SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 9

Yearly Examination 2015

Advanced Mathematics

General Instructions

- Working time – 90 minutes
- Write using black or blue pen.
- Clearly indicate your class by placing an X, next to your class
- All necessary working MUST be shown in every question if full marks are to be awarded.
- Unless otherwise indicated, give all answers in simplest exact form
- Marks may not be awarded for untidy or badly arranged work.
- Approved calculators may be used

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Examiner: A.M.Gainford

NAME:

Class	Teacher	
9 A	Ms Kilmore	
9 B	Mr Choy Mr Elliott	
9 C	Ms Millar Ms Evans	
9 D	Mr Wang	
9 E	Mr Fuller	
9 F	Ms Ward Ms Chan	
9G	Mr Parker	

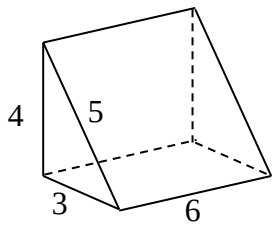
Question	Mark
1	**/14**
2	**/14**
3	**/14**
4	**/14**
5	**/14**
6	**/14**
7	**/14**
Total	**/98**

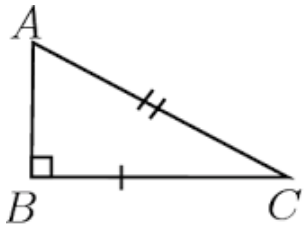
Question 1. (14 marks)

		Answers (Marks)
(a)	Find $\dfrac{66\cdot 7}{1\cdot 4+\sqrt{5\cdot 64}}$ correct to 2 decimal places.	(1)
(b)	Express $0\cdot 0007107$ in scientific notation with three significant figures.	(1)
(c)	Arrange this set of numbers in order, smallest to largest: $\left\{\sqrt{10},\ \pi,\ \sqrt{9\cdot 869},\ (0\cdot 3184)^{-1}\right\}$	(2)
(d)	Express $\dfrac{5}{12}$ as an exact decimal.	(1)
(e)	Rewrite $2y^{-2}$ with a positive index	(1)
(f)	Simplify the following expression: $\dfrac{4\left(a^2b\right)^3}{\left(2ab^3\right)^2}$	(1)
(g)	Express in simplest surd form (i) $4\sqrt{27}+6\sqrt{75}$ (ii) $\dfrac{\sqrt{10}\times 2\sqrt{2}}{4\sqrt{5}}$	(2) (i) (ii)
(h)	Expand and simplify $(2x+3)-3(x+1)$.	(1)

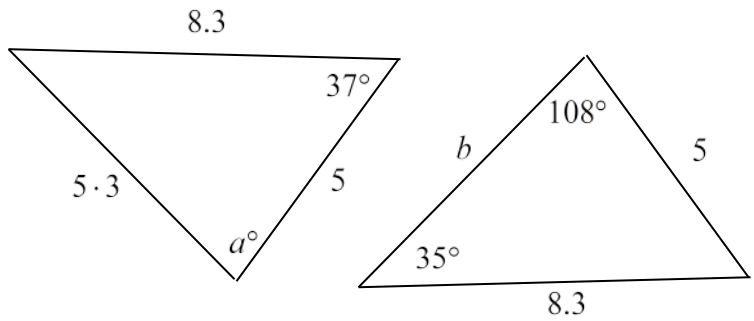
		Answers (Marks)
(i)	Given the set of scores: 8, 6, 7, 5, 6, 5, 6, find: (i) the mode (ii) the mean (iii) the median	(3) (i) (ii) (iii)
(j)	Evaluate $15\sin 30^{\circ}$.	(1)

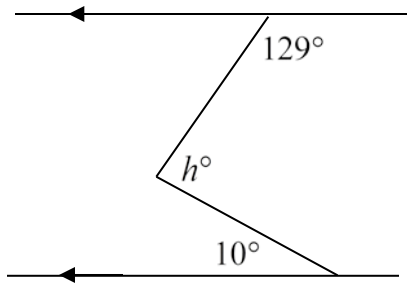
Question 2. (14 marks)

		Answers (Marks)
(a)	Solve: $3(x+1)-2(x-1)=7$	(2)
(b)	Factorise completely: (i) $4x^2y+10x$ (ii) m^2-16	(2) (i) (ii)
(c)	Find the volume and surface area of the closed prism, where measurements are in centimetres. 	(2) Volume = SA =
(d)	Factorise (i) x^2+5x+6 (ii) $10x^2-13x-3$	(2) (i) (ii)
(e)	Phuong can type at 80 words per minute. How long would he take to type a 1500 word document?	(1)

