pages 1 – 6 (Q1, 2 comp.) (25)

pages 6 – 11 Q3 (26)

pages 12 – 15 (24)

pages 16 – 20 (25)

CARLINGFORD HIGH SCHOOL

DEPARTMENT OF MATHEMATICS

Year 10 (5.2) Mathematics

Term 4 Yearly Exam 2019

Time allowed : ***90 Minutes***

Name : Solutions **Class : 10M2.** _____

Circle your Teacher's name: **Mr Cheng** **Mrs Lego** **Miss Aung** **Mr Wilson**

pg 1-6 Q1,2 pg 6 – 11, 12-15 Q3 pg 16-20

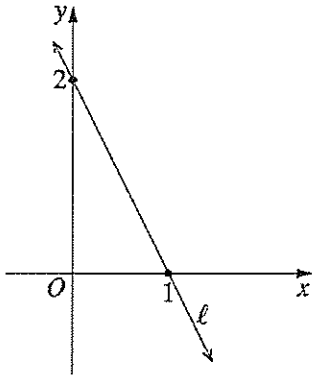
Instructions

- Board approved calculators may be used
- Show all necessary working by using blue/ black pen except graphs/diagrams
- Marks may be deducted for untidy setting out.
- Diagrams are **NOT** drawn to scale.

TOPICS	TOTAL
Linear Relationships	/ 12
Area and Surface Area	/ 11
Compound Interest	/10
Graphs	/9
Probability	/13
Binomial Expressions, Equations and Inequalities	/11
Data Analysis	/13
Trigonometry	/10
Geometry	/11
Total	/100

Linear Relationships (12 marks)

1. What is the equation of the line l ?



(A.) $y = -2x + 2$ B. $y = 2x + 2$ C. $y = -\frac{x}{2} + 2$ D. $y = \frac{x}{2} + 2$

2. On which line does the point $(2, -3)$ lie?

A. $y = x + 5$ (B.) $y = -2x + 1$

C. $x + y - 1 = 0$ D. $3x + 2y - 12 = 0$

3. An interval is formed by joining the points $A(4, 5)$ and $B(-2, 3)$

i) Find the distance from A to B. Leave your answer in surd form. 2

$d = \sqrt{(-2-4)^2 + (3-5)^2}$ (1)

$= \sqrt{(-6)^2 + (-2)^2}$

$= \sqrt{40}$ (1)

ii) Find the midpoint of AB. 1

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

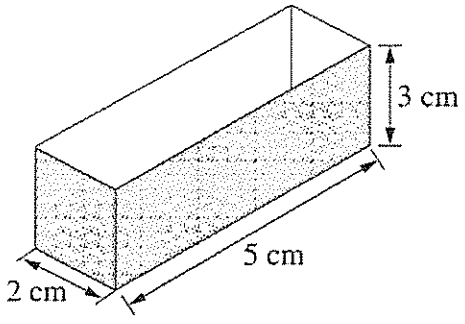
$= 1$ $= 4$ $(1, 4)$

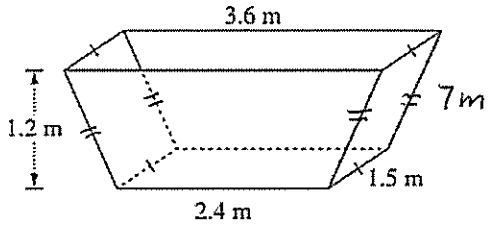
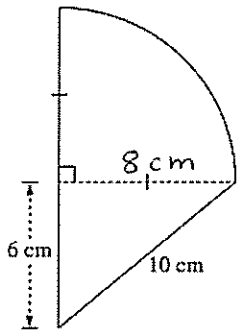
iii) Find the gradient of AB 1

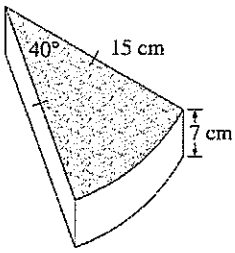
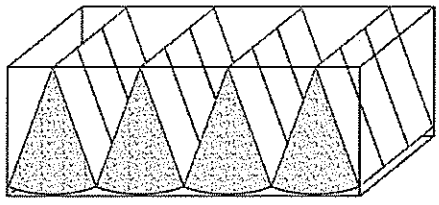
$m = \frac{3-5}{-2-4}$

