Carlingford High School

Mathematics
Year 10 (5.1) Yearly Exam
2016

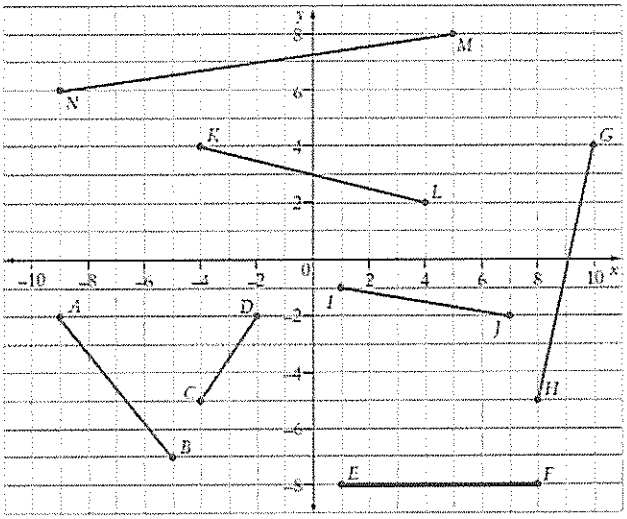
Name: _____ **Class:** _____

Time allowed: 1.5 hours

Topic	Mark
Linear Relationships	/11
Perimeter, Area and Surface Area	/10
Compound Interest	/7
Right-Angled Trigonometry	/9
Data Analysis	/11
Algebraic Expressions	/12
Equations	/12
Geometry	/10
Probability	/10
Number Plane Graphs	/12
Rates	/6
Total	/110

Linear Relationships

Question 1 (6 marks)



(a) Use $gradient = \frac{rise}{run}$ to find the gradients of the following lines:

(i) *GH* _____ (ii) *AB* _____

(b) Find the midpoint of the following intervals:

(i) *EF* (_____ , _____) (ii) *MN* (_____ , _____)

(c) Use Pythagoras' Theorem $a^2 + b^2 = c^2$ to calculate the length of *CD*, correct to 1 decimal place.

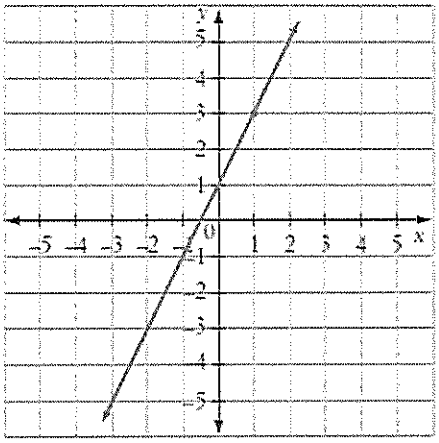
Question 2 (5 marks)

(a) For the graph of $y = 3x - 4$, state the:

(i) Gradient _____

(ii) y-intercept _____

(b)



(i) The y-intercept for this line is _____

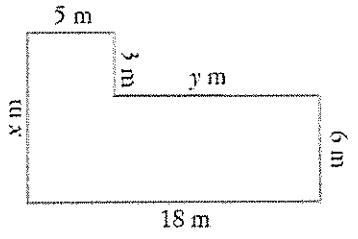
(ii) Use $y = mx + b$ to write the equation of the line.

$y =$ ____$x +$ ____

Perimeter, Area and Surface Area

Question 3 (10 marks)

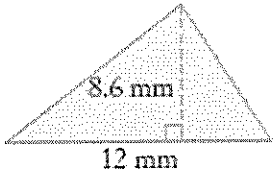
(a)



(i) Find the value of y.

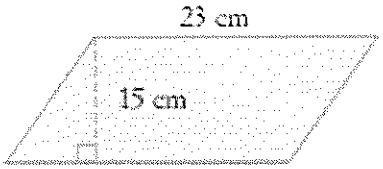
(ii) Perimeter = _____ m

(b) (i) Use $\boldsymbol{A = \frac{1}{2}bh}$ to find the area of this triangle.



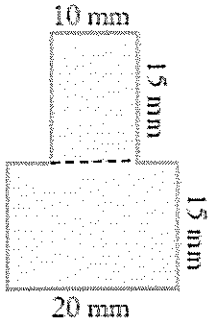
Area = _____ mm^2

(ii) Find the area of this parallelogram.



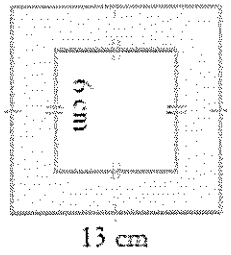
Area = _____ cm^2

(iii) Find the area of this composite shape.



