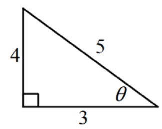
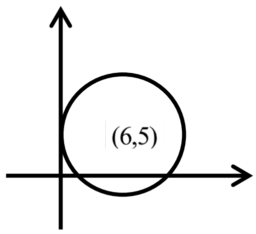
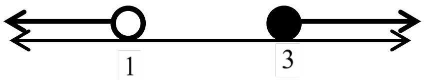
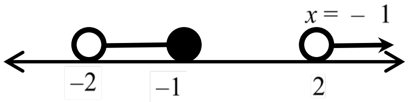
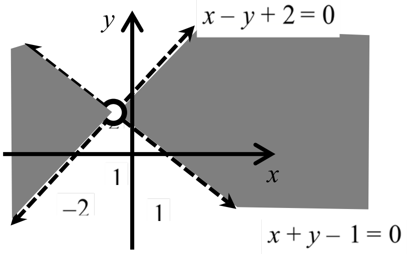
BAULKHAM HILLS HIGH SCHOOL
YEAR 11 MATHEMATICS EXTENSION HALF YEARLY ASSESSMENTS 2018 SOLUTIONS

Solution	Marks	Comments
SECTION I		
1. B - $8x^3 + 27 = (2x)^3 + 3^3$ $= (2x+3)\left((2x)^2 - (2x)(3)\right.$ $= (2x+3)(4x^2 - 6x + 9)$	**1**	
2. D – the only graph that satisfies the *"vertical line test"*	**1**	
3. A - $\frac{1+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2+3\sqrt{3}+3}{4-3}$ $= 5 + 3\sqrt{3}$	**1**	
4. D – from the diagram; Angle of elevation is α Angle of depression is θ	**1**	
5. C - $\cos\theta < 0$ and $\sin\theta < 0 \Rightarrow$ quadrant 3 , $\therefore \tan\theta > 0$ $\tan\theta = \frac{4}{3}$ 	**1**	
6. A - $\frac{x+5}{(x-3)(x+1)} - \frac{x-1}{x^2-x-2} = \frac{x+5}{(x-3)(x+1)} - \frac{x-1}{(x-2)(x+1)}$ $= \frac{(x+5)(x-2)-(x-1)(x-3)}{(x-3)(x-2)(x+1)}$ $= \frac{x^2+3x-10-x^2+4x-3}{(x-3)(x-2)(x+1)}$ $= \frac{7x-13}{(x-3)(x-2)(x+1)}$	**1**	
7. C - $\frac{\sin(360°-A)}{\sin(90°-A)} = \frac{-\sin A}{\cos A}$ $= -\tan A$	**1**	
8. B - $f(a) = g(2a)$ $3a^2 - 4 = (2a)^2 - 2(2a)$ $3a^2 - 4 = 4a^2 - 4a$ $a^2 - 4a + 4 = 0$ $(a-2)^2 = 0$ $a = 2 \Rightarrow$ only one solution	**1**	
9. C - $x^2 + y^2 - 12x - 10y + k = 0$ $(x-6)^2 + (y-5)^2 = 61 - k \Rightarrow$ centre is (6,5) For exactly three intercepts the radius = 6 $61 - k = 36$ $k = 25$ 	**1**	