$= \frac{-2}{-6}$

$= \frac{1}{3}$

4.	Write the equation of a line with gradient of $\frac{1}{3}$ and a y-intercept of -1. i) in gradient-intercept form. $y = \frac{1}{3}x - 1$ ii) in general form $y = \frac{1}{3}x - 1$ $3y = x - 3$ (1) $0 = x - 3y - 3$ or $x - 3y - 3 = 0$	1 2
5.	Find the equation of the line that is perpndicular to the line $y = -\frac{2}{3}x + 4$ and passing through the point (5, 2). $m = \frac{3}{2}$ (1) $y - 2 = \frac{3}{2}(x - 5)$ (1) $y - 2 = \frac{3}{2}x - \frac{15}{2}$ $y = \frac{3}{2}x - \frac{11}{2}$ (1)	3
	Area and Surface Area (11 marks)	
1.	What is the surface area of the open box?  A. $10\ cm^2$ B. $30\ cm^2$ (C.) $52\ cm^2$ D. $62\ cm^2$	

2.	A skip bin is in the shape of a trapezoidal prism, with dimensions as shown.  What is the surface area of the skip bin? $SA = \left[\frac{1}{2} \times 1.2 \times (3.6 + 2.4)\right] \times 2 + 2(1.5 \times 7) + (2.4 \times 1.5)$ $= 7.2 + 21 + 3.6$ $= 31.8\ m^2$ ① trapezium ① 2 areas ① total correct SA.	3
3.	A shape consisting of a quadrant and a right angled triangle is shown.  What is the area of this shape, correct to one decimal place? $A = \left(\frac{1}{2} \times 8 \times 6\right) + \left(\frac{1}{4} \times \pi \times 8^2\right)$ either $= 74.265\ldots$ $= 74.3\ cm^2$ ① one correct area.	2

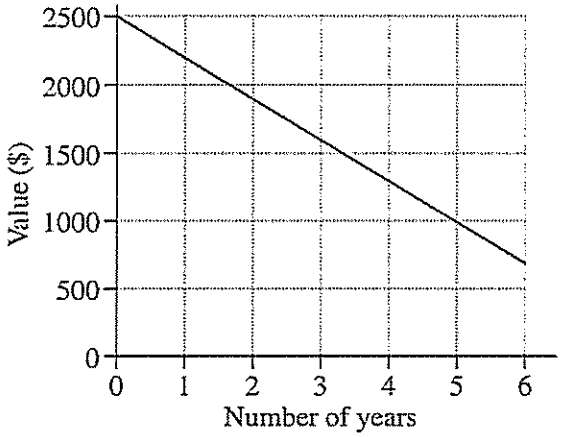
4.	Pieces of cheese are cut from cylindrical blocks with dimensions as shown.  	
	i) Calculate the volume of one piece of cheese, to one decimal place. $V = \frac{40}{360} \times \pi \times 15^2 \times 7$ ① 4948.008... either $\begin{cases} = 549.77... \\ = 549.8\ cm^3 \end{cases}$	2
	ii) Twelve pieces are packed in a rectangular box. There are three rows with four pieces of cheese in each row.  The dimensions of the rectangular box are $41\ cm \times 15\ cm \times 21\ cm$. Calculate the volume of the rectangular box. $V = 41 \times 15 \times 21$ $= 12915\ cm^3$	1
	iii) What is the volume of space remaining in the box after the twelve pieces of cheese have been packed inside? Answer correct to one decimal place. V of 12 cheese = 549.8×12 $= 6597.6\ cm^3$ ① V of space = $12915 - 6597.6$ $= 6317.4\ cm^3$ ①	2

Compound Interest (10 marks)

1. Bill borrows $420 000 to buy a house. Simple interest is charged at 0.6% per month. How much does he owe at the end of the first month, after he has made a $4000 repayment?

