AQA

Level 3 Certificate
MATHEMATICAL STUDIES
1350/2B

Paper 2B – Critical path and risk analysis

Mark scheme

Specimen

Version 1.1

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

Examinations are marked in such a way as to award positive achievement wherever possible. Thus, for mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	mark is for method
dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
ft	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

Q	Answer	Mark	Comments
1	the numbers in column D can be automatically calculated by using a sum formula to add those in columns B and C or cell D3 should be 23 or cell D3 has not been added up correctly or cell B3 or Cell C3 may have the wrong value as they don't add up to 33	B1	
	comments on sampling. eg sample size too small or he has not asked the whole class		
	no time period is given so an average per day cannot be calculated		
	comments on lack of average, eg.no averages mentioned: texts per person per day or similar is expected or totals cells needed/cell with formula to calculate average	B3	B1 each correct statement
	collection of texts received is irrelevant		

Q	Answer	Mark	Comments
Alt 1 **2**	3 × 66 000 = 198 000 (not 188 000)	B1	This is the amount the bank will lend him.
	Pete should divide by 0.9 (instead of multiplying by 0.9)	B1	This is to find the maximum house price he can afford. There is no purpose to the multiplication done.
	(£) 220 000	B1	This is the maximum price he can afford for a house.
Alt 2 **2**	188 000 ÷ 3 ≠ 66 000	B1	
	$\dfrac{188000}{90} \times 100$ or $\dfrac{198000}{90} \times 100$	B1	
	(£) 220 000	B1	This is the maximum price he can afford for a house.

|			
3(a)	says that the complaint was justified and gives any two of the following reasons • column headings needed • the last column should be stated to be percentages • the last but one column should be stated to be votes received • all candidates should be listed • the total electorate should be stated • the percentage turnout is omitted	E2	or equivalent E1 says that the complaint was justified and gives one correct reason (ignore any incorrect reasons given) or gives two correct reasons but does not say that the complaint was justified

Q	Answer	Mark	Comments
3 (b)	calculates 2010 electorate: 51 228 ÷ 0.714 or [71 740, 71750]	M1	oe
	uses their 2010 figure to make a sensible estimate of the 2014 figure and makes a valid conclusion based on 50% of their electorate	A1	eg assumes the electorate remains stable and compares half of their electorate assumes an increase in electorate and compares half of their increased electorate SC1 says that as we are not told the number of registered voters in 2014 we cannot say if half did not vote
	says that UKIP did make the biggest numerical gain and gives evidence or says that UKIP did make the biggest percentage gain and gives evidence	E1	relevant figures are: Conservative – 10 159 Labour – 4596 Liberal – 9242 UKIP + 8074 condone 'UKIP' were the only ones of the four parties from 2010 to increase their vote there is no need for a comment about the parties who did not take part in 2010, but accept any correct comment eg the other parties cannot have increased their vote beyond the 1891 of the independent candidate relevant figures are: Conservative – 8.9(%) Labour – 4.6(%) Liberal – 17.4(%) UKIP + 22.1(%) condone 'UKIP' were the only ones of the four parties from 2010 to increase their vote there is no need for a comment about the parties who did not take part in 2010, but accept any correct comment eg the other parties cannot have increased their vote beyond the 4.9% of the independent candidate

Q	Answer	Mark	Comments
3(c)	Jenrick (Conservative)		
	Conservatives did gain a majority, however more people voted against them (47.65) than for them (45%)	E2	full well communicated comment putting both sides E1 for partial explanation eg Jenrick was correct as Conservatives gained more votes than any other party or Jenrick is wrong as more people voted against the government (46.7%) than for the government (45%) or the government is a coalition so including the Liberal Democrat percentage gives the government an even bigger majority (47.6%)
	Helmer (UKIP)		
	any comparison of 3.8 and 25.9	M1	no credit for result in general election approx factor of 5 as not a justification
	$\dfrac{25.9}{3.8} \approx 6$ so he is right or 25.9 ÷ 3.8 is approx 7 so he is wrong or 6 × 3.8 = 22.8 so it's more than a factor of 6	A1	can conclude they agree or disagree with Helmer with correct reasoning
	any comparison of $7\,403$ and $16\,152$	M1	
	$\dfrac{7403}{16152} \approx \dfrac{1}{2}$ or 16152 ÷ 2 = 8076 and yes / they more than halved the majority	A1	
	Payne (Labour)		
	various sensible numerical arguments are possible, for example • reference to the $45.0\,\%$ being less than half	E1	