		Answers (Marks)
(f)	 In the triangle $\angle BAC = 65^\circ$, $AC = 21.7$. Find (i) AB (ii) BC both correct to 2 decimal places.	(2) (i) (ii)
(g)	Consider the line with equation $4x - 3y + 2 = 0$ (i)State the gradient of the line. (ii)State the y-intercept of the line	(i) (2) (ii) (1)

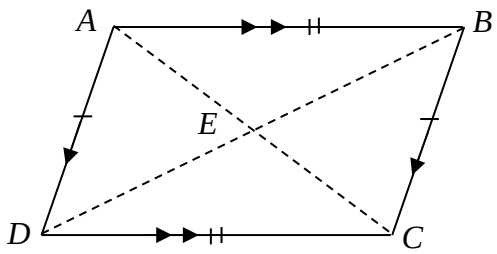
Question 3 (14 Marks)

		Answers (Marks)
(a)	A girl jogs at $1 \cdot 5$ m/s. (i) How far will she jog in 30 minutes? (ii) How long, to the nearest minute, will she take to jog 15 km?	(2) (i) (ii)
(b)	A class of students have a mean age of 15 years, and the sum of their ages is 405 years. Find the number of students in the class.	(1)
(c)	 (i) State which test you would use to show that these two triangles are congruent. (ii) Find the values of the pronumerals.	(i) (1) (ii) (2)

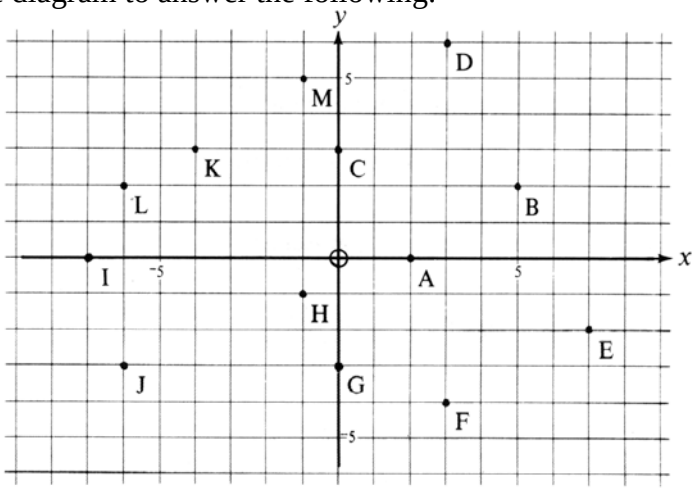
		Answers (Marks)
(d)	Find the value of the pronumeral in this figure:  	(2) h =
(e)	A standard die is rolled twice. Find the probablity that neither roll produces a six.	(2)
(f)	Anita is four times as old as Frank. In five years time Anita will only be three times as old as Frank. Find their present ages.	(2)
(g)	Factorise the following expression: $3ab - 2b^2 - 6a + 4b$	(2)

Question 4 (14 Marks)

		Answers (Marks)
(a)	Using the diagram below prove that the diagonals of a parallelogram bisect each other. (Hint: Consider ΔAEB and ΔCED.)	(6)

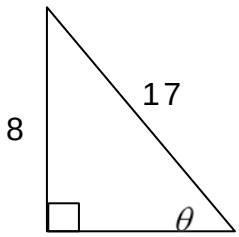


Give clear reasons for each step.

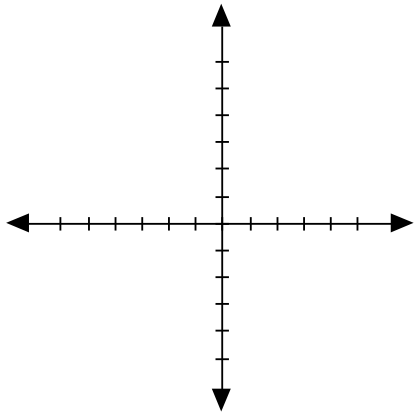
		Answers (Marks)
(b)	Use the diagram to answer the following:  	
	(i) Find the gradient of *CD*.	(i) (1)
	(ii) Find the gradient of *AE*.	(ii) (1)
	(iii) Find the gradient of *CK*.	(iii) (1)
	(iv) Find the length of *HF*.	(iv) (1)
	(v) Find the mid point of *JM*	(v) (2)
	(vi). Write the equation of the line *JK*.	(vi) (2)