(A.) $418 520 B. $422 520 C. $30 240 D. $26 240

2. A computer was purchased for $2500 and depreciated over six years, as shown in the graph below.



By how much did the computer depreciate each year?

A. $200 B. $250 (C.) $300 D. $350

3. A single amount of $10 000 is invested for 4 years, earning interest at the rate of 3% per annum, compounded monthly.

i) calculate the total amount of the investment at the end of four years. 2

$A = 10\,000\left(1+\frac{3}{12}\%\right)^{4\times 12}$ (1)

$= 11273.28$ (1)

ii) calculate the compound interest earned. 1

Interest $= 11273.28 - 10\,000$

$= \$1273.28$

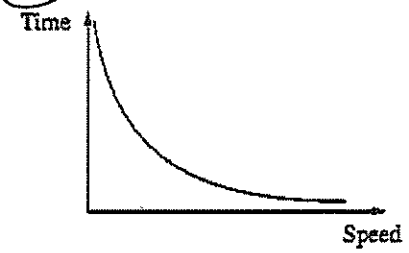
4.	Rachel bought a motorcycle advertised for $7990. She paid a $500 deposit and took out a flat-rate loan to repay the balance. Simple interest was charged at a rate of 7% per annum on the amount borrowed. She repaid the loan over 2 years, making equal weekly repayments. i) Calculate the amount Rachel borrowed. $\$7490$ ii) Calculate the amount of interest paid on the loan. $I = 7490 \times 7\% \times 2$ $= \$1048.60$ iii) Calculate the weekly repayment. Weekly Repayment $= (7490 + 1048.60) \div (2 \times 52)$ $= \$82.10$	1 1 1
5.	Tim's computer depreciates by 25% each year. i) If the computer is currently valued at $6500, what will its value be in 4 years? $A = 6500\,(1 - 25\%)^4$ $= \$2056.64$ ii) What is the depreciation over this time? Depreciation $= \$6500 - \$2056.64$ $= \$4443.36$	1 1

Graphs (9 marks)

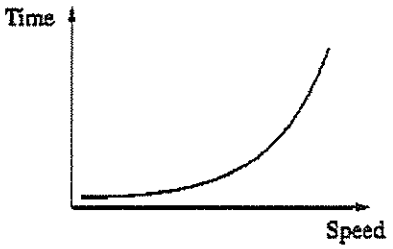
1. The time for a car to travel a certain distance varies inversely with its speed.
Which of the following graphs shows this relationship?

$T \propto \frac{1}{S}$

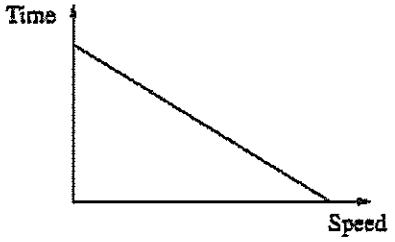
(A)



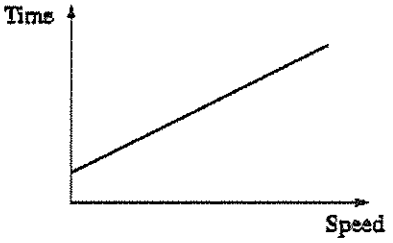
(B)



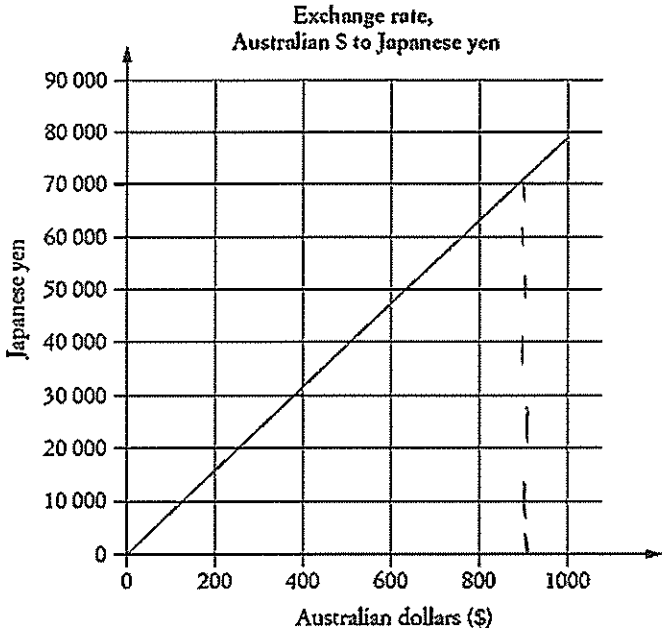
(C)



