Year 1 - Week 5 - Mixed Exam Questions

Mark scheme

Question 1

(a)

Answer	Marks	Guidance
$2-x<1+3(x-2)$ $\Rightarrow 2<4x-5$ $\Rightarrow 4x>7$ $\Rightarrow x>\frac{7}{4}$	**B1** **B1** **B1**	Remove brackets giving rhs 1 + 3x – 6 or better **Ft** Result in the form $ax>b$ **oe**
	[3]	

(b)

$-6<2x-1<7$

$\Rightarrow -5<2x<8 \Rightarrow -\frac{5}{2}<x<4$

Question 2

Question			Answer	Marks	Guidance	
6	(i)		(i) × 3: $9x+12y=54$ (ii) × 4: $28x-12y=20$ Add: $37x=74$ $\Rightarrow x=2$ $\Rightarrow y=3$	M1 M1 A1 A1	Making a coefficient the same Elimination	Alternatively soln by substitution SC Answer only or www seen B4
				[4]		
	(ii)		Sketch to show two lines, one +ve gradient and one –ve, intersecting at *their* point from (i)	B1 B1	Two lines Dep. *Their* intersection	
				[2]		

Question 3

Question			Answer	Marks	Guidance	
8	(i)		$\dfrac{x+a}{x}+\dfrac{x-2}{4}=0$ $\Rightarrow 4x+4a+x^2-2x=0$ $\Rightarrow x^2+2x=-4a$ $\Rightarrow x^2+2x+1=1-4a$ $\Rightarrow (x+1)^2=1-4a$	 M1 M1 A1	 Clear fractions on lhs Collection of terms to a 3 term quadratic and attempt to complete the square Correct final form	 "Attempt" means make lhs include $x^2+2px+p^2$
				[3]		
	(ii)		(Roots if) *their* $q \geqslant 0$ $\Rightarrow a \leqslant \dfrac{1}{4}$	M1 A1	Soi. Allow use of $>$ **ft** *their q* . correct inequality.	Allow = here only if ans is correct. Allow expansion of quadratic and use of discriminant
				[2]		
	(iii)		$(x+1)^2=5$ $\Rightarrow x=-1\pm\sqrt{5}$	M1 A1	Substitute to obtain quadratic in form $(x+p)^2=n$ Both required isw	 Allow use of formula
				[2]		

Question 4

Question			Answer	Marks	Guidance	
14	(a)	(i)	$s=\frac{1}{2}2t^2\left(=t^2\right)$	B1		
				[1]		
		(ii)	$90\text{ km h}^{-1}=25\text{ m s}^{-1}$ or $2\text{ms}^{-2}=25920\text{ km hr}^{-2}$ $v=2t\Rightarrow 25=2t$ $\Rightarrow t=12.5$ secs	B1 M1 A1	Units must be given - others are possible Application of $v=u+at$ with consistent units Units must be given	Beware mixing of units which could give 12.5
				[3]		

Question 5

Question			Answer	Marks	Guidance	
2			Line is $\pm 3x \pm 2y = k$ $3x-2y=k$ Satisfies $(3,-1)$ $\Rightarrow k=9+2=11$ giving $3x-2y=11$ **oe**	M1 A1 M1 A1	Swapping coefficients Correct form Substituting into *their* equation Final equation three terms only must be seen	Alt: gradient of line $=-\frac{2}{3}$ **B1** soi accept $-\frac{2}{3}x$ $\Rightarrow$ grad of perp $=\frac{3}{2}$ **M1** for finding numerical perp $\Rightarrow y = their\ \frac{3}{2}x+c$ **M1** substituting $(3,-1)$ that is not parallel to the original line $\Rightarrow y=\frac{3}{2}x-5.5$ **oe** **A1** i.e. writing "c = – 5.5" only loses last A mark
				4		

