CARLINGFORD HIGH SCHOOL

DEPARTMENT OF MATHEMATICS

Year 10 (5.2) Mathematics

Term 4 Yearly Exam 2016

Time allowed : ***90 Minutes***

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

Please circle your Teacher's name: Mr Gong Mrs Pennington

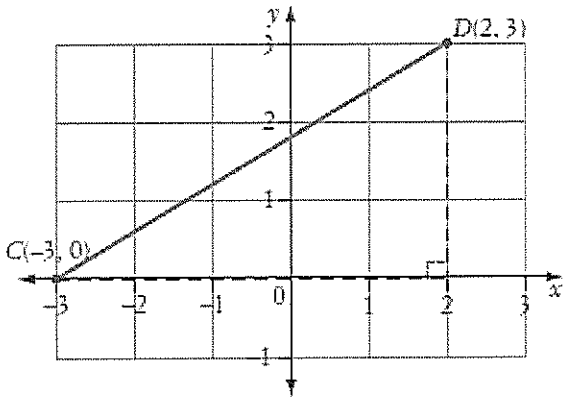
Instructions

- 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

TOPICS	STANDARD	EXTENSION(*)	TOTAL
Multiple Choice	/ 25		/ 25
Linear Relationships	/ 5	/ 2	/ 7
Compound Interest	/ 5	/2	/ 7
Surface Area & Volume	/ 5	/ 2	/ 7
Equations & Inequalities	/ 5	/ 2	/ 7
Data Analysis	/ 5	/ 2	/ 7
Graphs	/ 5	/ 2	/ 7
Trigonometry	/ 5	/ 2	/ 7
Algebra	/ 5	/ 2	/ 7
Probability	/ 5	/ 2	/ 7
Geometry	/ 5	/ 2	/ 7
TOTAL	/ 75	/ 20	/ 95

Multiple Choice Questions (Suggested time 25 mins, 25 marks)

Questions 1, 2 and 3 refer to this diagram of interval *CD*



1 What is the length of interval *CD* ?

(A) 5.8 units **(B)** 2 units **(C)** 8 units **(D)** 3.2 units

2 What is the midpoint of *CD* ?

(A) (– 5, 3) **(B)** (– 1, 3) **(C)** (– 2.5, 1.5) **(D)** (– 0.5, 1.5)

3 What is the gradient of *CD* ?

(A) -3 **(B)** $\frac{3}{5}$ **(C)** $-\frac{5}{3}$ **(D)** 2

4 Jane is paid a commission of 2.5% on the value of goods she sells. She also receives a weekly retainer of $875. How much will Jane earn if she sells goods to the value of $41 600 in one week?

(A) $1061.88 **(B)** $2187.50 **(C)** $1915 **(D)** $1018.13

5 Peter owed $783.26 on his credit card. The credit card company charged him one month's simple interest at 18% p.a. How much interest was he charged?

(A) $14.10 **(B)** $11.75 **(C)** $43.51 **(D)** $27.39

6 To save for a holiday, Davo invested $3480 for 6 months at a simple interest rate of 5.4% p.a. How much will this investment be worth by the end of the period?

(A) $32.40 **(B)** $93.96 **(C)** $3866.67 **(D)** $3573.96

7 How many faces has a triangular prism?

(A) 5 **(B)** 9 **(C)** 6 **(D)** 4

8 Calculate the area of a semicircle with a radius of 7 cm.

(A) 21.99 cm^2 **(B)** 43.98 cm^2 **(C)** 76.97 cm^2 **(D)** 153.9 cm^2

9 How many litres are there in a cubic metre?

(A) 1 **(B)** 1000 **(C)** 100 **(D)** 10 000

10 Solve $m^2 - 10 = 26$

(A) $m = \pm 4$ **(B)** $m = \dfrac{\pm\sqrt{26}}{10}$ **(C)** $m = \pm 8$ **(D)** $m = \pm 6$

11 Solve $x^2 + 6x - 40 = 0$.

(A) $x = 4$ or -10 **(B)** $x = -4$ or 10 **(C)** $x = -5$ or 8 **(D)** $x = 5$ or -8