10. B - $\frac{6^{r+s} \times 12^{r-s}}{8^r \times 9^{r+2s}} = \frac{2^{r+s} \times 3^{r+s} \times 2^{2r-2s} \times 3^{r-s}}{2^{3r} \times 3^{2r+4s}}$ $= \frac{2^{3r-s} \times 3^{2r}}{2^{3r} \times 3^{2r+4s}}$ $= 2^{-s} \times 3^{-4s}$ Thus $s \leq 0$ in order for expression to be an integer	**1**	

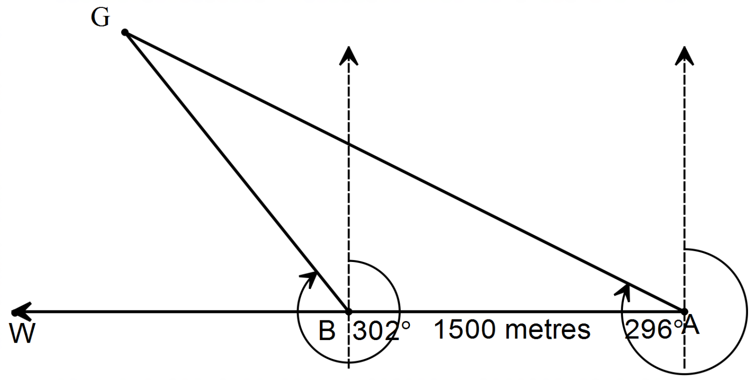
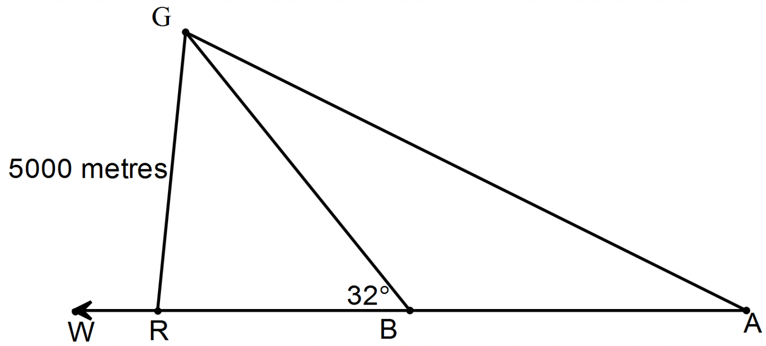
SECTION II		
QUESTION 11		
Solution	**Marks**	**Comments**
11(a) $\sqrt[4]{x^5} = x^{\frac{5}{4}}$	**1**	**1 mark** • Correct answer
11 (b) $\sqrt{\dfrac{4.81 \times 10^5}{7.36 \times 10^9}} = 0.00808413637...$ $= 0.0081$ correct to two significant figures	**2**	**2 marks** • Correct solution **1 mark** • Performs the correct calculation
11(c) $f(-1) = 7 - 2(-1)^2$ $= 7 - 2$ $= 5$	**1**	**1 mark** • Correct answer
11 (d) $\sqrt{75} - 2\sqrt{27} = 5\sqrt{3} - 6\sqrt{3}$ $= -\sqrt{3}$	**2**	**2 marks** • Correct solution **1 mark** • Simplifies at least one surd correctly
11 (e) $(3x-4)(x-2)(x+2)$ $= (3x-4)(x^2-4)$ $= 3x^3 - 12x - 4x^2 + 16$ $= 3x^3 - 4x^2 - 12x + 16$	**2**	**2 marks** • Correct solution **1 mark** • Performs a binomial product expansion
11 (f) $\dfrac{2}{x-1} \le 1$ $x - 1 \neq 0$ $2 = x - 1$ $x \neq 1$ $x = 3$  $x < 1$ or $x \ge 3$	**3**	**3 marks** • Correct graphical solution on number line or algebraic solution, with correct working **2 marks** • Bald answer • Identifies the two correct critical points via a correct method • Correct conclusion to their critical points obtained using a correct method **1 mark** • Uses a correct method • Acknowledges a problem with the denominator. **0 marks** • Solves like a normal equation , with no consideration of the denominator.