Question 6

Question			Answer	Marks	
4	(i)		$AB = \sqrt{(1--3)^2+(5-7)^2}\left(=\sqrt{16+4}\right)$ $\Rightarrow AB = \sqrt{20} \quad \left(=2\sqrt{5}\right)$ (isw for any decimal given)	M1 A1	Applying Pythagoras correctly
				2	
	(ii)		$(-1,6)$	B1	
				1	

Question 7

Question			Answer	Marks	Guidance	
7	(i)		$\Rightarrow x+7=3+5x-x^2$ $\Rightarrow x^2-4x+4=0$ oe $\Rightarrow x=2,$ $y=9$	**M1** **A1** **A1** **A1** **4**	Substitute, eliminating x or y. 3 term quadratic. x(or y) Substitute and find y (or x).	Or $y^2-18y+81=0$
	(ii)		Line is tangent to curve (at (2, 9))	**B1** **1**	Allow "touches".	Or a sketch with any parabola touched by any line

Question 8

Question			Answer	Marks	Guid
8	(i)		Grad AB = Grad CD $=1\ \left(=\frac{4--1}{0--5}\right)$ and $\left(=\frac{-2-3}{2-7}\right)$ **oe**	B1	For showing one pair of gradients equal and correct **www**
			Grad BC = Grad AD $=-\frac{1}{7}\ \left(=\frac{3-4}{7-0}\right)$ and $\left(=\frac{-2--1}{2--5}\right)$ Two pairs of parallel sides (means ABCD parallelogram)	B1 [2]	For showing other pair of gradients equal and correct plus completion
	(ii)		$AB^2=5^2+5^2\ (=50)$ **oe** for any side $BC^2=1^2+7^2\ (=50)$ $\Rightarrow AB^2=BC^2\ (=50)$ Equal sides (means rhombus)	B1 B1 [2]	One length (or squared length) For adjacent length plus completion **www**
	(iii)		Gradients do not fulfil $m_1 .\ m_2=-1$ **oe** ie $1\times-\frac{1}{7}\neq-1$ Therefore lines not perpendicular **Alternatives:** **A:** Use of cosine rule Does not give 90^0 **B:** Use of Pythagoras Not satisfied therefore not 90^0 **C:** Use of pythagoras to find length of diagonals (i.e. $\sqrt{160}$ and $\sqrt{40}$) Diagonals not equal	M1 A1 [2] M1 A1 M1 A1 M1 A1	For use of $m_1 .\ m_2=-1$ Gradients must be correct. **www** **www** **www**

Question 9

Q	Marking Instructions	Marks	Typical Solution
(a)	***Note:* Vectors in mark schemes are in bold type. Handwritten vectors should be underlined (do not penalise through loss of marks).** $\overrightarrow{BE} = \frac{2}{3}\mathbf{a}$ **or** $AE = \frac{5}{3}\mathbf{a}$ **(OE)** $\overrightarrow{ED} = -\overrightarrow{BE} - \overrightarrow{AB} + \overrightarrow{AD}$ (using *their* $\overrightarrow{BE}$) Correct final answer (must be simplified).	**B1** **M1** **A1** **3 marks**	$\overrightarrow{AB} = \mathbf{a}$, $AB : BE = 3 : 2$ $\overrightarrow{BE} = \frac{2}{3}\overrightarrow{AB}$ $= \frac{2}{3}\mathbf{a}$ $\overrightarrow{ED} = -\overrightarrow{BE} - \overrightarrow{AB} + \overrightarrow{AD}$ $= -\frac{2}{3}\mathbf{a} - \mathbf{a} + \mathbf{b}$ $= -\frac{5}{3}\mathbf{a} + \mathbf{b}$
(b)	$\overrightarrow{EF} = \frac{2}{5}\overrightarrow{ED}$ Correct final answer (must be simplified).	**B1** **A1** **2 marks**	Using 'similar triangles': $\overrightarrow{EF} = \frac{2}{5}\overrightarrow{ED}$ $= \frac{2}{5}\left(-\frac{5}{3}\mathbf{a} + \mathbf{b}\right)$ $= -\frac{2}{3}\mathbf{a} + \frac{2}{5}\mathbf{b}$