Carlingford High School

Mathematics

Year 9M5.3 Term 4 Test

2016

Name: _____

Teacher: Mr Cheng Mrs Strilakos Mrs Lego

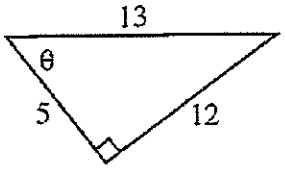
Time allowed: ***55 minutes***

- Calculators allowed.
- Show all necessary working.
- Complete the examination in blue or black pen.
- Attempt all questions.
- Extension questions are marked with an asterisk.

	Trigonometry	Surds	Statistics	Total
Questions	/13	/17	/25	/55
Extension	/6	/4	/0	/10
Total	/19	/21	/25	/65

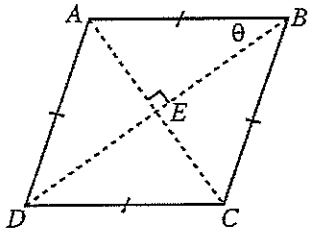
Trigonometry : (19 marks)

1.



For the triangle drawn above, state as a fraction, the value of $\sin\theta$. (1 mark)

2. A rhombus $ABCD$ has diagonals AC and BD of length 16 cm and 30 cm respectively, intersecting at E. (2 marks)

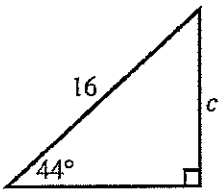


a) Find the side length of the rhombus.

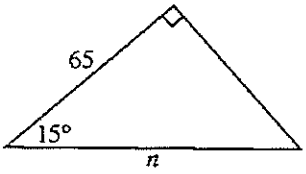
b) Find the value of $\tan\theta$, where $\angle ABE = \theta$.

3. Find the value of the pronumerals in each of the following triangles, to 2 decimal places. (4 marks)

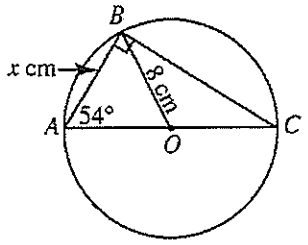
a)



b)



4. In the diagram below, AC is a diameter of the circle and O is the centre.



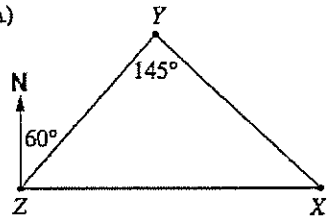
If $OB = 8$ cm, $\angle A = 54°$ and $\angle ABC = 90°$, find x, the length of the chord AB, correct to 1 decimal place. (2 marks)

5. The following information is given about the locations of three towns X, Y and Z.

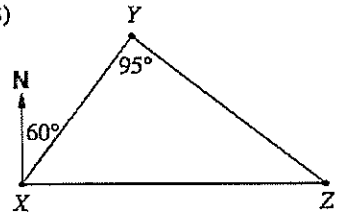
- X is due east of Z
- X is on a bearing of 145° from Y
- Y is on a bearing of 060° from Z

Which diagram best represents this information?

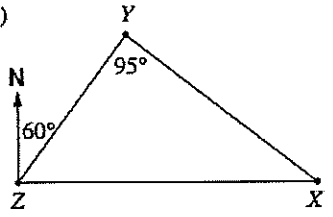
(A)



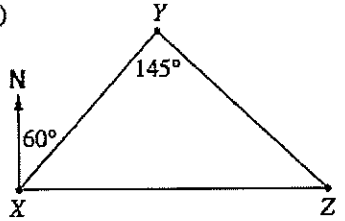
(B)



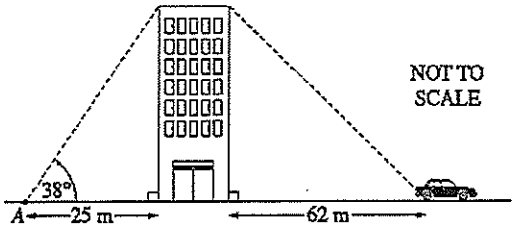
(C)



(D)



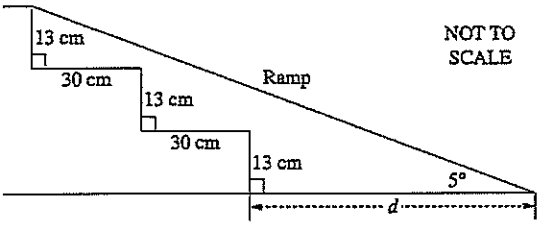
6. The point A is 25 m from the base of a building. The angle of elevation from A to the top of the building is 38°. (3 marks)



a) Calculate the height of the building, correct to 1 decimal place.