12 What is the y – intercept of the graph of $y = 3x^2 - 12x + 5$?

(A) -12 **(B)** 3 **(C)** 5 **(D)** 4

13 For which set of scores below is the mean the same as the median?

(A) 2, 2, 3, 3, 4 **(B)** 1, 2, 5, 6, 6 **(C)** 2, 4, 4, 4, 5 **(D)** 1, 2, 3, 4, 5, 6, 7, 8

14 Which one of these is a measure of spread?

(A) mode **(B)** outlier **(C)** median **(D)** interquartile range

15 The scores 4, 3, 7 and x have a mean of 4. What is the value of x ?

(A) 2 **(B)** 3.5 **(C)** 2.5 **(D)** 4

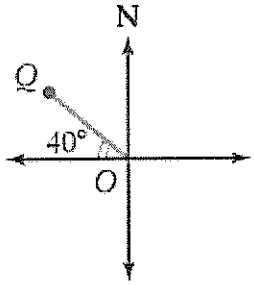
16 Which type of graph has one axis of symmetry ?

(A) circle **(B)** line **(C)** parabola **(D)** exponential curve

17 Which one of these equations is **not** the equation of a line ?

(A) $x + y = 2$ **(B)** $y = 2x$ **(C)** $y = 2$ **(D)** $y = 2^x$

18 What is the bearing of Q from O ?



(A) 320° **(B)** 310° **(C)** 040° **(D)** 140°

19 Evaluate $14 \tan 79°$.

(A) 72.02 **(B)** 0.49 **(C)** 19.70 **(D)** 79

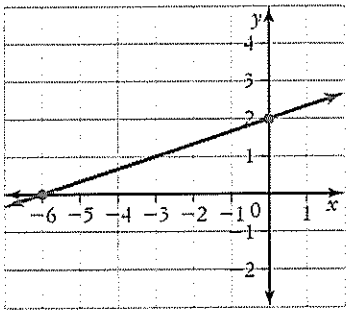
20 If the probability that it will snow tomorrow is 15%, what is the probability that it will not snow?

(A) 0% **(B)** 30% **(C)** 45% **(D)** 85%

21	When a coin is tossed twice, these events can be called:			
	(A) complementary	**(B)** independent	**(C)** dependent	**(D)** samples
22	S varies directly with t. If $t = 14$, $S = 106.4$, what is the value of S when $t = 0.3$?			
	(A) 36.12	**(B)** 27.72	**(C)** 2.28	**(D)** 446.88
23	The rate of vibration of a string varies inversely as its length. A string that is 8 cm long vibrates at 9375 Hz (hertz). What length of string of string will vibrate at 6250 Hz ?			
	(A) 5 cm	**(B)** 7 cm	**(C)** 73	**(D)** 12 cm
24	Which one of the following is not a test for congruent triangles?			
	(A) SSS	**(B)** SAS	**(C)** SSA	**(D)** RHS
25	How many sides has a pentagon?			
	(A) 5	**(B)** 7	**(C)** 8	**(D)** 10

End of Multiple Choice Questions

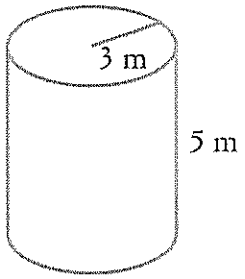
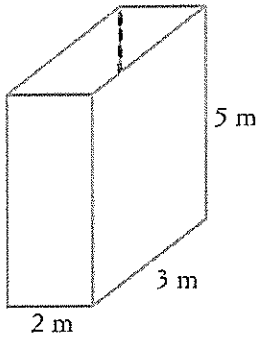
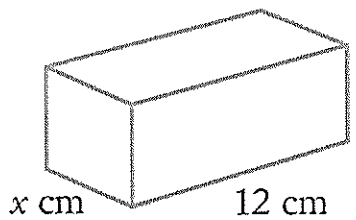
Answer in the space provided

	Linear Relationships (7 marks)	Mark
1	Write the equation of a line that has a gradient of 7 and a y-intercept of -3.	[1]
2	The interval AB on a number plane has endpoints $A(-3, 1)$ and $B(7, 5)$. Find: **a).** the gradient of AB.	[1]
	b). the length of AB as a surd.	[1]
	c). the midpoint of AB.	[1]
3	Write down the equation of this line. 	[1]
4 *	A triangle has vertices at $P(-2, -5)$, $Q(1, 4)$ and $R(10, 1)$. Prove that it is isosceles.	[2]