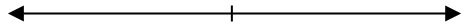
Question 5 (14 Marks)

		Answers (Marks)
(a)	Solve $\frac{2x+1}{3}-\frac{x-1}{2}=3$	(2)
(b)	Make x the subject of the formula $V=\frac{1-A}{2x}$.	(2)
(c)	Simplify, and express with rational denominator: $\frac{1}{2\sqrt{3}-\sqrt{2}}-\frac{1}{2\sqrt{3}+\sqrt{2}}$	(2)

		Answers (Marks)
(d)	Find θ correct to the nearest minute.  	(2)
(e)	*R* is the point (*x*, 3), while *S* is the point (5,7).The distance *RS* is 5 units. Show that there are two possible values for *x*, and state the possible co-ordinates of *R*.	(2)
(f)	Three different coins are tossed together. (i) Draw a tree diagram (below) to indicate the possible outcomes. (ii) State the probability of obtaining two heads and a tail.	(2) (ii) (2)

Question 6 (14 Marks)

		Answers (Marks)
(a)	Solve this set of equations graphically: $\left.\begin{aligned} 2x + y &= 1 \\ x - y &= 5 \end{aligned}\right\}$ 	(3)
(b)	Make *t* the subject of the formula $x = 4\sqrt{3 - t}$.	(2)
(c)	Solve the inequation $\frac{2x-1}{3} < x + 2$.	(2)

		Answers (Marks)
(d)	Simplify $\frac{x^2-7x+10}{x^2-10x+25}$.	(2)
(e)	Sketch the solution set of the inequation $3(5-2x) \leq 3$ on the number line.	(2) 

(f)

Score	Frequency
6	8
7	21
8	7
9	15
10	12
11	30

Consider the distribution at left.

Calculate (i) the mode

(ii) the median

(iii) the mean

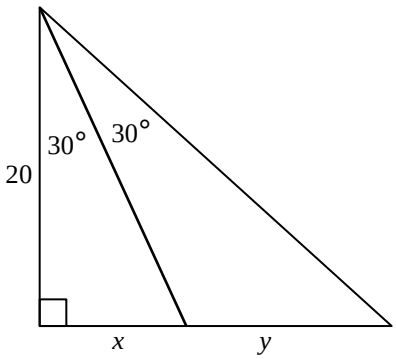
(3)

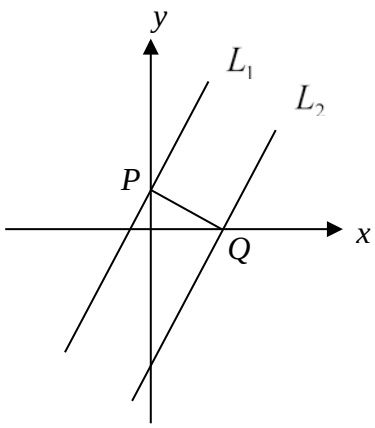
(i)

(ii)

(iii)

Quesrion 7 (14 Marks)

		Answers (Marks)
(a)	Find the general form equations of the lines: (i) Parallel to the line $2x-3y+7=0$ and passing through the point (2, 3).	(1)
	(ii) Perpendicular to the line $x-4y=1$ and with x-intercept at -2.	(1)
(b)	A card is drawn at random from a standard pack of 52 cards. State the probability that it is: (i) red (ii) a black 10 (iii) a court card (J, Q, or K) (iv) not a diamond	(4) (i) (ii) (iii) (iv)
(c)	Find the exact value of y.  NOT TO SCALE	**(2)**

		Answers (Marks)
(d)	A solid cylinder with diameter 15 cm and height 20 cm is dropped into a tank partially filled with water. The tank has a square base with sides 25 cm. How far will the water level rise in the tank if the cylinder is completely submerged? (Answer correct to nearest mm.)	(2)
(e)	 The line L_1 has equation $y = mx + k$. Line L_1 crosses the *y*-axis at *P* and line L_2 crosses the *x*-axis at *Q*. If *PQ* is perpendicular to both lines, then determine the *y*-intercept of L_2, in terms of *m* and *k*.	(4)

This is the end of the paper.

Use this space if you wish to **REWRITE** any answers

Clearly *indicate* the **QUESTION** number.

Question	

Use this space if you wish to **REWRITE** any answers

Clearly *indicate* the **QUESTION** number.

