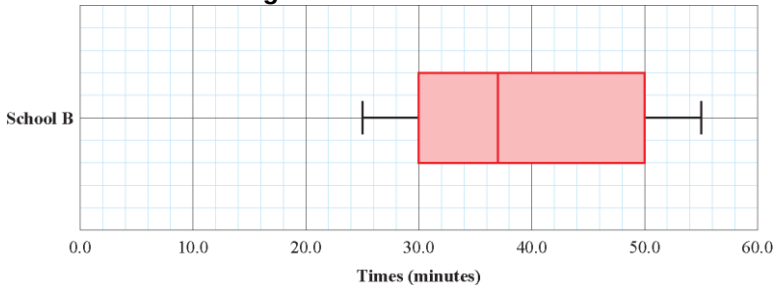


AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
1a	All readers of the online newspaper.	B1	1.2	2nd Understand the vocabulary of sampling.
		(1)		
1b	A list of readers who subscribe to the extra content.	B1	1.2	2nd Understand the vocabulary of sampling.
		(1)		
1c	The subscribers.	B1	1.2	2nd Understand the vocabulary of sampling.
		(1)		
1d	Advantage: accuracy of the data, unbiased.	B1	1.2	3rd
	Disadvantage: difficult to get a 100% response to a survey.	B1	1.2	Comment on the advantages and disadvantages of samples and censuses.
		(2)		
1e	Natural variation in a small sample.	B1	1.2	3rd
	Bias.	B1	1.2	Comment on the advantages and disadvantages of samples and censuses.
		(2)		
(7 marks)				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
2ai	37 (minutes).	B1	1.1b	2nd Draw and interpret box plots.
		(1)		
2aii	Upper quartile or Q_3 or third quartile or 75 th percentile or P_{75}	B1	1.2	2nd Understand quartiles and percentiles.
		(1)		
2b	Outliers. Sensible interpretation: For example: Observation that are very different from the other observations (and need to be treated with caution). Possible errors. These two children probably walked/took a lot longer.	B1 B1	1.2 2.4	3rd Recognise possible outliers in data sets.
		(2)		
2c	$50 + 1.5 \times 20 = 80$ or $30 - 1.5 \times 20 = 0$ Maximum value = 55 < 80 minimum value = 25 > 0 No outliers.	M1 A1 B1	1.1b 1.1b 1.1b	4th Calculate outliers in data sets and clean data.
		(3)		
2d	The scale must be the same as for school A. Figure 1  School B Times (minutes)	B1	1.1b	2nd Draw and interpret box plots.
	Box & whiskers 30, 37, 50	B1	1.1b	
	25, 55	B1	1.1b	
		(3)		