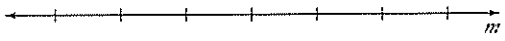
Answer in the space provided

	Compound Interest (7 marks)	Mark
1	Calculate the simple interest when \$5600 is borrowed at 9% p.a. for 7 months.	[1]
2	A principal of \$14 000 is invested at 3.75% p.a. compounded monthly for 5 years. Calculate: **a).** the final amount of the investment. **b).** the interest earned.	[2] [1]
3	When compound interest is earned on an investment, is it better for the interest to be compounded quarterly or monthly? Give a reason for your answer, assuming that the interest rate is the same for both cases.	[1]
4 *	Ali works in an electronics store and is paid \$18.90 per hour for a 38-hour week and time-and-a-half for any overtime. How much does he earn for working 44 hours this week?	[2]

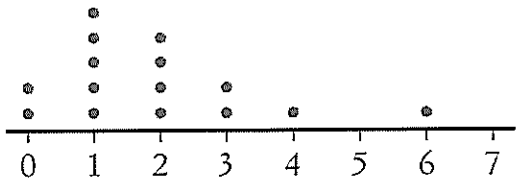
Answer in the space provided

	Surface Area & Volume (7 marks)	Mark
1	Find the curved surface area of this cylinder.  	[1]
2	**a).** Find its surface area.  **b).** Find its capacity in litres.	[2] [1]
3	Draw the net of a cylinder.	[1]
4 *	Find the value of x if this square prism has a volume of 192 cm^3.  	[2]

Answer in the space provided

	Equations & Inequalities (7 marks)	Mark
1	Solve $b^2 + 8b = 0$	[2]
2	**a).** Solve $\frac{m-6}{3} \leq -2$.	[2]
	b). Graph the solution on the number line below. 	[1]
3 *	A rectangle is three times as long as it is wide. Find its length and width if its perimeter is 56 cm.	[2]

Answer in the space provided

	Data Analysis (7 marks)	Mark
1	This stem-and-leaf plot lists the ages of people visiting a chemist in half an hour. Stem | Leaf 0 | 3 7 8 1 | 2 5 6 9 9 2 | 4 7 3 | 0 4 5 6 6 7 8 4 | 2 5 8 8 8 5 | 0 1 7 7 8 6 | 3 4 8 Find: **a).** the range. **b).** the mode. **c).** the median.	 **[1]** **[1]** **[1]**
2	This dot plot shows the number of rainy days per week in Mudgee over a 15-week period.  **a).** Describe the shape of this distribution. **b).** What is the outlier?	 **[1]** **[1]**
3 *	Alice's average mark for five exams is 67%. In her next exam, she wants to improve her average to 70%. What mark must she obtain in her next exam to achieve this?	**[2]**

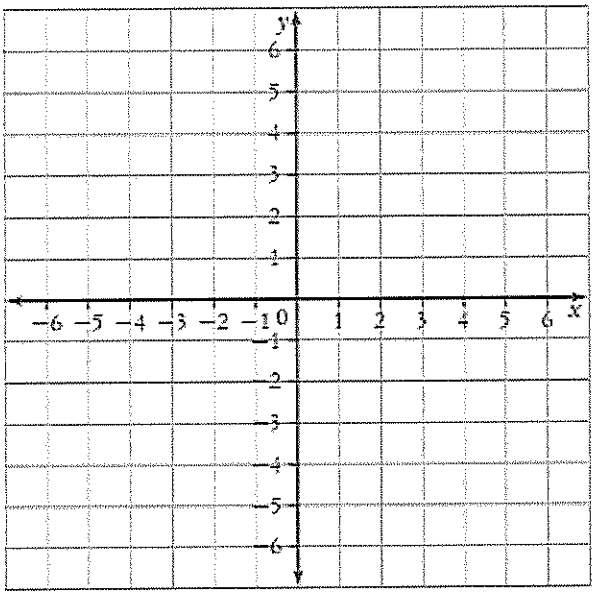
Answer in the space provided

	Graphs (7 marks)	Mark
1	**a).** Complete this table for $y = \frac{1}{2}x^2$.	

x	-3	-2	-1	0	1	2	3
y							

[2]

b). Graph on the number plane.



