

Name: \_\_\_\_\_

Teacher: \_\_\_\_\_



# Mathematics

Year 9, Half Yearly

2011

Time Allowed                    –     70 minutes

Non Calculator                –     10 Minutes

Calculator                      –     60 Minutes

## Instructions

- Approved calculators only may be used.
- All necessary working must be shown. Marks may not be awarded for careless or badly arranged work.
- Marks are shown next to each question.
- Total marks –

Non Calc.	Number	Algebra	Prob.	Surds	Geo.	Total
/10	/10	/24	/12	/13	/10	/79

## Section 3A Algebra

(one mark unless otherwise indicated)

Answers

<p>1. Expand and simplify</p> <p>a) <math>3(2a+5)+5a</math></p> <p>_____</p> <p>_____</p> <p>b) <math>(2m+3)(m-2)</math> (2 marks)</p> <p>_____</p> <p>_____</p> <p>(c) <math>(2x+3)^2 - 3(x-2)</math> (2 marks)</p> <p>_____</p> <p>_____</p>	<p>a)</p> <p>b)</p> <p>c)</p>
<p>2. Simplify</p> <p>a) <math>\frac{5x}{3} + \frac{x}{6}</math></p> <p>_____</p> <p>_____</p> <p>b) <math>\frac{2}{m} - \frac{3}{n}</math> (2 marks)</p> <p>_____</p> <p>_____</p> <p>(c) <math>\frac{2}{3a^2} \div \frac{4}{9a}</math> (2 marks)</p> <p>_____</p> <p>_____</p>	<p>a)</p> <p>b)</p> <p>c)</p>
<p>3. A boy is now 14 years old. How old will his mother be in <math>x</math> years time if she was <math>y</math> years old when her son was born?</p> <p>(2 marks)</p>	

## Section 3B Algebra

(one mark unless otherwise indicated)

Answers

4. Simplify using index laws

a)  $9ab \times 2a^3$

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(c)  $(3x + y)^0 + 8x^0 - 7$

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e)  $64^{\frac{2}{3}}$

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g)  $5x^{-1}$

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b)  $2x^3 \div 8x^9$  (as a fraction)

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d)  $(2xy^2)^3$

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f)  $(36x^{16})^{\frac{1}{2}}$

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h)  $\frac{m^7n^{-3}}{m^{-3}n^{-2}}$  [leave as a fraction  
with positive indices]  
(2 marks)

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a)

b)

c)

d)

e)

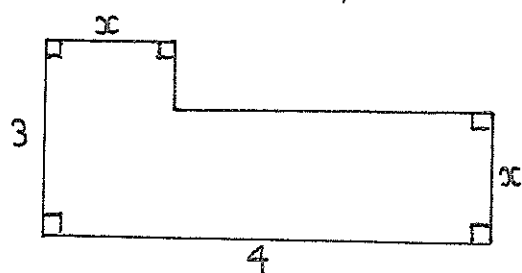
f)

g)

h)

5. a) Write an expression for the area of the workbench below in simplest form (measurements are in metres):

(2 marks)



b) Find the area of the workbench when  $x = 0.5$  metres.

a)

b)

## Section 4: Probability

## Answers

<p>1. Which of these probabilities mean an event is likely to occur?</p> <p>a) <math>\frac{1}{6}</math>      b) 0.5      c) 0.8      d) Unable to determine</p>	
<p>2. Darren's drawer contains 2 pairs of black socks and 3 pairs of grey socks. If one sock is drawn at random from the drawer, find the probability that the sock is grey.</p>	
<p>3. Jamie Soward's current goal-kicking success rate is 86%. Of his next 50 attempts, how many is he expected to miss?</p>	
<p>4. In a family of 3 children, find the probability of having 2 boys and 1 girl in any order.</p>	
<p>5. 9 MMS tossed coins a total of 750 times. What is the expected number of heads?</p>	
<p>6. A bag contains 3 times as many yellow table tennis balls as white. If one ball is chosen at random, find P (white).</p>	
<p>7. From a pack of 52 cards, one is chosen at random. Find the probability that it is:</p> <p>(i) a 2, 3 or 4</p> <p>(ii) a red Jack</p> <p>(iii) not a Jack, Queen or King</p>	<p>(i)</p> <p>(ii)</p> <p>(iii)</p>