AS Practice Paper I (Statistics & Mechanics) mark scheme

2e	Three comparisons in context. Comment on comparing averages. For example, children from school <i>A</i> took less time on average. Comment comparing consistency of times. For example, there is less variation in the times for school <i>A</i> than school <i>B</i>. Comment on comparing symmetry: For example, both positive skew (or neither symmetrical or median closer to LQ (o.e.) for both). (Most children took a short time with a few taking longer.) Comment on comparing outliers. For example, school <i>A</i> has two children whose times are outliers (or errors) where as school <i>B</i> has no outliers.	B3	2.2b	4th Compare data sets using a range of familiar calculations and diagrams.
		(3)		
(13 marks)				
Notes 2c Allow horizontal line through box.				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
3a	Find total frequency = $\text{width} \times \text{frequency density}$ $= (5 \times 2) + (4 \times 4) + (4 \times 6) + (7 \times 5) + (15 \times 1) = 100$ $P(\text{Takes longer than 18 mins}) = \frac{35+15}{100} = \frac{50}{100} = \frac{1}{2}$ or equivalent.	M1 A1 M1 A1	3.1a 1.1b 3.1a 1.1b	2nd Calculate probabilities from relative frequency tables and real data.
		(4)		
3b	$\frac{1}{3} \times 15 = 5$ $P(\text{Takes less than 30 mins}) = \frac{10+16+24+35+5}{100} = \frac{90}{100} = \frac{9}{10}$ or equivalent.	M1 M1 A1	2.2b 1.1b 1.1b	2nd Calculate probabilities from relative frequency tables and real data.
		(3)		
(7 marks)				
Notes 3a M1 for attempt to find total frequency by adding at least three “width $\times$ frequency density” terms (which may contain errors). Alternative: M1 for $\frac{2}{3} \times 15 = 10$. M1 for $1 - \frac{10}{100}$. A1 for $\frac{9}{10}$ o.e.				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
4	$H_0: p = 0.25, H_1: p > 0.25$	B1	2.5	5th Carry out 1-tail tests for the binomial distribution.
	Let X represent the number of seeds that germinate. (Under H_0) $X \sim B(25, 0.25)$	M1	3.4	
	$P(X \geq 10) = 1 - P(X \leq 9) = 0.0713$	M1	1.1b	
	> 0.05	A1	1.1b	
	10 is not in critical region therefore insufficient evidence to reject H_0 .	B1	2.2b	
	There is insufficient evidence at the 5% level to suggest that the book has underestimated the probability. (o.e.)	B1	3.2a	
				(6 marks)
Notes				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
5a	States or implies that $s = -80$	B1	3.1b	5th Use equations of motion to solve problems involving vertical motion.
	States or implies that $a = -9.8$	B1	3.1b	
	Writes $v^2 = u^2 + 2as$ or makes a substitution $v^2 = (16)^2 + 2(-9.8)(-80)$	M1	3.1b	
	Finds $v = 43 \text{ (m s}^{-1}\text{)}$. Accept $42.7 \text{ (m s}^{-1}\text{)}$.	A1	1.1b	
		(4)		
5b	States or implies that $s = 5 \text{ m}$.	B1	3.1b	5th Use equations of motion to solve problems involving vertical motion.
	Simplifies $5 = 16t - 4.9t^2$ to obtain $4.9t^2 - 16t + 5 = 0$	M1	1.1b	
	Makes an attempt to use the quadratic formula: $t = \frac{16 \pm \sqrt{(-16)^2 - 4(4.9)(5)}}{2(4.9)}$	M1	1.1b	
	Solves to find $t = 0.35 \dots \text{ (s)}$. Accept awrt 0.35 (s) .	A1	1.1b	
	Solves to find $t = 2.91 \dots \text{ (s)}$. Accept awrt 2.92 (s) .	A1	1.1b	
	States that the ball is above 85 m for $2.56 \dots \text{ (s)}$. Accept awrt 2.6 (s) .	B1	3.2a	
		(6)		
5c	States or implies that at the greatest height $v = 0$	B1	3.1b	5th Use equations of motion to solve problems involving vertical motion.
	Finds the value of u : $u = \frac{1}{5}(42.7 \dots) = 8.54 \dots \text{ (m s}^{-1}\text{)}$. Accept awrt $8.5 \text{ (m s}^{-1}\text{)}$.	M1	3.1b	
	Writes $v^2 = u^2 + 2as$ or makes a substitution $(0)^2 = (8.54 \dots)^2 + 2(-9.8)(s)$	M1	3.1b	
	Finds $s = 3.72 \dots \text{ (m)}$. Accept awrt 3.7 (m) .	A1 ft	1.1b	
		(4)		
(14 marks)				
Notes 5c Award ft marks for a correct answer using their answer from part a.				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
6a	States that $a = -4$. $6 - 2 + a = 0$ may be seen.	B1	1.1b	4th
	States that $b = -5$. $-4 + 9 + b = 0$ may be seen.	B1	1.1b	Understand Newton's first law and the concept of equilibrium.
		(2)		
6b	States that $\mathbf{R} = 2\mathbf{i} - 9\mathbf{j}$ (N).	M1	1.1b	4th
	States that the magnitude of $\mathbf{R} = \sqrt{(2)^2 + (-9)^2}$	M1	1.1b	Calculate resultant forces using vectors.
	States $R = \sqrt{85}$ (N) or $R = 9.21\dots$ (N). Accept awrt 9.2 (N).	A1	1.1b	
		(3)		
6c	States $\tan \theta = \frac{9}{2}$	M1	1.1b	4th
	Finds the value of θ : $\theta = 77.47\dots(^{\circ})$. Accept awrt $\theta = 77.5 (^{\circ})$.	A1 ft	1.1b	Calculate resultant forces using vectors.
		(2)		
(7 marks)				
Notes 6b Award second method mark and accuracy mark for a correct answer using their R. 6c Award ft marks for correct answer using their $\mathbf{R}$ vector from part a.				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
7a	$a = \frac{v-u}{t}$ seen or implied.	M1	3.1b	5th Use equations of motion to solve problems in familiar contexts.
	Finds the value of a : $a = \frac{20-6}{35} = \frac{14}{35} = 0.4 \text{ m s}^{-2}$	A1	1.1b	
		(2)		
7b	Use the fact that $\frac{t_1}{t_2} = \frac{4}{3}$ to write $3t_1 = 4t_2$ or $3t_1 - 4t_2 = 0$ or equivalent.	M1	1.1b	5th Use equations of motion to solve problems in familiar contexts.
	States or implies that $t_1 + t_2 = 35$	M1	3.1b	
	Solves to find $t_1 = 20$ or $t_2 = 15$. Could use substitution or simultaneous equations. Does not need to find both values for mark to be awarded as either value can be used going forward.	A1	1.1b	
	Use $v = u + at$ to write either $x = 6 + 0.4(20)$ or $20 = x + 0.4(15)$	M1	2.2a	
	Finds $x = 14 \text{ (m s}^{-1}\text{)}$.	A1ft	1.1b	
		(5)		
7c	States or implies that $s = \left(\frac{u+v}{2}\right)t$	M1	2.2a	5th Use equations of motion to solve problems in familiar contexts.
	Finds the value of s : $s = \left(\frac{6+20}{2}\right)(35) = 455 \text{ (m)}$.	A1	1.1b	
		(2)		
(9 marks)				
Notes				
7b				
Award ft marks for a correct answer using their value from part a.				