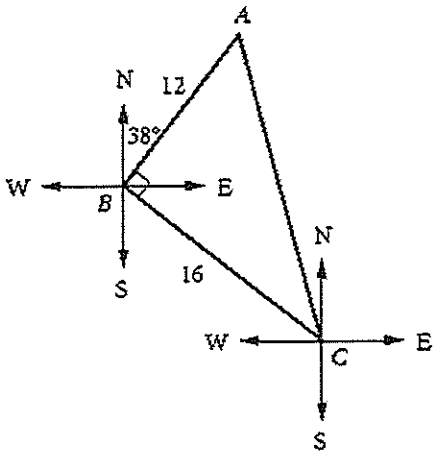
b) A car is parked 62 m from the base of the building. What is the angle of depression from the top of the building to the car? Give your answer to the nearest degree. (2 marks)

*7. A ramp is to be constructed to replace steps, as shown in the diagram. The angle of inclination for the ramp is to be 5°.



Calculate the extra distance, d, that the ramp will extend beyond the bottom step. Give your answer to the nearest centimetre. (3 marks)

*9. Two yachts sail in a straight line away from a buoy B. Yacht A sails 12 km in the direction 038° and yacht C sails 16 km in the direction 128°. What is the bearing of the yacht A, as seen from the yacht C? Answer correct to the nearest minute. (3 marks)



Surds: 2/ marks

1. Which of the following is a rational number? Circle you answer(s)

$\frac{1}{2}$ $\sqrt{11}$ $\sqrt{16}+\sqrt{49}$ π

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3. Simplify the following fully: (7 marks)

a) $5\sqrt{2}+2\sqrt{3}-6\sqrt{3}+2\sqrt{2}$

b) $\sqrt{28}+\sqrt{27}-\sqrt{63}+\sqrt{12}$ (2)

c) $2\sqrt{6}\times 3\sqrt{18}$ (2)

d) $4\sqrt{72}\div 2\sqrt{8}$ (2)

4. Between which two consecutive integers does $\sqrt{19}$ lies?

5. Expand and simplify fully: (5 marks)

a) $\sqrt{5}(\sqrt{2}-2\sqrt{3})$

b) $(\sqrt{7}+2\sqrt{3})(\sqrt{7}-2\sqrt{3})$

c) $(\sqrt{3}-5)^2$

*d) $(3\sqrt{a}-2\sqrt{b})(2\sqrt{a}+3\sqrt{b})$ (2)

6. Rationalise and simplify fully: (7 marks)

a) $\frac{2}{\sqrt{3}}$

(2)

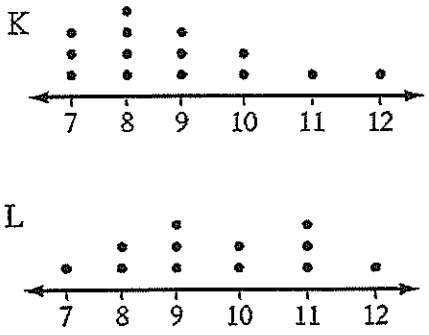
b) $\frac{4+\sqrt{6}}{\sqrt{3}}$

c) $\frac{3}{\sqrt{8}}-\frac{5}{\sqrt{2}}=$ (2)

*d) $\frac{\sqrt{2}+3}{3\sqrt{2}+5}$ (2)

Statistics: 25 marks

1. Which statement is true about the sets of data below?



A) K is positively skewed and L is symmetrical.