Question	

Use this space if you wish to **REWRITE** any answers

Clearly *indicate* the **QUESTION** number.

Question	

SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

2015

Year 9 Yearly

Advanced Mathematics

Solutions

Question	Teacher
Q1	**PSP**
Q2	**AW**
Q3	**AF**
Q4	**AYW**
Q5	**JM**
Q6	**EC**
Q7	**BK**

Question 1 SOLUTIONS

(a) Find $\dfrac{66.7}{1.4+\sqrt{5.64}}$ correct to 2 decimal places. **1**

17.67

(b) Express $0.000\,710\,7$ in scientific notation with three significant figures. **1**

$0.000\,7.10\,7$ $\quad 7.11\times10^{-4}$

Assuming a CASIO calculator

Calculator | SHIFT | MODE | 7 | 3 |

To return it to normal

Calculator | SHIFT | MODE | 8 | 1 |

(c) Arrange this set of numbers in order, smallest to largest: **2**

$\left\{\sqrt{10}, \pi, \sqrt{9.869}, (0.3184)^{-1}\right\}$ $\quad \left\{(0.3184)^{-1}, \sqrt{9.869}, \pi, \sqrt{10}\right\}$

(d) Express $\dfrac{5}{12}$ as an exact decimal. **1**

$\dfrac{5}{12} = 0.41\dot{6}$

(e) Rewrite $2y^{-2}$ with a positive index **1**

$2y^{-2} = 2\times\dfrac{1}{y^2} = \dfrac{2}{y^2}$

(f) Simplify the following expression: **1**

$$\frac{4\left(a^2b\right)^3}{\left(2ab^3\right)^2} = \frac{4a^{2\times3}b^3}{2^2a^2b^{3\times2}}$$

$$= \frac{\cancel{4}\,a^{6-2}\,\cancel{b^3}}{\cancel{4}\,\cancel{a^2}\,b^{6-3}} \qquad \text{OR} \qquad a^4b^{-3}$$

$$= \frac{a^4}{b^3}$$

(g) Express in simplest surd form

(i) $4\sqrt{27}+6\sqrt{75} = 4\times\sqrt{9\times3}+6\times\sqrt{25\times3}$ **1**

$= 4\times\sqrt{9}\times\sqrt{3}+6\times\sqrt{25}\times\sqrt{3}$

$= 12\sqrt{3}+5\sqrt{3}$

$= 17\sqrt{3}$

(ii) $\dfrac{\sqrt{10}\times 2\sqrt{2}}{4\sqrt{5}} = \dfrac{\sqrt{10}\times 2\sqrt{2}}{4\sqrt{5}}$ **1**

$= \dfrac{2\sqrt{20}}{4\sqrt{5}}$

$= \dfrac{2}{4}\times\sqrt{\dfrac{20}{5}}$

$= \dfrac{2}{4}\times\sqrt{4}$

$= 1$

Alternatively

$\dfrac{\sqrt{10}\times 2\sqrt{2}}{4\sqrt{5}} = \dfrac{2\sqrt{20}}{4\sqrt{5}}\times\dfrac{\sqrt{5}}{\sqrt{5}}$

$= \dfrac{2\sqrt{100}}{20}$

$= \dfrac{2\times 10}{20}$

$= 1$

(h) Expand and simplify $(2x+3)-3(x+1)$. **1**

$(2x+3)-3(x+1) = 2x+3-3x-3$

$= -x$

(i) Given the set of scores: 8, 6, 7, 5, 6, 5, 6, find:

(i) the mode 6 (most frequent) **1**

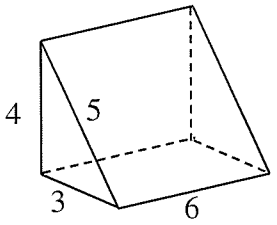
(ii) the mean $\dfrac{8+6+7+5+6+5+6}{7} = 6\frac{1}{7} \div 6.14$ **1**

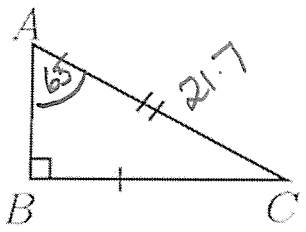
(iii) the median 5, 5, 6, 6, 6, 7, 8 6 **1**