[1]

c). What are the coordinates of the vertex ? [1]

d). How does the graph of $y = \frac{1}{2}x^2$ compare with the graph of $y = x^2$? [1]

2 *	For a certain equation, t is inversely proportional to s. If $s = 0.3$ when $t = 40$, find t when $s = 32$.	[2]

Answer in the space provided

	Trigonometry (7 marks)	Mark
1	Convert 43.15° to degrees and minutes	[1]
2	A right-angled triangle has the trigonometric ratio $\tan\theta = \frac{7}{24}$ **a).** Sketch and label the triangle.	[1]
	b). Use Pythagoras' theorem to find the length of the third side.	[2]
	c). Write the value of $\sin\theta$.	[1]
3 *	A kite is attached to a string 132 metres long. The string makes an angle of 22° with the ground. Calculate correct to the nearest metre the height of the kite above the ground.	[2]

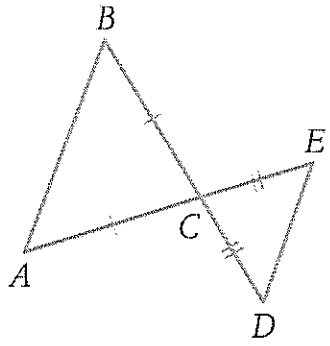
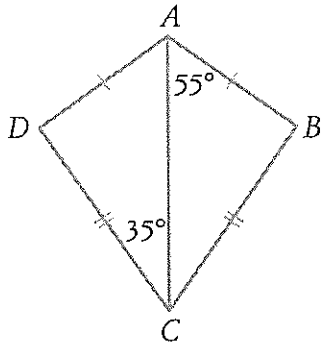
Answer in the space provided

	Algebra (7 marks)	Mark
1	Expand and simplify $-2(m-9)$	[1]
2	Factorise each of these expressions. **a).** $x(x-4)+7(x-4)$	[1]
	b). $x^2+13x+30$	[1]
3	Simplify $\frac{3m}{20a} \div \frac{15m}{12}$	[2]
4 *	Expand and simplify $3(4a-2+3b)-5(b-3a)$	[2]

Answer in the space provided

	Probability (7 marks)	Mark
1	Two four-sided dice, with sides numbered 1, 2, 3 and 4, are rolled. **a).** Draw a table to list all outcomes.	[1]
	b). How many outcomes are there?	[1]
	c). Find the probability of rolling a double (both numbers the same).	[1]
	d). Find the probability of rolling at least one odd number.	[2]
2 *	A bag contains 8 red marbles, 7 green marbles and 5 yellow marbles. Two marbles are drawn from the bag without replacement. What is the probability that: **a).** given one marble is red, the other is yellow?	[1]
	b). given one marble is green, the other is also green?	[1]

Answer in the space provided

	Geometry (7 marks)		Mark
1	What does the abbreviation RHS stand for in that congruent triangle test?		[1]
2	In the figure, $BC = AC$ and $CE = CD$.  	**a).** Prove that $\Delta ABC \equiv \Delta EDC$.	[2]
		b). Hence, prove that $BA \parallel ED$.	[1]
3	Draw a non-convex quadrilateral.		[1]
4 *	$ABCD$ is a kite.  	**a).** Which congruence test proves that $\Delta ABC \equiv \Delta ADC$? _____	[1]
		b). Find the size of $\angle D$.	[1]

End of Exam

Section I Multiple Choice Answer Sheet

Name:_____

* Tick or Cross in only ONE box for each question.

Questions	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
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23				
24				
25				

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

Please circle your Teacher's name: Mr Gong Mrs Pennington

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Trigonometry	/ 5	/ 2	/ 7
Algebra	/ 5	/ 2	/ 7
Probability	/ 5	/ 2	/ 7
Geometry	/ 5	/ 2	/ 7
TOTAL	/ 75	/ 20	/ 95

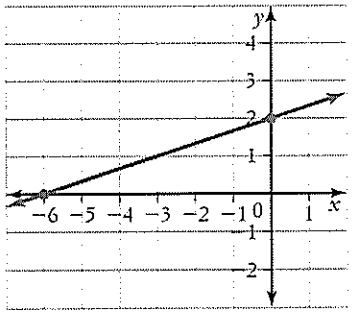
Section I Multiple Choice Answer Sheet

Name:_____

* Tick or Cross in only ONE box for each question.