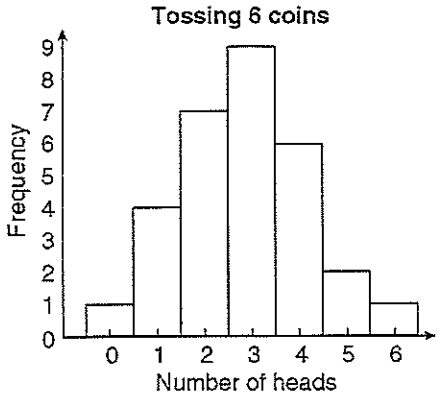
B) K is negatively skewed and L is bimodal.

C) L has two peaks and K is positively skewed

D) K is positively skewed and the median of L is 9.1.

2. The mean of a set of ten scores is 14. Another two scores are included and the new mean is 16. What is the mean of the two additional scores? (2 marks)

3. Six coins were tossed 30 times and the number of heads recorded. The results are shown in the frequency histogram below. (3 marks)



a) How many times were 4 heads thrown?

b) What is the mode?

c) Find the range.

4. a) Complete the frequency table below. (2 marks)

x	f	fx
22	3	
23	8	
24	7	
25	9	
26	5	
27	4	
	$\Sigma f =$	$\Sigma fx =$

b) Calculate the mean, correct to two decimal places. (1 mark)

5. The salaries of eight people are listed below. (5 marks)

$80 000 $105 000 $70 000 $93 000

$78 500 $180 000 $90 000 $101 000

a) Which salary is an outlier?

b) Find the mean and median. (2)

c) Which measure, the mean or the median, represents the salaries better?

d) Which measure, the mean or the median, is affected by the outlier?

6. For the frequency distribution table below: (3 marks)

Score	Frequency	Cumulative frequency
6	2	
7	2	
8	3	
9	5	
10	8	
11	6	

a) Complete the cumulative frequency column. (2)

b) Find the median.

7. The back-to-back stem-and-leaf plot shows the number of goals scored per match by two soccer teams during a season. (8 marks)

Rockets		Blues
7 5 4 3	1	7
8 7 6 5 4 2	2	0 5 6 8
7 6 4 3	3	4 5 7 7 8 9
5 4 0	4	2 3 7 8
2	5	1 3 7

a) Find the mean and median for Rockets. (2)

b) Where are the scores clustered for each team. (2)

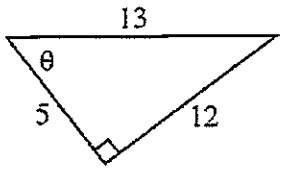
c) Describe the shape of each set of data. (2)

d) If the mean and median for Blues are 37.6 and 38.9 respectively, which team performed better? Justify your answer. (2)

End of paper

Trigonometry : (19 marks)

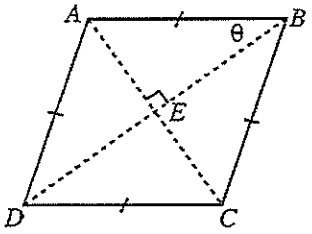
1.



For the triangle drawn above, state as a fraction, the value of $\sin\theta$. (1 mark)

$$\sin\theta = \frac{12}{13}$$

2. A rhombus $ABCD$ has diagonals AC and BD of length 16 cm and 30 cm respectively, intersecting at E. (2 marks)



a) Find the side length of the rhombus.

$$AB = \sqrt{8^2 + 15^2}$$

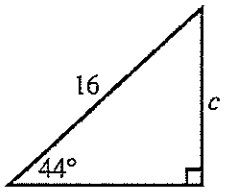
$$= 17 \text{ cm}$$

b) Find the value of $\tan\theta$, where $\angle ABE = \theta$.

$$\tan\theta = \frac{8}{15}$$

3. Find the value of the pronumerals in each of the following triangles, to 2 decimal places. (4 marks)

a)



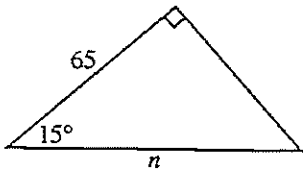
$$\sin 44^\circ = \frac{c}{16}$$

$$16 \times \sin 44^\circ = c$$

$$11.114\ldots = c$$

$$\therefore\ c = 11.11 \text{ units}$$

b)

