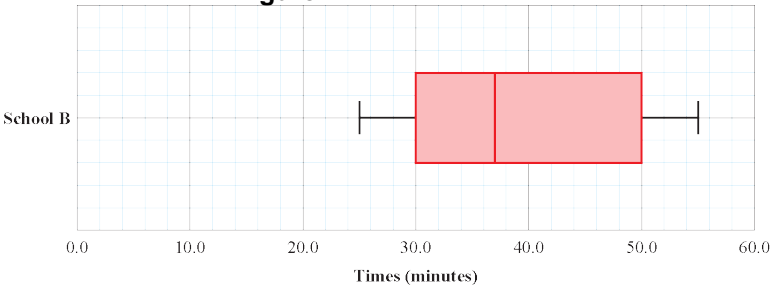


AS Practice Paper I (Statistics & Mechanics) mark scheme

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

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
2ai	37 (minutes).	<b>B1</b>	1.1b	2nd Draw and interpret box plots.
		<b>(1)</b>		
2aii	Upper quartile or $Q_3$ or third quartile or 75 <sup>th</sup> percentile or $P_{75}$	<b>B1</b>	1.2	2nd Understand quartiles and percentiles.
		<b>(1)</b>		
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.	<b>B1</b>  <b>B1</b>	1.2  2.4	3rd  Recognise possible outliers in data sets.
		<b>(2)</b>		
2c	$50 + 1.5 \times 20 = 80$ or $30 - 1.5 \times 20 = 0$ Maximum value = 55 < 80 minimum value = 25 > 0 No outliers.	<b>M1</b> <b>A1</b> <b>B1</b>	1.1b 1.1b 1.1b	4th Calculate outliers in data sets and clean data.
		<b>(3)</b>		
2d	The scale <b>must</b> be the same as for school A.	<b>B1</b>	1.1b	2nd Draw and interpret box plots.
	<b>Figure 1</b>			
	 <p>School B</p> <p style="text-align: center;">Times (minutes)</p>			
	Box & whiskers 30, 37, 50	<b>B1</b>	1.1b	
25, 55	<b>B1</b>	1.1b		
		<b>(3)</b>		

**AS Practice Paper I (Statistics & Mechanics) mark scheme**

<p><b>2e</b></p>	<p>Three comparisons in context.            Comment on comparing averages.            For example, children from school <i>A</i> took less time <b>on average</b>.</p> <p>Comment comparing consistency of times.            For example, there is less variation in the times for school <i>A</i> than school <i>B</i>.</p> <p>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.)</p> <p>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.</p>	<p><b>B3</b></p>	<p>2.2b</p>	<p>4th</p> <p>Compare data sets using a range of familiar calculations and diagrams.</p>
		<p><b>(3)</b></p>		
<p><b>(13 marks)</b></p>				
<p><b>Notes</b></p>				
<p><b>2c</b></p>	<p>Allow horizontal line through box.</p>			

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
3a	Find total frequency = $\sum \text{width} \times \text{frequency density}$ $= (5 \times 2) + (4 \times 4) + (4 \times 6) + (7 \times 5) + (15 \times 1) = 100$  $P(\text{Takes longer than 18 mins}) = \frac{35+15}{\text{"100"}} = \frac{50}{100} = \frac{1}{2}$ 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)		
<b>(7 marks)</b>				
<b>Notes</b>				
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 $1 - \frac{\text{"10"}}{\text{"100"}}$ . 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	$H_0: p = 0.25, H_1: p > 0.25$	<b>B1</b>	2.5	5th Carry out 1-tail tests for the binomial distribution.
	Let $X$ represent the number of seeds that germinate. (Under $H_0$ ) $X \sim B(25, 0.25)$	<b>M1</b>	3.4	
	$P(X \geq 10) = 1 - P(X \leq 9) = 0.0713$	<b>M1</b>	1.1b	
	$> 0.05$	<b>A1</b>	1.1b	
	10 is not in critical region therefore insufficient evidence to reject $H_0$ .	<b>B1</b>	2.2b	
	There is insufficient evidence at the 5% level to suggest that the book has underestimated the probability. (o.e.)	<b>B1</b>	3.2a	
<b>(6 marks)</b>				
<b>Notes</b>				