Questions	A	B	C	D
1	X			
2				X
3		X		
4			X	
5		X		
6				X
7	X			
8			X	
9		X		
10				X
11	X			
12			X	
13				X
14				X
15	X			
16			X	
17				X
18		X		
19	X			
20				X
21		X		
22			X	
23				X
24			X	
25	X			

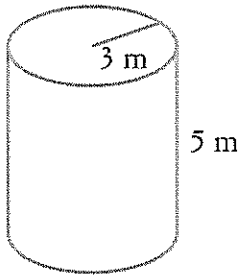
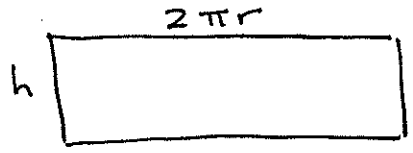
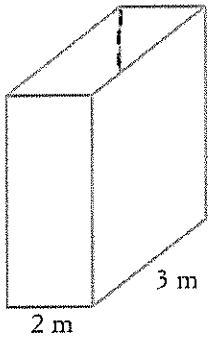
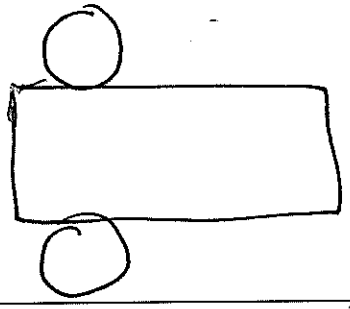
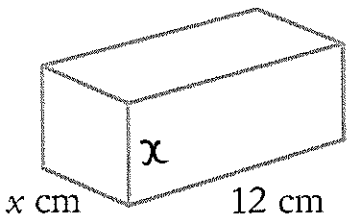
Answer in the space provided

	Linear Relationships (7 marks)	**Mark**
1	Write the equation of a line that has a gradient of 7 and a y-intercept of -3. $y = 7x - 3$	[1]
2	The interval AB on a number plane has endpoints $A(-3, 1)$ and $B(7, 5)$. Find: **a).** the gradient of AB. $m = \frac{y_2 - y_1}{x_2 - x_1}$ $m = \frac{5-1}{7-3}$ $\quad m = \frac{4}{10}$ $\quad m = \frac{2}{5}$ **b).** the length of AB as a surd. $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $d = \sqrt{(7+3)^2 + (5-1)^2}$ $d = \sqrt{10^2 + 4^2}$ $d = \sqrt{100+16}$ $\quad d = \sqrt{116}$ or $d = 2\sqrt{29}$ **c).** the midpoint of AB. $m = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{-3+7}{2}, \frac{1+5}{2}\right)$ $= \left(\frac{4}{2}, \frac{6}{2}\right) = (2, 3)$	[1] [1] [1]
3	Write down the equation of this line.  $m = \frac{2}{6}$ $\quad b = 2$ $m = \frac{1}{3}$ $y = \frac{1}{3}x + 2$	[1]
4 *	A triangle has vertices at $P(-2, -5)$, $Q(1, 4)$ and $R(10, 1)$. Prove that it is isosceles. PQ $d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$ $d = \sqrt{(1+2)^2 + (4+5)^2}$ $d = \sqrt{3^2 + 9^2}$ $d = \sqrt{90}$ QR $d = \sqrt{(10-1)^2 + (1-4)^2}$ $d = \sqrt{9^2 + (-3)^2}$ $d = \sqrt{81+9}$ $d = \sqrt{90}$ $\therefore$ Since $PQ = QR$ then $\triangle PQR$ is isosceles	[2]

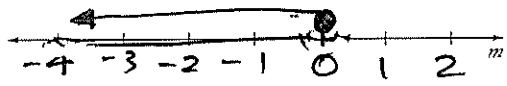
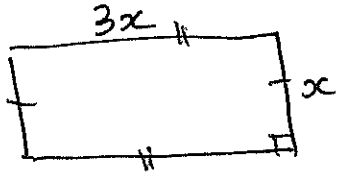
Answer in the space provided