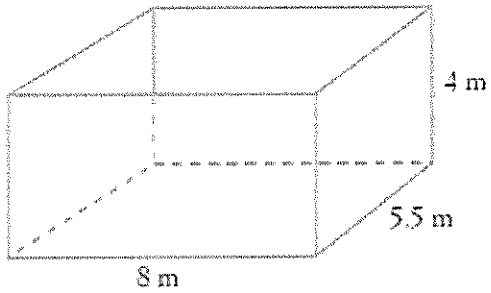
Area = _____ mm^2

(iv) Find the shaded area.



Area = _____ cm^2

(c) Use the formula $\boldsymbol{A = 2l + 2b + 2h}$ to find the surface area of this rectangular prism.



Surface Area = _____ m^2

Compound Interest

Question 4 (7 marks)

(a) $55 300 is invested at 4% pa, with interest compounded annually.

(i) Find 4% of $55 300

(ii) Find the value of the investment after 1 year.

(iii) Use $\boldsymbol{A = P(1 + r)^n}$ to find the value of the investment after 4 years.

(b) Harold purchases a new car for $39 888. Its value depreciates by 15% each year.

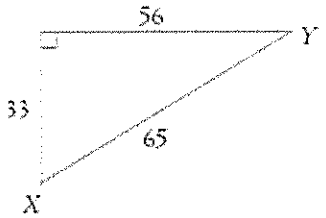
(i) Use $\boldsymbol{A = P(1 - r)^n}$ to find the value of the car after 4 years.

(ii) How much has the car depreciated in value?

Right-Angled Trigonometry

Question 5 (5 marks)

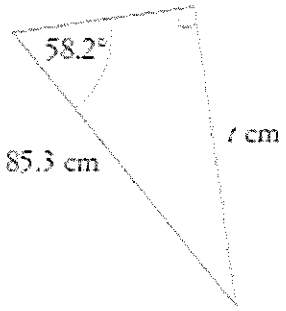
(a) For this triangle, use $\boldsymbol{SohCahToa}$ to write a fraction for:



(i) $tanX =$ ____ (ii) $sinY =$ ____

(b) Solve $\cos 30^\circ = \frac{x}{5}$ correct to 1 decimal place.

(c) Find the value of t correct to the nearest cm.



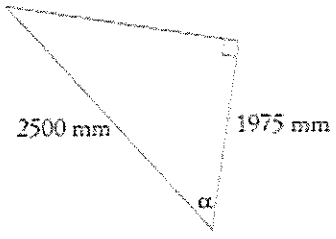
Question 6 (4 marks)

(a) Solve $\tan\theta = \frac{9}{4}$

(i) Correct to the nearest degree.

(ii) Correct to the nearest minute.

(b) Find the size of angle α correct to the nearest degree.



Data Analysis

Question 7 (11 marks)

(a) For the data 4, 6, 6, 8, 9, 10, 16 find the:

(i) Mean (correct to 1 decimal place).

(ii) Mode.

(iii) Median.

(iv) Range.

(v) Interquartile Range.

(b)

Score, x	Frequency, f	fx
0	3	0
1	7	
2	6	
3	4	12
4	2	
5	1	
6	1	
Total	24	

(i) Complete the table.

(ii) Use $Mean = \frac{Sum\ of\ fx\ column}{Sum\ of\ f\ column}$ to find the mean correct to 1 decimal place.

(iii) Find the mode.

(iv) Find the median.

(v) Find the range.

Algebraic Expressions

Question 8 (12 marks)

(a) If $a = 3$ and $b = 4$, find the value of:

(i) $2a - b$

(ii) $3ab$

(iii) $7a - b^2$

(iv) $\sqrt{7(a+b)}$

(b) Simplify:

(i) $8y + 6y - 3y$

(ii) $5m - 3n + m$

(iii) $2k^2 + k^2 + 3k - 4k$

(iv) $4g \times 2h \times 3$

(v) $(-2r) \times (-r)$

(vi) $24xy \div 6x$

(c) Expand:

(i) $3(x + 7)$

(ii) $-3f(2 - g)$

Equations

Question 9 (12 marks)

(a) Solve:

(i) $x + 5 = 49$

$x =$ _____

(ii) $4a = 27$

$a =$ _____

(iii) $b - 2 = -5$

$b =$ _____

(iv) $\frac{c}{4} + 3 = 17$

$\frac{c}{4} =$ _____

$c =$ _____

(v) $6d + 2 = 5d$

$d =$ _____

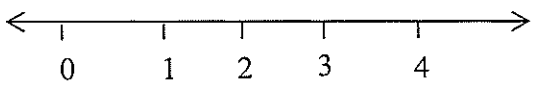
(vi) $5(e - 2) = 30$

$e - 2 =$ _____

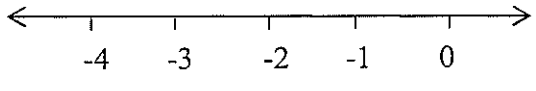
$e =$ _____

(b) Graph the following inequalities:

(i) $x \geq 1$



(i) $x < -3$



(c) Solve these inequations:

(i) $4x \leq -12$

$x \leq$ _____

(ii) $-2x < 8$

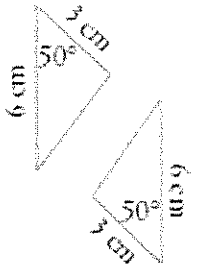
x _____ -2

Geometry

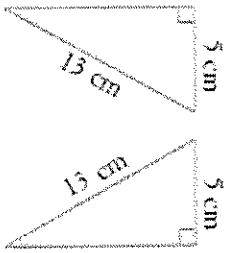
Question 10 (10 marks)

(a) Which congruence test (SSS, SAS, AAS or RHS) proves that the triangle is congruent?

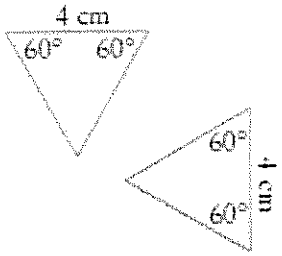
(i)



(ii)



(iii)

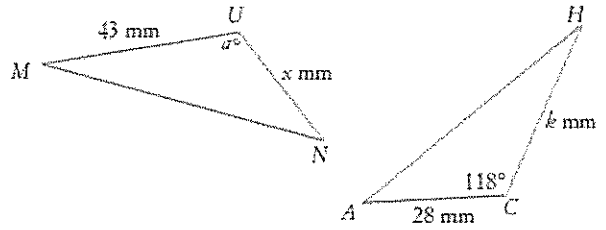


(b) Complete the sentence:

_____ sides and angles of congruent triangles are equal.

(c) For the following pair of triangles,

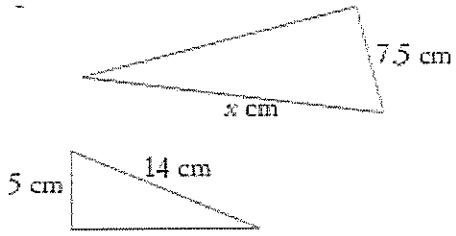
$\triangle NUM \equiv \triangle ACH$



(i) Find the value of a.

(ii) Find the value of k.

(d) The following pair of triangles are similar.

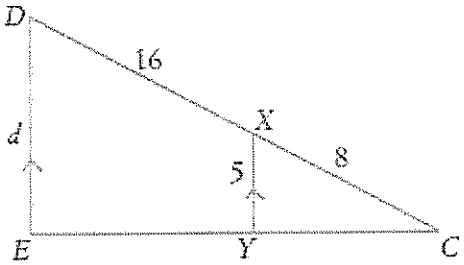


(i) Find the value of x by solving $\frac{x}{14} = \frac{7{\cdot}5}{5}$

(ii) What is the scale factor for this enlargement?

(d) For the following pair triangles,

$\triangle CED \parallel\!\parallel \triangle CYX$



(i) Complete the equation:

$$\frac{d}{5} = \frac{}{8}$$

(ii) Solve for d

Probability

Question 10 (10 marks)

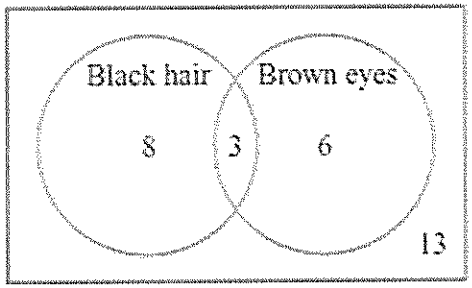
(a) 100 batteries were selected at random from a production line and tested. The results are shown in this table:

Battery life (h)	Frequency
<10	3
10–19	21
20–29	60
30–49	15
40–49	1

(i) How many batteries had a life of less than 30 hours?

(ii) What is the relative frequency for a result of 10-19 hours?

(b) The Venn diagram shows the hair and eye colour of 30 students in a class:



What is the probability that a student chosen at random will have:

(i) Black hair and brown eyes?

(ii) Black hair or brown eyes, but not both?

(iii) Neither black hair nor brown eyes?

(c) The following two-way table shows the number of people in a class who study History and Art:

	Study art	Do not study art	
Study history	7	11	18
Do not study history	6	5	11
	13	16	29

(i) How many students are in the class?

(ii) How many students study Art?

(iii) How many students study History but not Art?