11 (g) (i) $2x^2 + 3x - 2$ $= (2x-1)(x+2)$	**1**	**1 mark** • Correct answer
11 (g) (ii) $x^3 + 5x^2 + x + 5$ $= x^2(x+5) + 1(x+5)$ $= (x+5)(x^2+1)$	**1**	**1 mark** • Correct answer
11 (g) (iii) $4a^2(x^3 + 18ab^2) - (32a^5 + 9b^2x^3)$ $= x^3(4a^2 - 9b^2) - 8a^3(4a^2 - 9b^2)$ $= (4a^2 - 9b^2)(x^3 - 8a^3)$ $= (2a-3b)(2a+3b)(x-2a)(x^2+2ax+4a^2)$	**2**	**2 marks** • Correct solution **1 mark** • Correctly uses $a^2 - b^2$ or $a^3 - b^3$ factorisation
QUESTION 12		
12 (a) (i) $\dfrac{125a^3 - 8}{a^2 - 7a + 10} \times \dfrac{a-5}{25a^2 - 4}$ $= \dfrac{(5a-2)(25a^2+10a+4)}{(a-5)(a-2)} \times \dfrac{a-5}{(5a-2)(5a+2)}$ $= \dfrac{25a^2 + 10a + 4}{(a-2)(5a+2)}$	**2**	**2 marks** • Correct solution **1 mark** • Factorises 2 out of the 3 non-linear expressions

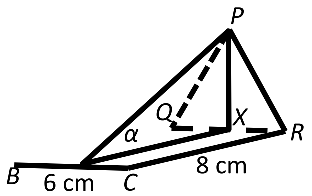
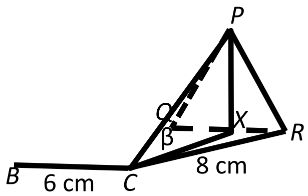
QUESTION 12…*continued.*		
Solution	**Marks**	**Comments**
12 (a) (ii) $\frac{2}{x^2-1}-\frac{1}{x^2-x}+\frac{x-1}{x^2+x}$ $=\frac{2}{(x-1)(x+1)}-\frac{1}{x(x-1)}+\frac{x-1}{x(x+1)}$ $=\frac{2x-(x+1)+(x-1)^2}{x(x+1)(x-1)}$ $=\frac{2x-x-1+x^2-2x+1}{x(x+1)(x-1)}$ $=\frac{x^2-x}{x(x+1)(x-1)}$ $=\frac{x(x-1)}{x(x+1)(x-1)}$ $=\frac{1}{x+1}$	3	**3 marks** • Correct solution **2 marks** • Rewrites as a single fraction **1 mark** • Finds the LCD
12 (b) (i) $\frac{3x-2}{4}-\frac{2x-1}{8}=5$ $2(3x-2)-(2x-1)=40$ $6x-4-2x+1=40$ $4x=43$ $x=\frac{43}{4}$	2	**2 marks** • Correct solution **1 mark** • Removes the fractions by multiplying by the LCD, or equivalent
12 (b) (ii) $\lvert 2x+6\rvert=3x-1$ $2x+6=3x-1$ $x=7$ ***OR*** $-(2x+6)=3x-1$ $5x=-5$ $x=-1$ *NOT A SOLUTION* $\therefore x=7$	3	**3 marks** • Correct solution **2 marks** • Finds two "possible" answers **1 mark** • Finds an answer without considering cases.
12 (b) (iii) $2x^2-6x\leq 0$ $2x(x-3)\leq 0$ $0\leq x\leq 3$	2	**2 marks** • Correct solution **1 mark** • Establishes the two critical points of the solution.
12(b) (iv) $\frac{x+1}{x^2-4}\geq 0$ $x^2-4\neq 0$ $x\neq \pm 2$ $x+1=0$ $x=-1$  $-2<x\leq -1$ or $x>2$	3	**3 marks** • Correct graphical solution on number line or algebraic solution **2 marks** • Bald answer • Identifies the three correct critical points via a correct method • Correct conclusion to their critical points obtained using a correct method **1 mark** • Uses a correct method • Acknowledges a problem with denominator.