	Compound Interest (7 marks)	Mark
1	Calculate the simple interest when \$5600 is borrowed at 9% p.a. for 7 months. $S = PrN$ $S = \$5600 \times 0.09 \times 7/12$ $S = \$294$	[1]
2	A principal of \$14 000 is invested at 3.75% p.a. compounded monthly for 5 years. Calculate: $= 0.003125$ / month. **a).** the final amount of the investment. $A = P(1+r)^n$ $A = \$14000(1+0.003125)^{60}$ $A = \$14000(1.003125)^{60}$ $= \$16882.29$ **b).** the interest earned. $I = \$16882.29 - \$14000$ $\$2882.29$	[2] [1]
3	When compound interest is earned on an investment, is it better for the interest to be compounded quarterly or monthly? Give a reason for your answer, assuming that the interest rate is the same for both cases. monthly as the more often the interest is paid the more there is invested to calculate the interest on.	[1]
4 *	Ali works in an electronics store and is paid \$18.90 per hour for a 38-hour week and time-and-a-half for any overtime. How much does he earn for working 44 hours this week? $38 \times \$18.90 = \$718.20$ $6 \times 18.90 \times 1.5 = \$170.10$ $\$888.30$ He earns \$888.30	[2]

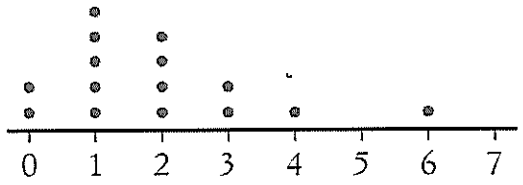
Answer in the space provided

	Surface Area & Volume (7 marks)	Mark
1	Find the curved surface area of this cylinder.   $SA = 2\pi rh$ $SA = 2 \times \pi \times 3 \times 5$ $SA = 94.25\ m^2$ or $30\pi\ m^2$	[1]
2	**a).** Find its surface area.  $SA = (2 \times 5 \times 3) + (2 \times 2 \times 3) + (2 \times 2 \times 5)$ $= 30 + 12 + 20$ $= 62\ m^2$	[2]
	b). Find its capacity in litres.	[1]
	$V = 2 \times 3 \times 5$ $V = 30\ m^3$ $V = 30 \times 1000$ $V = 30000\ L$ $1\ m^3 = 1000\ L$	
3	Draw the net of a cylinder. 	[1]
4 *	Find the value of x if this square prism has a volume of 192 cm^3.  $V = l \times b \times h$ $192 = x \times 12 \times x$ $x^2 = 16$ $x = \sqrt{16}$ $x = 4\ cm$	[2]

Answer in the space provided

	Equations & Inequalities (7 marks)	Mark
1	Solve $b^2 + 8b = 0$ $b(b+8)=0$ $b=0,-8$	[2]
2	**a).** Solve $\frac{m-6}{3} \leq -2$. $m-6 \leq -2\times 3$ $m-6 \leq -6$ $m \leq 0$	[2]
	b). Graph the solution on the number line below.  	[1]
3 *	A rectangle is three times as long as it is wide. Find its length and width if its perimeter is 56 cm.  Let x be the width. $3x + x + 3x + x = 56$ $8x = 56$ $x = 7$ $\therefore$ The length is $3\times 7 = 21$ cm & the width is 7cm	[2]

Answer in the space provided

	Data Analysis (7 marks)	Mark
1	This stem-and-leaf plot lists the ages of people visiting a chemist in half an hour. Stem | Leaf 0 | 3 7 8 1 | 2 5 6 9 9 2 | 4 7 3 | 0 4 5 6 6 7 8 4 | 2 5 8 8 8 5 | 0 1 7 7 8 6 | 3 4 8 Find: **a).** the range. $68-3=65$ **b).** the mode. 48 **c).** the median. $\frac{36+37}{2}=36.5$	[1] [1] [1]
2	This dot plot shows the number of rainy days per week in Mudgee over a 15-week period.  **a).** Describe the shape of this distribution. Positively skewed **b).** What is the outlier? 6	[1] [1]
3 *	Alice's average mark for five exams is 67%. In her next exam, she wants to improve her average to 70%. What mark must she obtain in her next exam to achieve this? $\frac{T}{5}=67$ $T=67\times5$ $=335$ $\frac{335+x}{6}=70$ $x=6\times70-335$ $=85\%$	[2]

