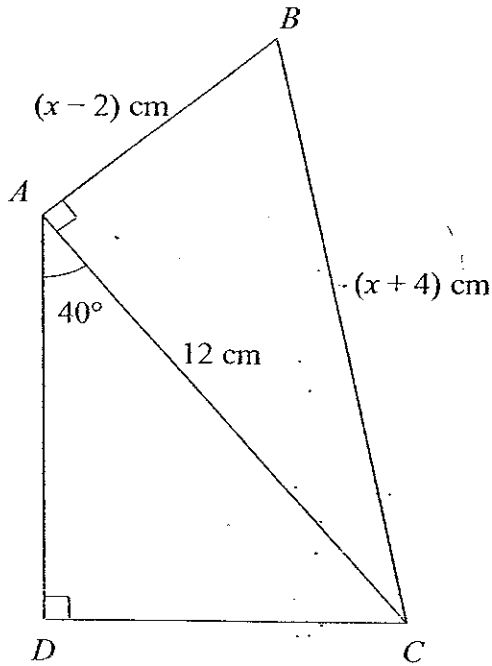
(a) \_\_\_\_\_

(b) \_\_\_\_\_

(c) \_\_\_\_\_

(d) \_\_\_\_\_

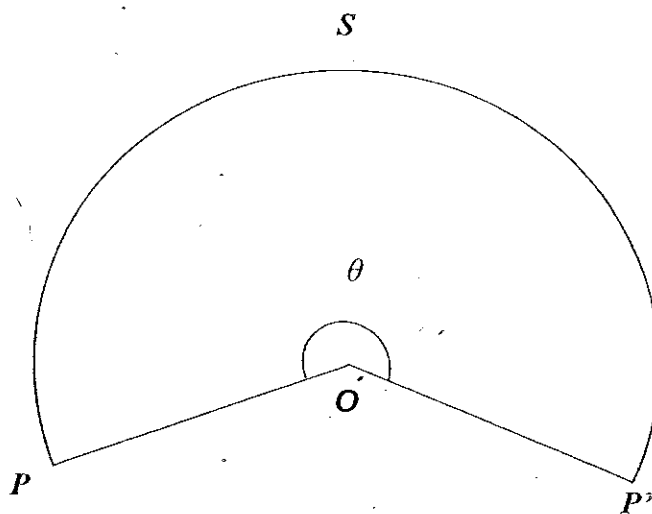
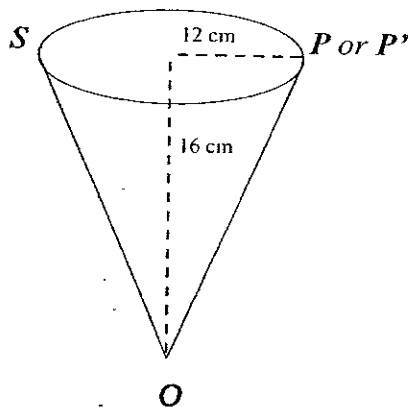
7. The figure below is formed by 2 right-angled triangles  $BAC$  and  $ADC$ .  
Given that angle  $DAC$  is  $40^\circ$  and  $AC = 12$  cm,  $AB = (x - 2)$  cm and  $BC = (x + 4)$  cm.  
Calculate (a) the length  $AD$  [2]  
(b) the value of  $x$  [3]



Answer (a) Length  $AD =$  \_\_\_\_\_ cm

(b)  $x =$  \_\_\_\_\_

8. A paper cone of base radius 12 cm and height 16 cm is shown below.
- (a) Calculate the lateral curved surface area of the cone [3]
- (b) The cone is cut open with a scissor along the side  $OP$  to reveal a sector  $OPSP'$  as shown. Find the size of the angle  $\theta$  of the sector. [2]
- (Take  $\pi = 3.142$ )

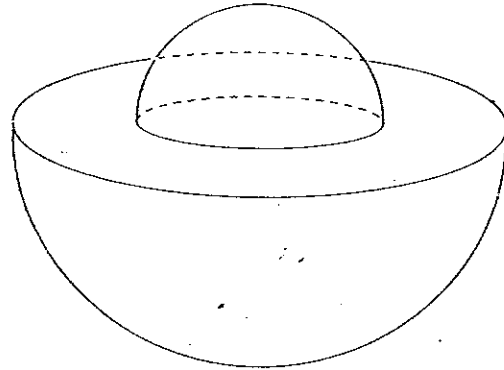


Answer (a) \_\_\_\_\_  $\text{cm}^2$

(b) Angle  $\theta =$  \_\_\_\_\_

9. Two hemispheres of different sizes are glued together to form a new solid as shown. The radius of the bigger hemisphere is twice the radius of the smaller hemisphere. If the volume of the smaller hemisphere is  $18\pi \text{ cm}^3$ ,

- (a) Find, in terms of  $\pi$ , the volume of the bigger hemisphere [2]
- (b) Find the total surface area of the new solid if the radius of the smaller hemisphere is 3 cm. ( Take  $\pi$  as 3.142 ) [2]