QUESTION 13		
13 (a) Using the graph, the question becomes; *"whenis the linebelow the absolute value graph?"* As we are only concerned with the x values, the solution is $x\leq -1$ or $x\geq 3$	1	**1 mark** • Correct solution
13 (b) $\frac{10}{\sqrt{5}-\sqrt{3}}\times\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}=\frac{10(\sqrt{5}+\sqrt{3})}{5-3}$ $=\frac{10(\sqrt{5}+\sqrt{3})}{2}$ $=5(\sqrt{5}+\sqrt{3})$	2	**2 marks** • Correct solution **1 mark** • Attempts to multiply by the conjugate of the denominator

QUESTION 13…*continued.*		
Solution	**Marks**	**Comments**
13 (c) let $x = 0.01232323...$ $100x = 1.23232323...$ $99x = 1.22$ $x = \frac{1.22}{99}$ $= \frac{122}{9900}$ $= \frac{61}{4950}$ ***OR*** $0.01\dot{2}\dot{3} = \frac{123 - 1}{9900}$ $= \frac{122}{9900}$ $= \frac{61}{4950}$ $\therefore 0.01\dot{2}\dot{3} = \frac{61}{4950}$	2	**2 marks** • Correct solution **1 mark** • Evidence of a valid manual calculation
13 (d) $F = \frac{mv^2}{gr}$ $mv^2 = Fgr$ $v^2 = \frac{Fgr}{m}$ $v = \pm\sqrt{\frac{Fgr}{m}}$	2	**2 marks** • Correct solution **1 mark** • makes v^2 the subject of the formula
13 (e) $x^2 - 8x + 9 = 0$ $x^2 - 8x = -9$ $x^2 - 8x + 4^2 = 7$ $(x - 4)^2 = 7$ $x - 4 = \pm\sqrt{7}$ $x = 4 \pm \sqrt{7}$ ***OR*** $x^2 - 8x + 9 = 0$ $(x - 4)^2 - 7 = 0$ $(x - 4 - \sqrt{7})(x - 4 + \sqrt{7}) = 0$ $x = 4 \pm \sqrt{7}$	2	**2 marks** • Correct solution **1 mark** • Completes the square to obtain $(x-4)^2$ • Solves the equation for a different completed square.
13 (f) (i) when $x = 2$ and $y = 1$ $(x + 2y)(2x - y) + (x - y)(3x + 4y) = (2 + 2)(4 - 1) + (2 - 1)(6 + 4)$ $= 12 + 10$ $= 22$	1	**1 mark** • Correct answer
13 (f) (ii) when $y = 1$ $(x + 2)(2x - 1) + (x - 1)(3x + 4) = 22$ $2x^2 + 3x - 2 + 3x^2 + x - 4 = 22$ $5x^2 + 4x - 28 = 0$ $(x - 2)(5x + 14) = 0$ $x = 2$ or $x = -\frac{14}{5}$ $\therefore$ the only other posible value of x is $-\frac{14}{5}$	2	**2 marks** • Correct solution **1 mark** • Establishes quadratic in terms of x
13 (g) (i) $(x - y + 2)(x + y - 1)$ $= x^2 + xy - x - xy - y^2 + y + 2x + 2y - 2$ $= x^2 - y^2 + x + 3y - 2$ $= f(x)$	1	**1 mark** • Correct solution
13 (g) (ii) $x^2 - y^2 + x + 3y > 2$ $x^2 - y^2 + x + 3y - 2 > 0$ $(x - y + 2)(x + y - 1) > 0$ $\therefore$ either $x - y + 2 > 0$ and $x + y - 1 > 0$ *OR* $x - y + 2 < 0$ and $x + y - 1 < 0$  	2	**2 marks** • Correct solution **1 mark** • Some correct regions indicated, with no more than one incorrect region.