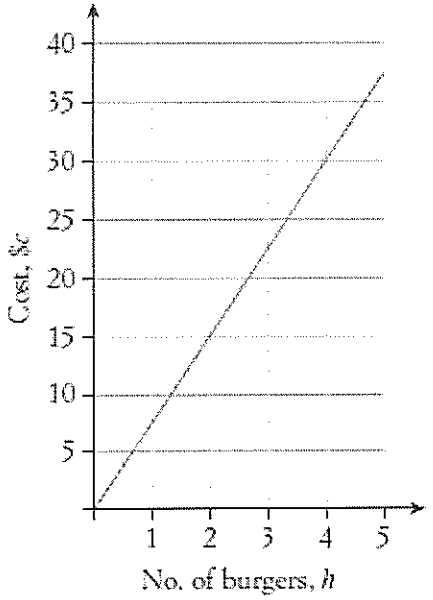
(iv) What is the probability that a student chosen at random studies History and Art?

(v) A student who studies History is chosen. What is the probability that this student also studies Art?

Number Plane Graphs

Question 11 (12 marks)

(a) This graph shows that the cost of hamburgers purchased from the local takeaway store is directly proportional to the number of burgers purchased.



(i) Use the graph to complete the following table:

No. of burgers, h	Cost, c ($)
1	7.50
2	
3	

(ii) Use the table to complete the equation:

$c =$ _____h

(b) Eddie works part time and is paid at a fixed rate per hour. If he earns $135 for 6 hours work,

(i) How much is he paid per hour?

(ii) How much will he earn for 10 hours work?

(c) Complete these tables for the given equations:

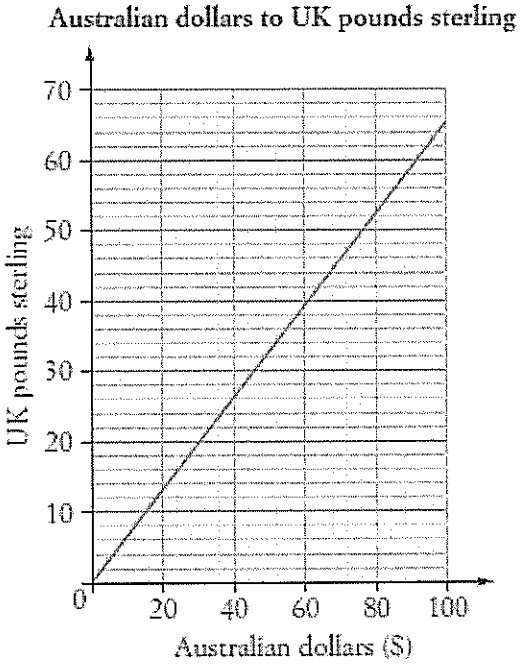
(i) $y = 2^x$

x	-2	-1	0	1	2
y					

(ii) $y = 2x^2$

x	-2	-1	0	1	2
y					

(d) This conversion graph can be used to convert between Australian dollars and UK pounds sterling.



(i) Use the graph to convert $40 to pounds.

(ii) Use the graph to convert 40 pounds to Australian dollars.

(e) Write down the equation of a circle with centre (0,0) and radius 5.

Rates (6 marks)

Question 12

(a) Simplify 240 km in 4 hours

(b) An electrician took 3.5 hours to complete a job. If he charged $217, work out the rate he charged per hour.

(c) While a cow browsing peacefully for 12 minutes in the grasslands , its heart beat 780 times. What was the cow's rate in beats/min?

(d) A car is travelling at 90 km/h

(i) How far does it travel in one minute?

(ii) How many metres is this ?

(iii) Find the speed in m/s.

END OF TEST

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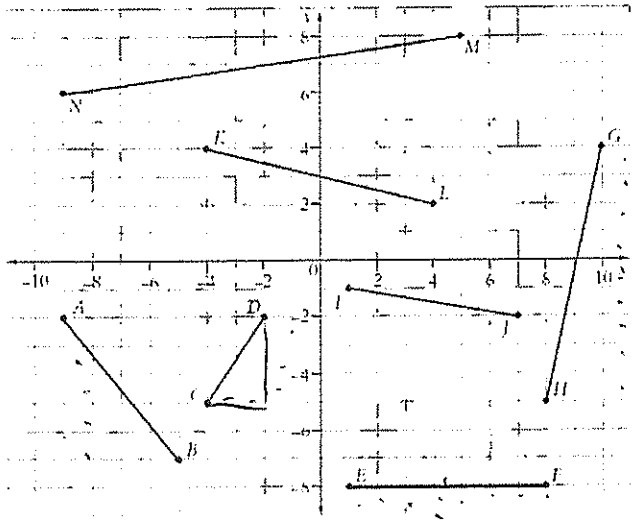
Total	/110

Linear Relationships

Question 1 (6 marks)



(a) Use $gradient = \frac{rise}{run}$ to find the gradients of the following lines:

(i) GH $\frac{9}{2}$ (ii) AB $-\frac{5}{4}$

(b) Find the midpoint of the following intervals:

(i) EF $(\frac{8+1}{2}, \frac{-1}{2})$ $(4.5, -5)$ (ii) MN $(\frac{-6+5}{2}, \frac{8+6}{2})$ $(-2, 7)$

(c) Use Pythagoras' Theorem $a^2 + b^2 = c^2$ to calculate the length of CD, correct to 1 decimal place.