AS Practice Paper I (Statistics & Mechanics) mark scheme

Q	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
<b>5a</b>	States or implies that $s = -80$	<b>B1</b>	3.1b	5th Use equations of motion to solve problems involving vertical motion.
	States or implies that $a = -9.8$	<b>B1</b>	3.1b	
	Writes $v^2 = u^2 + 2as$ or makes a substitution $v^2 = (16)^2 + 2(-9.8)(-80)$	<b>M1</b>	3.1b	
	Finds $v = 43 \text{ (m s}^{-1}\text{)}$ . Accept $42.7 \text{ (m s}^{-1}\text{)}$ .	<b>A1</b>	1.1b	
		<b>(4)</b>		
<b>5b</b>	States or implies that $s = 5 \text{ m}$ .	<b>B1</b>	3.1b	5th Use equations of motion to solve problems involving vertical motion.
	Simplifies $5 = 16t - 4.9t^2$ to obtain $4.9t^2 - 16t + 5 = 0$	<b>M1</b>	1.1b	
	Makes an attempt to use the quadratic formula: $t = \frac{16 \pm \sqrt{(-16)^2 - 4(4.9)(5)}}{2(4.9)}$	<b>M1</b>	1.1b	
	Solves to find $t = 0.35 \dots \text{ (s)}$ . Accept awrt $0.35 \text{ (s)}$ .	<b>A1</b>	1.1b	
	Solves to find $t = 2.91 \dots \text{ (s)}$ . Accept awrt $2.92 \text{ (s)}$ .	<b>A1</b>	1.1b	
	States that the ball is above $85 \text{ m}$ for $2.56 \dots \text{ (s)}$ . Accept awrt $2.6 \text{ (s)}$ .	<b>B1</b>	3.2a	
		<b>(6)</b>		
<b>5c</b>	States or implies that at the greatest height $v = 0$	<b>B1</b>	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 $8.5 \text{ (m s}^{-1}\text{)}$ .	<b>M1</b>	3.1b	
	Writes $v^2 = u^2 + 2as$ or makes a substitution $(0)^2 = (8.54 \dots)^2 + 2(-9.8)(s)$	<b>M1</b>	3.1b	
	Finds $s = 3.72 \dots \text{ (m)}$ . Accept awrt $3.7 \text{ (m)}$ .	<b>A1 ft</b>	1.1b	
		<b>(4)</b>		
				<b>(14 marks)</b>
<b>Notes</b>				
<b>5c</b>	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.	<b>B1</b>	1.1b	4th Understand Newton's first law and the concept of equilibrium.
	States that $b = -5$ . $-4 + 9 + b = 0$ may be seen.	<b>B1</b>	1.1b	
		<b>(2)</b>		
6b	States that $\mathbf{R} = 2\mathbf{i} - 9\mathbf{j}$ (N).	<b>M1</b>	1.1b	4th Calculate resultant forces using vectors.
	States that the magnitude of $\mathbf{R} = \sqrt{(2)^2 + (-9)^2}$	<b>M1</b>	1.1b	
	States $R = \sqrt{85}$ (N) or $R = 9.21\dots$ (N). Accept awrt 9.2 (N).	<b>A1</b>	1.1b	
		<b>(3)</b>		
6c	States $\tan \theta = \frac{9}{2}$	<b>M1</b>	1.1b	4th Calculate resultant forces using vectors.
	Finds the value of $\theta$ : $\theta = 77.47\dots(^{\circ})$ . Accept awrt $\theta = 77.5 (^{\circ})$ .	<b>A1 ft</b>	1.1b	
		<b>(2)</b>		
				<b>(7 marks)</b>
<b>Notes</b>				
<b>6b</b>	Award second method mark and accuracy mark for a correct answer using their $R$ .			
<b>6c</b>	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)		
				<b>(9 marks)</b>
<b>Notes</b>				
7b	Award ft marks for a correct answer using their value from part a.			