QUESTION 14		
Solution	**Marks**	**Comments**
14 (a) some possibilities would include; • A divides BP externally in the ratio 1:4 • B divides PA in the ratio 3:1 • P divides BA externally in the ratio 3:4	1	**1 mark** • Two different statements
14 (b) (i) $f(x)$ is even if $f(-x) = f(x)$	1	**1 mark** • Correct condition
14 (b) (ii) some examples would include; • $y = x^2$ • $y = \|x\|$ • $y = \cos x$	1	**1 mark** • Correct example
14 (c) $f(2) + f(5) - f(-2) = 3(2) + (5^2 + 1) - 3(-2)$ $= 6 + 26 + 6$ $= 38$	2	**2 marks** • Correct solution **1 mark** • finds at least two function values
14 (d) (i) $x^2 - 16 \geq 0$ $x \leq -4$ or $x \geq 4$	1	**1 mark** • Correct answer
14 (d) (ii) $y \geq 0$	1	**1 mark** • Correct answer
14 (e) (i) $P(0,1)$	1	**1 mark** • Correct answer
14 (e) (ii) $x^2 + y^2 = 2^2 + 4^2$ $= 20$ $\therefore$ circle has equation $x^2 + y^2 = 20$	2	**2 marks** • Correct solution **1 mark** • Recognises that a circle's equation is of the form $x^2 + y^2 = k$
14 (e) (iii) $(2,4) : 4 = a^2$ $a = 2$ $\therefore$ exponential has the equation $y = 2^x$	1	**1 mark** • Correct answer
14 (e) (iv) $x \geq 0$ $x^2 + y^2 \leq 20$ $y \geq 2^x$	2	**2 marks** • Correct solution **1 mark** • At least two correct inequations
14 (f) $f(-x) = \|-x-2\| - \|-x+2\|$ $= \|-1\|\,\|x+2\| - \|-1\|\,\|x-2\|$ $= \|x+2\| - \|x-2\|$ $= -f(x)$ $\therefore$ function is odd	2	**2 marks** • Correct solution **1 mark** • Recognises the condition for an odd function
QUESTION 15		
15 (a) (i) $\cos 75° = \sin(90° - 75°)$ $= \sin 15°$ $= \dfrac{\sqrt{3} - 1}{2\sqrt{2}}$	1	**1 mark** • Correct solution
15 (a) (ii) $\operatorname{cosec} 15° = \dfrac{1}{\sin 15°}$ $= \dfrac{2\sqrt{2}}{\sqrt{3} - 1}$	1	**1 mark** • Correct solution
15 (a) (iii) $\sin 195° = \sin(180° + 15°)$ $= -\sin 15°$ $= \dfrac{1 - \sqrt{3}}{2\sqrt{2}}$	1	**1 mark** • Correct solution
15 (b) $2x + y = 4 \Rightarrow 4x + 2y = 8$ $5x + 2y = 9 \qquad 5x + 2y = 9$ $x = 1 \quad \therefore y = 2$	2	**2 marks** • Correct solution **1 mark** • Finds the correct value for one pronumeral

QUESTION 15…*continued.*		
Solution	**Marks**	**Comments**
15 (c) $\sin^4 x - \cos^4 x = (\sin^2 x - \cos^2 x)(\sin^2 x + \cos^2 x)$ $= \sin^2 x - \cos^2 x$ $= (1 - \cos^2 x) - \cos^2 x$ $= 1 - 2\cos^2 x$	2	**2 marks** • Correct solution **1 mark** • Uses a valid trig identity in a relevant manner.