(j) Evaluate $15\sin 30°$. **1**

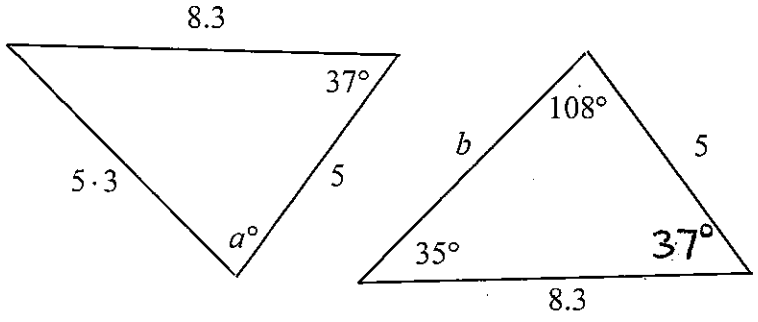
$15\sin 30° = 15\times\dfrac{1}{2} = 7.5$ No penalty for just using the calculator or leaving the degree symbol

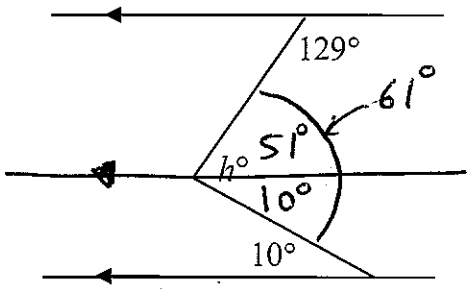
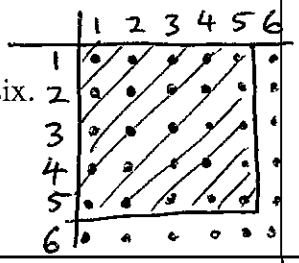
Question 2. (14 marks)

		Answers (Marks)
(a)	Solve: $3(x+1)-2(x-1)=7$ $3x+3-2x+2=7$ $x=2$	(2) 2
(b)	Factorise completely: (i) $4x^2y+10x$ $2x(2xy+5)$ (ii) m^2-16	(2) (i) $2x(2xy+5)$ (ii) $(m+4)(m-4)$
(c)	Find the volume and surface area of the closed prism, where measurements are in centimetres.  $V=ah$ $=\frac{1}{2}(3)(4)\times(6)$ $=36$ $S.A=2\times(\frac{1}{2})(3)(4)+(3)(6)+4(6)+5(6)$ $=12+18+24+30$	(2) Volume = $36\,cm^3$ SA = $84\,cm^2$
(d)	Factorise (i) x^2+5x+6. $(x+3)(x+2)$ (ii) $10x^2-13x-3$ $10x^2-15x+2x-3$ $5x(2x-3)+(2x-3)$ $(5x+1)(2x-3)$	(2) (i) $(x+3)(x+2)$ (ii) $(5x+1)(2x-3)$
(e)	Phuong can type at 80 words per minute. How long would he take to type a 1500 word document? $\frac{1500}{80}$	(1) 18m 45s

		Answers (Marks)
(f)	 In the triangle $\angle BAC = 65^\circ$, $AC = 21.7$. Find (i) $AB = 21.7 \times \cos(65)$ (ii) $BC = 21.7 \times \sin(65)$ both correct to 2 decimal places.	(2) (i) 9.17 u (2 dp) (ii) 19.67 u (2 dp)
(g)	Consider the line with equation $4x - 3y + 2 = 0$ (i)State the gradient of the line. $3y = 4x + 2$ $m = \frac{4}{3}$ (ii)State the y-intercept of the line	(i) $\frac{4}{3}$ (2) (ii) $\frac{2}{3}$ (1)

Question 3 (14 Marks)

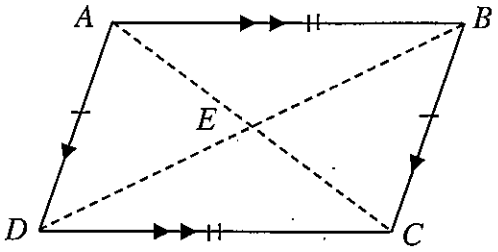
		Answers (Marks)
(a)	A girl jogs at 1·5 m/s. (i) How far will she jog in 30 minutes? 1·5m/s 90m/min 2700m/30mins (ii) How long, to the nearest minute, will she take to jog 15 km? 1·5m/s 15000m/10000s	(2) (i) 2700 m or 2·7Km (ii) ≈ 167mins or 2 hours 47mins
(b)	A class of students have a mean age of 15 years, and the sum of their ages is 405 years. Find the number of students in the class. $\frac{405}{n} = 15$ $n = 27$	(1) 27
(c)	 (i) State which test you would use to show that these two triangles are congruent. (ii) Find the values of the pronumerals.	(i) SAS (1) (ii) (2) a = 108 b = 5·3