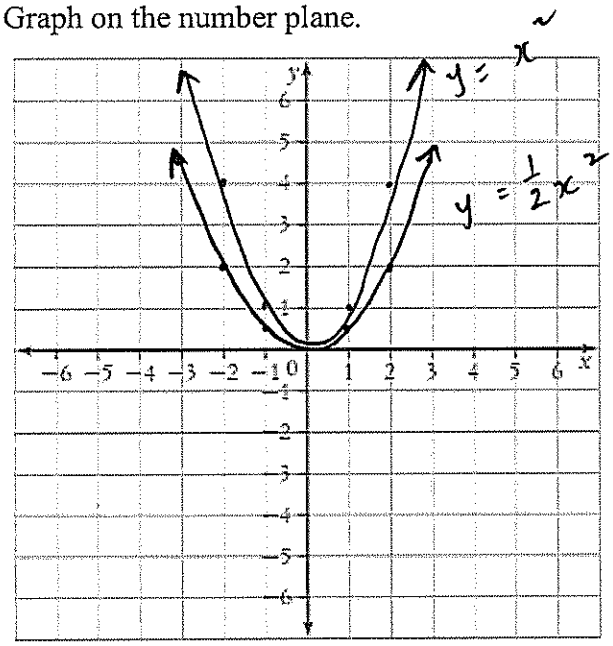
Answer in the space provided

	Graphs (7 marks)	Mark
1	**a).** Complete this table for $y=\frac{1}{2}x^2$.	

x	-3	-2	-1	0	1	2	3
y	4·5	2	$\frac{1}{2}$	0	$\frac{1}{2}$	2	4·5

[2]

b). Graph on the number plane.



[1]

c). What are the coordinates of the vertex ? (0, 0) [1]

d). How does the graph of $y=\frac{1}{2}x^2$ compare with the graph of $y=x^2$? [1]

$y = \frac{1}{2}x^2$ goes up more slowly than $y = x^2$

2 *	For a certain equation, t is inversely proportional to s. If $s = 0.3$ when $t = 40$, find t when $s = 32$.	[2]

$t = \frac{k}{s}$

$40 = \frac{k}{0.3}$

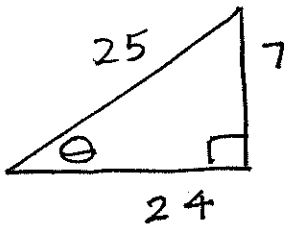
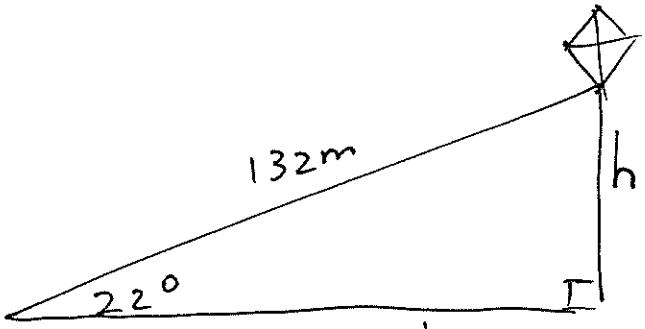
$k = 40 \times 0.3$

$k = 12$

$t = \frac{12}{32}$

$t = 0.375$

Answer in the space provided

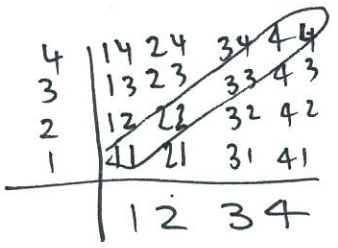
	Trigonometry (7 marks)	Mark
1	Convert 43.15° to degrees and minutes $43°9'$	[1]
2	A right-angled triangle has the trigonometric ratio $\tan\theta = \frac{7}{24}$ **a).** Sketch and label the triangle.  	[1]
	b). Use Pythagoras' theorem to find the length of the third side. $x^2 = 24^2 + 7^2$ $x^2 = 576 + 49$ $x^2 = 625$ $x = \sqrt{625}$ $x = 25$	[2]
	c). Write the value of sin θ. $\sin\theta = \frac{O}{H}$ $\sin\theta = \frac{7}{25}$	[1]
3 *	A kite is attached to a string 132 metres long. The string makes an angle of 22° with the ground. Calculate correct to the nearest metre the height of the kite above the ground.  $\sin 22° = \frac{h}{132}$ $h = 132 \times \sin 22°$ $h \approx 49m$	[2]