15 (d) (i) The student divided out a possible solution when canceling $\sin x$. When solving equations you can only divide by an unknown if there is no possibility that the unknown could equal zero.	1	**1 mark** • Correct explanation
15 (d) (ii) The missing answer comes from the possibility that; $\sin x = 0$ $x = 0°, 180°, 360°$ So the missing answer is $x = 180°$.	1	**1 mark** • Correct solution
15 (e) (i) $\sin\theta\tan\theta + 2\sin\theta = 3\cos\theta$ $\frac{\sin^2\theta}{\cos\theta} + 2\sin\theta = 3\cos\theta$ $\sin^2\theta + 2\sin\theta\cos\theta = 3\cos^2\theta$ $3\cos^2\theta - 2\sin\theta\cos\theta - \sin^2\theta = 0$ $(3\cos\theta + \sin\theta)(\cos\theta - \sin\theta) = 0$ $\tan\theta = -3$ OR $\tan\theta = 1$. $\theta = 108°, 288°$ $\theta = 45°, 225°$ $\therefore \theta = 45°, 108°, 225°, 288°$	3	**3 marks** • Correct solution **2 marks** • Finds the two possibilities for $\tan\theta$ **1 mark** • Correctly manipulates terms into a quadratic equation
15 (e) (ii) $\sin(20° - 2\theta) = \frac{1}{7}$ $\sin\alpha = \frac{1}{7}$ $\alpha = 8°$ $(20° - 2\theta) = 8°, 172°, 368°, 532°$ $-2\theta = -12°, 152°, 348°, 512°$ $\theta = 6°, -76°, -174°, -256°$ However solutions need to be $0° \leq \theta \leq 360°$, so add $\pm 360°$ to any answers not I required range $\therefore \theta = 6°, 104°, 186°, 284°$	3	**3 marks** • Correct solution **2 marks** • Finds four consecutive answers for $(20° - 2\theta)$ • Finds two answers for θ **1 mark** • Finds four consecutive answers for $(20° - 2\theta)$ • Finds two answers for $\pm 2\theta$
QUESTION 16		
16(a) (i) $\sin\angle TPS = \frac{2.5}{4}$ $\angle TPS = 36.6821875...$ $= 36°$ to nearest degree	1	**1 mark** • Correct answer *Note: no rounding penalty*
16 (a) (ii) $\left(\frac{1}{2}PS\right)^2 = 4^2 - 2.5^2$ $\frac{1}{2}PS = 3.1224998999...$ $PS = 6.244997998...$ $= 6.24$ metres to the nearest centimetre	1	**1 mark** • Correct answer *Note: no rounding penalty*
16 (a) (iii) $\frac{2.5}{TQ} = \sin 65°$ $TQ = \frac{2.5}{\sin 65°}$ $= 2.758444797...$ $= 276$ metres to the nearest centimetre	1	**1 mark** • Correct answer *Note: no rounding penalty*
16 (b) (i) $\text{Area} = \frac{1}{2} \times 40 \times 80 \times \sin 130°$ $= 1225.671109...$ $= 1226\ m^2$	1	**1 mark** • Correct answer *Note: no rounding penalty*
16 (b) (ii) The largest side is always opposite the largest angle, and since the angle is obtuse, it must be the largest angle.	1	**1 mark** • Correct explanation
16 (b) (iii) $x^2 = 40^2 + 80^2 - 2 \times 40 \times 80 \times \cos 130°$ $x = 110.0628943...$ $x = 110$ metres to the nearest metre	1	**1 mark** • Correct answer *Note: no rounding penalty*

QUESTION 16…*continued.*		
Solution	**Marks**	**Comments**
16 (c) (i) 	1	**1 mark** • Correct diagram with **all** information labelled
16 (c) (ii) $\angle GBW = 302° - 270° = 32°$ $\angle GAB = 296° - 270° = 26°$ $\angle GBW = \angle AGB + \angle GAB$ (exterior$\angle$,ΔBAG) $32° = \angle AGB + 26°$ $\angle AGB = 6°$	1	**1 mark** • Correct explanation *Note: formal geometric explanation not required*
16 (c) (iii) $\dfrac{BG}{\sin\angle GAB} = \dfrac{AB}{\sin\angle AGB}$ $\dfrac{BG}{\sin 26°} = \dfrac{1500}{\sin 6°}$ $BG = \dfrac{1500\sin 26°}{\sin 6°}$	1	**1 mark** • Evidence of using sine rule in finding the correct expression, or similar merit.