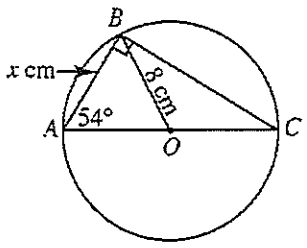


$$\cos 15^\circ = \frac{65}{n}$$

$$n = \frac{65}{\cos 15^\circ}$$

$$n = 67.29 \text{ units}$$

4. In the diagram below, AC is a diameter of the circle and O is the centre.



If $OB = 8$ cm, $\angle A = 54°$ and $\angle ABC = 90°$, find x, the length of the chord AB, correct to 1 decimal place. (2 marks)

$\cos 54° = \frac{x}{16}$

$16 \times \cos 54° = x$

$9.4045\ldots = x$

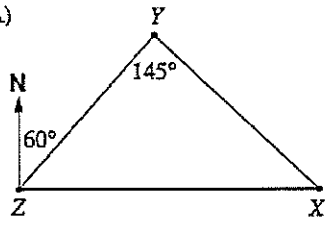
$\therefore\ x = 9.4$ cm

5. The following information is given about the locations of three towns X, Y and Z.

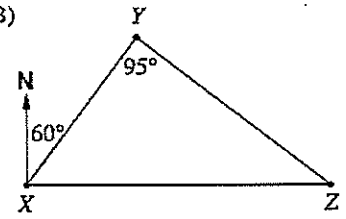
- X is due east of Z
- X is on a bearing of 145° from Y
- Y is on a bearing of 060° from Z

Which diagram best represents this information?

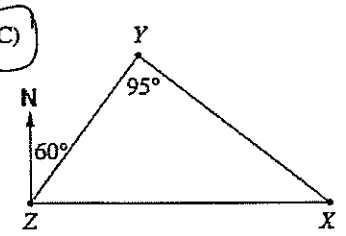
(A)



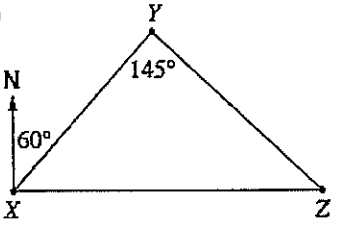
(B)



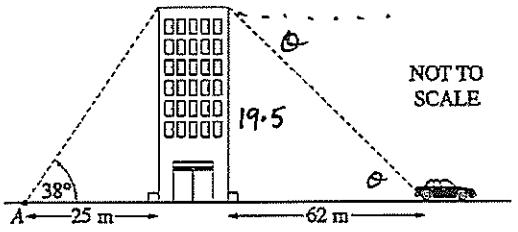
(C)



(D)



6. The point A is 25 m from the base of a building. The angle of elevation from A to the top of the building is 38°. (3 marks)



a) Calculate the height of the building, correct to 1 decimal place.

$$\tan 38^\circ = \frac{h}{25}$$

$$h = 25 \times \tan 38^\circ$$

$$= 19.532...$$

$$= 19.5 \text{ m}$$

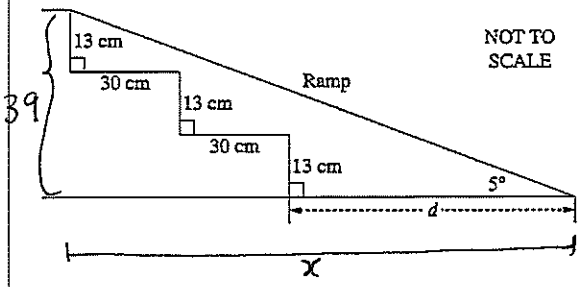
b) A car is parked 62 m from the base of the building. What is the angle of depression from the top of the building to the car? Give your answer to the nearest degree. (2 marks)

$$\tan \theta = \frac{19.5}{62}$$

$$\theta = 17^\circ\ 27'\ 33.13''$$

$$\theta = 17^\circ.$$

*7. A ramp is to be constructed to replace steps, as shown in the diagram. The angle of inclination for the ramp is to be 5°.