		Answers (Marks)
(d)	Find the value of the pronumeral in this figure:  	(2) $h = 61$
(e)	A standard die is rolled twice. Find the probablity that neither roll produces a six.  	(2) $\frac{25}{36}$
(f)	Anita is four times as old as Frank. In five years time Anita will only be three times as old as Frank. Find their present ages. $a = 4f$ ___ (1) $a + 5 = 3(f+5)$ ___ (2) sub (1) into (2) $4f + 5 = 3f + 15$ $f = 10$ sub into (1) $a = 4(10)$ $= 40$	(2) Anita is 40 Frank is 10
(g)	Factorise the following expression: $3ab - 2b^2 - 6a + 4b$ $= b(3a-2b) - 2(3a-2b)$ $= (3a-2b)(b-2)$	(2) $(3a-2b)(b-2)$

No $\frac{1}{2}$ marks.

Question 4 (14 Marks)

		Answers (Marks)
(a)	Using the diagram below prove that the diagonals of a parallelogram bisect each other. (Hint: Consider ΔAEB and ΔCED.)	(6)



Give clear reasons for each step.

In $\triangle AEB$ and $\triangle CED$

$AB = CD$ (given) (1)

$\angle AEB = \angle DEC$ (vertically opposite angles) (1)

$\angle BAE = \angle ECD$ (alternate angles, AB∥CD) (1)

$\therefore \triangle AEB \equiv \triangle CED$ (AAS) (1)

$AE = EC$ (corresponding sides of congruent triangles) (1)

$BE = ED$ (corresponding sides of congruent triangles) (1)

$\therefore$ Diagonals of a parallelogram bisect each other.

* Notes

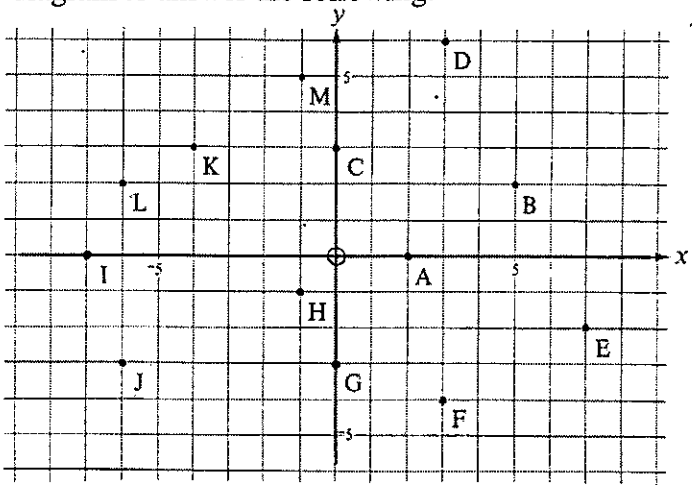
(1) Many students forgot the introduction for congruency test.

(2) Students wrote alternate angles without "~~parallel~~ AB∥CD" which they lost a mark. Alternate angles are not equal unless two lines are parallel.

(3) Students need to specify the parallel lines, if the lines are labelled. Students whom wrote parallel lines ~~lines~~ were not given marks for that part of working.

(4) Students need to specify why $AE = EC$ and $BE = ED$. Marks were lost if no mention.

No $\frac{1}{2}$ marks

		Answers (Marks)
(b)	Use the diagram to answer the following: 	
	(i) Find the gradient of *CD*. $C(0,3)\quad D(3,6)\quad m=\frac{6-3}{3-0}=1$	(i) (1) $m=1$ (1)
	(ii) Find the gradient of *AE*. $A(2,0)\quad E(7,-2)\quad m=\frac{-2-0}{7-2}$	(ii) (1) $m=-\frac{2}{5}$ (1)
	(iii) Find the gradient of *CK*. $C(0,3)\quad K(-4,3)\quad m=\frac{3-3}{-4-0}=0$	(iii) (1) $m=0$ (1)
	(iv) Find the length of *HF*. $H(-1,-1)\quad F(3,-4)\quad d=\sqrt{(-4-(-1))^2+(3-(-1))^2}$ $=\sqrt{(-3)^2+4^2}$ $=\sqrt{25}$	(iv) (1) $d=5$ (1)
	(v) Find the mid point of *JM* $J=(-6,-3)$ $M=(-1,5)$ $M=\left(\frac{-6+(-1)}{2},\frac{-3+5}{2}\right)$ $=\left(-\frac{7}{2},1\right)$ (1)	(v) (2) Midpoint $=\left(-\frac{7}{2},1\right)$ (1) (1)
	(vi). Write the equation of the line *JK*. $J=(-6,-3)\quad K=(-4,3)$ $m=\frac{y_2-y_1}{x_2-x_1}=\frac{3-(-3)}{-4-(-6)}=\frac{6}{2}=3$	(vi) (2) $3x-y+15=0$ or $y=3x+15$ (1) (1)