(D)



2. The graph below shows the exchange rate to convert Australian dollars to Japanese yen. (1)



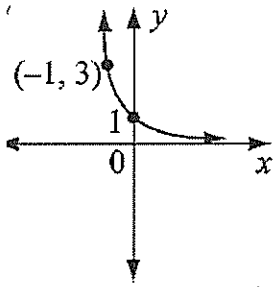
Use the graph above to convert $A900 to Japanese yen.

$70 000 (must use graph)

3. Match each graph drawn below to its equation (choose from the list below): **4**

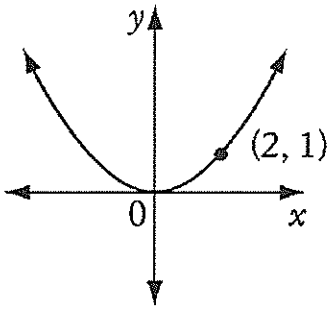
$x^2 + y^2 = 9$ $\quad y = \frac{1}{4}x^2$ $\quad y = 3^{-x}$ $\quad y = x^2$ $\quad y = -2x - 2$

i)



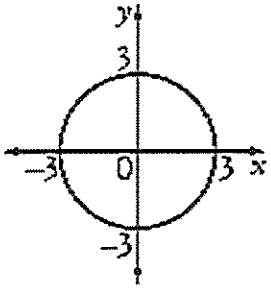
$y = 3^{-x}$

ii)



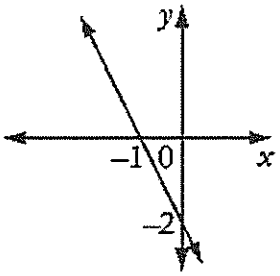
$y = \frac{1}{4}x^2$

iii)



$x^2 + y^2 = 9$

iv)



$y = -2x - 2$

4. The height (H) of a particular termite mound is directly proportional to the square root of the number of termites (N). The height of this mound is 35 cm when the number of termites is 4000.

i) Write an equation relating H, N *and* k, where k is the constant of variation. Answer correct to 1 decimal place. **2**

$H \propto \sqrt{N}$

$H = k\sqrt{N}$

$35 = k\sqrt{4000}$

$\frac{35}{\sqrt{4000}} = k$

$k = 0.55\ldots$

$k = 0.6$ (1)

$\therefore H = 0.6\sqrt{N}$ (1)

ii) What is the height of this mound, in centimetres, when there are 10 000 termites? **1**

$H = 0.6\sqrt{10\,000}$

$= 60$ cm.

Probability (13 marks)

1. A set of traffic lights shows red for 45 seconds, green for 30 seconds and amber for 5 seconds.

$\frac{30}{80}$

At any instant, what is the probability that the lights show green?

A. $\frac{1}{3}$ B. $\frac{2}{3}$ C. $\frac{3}{5}$ (D.) $\frac{3}{8}$

2. A group of 150 people was surveyed and the results recorded.

Survey results

	Owns a mobile	*Does not own a mobile*	*Total*
Male	42	28	70
Female	63	17	80
	105	45	150