<p>8. Two dice are rolled. Find the probability that the sum is:</p> <p>(i) 7</p> <p>(ii) even</p> <p>(iii) less than 4</p>	<p>(i)</p> <p>(ii)</p> <p>(iii)</p>
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## Section 5 Surds

(one mark unless otherwise indicated)

Answers

<p>1. Simplify these surds to their lowest form</p> <p>a) <math>\sqrt{150}</math>                      b) <math>3\sqrt{18}</math>                      c) <math>\sqrt{28} - \sqrt{63}</math> (2 marks)</p> <p>_____</p> <p>_____</p> <p>(d) <math>4\sqrt{6} \times 3\sqrt{2}</math> (2 marks)                      (e) <math>10\sqrt{70} \div \sqrt{10}</math></p> <p>_____</p> <p>_____</p>	<p>a)</p> <p>b)</p> <p>c)</p> <p>d)</p> <p>e)</p>
<p>2. Expand and simplify (2 marks each)</p> <p>a) <math>2\sqrt{2}(\sqrt{3} - 3\sqrt{2})</math>                      b) <math>(4\sqrt{5} + 2)^2</math></p> <p>_____</p> <p>_____</p>	<p>a)</p> <p>b)</p>
<p>3. Rationalise the denominator of <math>\frac{1+\sqrt{6}}{2\sqrt{6}}</math> (2 marks)</p>	

## Section 6 Geometry / Pythagoras

(one mark unless otherwise stated)

Answers

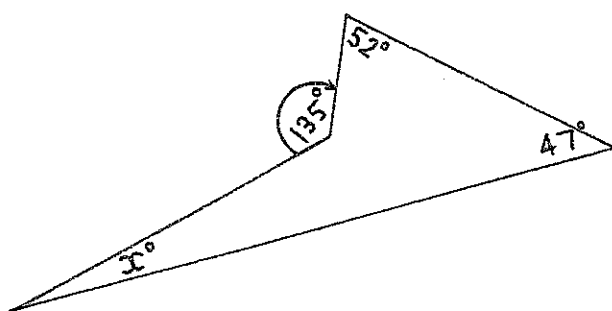
1. Give the specific name for the quadrilateral described below.

"The diagonals have different lengths. They bisect the angles through which they pass."

2. Find the size of the exterior angle in a regular octagon.

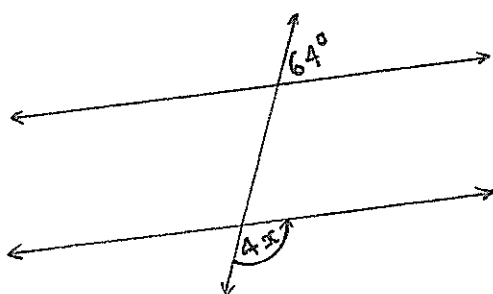
3. Find  $x$

a)



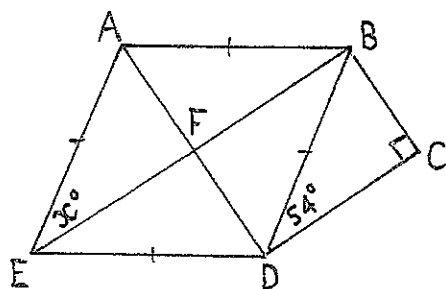
a)

b)



b)

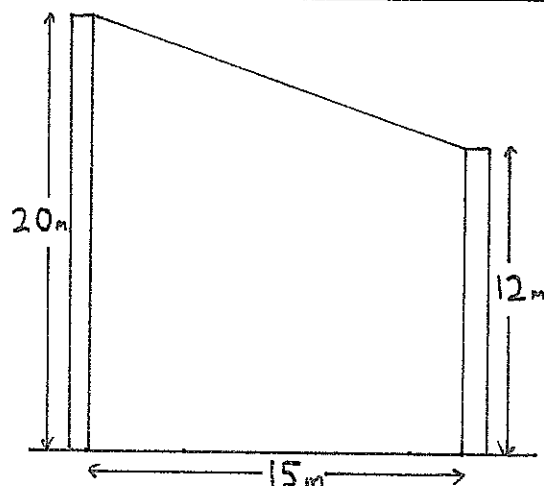
c)



c)

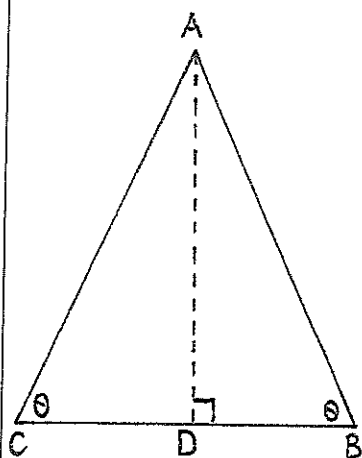
(BCDF is a rectangle)

4.