16 (c) (iv)  $RG^2 = BG^2 + BR^2 - 2\times BG\times BR\times\cos\angle RBG$ $BR^2 - (2\times BG\times\cos\angle RBG)\,BR + (BG^2 - RG^2) = 0$ $BR = \dfrac{2\times BG\times\cos 32° \pm\sqrt{(2\times BG\times\cos 32°)^2 - 4(BG^2 - RG^2)}}{2}$ $= 1608.235614...$ or 9061.388854 $\therefore$ the soldier can travel 1608 metres	3	**3 marks** • Correct solution **2 marks** • Establishes a quadratic equation in terms of BR or similar merit **1 mark** • Attempts to find RG using the cosine rule or similar merit. *Notes:* • *no rounding penalty* • *OK for approximate BG value (6290.695373…) to be used in working and calculations*
16 (d) In ΔOPQ; $\cos\theta = \dfrac{OP^2 + OQ^2 - PQ^2}{2\times OP\times OQ}$ $= \dfrac{\left(\frac{R}{2}\right)^2 + (R-r)^2 - \left(\frac{R}{2}+r\right)^2}{2\left(\frac{R}{2}\right)(R-r)}$ $= \dfrac{\frac{R^2}{4} + R^2 - 2rR + r^2 - \frac{R^2}{4} - rR - r^2}{R(R-r)}$ $= \dfrac{R^2 - 3rR}{R(R-r)}$ $= \dfrac{R-3r}{R-r}$ $(R-r)\cos\theta = R - 3r$ $r(3-\cos\theta) = R(1-\cos\theta)$ $\dfrac{r}{R} = \dfrac{1-\cos\theta}{3-\cos\theta}$	3	**3 marks** • Correct solution **2 marks** • Establishes $\cos\theta = \dfrac{R-3r}{R-r}$, or equivalent **1 mark** • Finds a relationship between θ, R and r.

QUESTION 17		
Solution	**Marks**	**Comments**
17 (a) $A(-2,4)$ $B(3,-11)$ 2:3 $P\left(\dfrac{6-6}{5},\dfrac{12-22}{5}\right)$ $=(0,-2)$	**2**	**2 marks** • Correct solution **1 mark** • Finds correct x or y value
17 (b) (i) $PX^2 = PR^2 - RX^2$ $= 6^2 - 3^2$ $= 27$ $PX = 3\sqrt{3}$ $\tan\alpha = \dfrac{3\sqrt{3}}{8}$ $\alpha = 33.0044916...$ $\alpha = 33°$ 	**2**	**2 marks** • Correct solution **1 mark** • Calculates PX • Correctly identifies the angle to be found *Note: no rounding penalty*
17 (b) (ii) $PC^2 = PR^2 + PR^2$ $= 6^2 + 8^2$ $= 100$ $PC = 10$ $\sin\beta = \dfrac{3\sqrt{3}}{10}$ $\beta = 31.30644625...$ $\beta = 31°$ 	**2**	**2 marks** • Correct solution **1 mark** • Calculates PC or CX • Correctly identifies the angle to be found *Note: no rounding penalty*
17 (c) $y = \dfrac{x^2}{x^2+5x+6}$ $= \dfrac{x^2+5x+6}{x^2+5x+6} - \dfrac{5x+6}{x^2+5x+6}$ $= 1 - \dfrac{5x+6}{(x+3)(x+2)}$ Thus; vertical asymptotes are $x=-3$ and $x=-2$ horizontal asymptote is $y = 1$	**2**	**2 marks** • Correct solution **1 mark** • Finds both vertical asymptotes • Finds the horizontal asymptote
17 (d) $3^{2018} - 2^{2018} = (3^2)^{1009} - (2^2)^{1009}$ $= (3^2 - 2^2)(3^{2016} + 3^{2014} \times 2^2 + 3^{2012} \times 2^4 + ... + 2^{2016})$ As neither factor is equal to 1, then $3^{2018} - 2^{2018}$ is **not** prime	**1**	**1 mark** • Correct explanation
17 (e) (i) $M(1,2)$ $N(-1,-4)$ k:1 $x = \dfrac{1-k}{k+1}$ $y = \dfrac{2-4k}{k+1}$	**1**	**1 mark** • Correct answer
17 (e) (ii) $3\left(\dfrac{1-k}{k+1}\right) - 4\left(\dfrac{2-4k}{k+1}\right) - 5 = 0$ $3(1-k) - 4(2-4k) - 5(k+1) = 0$ $3 - 3k - 8 + 16k - 5k - 5 = 0$ $8k - 10 = 0$ $k = \dfrac{10}{8}$ $k = \dfrac{5}{4}$	**2**	**2 marks** • Correct solution **1 mark** • Substitutes the found coordinates of K into the equation if the line.