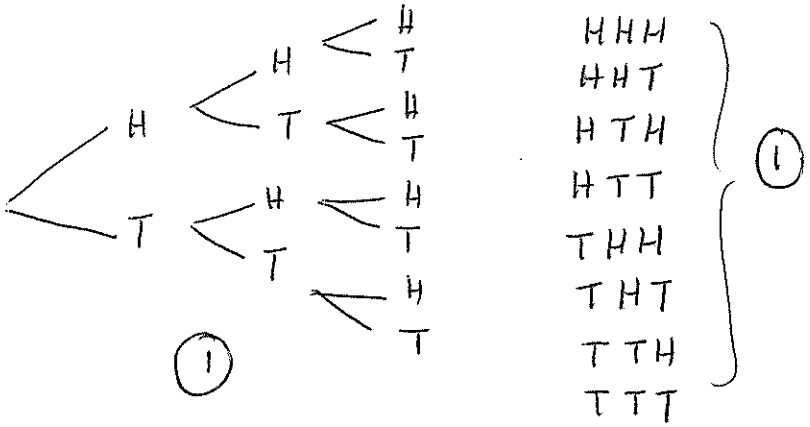
A person is selected at random from the surveyed group. 1

What is the probability that the person selected is a female who does not own a mobile?

$\frac{17}{150}$

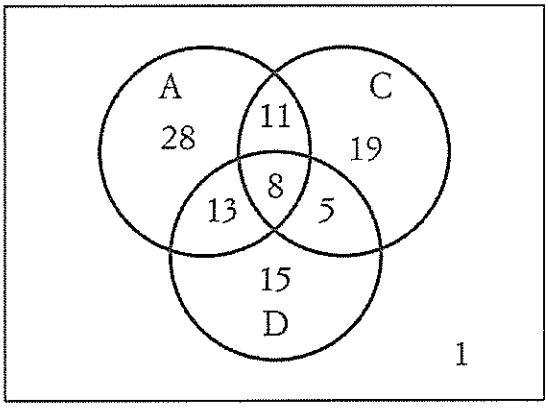
3. A fair coin is tossed three times.

i) Draw a tree diagram, and list all possible outcomes. 2



ii) What is the probability of obtaining two heads and a tail in any order? 1

$\frac{3}{8}$

4.	Jeremy rolled a biased 6-sided die 150 times. He recorded the results in a table. | Number	1	2	3	4	5	6
---	---	---	---	---	---	---
Frequency	23	19	48	20	21	19 | What is the relative frequency of rolling a 2? $\frac{19}{150}$	1
5.	The Venn diagram below shows the results of a survey on what type of movies that students prefer to watch. A (action) C (comedy) D (drama),  i) How many students were surveyed? 100 ii) What is the probability, as a decimal, of selecting a student who prefers to watch action movies only? $\frac{28}{100} = 0.28$ iii) What is the probability of selecting a student who prefers to watch drama or comedy but not action? $\frac{15+5+19}{100} = \frac{39}{100}$	1 1 1

6. In Lotto, 6 balls and 2 supplementary balls are drawn without replacement. Are the events of drawing each of the balls dependent or independent events? (1)

Dependent

7. A die was repeatedly rolled and the results are shown in the table below.

Outcome	Frequency
1	85
2	100
3	114
4	92
5	91
6	95

i) How many times was the die rolled? (1)

577

ii) Find the experimental probability of rolling a number 3 or less. (1)

$\frac{299}{577}$

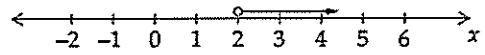
iii) Find the theoretical probability of rolling an odd number. (1)

$\frac{1}{2}$

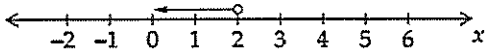
Binomial Expressions, Equations and Inequalities (11 marks)

1. Which graph below represents the inequality $x > 2$?

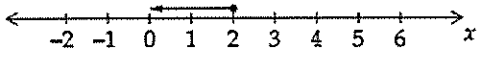
(A.)



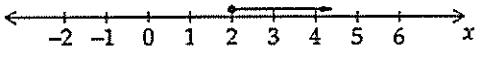
B.



C.



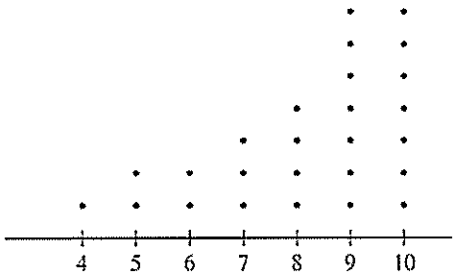
D.