Calculate the extra distance, d, that the ramp will extend beyond the bottom step. Give your answer to the nearest centimetre. (3 marks)

$$\tan 5^\circ = \frac{39}{x}$$

$$x = \frac{39}{\tan 5^\circ}$$

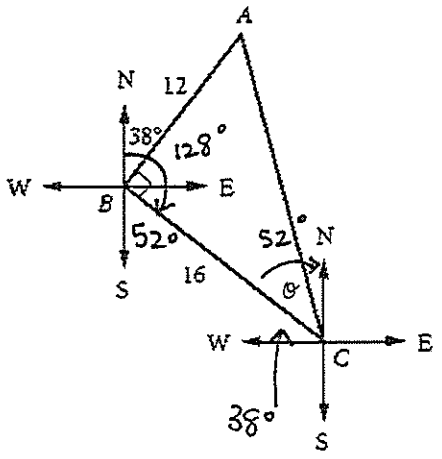
$$x = 445.77...$$

$$x = 446 \text{ cm}$$

$$\therefore d = 446 - 30 - 30$$

$$= 386 \text{ m}.$$

*9. Two yachts sail in a straight line away from a buoy B. Yacht A sails 12 km in the direction 038° and yacht C sails 16 km in the direction 128°. What is the bearing of the yacht A, as seen from the yacht C? Answer correct to the nearest minute. (3 marks)



$\tan\theta = \frac{12}{16}$

$\theta = 36°52'$

Bearing of A from C is :

$270° + 38° + 36°52'$

$= 344°52'$.

Surds: 23 marks

1. Which of the following is a rational number? Circle you answer(s)

$\frac{1}{2}$ $\sqrt{11}$ $\sqrt{16}+\sqrt{49}$ π

3. Simplify the following fully: (7 marks)

a) $5\sqrt{2} + 2\sqrt{3} - 6\sqrt{3} + 2\sqrt{2}$

$= 7\sqrt{2} - 4\sqrt{3}$

b) $\sqrt{28} + \sqrt{27} - \sqrt{63} + \sqrt{12}$ (2)

$= 2\sqrt{7} + 3\sqrt{3} - 3\sqrt{7} + 2\sqrt{3}$

$= -\sqrt{7} + 5\sqrt{3}$

d) $2\sqrt{6} \times 3\sqrt{18}$ (2)

$= 6\sqrt{108}$

$= 6 \times \sqrt{36} \times \sqrt{3}$

$= 36\sqrt{3}$

e) $4\sqrt{72} \div 2\sqrt{8}$ (2)

$= 2\sqrt{9}$

$= 6$

4. Between which two consecutive integers does $\sqrt{19}$ lie?

4 and 5

5. Expand and simplify fully: (5 marks)

a) $\sqrt{5}(\sqrt{2}-2\sqrt{3})$

$= \sqrt{10} - 2\sqrt{15}$

b) $(\sqrt{7}+2\sqrt{3})(\sqrt{7}-2\sqrt{3})$

$= 7 - 4\times 3$

$= -5$

c) $(\sqrt{3}-5)^2$

$= 3 - 10\sqrt{3} + 25$

$= 28 - 10\sqrt{3}$

*d) $(3\sqrt{a}-2\sqrt{b})(2\sqrt{a}+3\sqrt{b})$ (2)

$= 6a - 4\sqrt{ab} + 9\sqrt{ab} - 6b$

$= 6a - 5\sqrt{ab} - 6b$

6. Rationalise and simplify fully: (9 marks)

a) $\frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

b) $\frac{4+\sqrt{6}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ (2)

$= \frac{4\sqrt{3} + \sqrt{18}}{3}$

$= \frac{4\sqrt{3} + 3\sqrt{2}}{3}$

c) $\frac{3}{\sqrt{8}} - \frac{5}{\sqrt{2}} =$ (2)

$= \frac{3\sqrt{8}}{8} - \frac{5\sqrt{2}}{2}$

$= \frac{3\sqrt{8} - 20\sqrt{2}}{8}$

$= \frac{6\sqrt{2} - 20\sqrt{2}}{8}$

$= -\frac{7\sqrt{2}}{4}$

d) $\frac{(\sqrt{2}+3)}{(3\sqrt{2}+5)} \times \frac{(3\sqrt{2}-5)}{(3\sqrt{2}-5)}$ (2)