In the diagram above, how long is the wire joined between the two buildings?

5. By using a congruent triangle proof, show that the sides AB and AC opposite 2 equal angles in a triangle, must also be equal. (4 marks)




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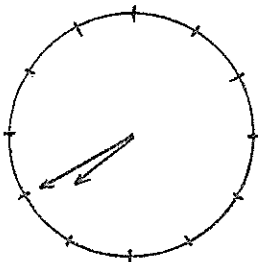


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## Section 2 (Calculators now allowed)

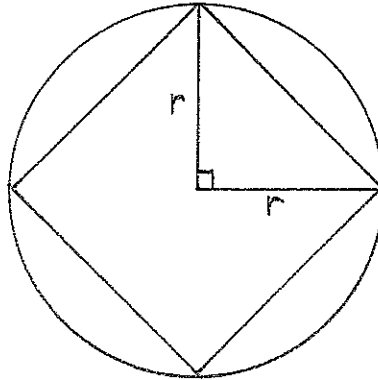
Number (1 mark unless otherwise indicated)

Answers

1. Greater Union recently increased its prices by 8%. Calculate the original price of an adult ticket that now costs \$16.20.	
2. Calculate $\frac{3.4 \times 10^8}{10.6 - 2.9}$ correct to 2 significant figures	
3. Simplify the ratio 0.04 : 0.8	
4. Change the rate of 55L / 275 km into L / 100 km	
5. One Australian dollar currently buys 0.75 Euros. How many Australian dollars do I need to buy 180 Euros?  _____ _____	
6. Convert $0.\dot{1}8\dot{9}$ into a simplified fraction. (2 marks)  _____ _____ _____	
7. Find the angle between the hands of a clock at 7:40 pm.  	

8. What percentage of the circle does the square cover?  
(Correct to one decimal place)

(2 marks)

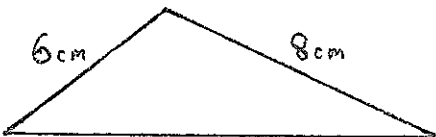


Name: \_\_\_\_\_

## Section 1

*Non Calculator (1 mark each unless shown otherwise)*

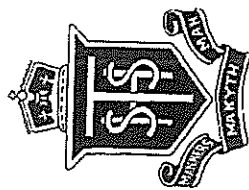
**Answers**

1. Express $3.5 \times 10^{-5}$ as a basic numeral	
2. The closest estimate of $\frac{\sqrt{79.9}}{2.5 \times 40}$ is:  A. 0.09 B. 0.9 C. 9 D. 0.05	
3. How many significant figures are there in 0.0308?	
4. Arrange in ascending order: 0.5, 0.505, 0.55, 0.5	
5. If 12.5% of T is 3.5, find 5% of T.	
6. Convert $64000 \text{ cm}^2$ into $\text{m}^2$	
7. If $148 \times 269 = 39812$ , evaluate $14.8 \times 26900$	
8. The length of the missing side on this triangle could be:    a) 15cm      b) 16cm      c) 13cm      d) 17cm	

<p>9. Evaluate <math>12\frac{4}{7} \div 3\frac{2}{7}</math> as a mixed number</p> <hr/> <hr/> <hr/>	
<p>10. In a mixture of oil, water and alcohol, the ratio of oil to water is 2:3 and the ratio of water to alcohol is 2:1. Find the ratio of oil : alcohol.</p> <hr/> <hr/> <hr/>	

Name: Solutions

Teacher: \_\_\_\_\_



# Mathematics

Year 9, Half Yearly

2011

Time Allowed	–	70 minutes
Non Calculator	–	10 Minutes
Calculator	–	60 Minutes

## Instructions


- Approved calculators only may be used.
- All necessary working must be shown. Marks may not be awarded for careless or badly arranged work.
- Marks are shown next to each question.
- Total marks –