2.	Expand $(x+3)(2x-4)$ $2x^2+6x-4x-12$ $= 2x^2+2x-12$	1
3.	Factorise fully: $3x(x+1)-4(x+1)$ $(3x-4)(x+1)$	1
4.	Solve the following quadratic equations: i) $(m+3)(m-1)=0$ $m=-3$ or $m=1$ (1) ii) $y^2+5y+4=0$ $(y+1)(y+4)=0$ (1) $y=-1$ or $y=-4$ (1) iii) $5w^2=180$ $w^2=36$ (1) $w=\pm 6$ (1)	5
5.	Solve the following inequalities: i) $2x-10\leq 16$ $2x\leq 26$ $x\leq 13$ (1) ii) $\frac{2a+5}{-3}>4$ $2a+5<-12$ (1) $2a<-17$ $a<-\frac{17}{2}$ (1)	3

Data Analysis (13 marks)

1. Which of the following best describes the spread of the scores in the dot plot drawn below?



A. Symmetrical
B. Positively skewed
C. Negatively skewed
D. Normally distributed

2. A soccer referee wrote down the number of goals scored in 9 different games during the season.

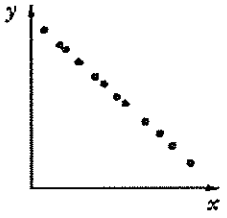
2, 3, 3, 3, 5, 5, 8, 9, 12

The last number has been omitted. The range of the data is 10. What is the five-number summary for this data set?

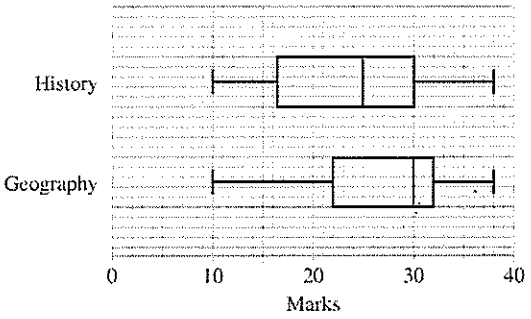
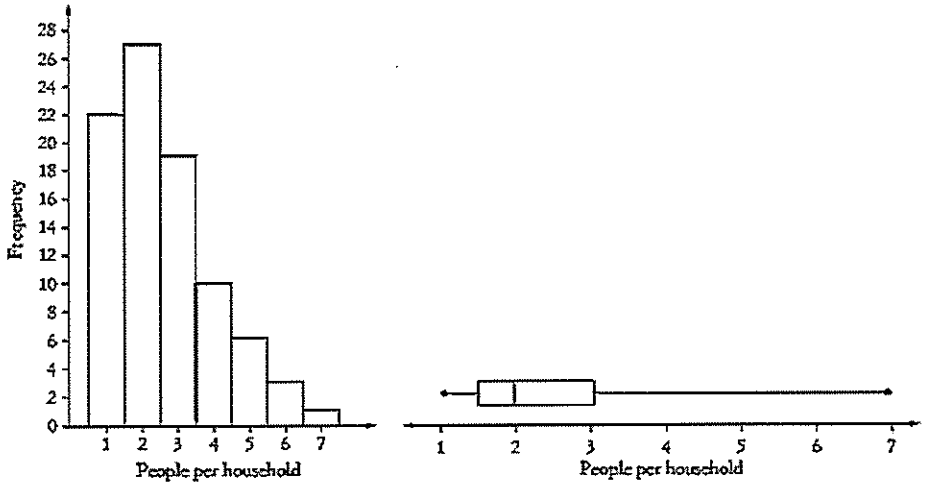
A. 2, 3, 5, 8.5, 12
B. 2, 3, 5, 8.5, 10
C. 2, 3, 5, 8, 12
D. 2, 3, 5, 8, 10

3. Describe the strength and direction of the relationship shown in each scatterplot below. 2

strong positive



perfect negative

4.	The box-and-whisker plots show the results of a History test and a Geography test.  i) What percentage of these students scored above 30 marks in the History test. 25% ii) In History, 112 students completed the test. The number of students who scored above 30 marks was the same for the History test and the Geography test. How many students completed the Geography test? $112 \times 25\% = 28$ (1) $28 = 50\% \times n$ (1) $56 = n$	1 2
5.	A surevey to determine the number of people per household was conducted in several shopping centres. The results are shown in the frequency histogram and boxplot below.  i) Find the mode. 2 ii) Find the median. 2	1 1

6. Data was collected from 30 students on the number of text messages they had sent in the previous 24 hours. The set of data collected is displayed.