Answer in the space provided

	Algebra (7 marks)	**Mark**
1	Expand and simplify $-2(m-9)$ $= -2m + 18$	[1]
2	Factorise each of these expressions. **a).** $x(x-4)+7(x-4)$ $= (x-4)(x+7)$ **b).** $x^2+13x+30$ $= (x+10)(x+3)$ $30 \mid 10, 3$ 13	[1] [1]
3	Simplify $\frac{3m}{20a} \div \frac{15m}{12}$ $\frac{1}{10a} \times \frac{6}{5}$ $= \frac{6}{50a}$ $= \frac{3}{25a}$	[2]
4 *	Expand and simplify $3(4a-2+3b)-5(b-3a)$ $= 12a - 6 + 9b - 5b + 15a$ $= 27a + 4b - 6$	[2]

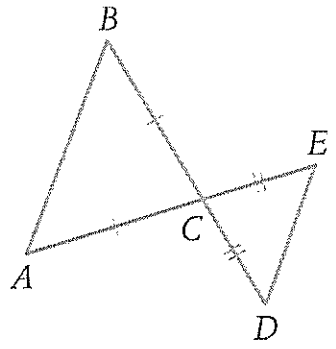
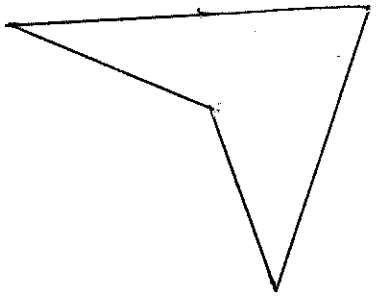
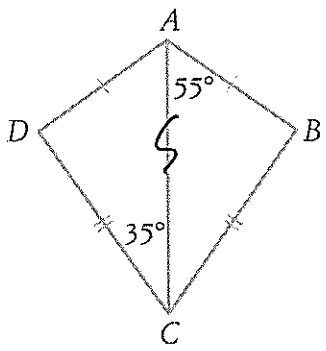
Answer in the space provided

	Probability (7 marks)	Mark
1	Two four-sided dice, with sides numbered 1, 2, 3 and 4, are rolled.	
	a). Draw a table to list all outcomes.	[1]



	b). How many outcomes are there? 16	[1]
	c). Find the probability of rolling a double (both numbers the same). $P(\text{Double}) = \frac{4}{16} = \frac{1}{4}$	[1]
	d). Find the probability of rolling at least one odd number. $P(\text{odd}) = \frac{8}{16} = \frac{1}{2}$ (1mk for this) $\frac{12}{16} = \frac{3}{4}$ (2mks)	[2]
2 *	A bag contains 8 red marbles, 7 green marbles and 5 yellow marbles. Two marbles are drawn from the bag without replacement. What is the probability that:	
	a). given one marble is red, the other is yellow? $P(R,Y) = \frac{8}{20} \times \frac{5}{19} = \frac{40}{380} = \frac{2}{19}$.	[1]
	b). given one marble is green, the other is also green? $P(G,G) = \frac{7}{20} \times \frac{6}{19} = \frac{42}{380} = \frac{21}{190}$	[1]

Answer in the space provided

	Geometry (7 marks)		Mark
1	What does the abbreviation RHS stand for in that congruent triangle test? Right Angle Hypotenuse Side		[1]
2	In the figure, $BC = AC$ and $CE = CD$. 	**a).** Prove that $\Delta ABC \equiv \Delta EDC$. In $\triangle ABC$ & $\triangle EDC$ $\frac{AC}{EC} = \frac{BC}{DC}$ (given) $\angle ACB = \angle ECD$ (vertically opp $\angle$s) $\therefore \Delta ABC \equiv \Delta EDC$ (Two corresponding sides are in proportion & the included angle are equal) **b).** Hence, prove that $BA \parallel ED$. $\because \angle BAC = \angle DEC$ (corresponding $\angle$s of similar Δ are equal) $\therefore BA \parallel ED$ (alternate angle equal)	[2] [1]
3	Draw a non-convex quadrilateral. 		[1]
4 *	$ABCD$ is a kite. 	**a).** Which congruence test proves that $\Delta ABC \equiv \Delta ADC$? SSS **b).** Find the size of $\angle D$. $\angle DAC = 55°$ $\angle D = 180° - (35 + 55)$ $\angle D = 90°$	[1] [1]

End of Exam