$\therefore\ y-y_1=m(x-x_1)$ (1)

$y-(-3)=3(x-(-6))$

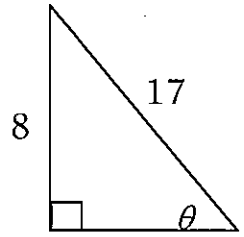
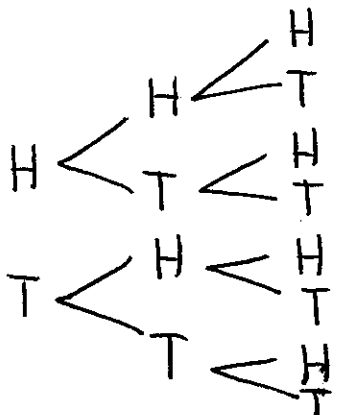
$y+3=3x+18$

$y=3x+15$

$3x-y+15=0.$

Question 5 (14 Marks)

		Answers (Marks)
(a)	Solve $\frac{2x+1}{3}-\frac{x-1}{2}=3$ $2(2x+1)-3(x-1)=18$ $4x+2-3x+3=18$ $x+5=18$ $\boxed{x=13}$	(2)
(b)	Make x the subject of the formula $V=\frac{1-A}{2x}$. $2x.V=1-A$ $\boxed{x=\frac{1-A}{2V}}$	(2)
(c)	Simplify, and express with rational denominator: $\frac{1}{2\sqrt{3}-\sqrt{2}}-\frac{1}{2\sqrt{3}+\sqrt{2}}$ $=\frac{2\sqrt{3}+\sqrt{2}-(2\sqrt{3}-\sqrt{2})}{(2\sqrt{3})^2-(\sqrt{2})^2}$ $=\frac{2\sqrt{2}}{10}$ $\boxed{=\frac{\sqrt{2}}{5}}$	(2)

		Answers (Marks)
(d)	Find θ correct to the nearest minute.  $\sin\theta = \frac{8}{17}$ $\theta = \sin^{-1}\left(\frac{8}{17}\right)$ $\theta = 28°4'$	(2)
(e)	R is the point $(x, 3)$, while S is the point $(5,7)$. The distance RS is 5 units. Show that there are two possible values for x, and state the possible co-ordinates of R. $d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$ $5 = \sqrt{(x-5)^2 + (3-7)^2}$ $25 = (x-5)^2 + 16$ $0 = x^2 - 10x + 16$ $\therefore (x-8)(x-2) = 0$ $\therefore x = 2$ or 8	(2)
(f)	Three different coins are tossed together.	
	(i) Draw a tree diagram (below) to indicate the possible outcomes.  Outcomes: HHH, HHT, HTH, HTT, THH, THT, TTH, TTT	(2)
	(ii) State the probability of obtaining two heads and a tail. $P(HHT) + P(HTH) + P(THH)$ $= \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$ $= \frac{3}{8}$	(ii) (2)

Solution to question (6) (14 marks)

(a) Reading from the graph.