$CD = \sqrt{2^2+3^2}$

$= \sqrt{13}$

$= 3.6$

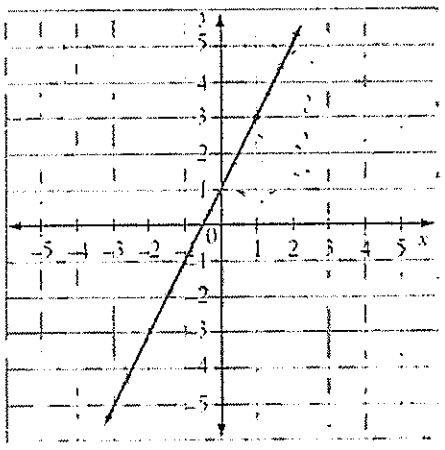
Question 2 (5 marks)

(a) For the graph of $y = 3x - 4$, state the:

(i) Gradient 3

(ii) y-intercept -4

(b)



(i) The y-intercept for this line is 1

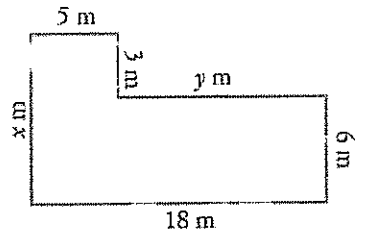
(ii) Use $y = mx + b$ to write the equation of the line.

$y = 2x + 1$

Perimeter, Area and Surface Area

Question 3 (10 marks)

(a)



(i) Find the value of y.

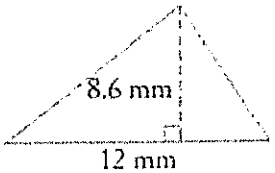
$18 - 5 = 13$

(ii) Perimeter = 54 m

$9 + 18 + 9 + 18$ 27 27

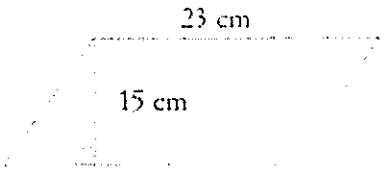
(b) (i) Use $\boldsymbol{A = \frac{1}{2}bh}$ to find the area of this triangle.

$\frac{1}{2} \times 12 \times 8.6$



Area = 51.6 mm^2

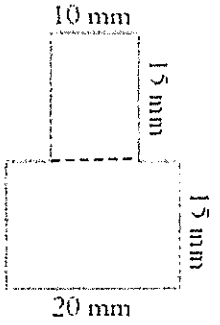
(ii) Find the area of this parallelogram.



$A = 15 \times 23$

Area = 345 cm^2

(iii) Find the area of this composite shape.

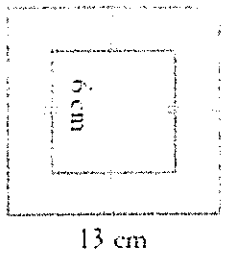


$15 \times 10 = 150$

$15 \times 20 = 300$

Area = 450 mm^2

(iv) Find the shaded area.



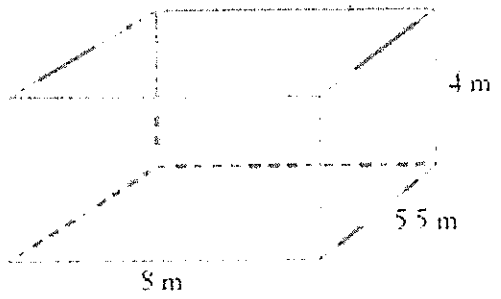
$13^2 - 6^2$

$= 19 \times 7$

19, 7, 3

Area = 133 cm^2

(c) Use the formula $A = 2l + 2b + 2h$ to find the surface area of this rectangular prism.



$A = 2(8) + 2(5.5) + 2 \times 4$

$= 16 + 11 + 8$

Surface Area = 35 m^2

Compound Interest

Question 4 (7 marks)

(a) $55 300 is invested at 4% pa, with interest compounded annually.