Non Calc.	Number	Algebra	Prob.	Surds	Geo.	Total
/10	/10	/24	/12	/13	/10	/79

Name: \_\_\_\_\_

## Section 1

Non Calculator (1 mark each unless shown otherwise)  
Answers

1. Express $3.5 \times 10^{-5}$ as a basic numeral	0.000035
2. The closest estimate of $\frac{\sqrt{79.9}}{2.5 \times 40}$ is: A. 0.09 B. 0.9 C. 9 D. 0.05	A
3. How many significant figures are there in 0.0308?	3
4. Arrange in ascending order: 0.5, 0.505, 0.55, 0.5	0.5, 0.505, 0.55, 0.5
5. If 12.5% of T is 3.5, find 5% of T.	$\frac{7}{5}$ or $1\frac{2}{5}$ or 1.4
6. Convert $64000 \text{ cm}^2$ into $\text{m}^2$	$6.4 \text{ m}^2$
7. If $148 \times 269 = 39812$ , evaluate $14.8 \times 26900$	398120
8. The length of the missing side on this triangle could be: 	a) 15cm   b) 16cm   c) 13cm   d) 17cm c

Name: \_\_\_\_\_

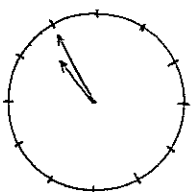
## Section 2 (Calculators now allowed)

Number (1 mark unless otherwise indicated)

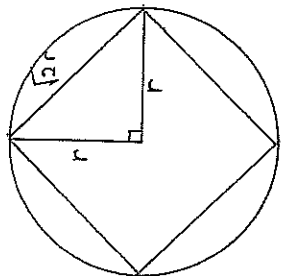
Answers

9. Evaluate $12\frac{4}{7} \div 3\frac{2}{7}$ as a mixed number	$\frac{88}{23}$ or $3\frac{19}{23}$
$\frac{88}{7} \div \frac{23}{7} = \frac{88}{7} \times \frac{7}{23} = 8\frac{19}{23}$	
10. In a mixture of oil, water and alcohol, the ratio of oil to water is 2:3 and the ratio of water to alcohol is 2:1. Find the ratio of oil : alcohol.	
Oil : water : alcohol	
2 : 3 : 1	4 : 3

1. Greater Union recently increased its prices by 8%. Calculate the original price of an adult ticket that now costs \$16.20.	\$15
2. Calculate $\frac{3.4 \times 10^8}{10.6 - 2.9}$ correct to 2 significant figures	$4.4 \times 10^7$
3. Simplify the ratio 0.04 : 0.8	1 : 20
4. Change the rate of 55L / 275 km into L / 100 km	20L / 100km
5. One Australian dollar currently buys 0.75 Euros. How many Australian dollars do I need to buy 180 Euros?	\$240
6. Convert 0.189 into a simplified fraction.	$\frac{189}{1000} = \frac{189}{1000}$
7. Find the angle between the hands of a clock at 7:40 pm.	10°



8. What percentage of the circle does the square cover?  
(Correct to one decimal place)



$$\frac{2s^2}{\pi r^2} \times \frac{100}{1}$$

(2)

63.7%

## Section 3A Algebra

(one mark unless otherwise indicated)