		• only a quarter of the electorate voted **against** the Conservative candidate		
	clearly communicated answers with links to each candidate's statement and numerical justifications	B1	
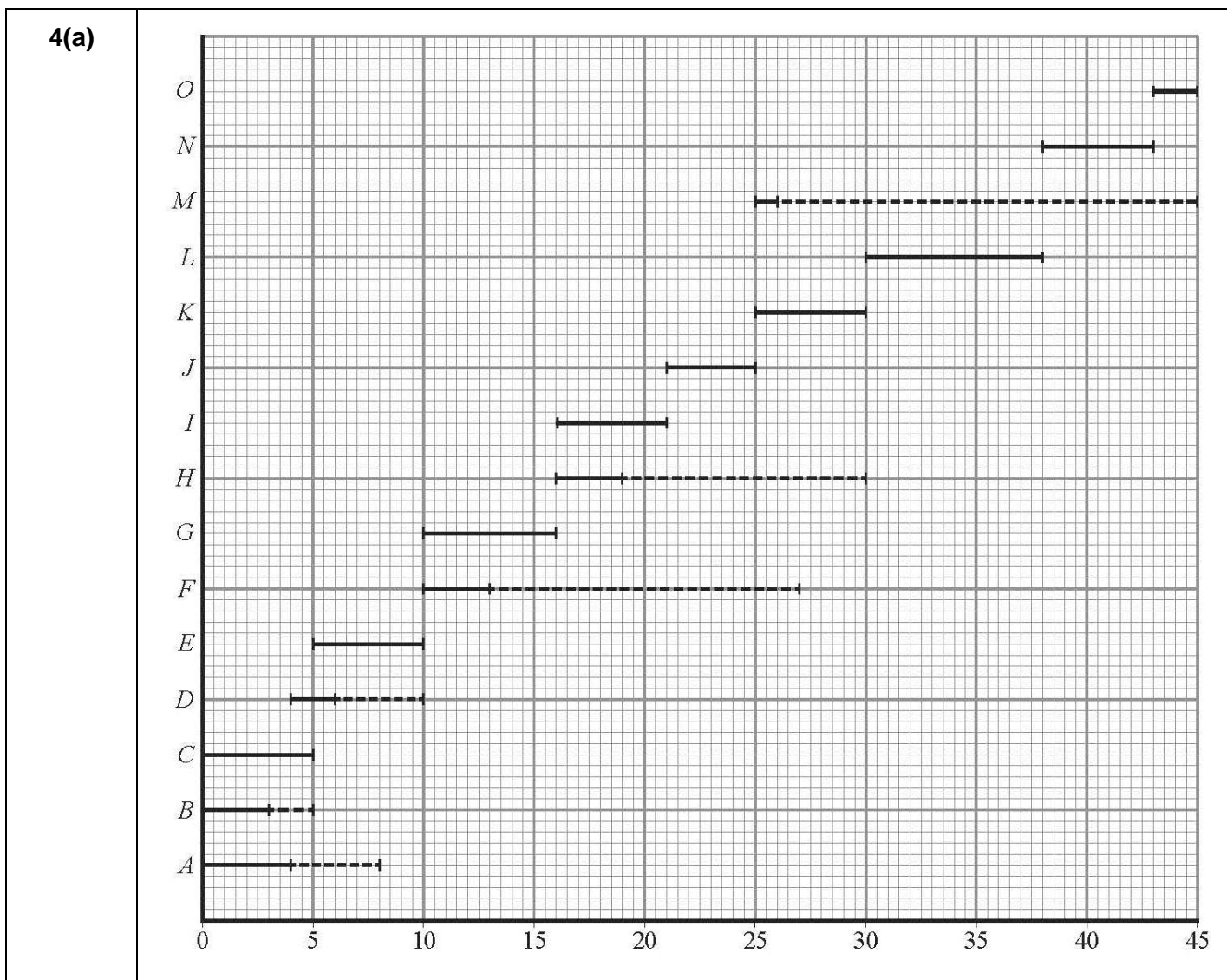
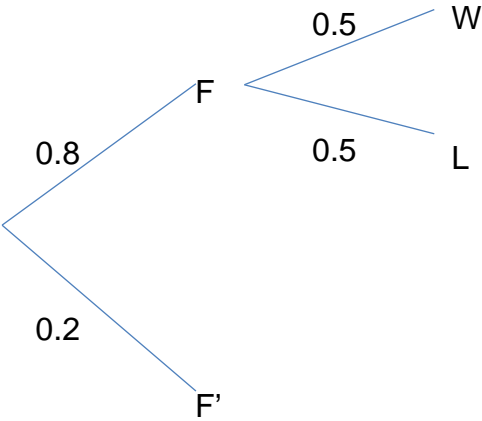| Q	Answer	Mark	Comments
4(a)			
		M1	SCA at least 10 activities
		B1	2 or more floats seen
		A2, 1, 0	– 1 each independent error
	minimum 30	B1	condone 38, 43 or 45 if valid reason given
	maximum 45	B1	condone 30, 38 or 43 if valid reason given and greater than or equal to minimum above
4(b)	D: no effect and N: delay by 2 hours	B1	
	complete 47 hours	B1	