(i) Find 4% of $55 300

$\frac{4}{100} \times 55300 = 2212$

(ii) Find the value of the investment after 1 year.

$55300 + 2212 = 57512$

(iii) Use $A = P(1 + r)^n$ to find the value of the investment after 4 years.

$A = 55300(1 + 0.04)^4$

$= \$64693.18$

(b) Harold purchases a new car for $39 888. Its value depreciates by 15% each year.

(i) Use $A = P(1 - r)^n$ to find the value of the car after 4 years.

$A = 39888(1 - 0.15)^4$

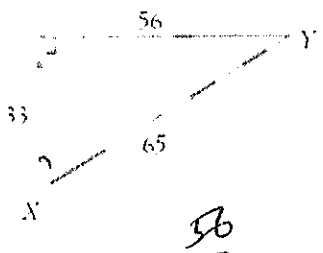
$= \$20821.79$

(ii) How much has the car depreciated in value?

Right-Angled Trigonometry

Question 5 (5 marks)

(a) For this triangle, use ***SohCahToa*** to write a fraction for:



(i) $tanX = \frac{56}{33}$

(ii) $sinY = \frac{33}{65}$

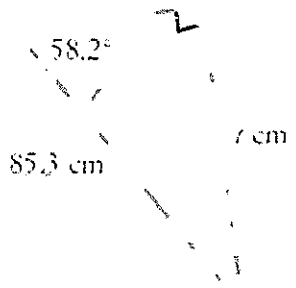
(b) Solve $\cos 30^\circ = \frac{x}{5}$ correct to 1 decimal place.

$x = 5 \times \cos 30^\circ$

$= 5 \times \cos 30^\circ$

$= 4.3$

(c) Find the value of t correct to the nearest cm.



$\frac{t}{85.3} = \sin 58.2^\circ$

$t = 85.3 \times \sin 58.2^\circ$

$= 72 \text{ cm}$

Question 6 (4 marks)

(a) Solve $\tan\theta = \frac{9}{4}$

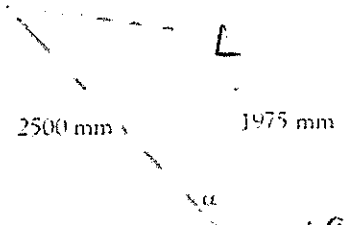
(i) Correct to the nearest degree.

$\theta = \tan^{-1}\left(\frac{9}{4}\right) = 66^\circ$

(ii) Correct to the nearest minute.

$66^\circ 21'$

(b) Find the size of angle α correct to the nearest degree.



$\cos\alpha = \frac{1975}{2500}$

$= 38^\circ$

Data Analysis

Question 7 (11 marks)

(a) For the data 4, 6, 6, 8, 9, 10, 16 find the:

(i) Mean (correct to 1 decimal place).

8.4

(ii) Mode.

6

(iii) Median.

8

(iv) Range.

$16 - 4 = 12$

(v) Interquartile Range.

$10 - 6 = 4$

(b)

Score, x	Frequency, f	fx
0	3	0
1	7	7
2	6	12
3	4	12
4	2	8
5	1	5
6	1	6
Total	24	50

(i) Complete the table.

(ii) Use $Mean = \frac{Sum\ of\ fx\ column}{Sum\ of\ f\ column}$ to find the mean correct to 1 decimal place.

2.1

(iii) Find the mode.

1

(iv) Find the median.

2

(v) Find the range.

6

Algebraic Expressions

Question 8 (12 marks)

(a) If $a = 3$ and $b = 4$, find the value of:

(i) $2a - b$ $2\times3-4$ $= 2$

(ii) $3ab$ $3\times3\times4$ $= 36$

(iii) $7a - b^2$ $7\times3-4^2$ $= 21-16=5$

(iv) $\sqrt{7(a+b)}$ $= 7$

(b) Simplify:

(i) $8y + 6y - 3y$ $11y$

(ii) $5m - 3n + m$ $3m\ 6m-3n$

(iii) $2k^2 + k^2 + 3k - 4k$ $3k^2-k$

(iv) $4g \times 2h \times 3$ $24gh$

(v) $(-2r) \times (-r)$ $2r^2$

(vi) $24xy \div 6x$ $4y$

(c) Expand:

(i) $3(x + 7)$ $3x+21$

(ii) $-3f(2 - g)$ $-6f+3fg$

Equations

Question 9 (12 marks)

(a) Solve:

(i) $x + 5 = 49$ $x = 44$

(ii) $4a = 27$ $a = \frac{27}{4}$

(iii) $b - 2 = -5$ $b = -3$

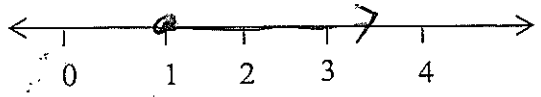
(iv) $\frac{c}{4} + 3 = 17$ $\frac{c}{4} = 14$ $c = 56$