Males		Females
6 5 4 2 1	0	8 9 0
7 1 1 0 0	1	1 1 2 5 6 8 8 9
9 9 8 0	2	0 1 7
	3	5
	4	
	5	
	6	
1	7	

i) What is the outlier for this set of data? 1

71

ii) What is the interquartile range of the data collected from the male students? 1

IQR = 28 − 5
= 23

iii) Find the mean for the Males, to one decimal place. 1

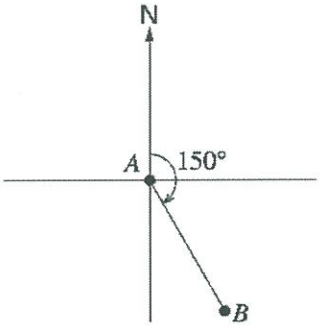
$\bar{x}$ = 16.93... } either
= 16.9

iii) The mean for the Females is 16 and the median is 16. 1
Did the Males or Females generally make more text messages? Justify your answer.

Females, as their median is 16 } must have reason refering to Median
while the median for Males is 11.

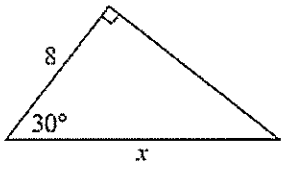
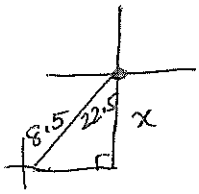
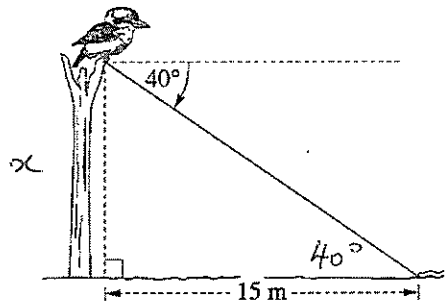
Trigonometry (10 marks)

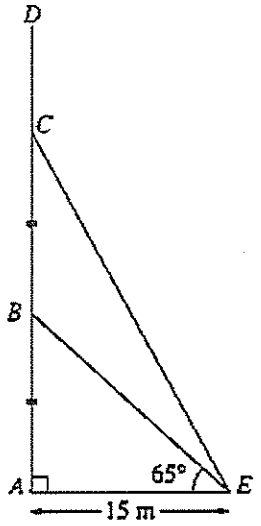
1. A plane flies on a bearing of 150° from A to B.

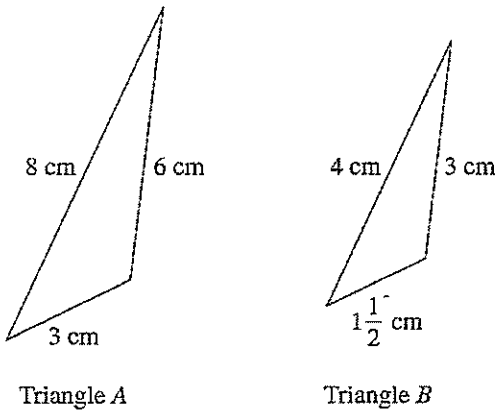
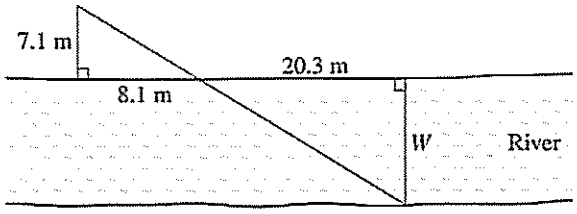