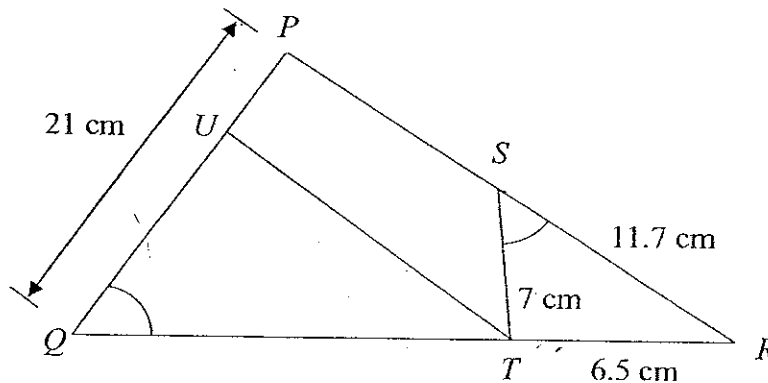


Answer (a) \_\_\_\_\_  $\text{cm}^3$

(b) \_\_\_\_\_  $\text{cm}^2$

10. In the figure,  $\angle PQR = \angle TSR$ .  $PQ = 21$  cm,  $ST = 7$  cm,  $RT = 6.5$  cm,  $RS = 11.7$  cm.  
 $UT$  is not parallel to  $PR$ .

- (a) Name a pair of similar triangles and give reasons for your answer. [2]  
(b) Find the length of  $QT$ . [2]



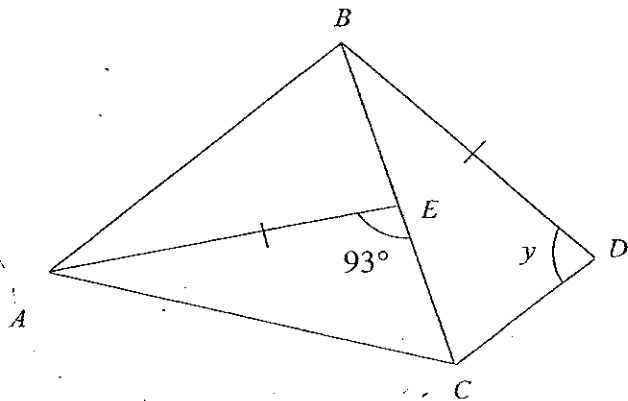
Answer (a) \_\_\_\_\_

(b) Length  $QT =$  \_\_\_\_\_ cm

11. In the figure below,  $AB = 10$  cm,  $BC = 10$  cm,  $EC = 5$  cm,  $CD = 5$  cm and  $AE = BD$ .

(Note the figure is not drawn to scale)

- (a) Name a pair of congruent triangles and state your reasons for their congruency [3]  
(b) Find the angle  $y$  as shown. [2]



Answer (a) \_\_\_\_\_

(b) angle  $y =$  \_\_\_\_\_

12. Answer the whole of this question on a sheet of graph paper.

The variables  $x$  and  $y$  are connected by the equation  $y = x^2 - 3x - 7$ .

- (a) The table below shows some corresponding values of  $x$  and  $y$ .  
Calculate the value of  $k$ .

[1]

$x$	-2	-1	0	1	2	3	4	5	6
$y$	3	-3	-7	-9	-9	$k$	-3	3	11

- (b) Taking 2 cm to represent 1 unit on the  $x$ -axis and 1 cm to represent 1 unit on the  $y$ -axis, draw the graph of  $y = x^2 - 3x - 7$ , for values of  $x$  in the range  $-2 \leq x \leq 6$ .

[3]

- (c) From your graph, write down the equation of the line of symmetry.

[1]

- (d) On the same graph, draw and label the graph of  $y = -2$ .

[1]

- (e) Hence, estimate the  $x$  co-ordinates of the points of intersection of  $y = x^2 - 3x - 7$  and  $y = -2$ .

[2]

Answer (a)  $k =$  \_\_\_\_\_

(c) \_\_\_\_\_

(e)  $x =$  \_\_\_\_\_ or

$x =$  \_\_\_\_\_

Answers to Mathematics Part II

1. (a)  $\frac{1}{2bc}$  (b) 124.5
2. (a) 12.5 % (b) \$172 (c) \$5 504
3. (a) 31.5 (b) \$7 938
4. (a)  $1 \leq x < 4$  (b)(i) 25 (ii) -10
5. (a)  $34.2^\circ$  (b) 18.7 m
6. (a)  $HP = R$   
(b)  $\begin{pmatrix} 0.15 & -0.1 \\ -0.08 & 0.12 \end{pmatrix}$  or  $\begin{pmatrix} \frac{3}{20} & \frac{1}{10} \\ \frac{2}{25} & \frac{3}{25} \end{pmatrix}$  (c)  $\begin{pmatrix} 200 \\ 180 \end{pmatrix}$   
(d) The answer shows the prices of the Noka and Samsu models respectively
7. (a) 9.19 cm (b) 11
8. (a)  $754 \text{ cm}^2$  (b)  $216^\circ$
9. (a)  $144 \pi \text{ cm}^3$  (b)  $368 \text{ cm}^2$
10. (a)  $\triangle PRQ, \triangle TRS$  (b) 28.6 cm
11. (a)  $\triangle ABE \equiv \triangle BCD$  (SSS Test) (b)  $87^\circ$
12. (a) -7 (c)  $x = 1.5$  or  $x = \frac{3}{2}$  (e) -1.2, 4.2