$= \frac{6 + 9\sqrt{2} - 5\sqrt{2} - 15}{18 - 25}$

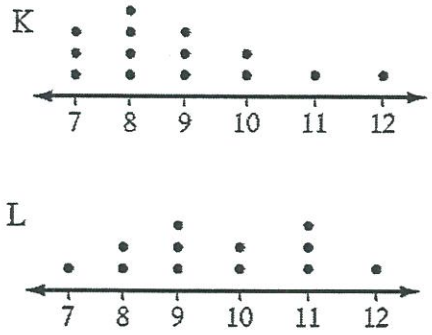
$= \frac{-9 + 4\sqrt{2}}{-7}$

$= \frac{9 - 4\sqrt{2}}{7}$

Seema

Statistics: 25 marks

1. Which statement is true about the sets of data below?



A) K is positively skewed and L is symmetrical.

B) K is negatively skewed and L is bimodal.

C) L has two peaks and K is positively skewed

D) K is positively skewed and the median of L is 9.1.

2. The mean of a set of ten scores is 14. Another two scores are included and the new mean is 16. What is the mean of the two additional scores? (2 marks)

$\bar{x} = 14$

total $= 140$

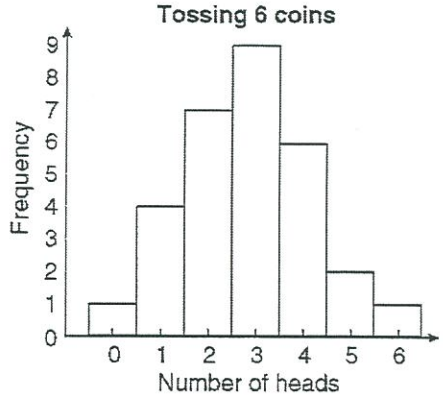
$\frac{140 + x + y}{12} = 16$

$140 + x + y = 192$

$x + y = 52$

∴ mean of x and y is $\frac{52}{2} = 26$.

3. Six coins were tossed 30 times and the number of heads recorded. The results are shown in the frequency histogram below. (3 marks)



a) How many times were 4 heads thrown?

6

b) What is the mode?

3

c) Find the range. 6

4. a) Complete the frequency table below. (2 marks)

x	f	fx
22	3	66
23	8	184
24	7	168
25	9	225
26	5	130
27	4	108
	$\Sigma f = 36$	$\Sigma fx = 881$

b) Calculate the mean, correct to two decimal places. (1 mark)

$\bar{x} = 24.47$

5. The salaries of eight people are listed below. (5 marks)

$80 000	$105 000	$70 000	$93 000
$78 500	$180 000	$90 000	$101 000

a) Which salary is an outlier?

$180 000

b) Find the mean and median. (2)

$\bar{x}$ = $99687.50

median = $91500

c) Which measure, the mean or the median, represents the salaries better?

Median

d) Which measure, the mean or the median, is affected by the outlier?

Mean

6. For the frequency distribution table below: (3 marks)

Score	Frequency	Cumulative frequency
6	2	2
7	2	4
8	3	7
9	5	12
10	8	20
11	6	26

a) Complete the cumulative frequency column (2)

b) Find the median.

10

7. The back-to-back stem-and-leaf plot shows the number of goals scored per match by two soccer teams during a season. (8 marks)

Rockets		Blues
7 5 4 3	1	7
8 7 6 5 4 2	2	0 5 6 8
7 6 4 3	3	4 5 7 7 8 9
5 4 0	4	2 3 7 8
2	5	1 3 7

a) Find the mean and median for Rockets. (2)

$\bar{x}$ = 29.5 median = 27.5

b) Where are the scores clustered for each team. (2)

Rockets : 20s

Blues : 30s

c) Describe the shape of each set of data. (2)

Blues : negatively skewed

Rockets : positively skewed

d) If the mean and median for Blues are 37.6 and 38.9 respectively, which team performed better? Justify your answer. (2)

Blues, as both the mean and median were higher than the mean and median of Rockets.

End of paper