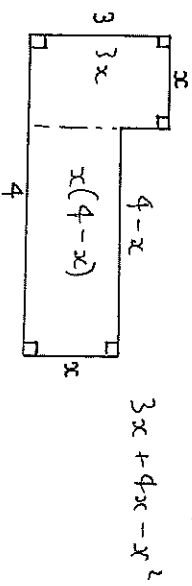
Answers

<p>1. Expand and simplify</p> <p>a) <math>3(2a+5)+5a</math>  <math>6a+15+5a</math>  <math>11a+15</math></p> <p>b) <math>(2m+3)(m-2)</math> (2 marks)  <math>2m^2-4m+3m-6</math>  <math>2m^2-m-6</math></p> <p>(c) <math>(2x+3)^2-3(x-2)</math> (2 marks)  <math>4x^2+12x+9-3x+6</math>  <math>4x^2+9x+15</math></p>	<p>a) <math>11a+15</math></p> <p>b) <math>2m^2-m-6</math></p> <p>c) <math>4x^2+9x+15</math></p>
<p>2. Simplify</p> <p>a) <math>\frac{5x}{3} + \frac{x}{6}</math>  <math>\frac{10x}{6} + \frac{x}{6}</math>  <math>\frac{11x}{6}</math></p> <p>b) <math>\frac{2}{m} - \frac{3}{n}</math> (2 marks)  <math>\frac{2n}{mn} - \frac{3m}{mn}</math></p> <p>(c) <math>\frac{2}{3a^2} \div \frac{4}{9a}</math> (2 marks)  <math>\frac{2}{3a^2} \times \frac{9a}{4}</math>  <math>\frac{2 \times 9a}{3a^2 \times 4}</math>  <math>\frac{18a}{12a^2}</math>  <math>\frac{3}{2a}</math></p>	<p>a) <math>\frac{11x}{6}</math></p> <p>b) <math>\frac{2n-3m}{mn}</math></p> <p>c) <math>\frac{3}{2a}</math></p>
<p>3. A boy is now 14 years old. How old will his mother be in <math>x</math> years time if she was <math>y</math> years old when her son was born? (2 marks)</p>	<p><math>y+14+x</math></p>

## Section 3B Algebra

(one mark unless otherwise indicated)

Answers	
4. Simplify using index laws	
a) $9ab \times 2a^3$ $18a^4b$	a) $18a^4b$
b) $2x^3 \div 8x^9$ (as a fraction) $\frac{2x^3}{8x^9} = \frac{1}{4x^6}$	b) $\frac{1}{4x^6}$
c) $(3x + y)^2 + 8x^2 - 7$ $1 + 8 - 7$	c) $2$
d) $(2xy)^3$ $8x^3y^6$	d) $8x^3y^6$
e) $64^{\frac{3}{2}}$ $16$	e) $16$
f) $(36x^{16})^{\frac{1}{2}}$ $6x^8$	f) $6x^8$
g) $5x^{-1}$ $\frac{5}{1 \times \frac{1}{x}}$	g) $\frac{5}{x}$
h) $\frac{m^2n^{-3}}{m^{-3}n^{-2}}$ (leave as a fraction with positive indices) $\frac{m^{7-3}n^{-3-(-2)}}{m^{10}n^{-1}}$ (2 marks)	h) $\frac{m^4n^1}{n}$
5. a) Write an expression for the area of the workbench below in simplest form (measurements are in metres): (2 marks)	a) $7x - x^2$
b) Find the area of the workbench when $x = 0.5$ metres. $3.5 - 0.25$	b) $3.25$



## Section 4: Probability

Answers

1. Which of these probabilities mean an event is likely to occur? a) $\frac{1}{6}$ b) 0.5    c) 0.8    d) Unable to determine	c
2. Darren's drawer contains 2 pairs of black socks and 3 pairs of grey socks. If one sock is drawn at random from the drawer, find the probability that the sock is grey. $\frac{3}{5}$	$\frac{3}{5}$
3. Jamie Soward's current goal-kicking success rate is 86%. Of his next 50 attempts, how many is he expected to miss? 7	7
4. In a family of 3 children, find the probability of having 2 boys and 1 girl in any order. 	$\frac{3}{8}$
5. 9 MMS tossed coins a total of 750 times. What is the expected number of heads? 375	375
6. A bag contains 3 times as many yellow table tennis balls as white. If one ball is chosen at random, find P (white). $\frac{1}{4}$	$\frac{1}{4}$
7. From a pack of 52 cards, one is chosen at random. Find the probability that it is: (i) a 2, 3 or 4 $\frac{12}{52}$ (ii) a red Jack $\frac{2}{13}$ (iii) not a Jack, Queen or King $\frac{10}{13}$	(i) $\frac{3}{13}$ (ii) $\frac{1}{6}$ (iii) $\frac{10}{13}$



## Section 5 Surds

(one mark unless otherwise indicated)