Q	Answer	Mark	Comments
Alt 1 5	0.8 × 0.5 or 0.4	M1	probability of winning
	20 × their 0.4 or 8	M1	number of races won
	their 8 × 500 = 4000	M1	total winnings
	20 × 50 or 1000	M1	total entry fee
	4000 – their 1000	M1	
	(£)3000	A1	

Q	Answer	Mark	Comments
Alt 2 5	0.8 × 20 or 16	M1	number of races finished
	their 16 × 0.5 or 8	M1	number of races won
	their 8 × (500 – 50) or 3600	M1	amount won in races won
	(20 – their 8) × 50 or 600	M1	amount lost in races lost
	3600 – their 600	M1	
	(£)3000	A1	

Q	Answer	Mark	Comments
Alt 3 5	0.8 × 0.5 or 0.4	M1	probability of winning
	500 – 50 or 450 and –50	M1	net winnings and net losses
	1 – 0.4 = 0.6 or 0.8 – 0.4 = 0.4 and 1 – 0.8 = 0.2	M1	probability of losing
	0.4 × 450 + 0.6 × –50 =150 or 0.4 × 450 + 0.4 × –50 + 0.2 × –50 = 150	M1	expected winning per race
	(0.4 × 450 + 0.6 × –50) × 20 or (0.4 × 450 + 0.4 × –50 + 0.2 × –50) × 20 or 150 × 20	M1	
	(£)3000	A1	

Q	Answer	Mark	Comments
Alt 4 5		M1	
	P(win) = 0.8 × 0.5 = 0.4 and P(lose) = 0.2 + 0.8 × 0.5 = 0.6	M1	or P(win) = 0.8 × 0.5 = 0.4 and P(lose) = 1 − 0.4 = 0.6
	0.4 × 20 × (500 − 50) or 3600	M1	amount won in races won
	0.6 × 20 × 50 or 600	M1	amount lost in races lost
	3600 – their 600	M1	
	(£)3000	A1	