QUESTION 17…*continued.*		
Solution	**Marks**	**Comments**
17 (f) $\frac{AC}{h} = \tan 56°$ $AC = h\tan 56°$ $\angle ACB = 72°$ (alternate $\angle$'s = ||lines) $\angle ABC + 45° + \angle ACB = 180°$ ($\angle$ sum of Δ) $\angle ABC + 45° + 72° = 180°$ $\angle ABC = 63°$ $\frac{AC}{\sin 63°} = \frac{1}{\sin 72°}$ $h\tan 56° = \frac{\sin 63°}{\sin 72°}$ $h = \frac{\sin 63°}{\sin 72° \tan 56°}$ $h = 0.63199198479...$ $h = 632$ m , correct to the nearest metre	3	**3 marks** • Correct solution **2 marks** • Finds sufficient sides and angles in ΔABC in order to solve th eproblem **1 mark** • Finds an expression for AC in terms of *h*. • Finds the missing two angles in ΔABC *Note: full marks awarded for the "exact value" for h*
QUESTION 18		
18 (a) (i) Ways $= 8!$ $= 40320$	1	**1 mark** • Correct answer
18(a) (ii) Ways $= 2! \times (3 \times 2) \times 6!$ $= 8640$	2	**2 marks** • Correct solution **1 mark** • Handles restriction in a logical manner
18 (b) (i) Possibilities $= {}^{22}\mathbf{C}_5$ $= 26334$	1	**1 mark** • Correct answer
18(b) (ii) Committees $= {}^{22}\mathbf{C}_5 - {}^{13}\mathbf{C}_5 - {}^{9}\mathbf{C}_5$ $= 24921$	2	**2 marks** • Correct solution **1 mark** • Handles restriction in a logical manner
18 (b) (iii) Ways $= 4!$ $= 24$	1	**1 mark** • Correct answer
18 (c) (i) Arrangements $= \frac{10!}{3!2!}$ $= 302400$	1	**1 mark** • Correct answer
18 (c) (ii) Arrangements $= \frac{7!}{21} \times {}^{8}\mathbf{C}_3$ $= 141120$	2	**2 marks** • Correct solution **1 mark** • Approaches the restriction in a logical manner
18 (d) # triangles $= {}^{10}\mathbf{C}_3 - {}^{4}\mathbf{C}_3$ $= 116$	2	**2 marks** • Correct solution **1 mark** • Selects three points from ten, without considering the implication of the collinear points
18 (e) Case 1: 3 red plus 1 other colour $= 2 \times \frac{4!}{3!}$ $= 8$ Case 2: 2 red plus 2 blue $= \frac{4!}{2!2!}$ $= 6$ Case 3: 2 of one colour plus 2 other colours $= 2 \times \frac{4!}{2!}$ $= 24$ Total # signals $= 8 + 6 + 24$ $= 38$	3	**3 marks** • Correct solution **2 marks** • Finds the correct number of ways in their different cases **1 mark** • Considers different cases in an attempt to solve the problem