Answers	
1. Simplify these surds to their lowest form	
a) $\sqrt{150}$ <u><math>5\sqrt{6}</math></u>	a) $5\sqrt{6}$
b) $3\sqrt{18}$ <u><math>3 \times 3\sqrt{2}</math></u>	b) $9\sqrt{2}$
c) $\sqrt{28} - \sqrt{63}$ (2 marks) <u><math>2\sqrt{7} - 3\sqrt{7}</math></u>	c) $-\sqrt{7}$
d) $4\sqrt{6} \times 3\sqrt{2}$ (2 marks) <u><math>12\sqrt{12}</math></u> <u><math>12 \times 2\sqrt{3}</math></u>	d) $24\sqrt{3}$
e) $10\sqrt{70} \div \sqrt{10}$ <u><math>10\sqrt{7}</math></u>	e) $10\sqrt{7}$
2. Expand and simplify (2 marks each)	
a) $2\sqrt{2}(\sqrt{3} - 3\sqrt{2})$ <u><math>2\sqrt{6} - 6 \times 2</math></u> <u><math>2\sqrt{6} - 12</math></u>	a) $2\sqrt{6} - 12$
b) $(4\sqrt{5} + 2)^2$ <u><math>80 + 8\sqrt{5} + 8\sqrt{5} + 4</math></u>	b) $84 + 16\sqrt{5}$
3. Rationalise the denominator of $\frac{1+\sqrt{6}}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$ (2 marks)	$\frac{\sqrt{6} + 6}{12}$

8. Two dice are rolled. Find the probability that the sum is:

- (i) 7  
(ii) even  
(iii) less than 4

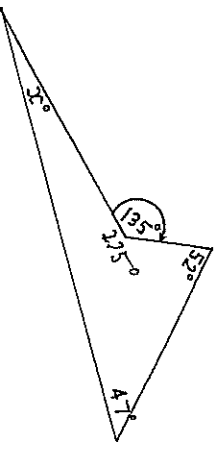
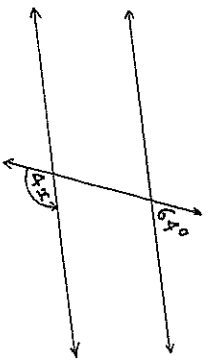
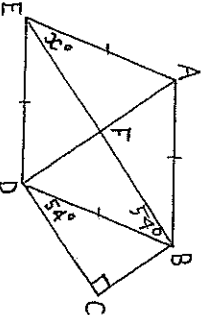
	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

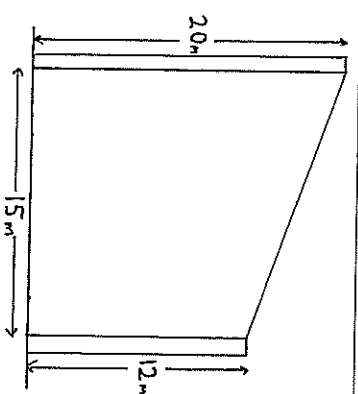
- (i)  $\frac{1}{6}$   
(ii)  $\frac{1}{2}$   
(iii)  $\frac{1}{12}$

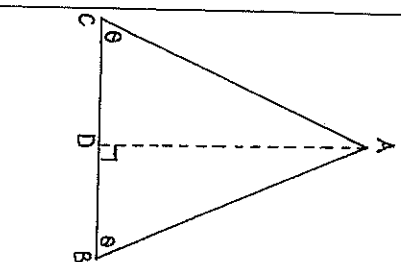
## Section 6 Geometry / Pythagoras

(one mark unless otherwise stated)

Answers

1. Give the specific name for the quadrilateral described below. "The diagonals have different lengths. They bisect the angles through which they pass."	Rhombus
2. Find the size of the exterior angle in a regular octagon.	$45^\circ$
3. Find $x$	
a) 	$36^\circ$
b) 	$29^\circ$
c)  (BCDF is a rectangle)	$54^\circ$

4. 	17m
5. By using a congruent triangle proof, show that the sides AB and AC opposite 2 equal angles in a triangle, must also be equal. (4 marks)	



In  $\Delta$ 's  $ACD$  and  $ABD$   
 $AD$  is common  
 $\angle ACD = \angle ABD$  (given)  
 $\angle ADB = \angle ADC$  (angle sum on straight line)  
 $\therefore \triangle ADC \cong \triangle ADB$  (AAS)  
 $\therefore AB = AC$  (corresponding angles in congruent triangles)