Q	Answer	Mark	Comments
6(a)	see diagram below		also accept methods based on activities on arcs convention
		M1	network, at least 9 activities and some arcs
		A1	up to 2 independent errors
		A1	all correct
		M1	forward pass, correct at *D*
		A1	all correct
		M1	back pass, correct at *H*, *I*, *J*, ft
		A1	all correct
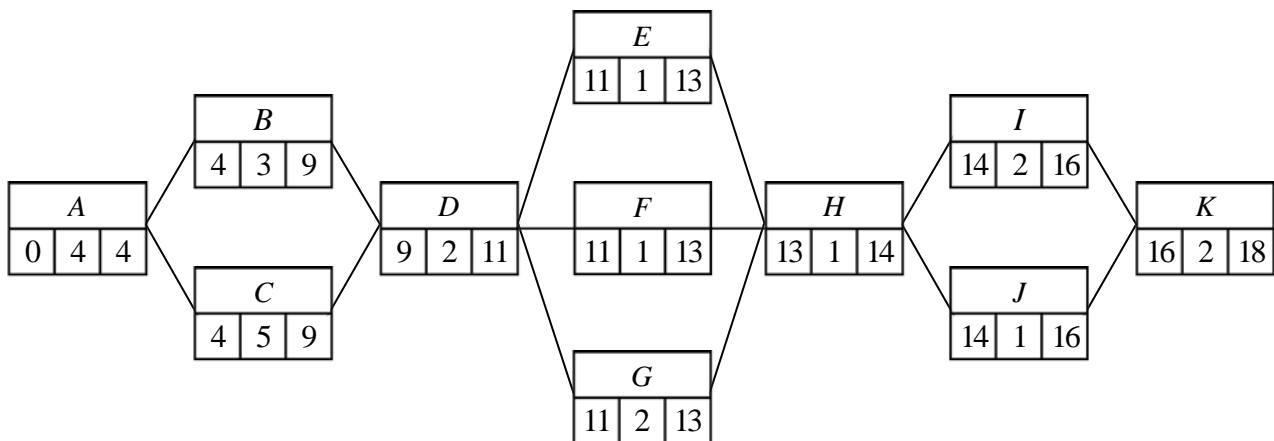
Q	Answer	Mark	Comments
6(b)	(Critical) *A C D G H I K*	B1	
Alt 1 6(c)	counts their 18 weeks (126 days) from July 1st	M1	
	November 3 or November 4	A1ft	ft their number of weeks in (a)
	no, with November 3 or November 4 or explanation that they will be 2 or 3 days late	E1ft	ft their number of weeks in (a)
Alt 2 6(c)	counts their 18 weeks (126 days) from Nov 1st	M1	
	June 28 or June 29	A1ft	ft their number of weeks in (a)
	no, with June 28 or June 29 or explanation that they will be 2 or 3 days late	E1ft	ft their number of weeks in (a)

Q	Answer	Mark	Comments
7(a)	4 and 14 identified or $$\dfrac{1+3}{1+2+3+8}$$	M1	eg 1 + 3 and 1 + 2 + 3 + 8
	$\dfrac{4}{14}$ or $\dfrac{2}{7}$	A1	
7(b)	6 + 1 + 2 + 7 = 16	M1 A1	or 36 + 3 + 8 + 37 = 84
	0.16	A1	or − 0.84

Q	Answer	Mark	Comments
8(a)	0.1 + 0.3 − 0.03 = 0.37	M1 A1	or (0.1 × 0.7) + (0.3 × 0.9) + (0.1 × 0.3) = 0.37
	the delays in the two activities are independent	B1	
	0.37 × 30 000= 11 100	M1 A1	
8(b)	recommend preventing a delay on y only	E1	or recommend both
	y costs less than others	E1	both not much more expensive and may be worth the investment to protect contractor's reputation
	y = £10,000 none = £11 100 x = £13 000 x and y = £11 000	M1 A2	A1 if three values correct A2 for all correct and seen

SP/01/14