(v) $6d + 2 = 5d$ $d = -2$

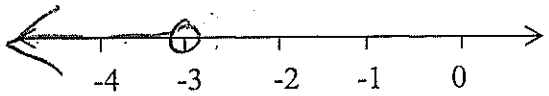
(vi) $5(e - 2) = 30$ $e - 2 = 6$ $e = 8$

(b) Graph the following inequalities:

(i) $x \geq 1$



(i) $x < -3$



(c) Solve these inequations:

(i) $4x \leq -12$

$x \leq -3$

(ii) $-2x < 8$

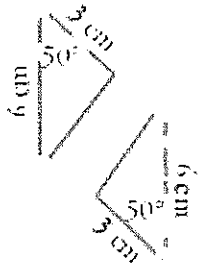
$x > -4$ (−6)

Geometry

Question 10 (10 marks)

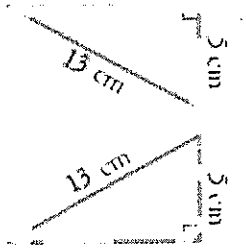
(a) Which congruence test (SSS, SAS, AAS or RHS) proves that the triangle is congruent?

(i)



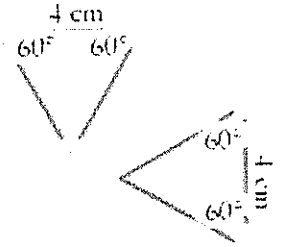
SAS

(ii)



RHS

(iii)



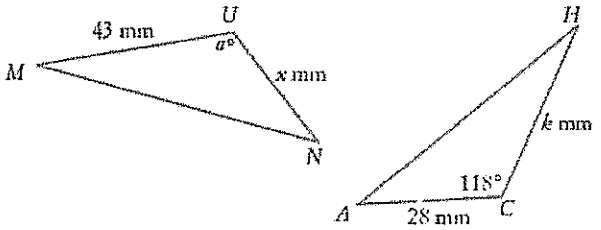
AAS

(b) Complete the sentence:

matching
corresponding sides and angles of congruent triangles are equal.

(c) For the following pair of triangles,

$\triangle NUM \equiv \triangle ACH$



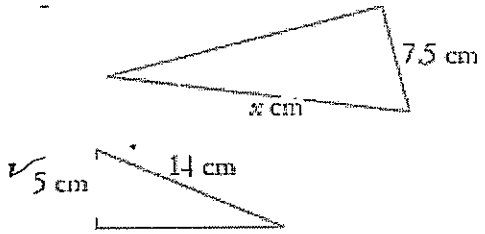
(i) Find the value of a.

118°

(ii) Find the value of k.

43 mm

(d) The following pair of triangles are similar.



(i) Find the value of x by solving $\frac{x}{14} = \frac{7.5}{5}$

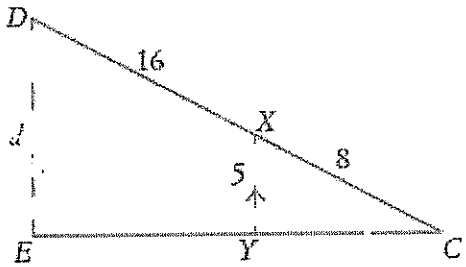
$x = 21$

(ii) What is the scale factor for this enlargement?

1.5

(d) For the following pair triangles,

$\triangle CED \parallel\!\parallel \triangle CYX$



(i) Complete the equation:

$\frac{d}{5} = \frac{24}{8}$

(ii) Solve for d

15

Probability

Question 10 (10 marks)

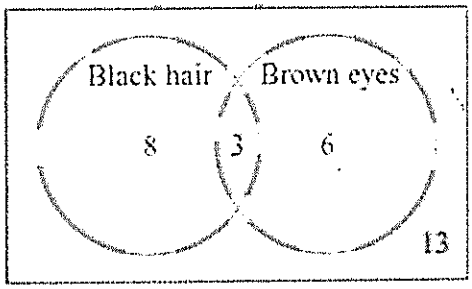
(a) 100 batteries were selected at random from a production line and tested. The results are shown in this table:

Battery life (h)	Frequency
≤10	3
10–19	21
20–29	60
30–49	15
40–49	1

(i) How many batteries had a life of less than 30 hours? 3 + 21 + 60 = 84

(ii) What is the relative frequency for a result of 10-19 hours? 21/100

(b) The Venn diagram shows the hair and eye colour of 30 students in a class:



What is the probability that a student chosen at random will have:

(i) Black hair and brown eyes? 3/30 = 1/10

(ii) Black hair or brown eyes, but not both? 14/30 = 7/15

(iii) Neither black hair nor brown eyes? 13/30

(c) The following two-way table shows the number of people in a class who study History and Art:

	Study art	Do not study art	
Study history	7	11	18
Do not study history	6	5	11
	13	16	29

(i) How many students are in the class? 29

(ii) How many students study Art? 13

(iii) How many students study History but not Art? 11

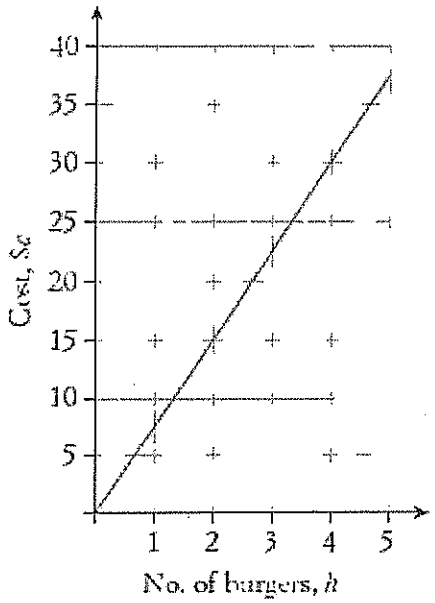
(iv) What is the probability that a student chosen at random studies History and Art? 7/29

(v) A student who studies History is chosen. What is the probability that this student also studies Art? 7/18

Number Plane Graphs

Question 11 (12 marks)

(a) This graph shows that the cost of hamburgers purchased from the local takeaway store is directly proportional to the number of burgers purchased.



(i) Use the graph to complete the following table:

No. of burgers, h	Cost, c ($)
1	7.50
2	15
3	22.50

(ii) Use the table to complete the equation:

$c =$ 7.5 h

(b) Eddie works part time and is paid at a fixed rate per hour. If he earns $135 for 6 hours work,

(i) How much is he paid per hour?

$22.50

(ii) How much will he earn for 10 hours work?

$225

(c) Complete these tables for the given equations:

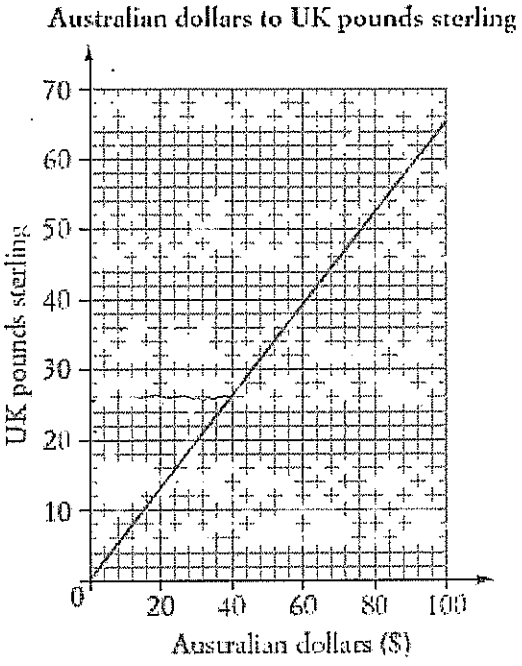
(i) $y = 2^x$

x	−2	-1	0	1	2
y	$2^{-2} = \frac{1}{4}$	$2^{-1} = \frac{1}{2}$	1	2	4

(ii) $y = 2x^2$

x	-2	-1	0	1	2
y	8	2	0	2	8

(d) This conversion graph can be used to convert between Australian dollars and UK pounds sterling.



(i) Use the graph to convert $40 to pounds.

24 pounds

(ii) Use the graph to convert 40 pounds to Australian dollars.

$60 to 65

(e) Write down the equation of a circle with centre (0,0) and radius 5.

$x^2 + y^2 = 5^2$

Rates (6 marks)

Question 12

(a) Simplify 240 km in 4 hours

6 km/h.

(b) An electrician took 3.5 hours to complete a job. If he charged $217, work out the rate he charged per hour.

$\frac{217}{3.5}$ = $62/h.

(c) While a cow browsing peacefully for 12 minutes in the grasslands , its heart beat 780 times. What was the cow's rate in beats/min?

$\frac{780}{12}$ = 65 beats/min

(d) A car is travelling at 90 km/h

(i) How far does it travel in one minute?

1.5 km/min $\frac{90 \times 1000}{60}$

(ii) How many metres is this ?

1.5 × 1000 = 1500 metres.

(iii) Find the speed in m/s.

$\frac{1500}{60}$ = 25 m/s.

END OF TEST