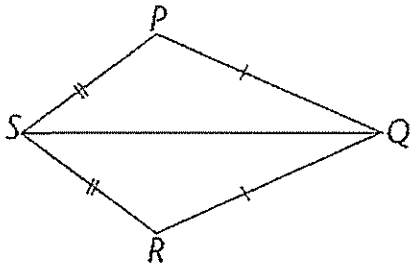
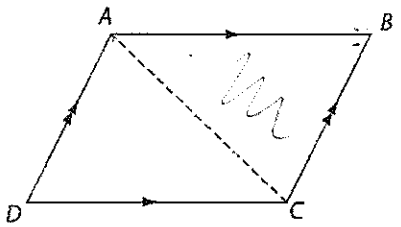
What is the bearing A from B?

A. 30° B. 150° C. 210° (D.) 330°

2.	Which is the correct expression for the value of x in this triangle?  $\cos 30 = \frac{8}{x}$ (A.) $\frac{8}{\cos 30°}$ B. $\frac{8}{\sin 30°}$ C. $8 \times \cos 30°$ D. $8 \times \sin 30°$	
3.	Harry travelled for 8.5 km on a bearing of *SSW* from his home. i) How far south is Harry from home? Answer correct to two decimal places.  $\cos 22.5 = \frac{x}{8.5}$ (1) $8.5 \times \cos 22.5° = x$ $x = 7.8529...$ $= 7.85$ km } either ii) What is the bearing of his home from his current position? 1 NNE or 022.5°	2
4.	The angle of depression from a kookaburra's feet to a worm on the ground is 40°. The worm is 15 metres from a point on the ground directly below the kookaburra's feet.  How high above the ground are the kookaburra's feet, correct to the nearest metre? $\tan 40° = \frac{x}{15}$ $15 \times \tan 40° = x$ (1) $12.586... = x$ (1) $13\text{m} = x$ rounding question	2

5.	The diagram below shows a radio mast AD with two of its supporting wires, BE and CE. The point B is half-way between A and C.  	
	i) Calculate the height AB in metres, correct to one decimal place. $\tan 65^\circ = \frac{AB}{15}$ $15 \times \tan 65^\circ = AB$ either (1) { $32.167.. = AB$ $32.2 = AB$.	1
	ii) Calculate the distance CE in metres, correct to one decimal place. $AC = 2 \times 32.2$ $= 64.4$ (1) $CE = \sqrt{15^2 + 64.4^2}$ $CE = 66.123..$ } either (1) $= 66.1$ m	2
	Geometry (11 marks)	
1.	Find the angle sum of a pentagon. angle sum $= 180(5-2)$ $= 540^\circ$	1

2.	What scale factor has been used to transform Triangle *A* to Triangle *B*?  Triangle *A* Triangle *B* (A.) $\frac{1}{2}$ B. 3 C. $\frac{3}{4}$ D. 2	
3.	Find the number of sides in a regular polygon of each interior angle is 140°. exterior = 180 − 140 = 40° (1) number of sides = 360 ÷ 40 = 9 (1)	2
4.	The width (W) of a river can be calculated using similar triangles, as shown in the diagram below.  What is the width of the river, to one decimal place? $\frac{20.3}{8.1} = \frac{W}{7.1}$ (1) $7.1 \times \frac{20.3}{8.1} = W$ either (1) { 17.79.. = W 17.8m = W	2

5.	Complete the following proof.  	In ΔPQS and ΔRQS $PS = RS$ (given) SQ is common $PQ =$ RQ (given) $\therefore \Delta PQS \equiv \Delta RQS$ (SSS)	2
6.	$ABCD$ is a parallelogram. Prove that the opposite sides of a parallelogram are equal.  	In $\triangle ABC$ and $\triangle ADC$ AC is common $\angle BAC = \angle DCA$ (alternate angles, AB ∥ DC) $\angle BCA = \angle DAC$ (alternate angles, AD ∥ BC) $\therefore \triangle ABC \equiv \triangle ADC$ (AAS) $\therefore AB = DC$ (matching sides of congruent triangles) $AD = BC$ (matching sides of congruent triangles) $\therefore$ opposite sides of a parallelogram are equal.	3

-1 mark each incorrect

End of Paper