$(2, -3)$ [3]

(b) $\frac{x}{4} = \sqrt{3-t}$

$\frac{x^2}{16} = 3 - t$

$\therefore t = 3 - \frac{x^2}{16}$

[2]

(c) $\frac{2x-1}{3} < x+2$

$2x - 1 < 3x + 6$

$-1 < x + 6$

$\therefore x > -7$

[2]

(d) $\frac{(x-5)(x-2)}{(x-5)}$

$= \frac{x-2}{x-5}$ [2]

(e) $5 - 2x \leq 1$

$2x \geq 4$

$x \geq 2$

[2]

(f)

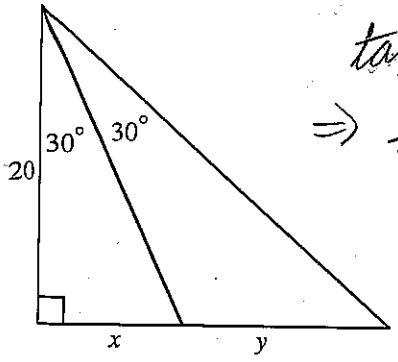
(i) mode = 11

(ii) median = 9

(iii) Mean = 8.98

[3]

Question 7 (14 Marks)

		Answers (Marks)
(a)	Find the general form equations of the lines: (i) Parallel to the line $2x-3y+7=0$ and passing through the point (2, 3).	(1) $2x-3y+5=0$ ✓
	(ii) Perpendicular to the line $x-4y=1$ and with x-intercept at -2.	(1) $4x+y+8=0$ ✓
(b)	A card is drawn at random from a standard pack of 52 cards. State the probability that it is: (i) red (ii) a black 10 (iii) a court card (J, Q, or K) (iv) not a diamond	(4) (i) $\frac{1}{2}$ ✓ (ii) $\frac{2}{52}=\frac{1}{26}$ ✓ (iii) $\frac{12}{52}=\frac{3}{13}$ ✓ (iv) $\frac{3}{4}$ ✓
(c)	Find the exact value of y.  NOT TO SCALE	(2)

$\tan 30 = \frac{x}{20}$ (1) $\tan 60 = \frac{x+y}{20}$ (2)

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{x}{20}$

$x = \frac{20}{\sqrt{3}}$ ✓

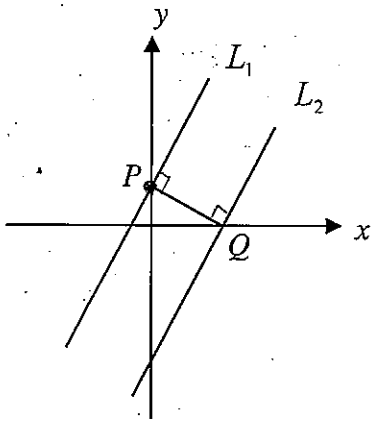
Sub in (2)

$\Rightarrow \frac{\frac{20}{\sqrt{3}}+y}{20} = \sqrt{3}$

$\frac{20}{\sqrt{3}} + y = 20\sqrt{3}$

$y = 20\sqrt{3} - \frac{20}{\sqrt{3}}$

$= \frac{60-20}{\sqrt{3}} = \frac{40}{\sqrt{3}}$ ✓

		Answers (Marks)
(d)	A solid cylinder with diameter 15 cm and height 20 cm is dropped into a tank partially filled with water. The tank has a square base with sides 25 cm. How far will the water level rise in the tank if the cylinder is completely submerged? (Answer correct to nearest mm.) $V_{tank} = 625 \times h$ $V_{cylinder} = \pi\left(\frac{15}{2}\right)^2 20 = \frac{225}{4}\pi \times 20 = 1125\pi \; (= 3534.29\text{cm}^3)$ $V_{tank+cylinder} = 625h + 1125\pi\text{ cm}^3$ Vol. increases by $1125\pi\text{cm}^3$ $\therefore$ Height increases by $\frac{1125\pi}{625}$ Increase $h = 1.8\pi$ cm $\rightarrow 18\pi$ mm $\simeq 57$mm	(2)
(e)	 The line L_1 has equation $y = mx + k$. Line L_1 crosses the y-axis at P and line L_2 crosses the x-axis at Q. If PQ is perpendicular to both lines, then determine the y-intercept of L_2, in terms of m and k. $L_1: y = mx + k$ where $P = (0, k)$ $L_1 \parallel L_1$ ($\angle P + \angle Q = 180^\circ$ cointerior $\angle$s are supplementary) $\therefore$ m of $L_2 = m$ Line PQ has grad. $-\frac{1}{m}$ and passes through $(0, k)$ $\Rightarrow y - k = -\frac{1}{m}(x - 0)$ $my - mk = -x$ $my + x = mk$ For x-intercept, $y = 0 \Rightarrow x = mk \Rightarrow Q = (mk, 0)$ Then gradient $L_2 = m$ Eqn L_1: $y - 0 = m(x - mk)$ $y = mx - m^2k$ $\therefore$ y-int of $L_2 = -m^2k$	(4)

This is the end of the paper.