

AS Applied Paper 1- MathsFlex Tutoring

Statistics Part A

1.

1a	$\bar{x} = 6.21(428\dots)$	B1
1b	$\sigma_x = 1.65(523\dots)$	B1ft
	Sight of "knots" or "kn"	B1
1c	August...since	B1
	there is less wind in the summer months	B1
1di	They represent outliers	B1
1dii	Y has a low median so expect a lowish mean and Y has small range/IQR or spread so expect smaller st. dev	M1
	Suggests E	A1

2.

2	1 square is $105 \div (5 \times 5 + 2 \times 4 + 3 \times 3) = 2.5$ and $(7 \times 2 + 2 \times 6) \times 2.5$	M1
	65 students took less than 12 minutes	A1
	Percentage of students = $(65 \div (65 + 105 + 1 \times 6 \times 2.5)) \times 100$	M1
	= 35.13... awrt 35%	A1

3.

a	[Let $p = P(F C)$ Tree diagram or some other method to find an equation for p	M1
	$0.3 \times 0.04 + 0.2 \times 0.14 + 0.5 \times p = 0.1$	A1
	$p = 0.12$ ie 12%	A1
b	$P(B \text{ and } F) = 0.2 \times 0.14 = 0.028$ but $P(B) \times P(F) = 0.2 \times 0.1 = 0.02$ These are not equal so not independent.	B1

4.

!a	Label each year group	B1
	Use <u>random</u> numbers to select a...	B1
	Simple random sample of <u>20 Year 12s</u> and <u>15 Year 13s</u>	B1
!b	<u>Increase</u> by <u>2.1</u> marks	B1
!c	For example: the best performance is predicted for the students who never wake up	B1

5.

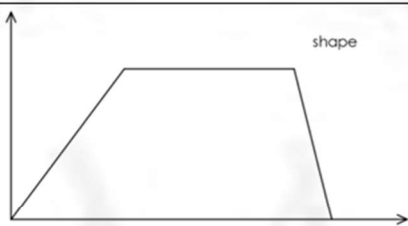
a	Let N = the number of games Rebecca wins	$N \sim B(30, \frac{1}{5})$	M1
ai	$P(N = 4)$	$= 0.13252... \text{ awrt } 0.133$	A1
aii	$P(N > 7)$	$= 1 - P(N \leq 6)$ $= 0.39303... \text{ awrt } 0.393$	A1
b	$H_0: p = \frac{1}{5}$	$H_1: p > \frac{1}{5}$	B1
	Let X = the number of games Rebecca wins	$X \sim B(64, \frac{1}{5})$	M1
	$P(X \geq 19)$	$= 1 - P(X \leq 18)$ $= 0.04206... (< 0.05)$	A1
	[Significant result so reject H_0 (the null model) and conclude:] There is evidence to support Rebecca's claim oe		A1

Mechanics section B

6.

Equation in t only	M1
$-2 = 17.5t - \frac{1}{2} \times 9t^2$	A1
$9t^2 - 35t - 4 = 0 = (9t + 1)(t - 4)$	dM1
$T = 4$ (only)	A1

7.

ai	18 (ms ⁻¹)	B1
a ii	45 (s)	B1
a iii		B1
	Equating area under graph to 1845 to give an equation in one unknown.	M1
b	$\frac{1}{2}(T + T + 90 + 45) \times 18 = 1845$ or $(\frac{1}{2} \times 90 \times 18) + 18T + (\frac{1}{2} \times 45 \times 18) = 1845$ oe	A1ft
	$T = 35$ so total time is 170 (s)	A1
c	Accept Either: a smooth change from acceleration to constant velocity or from constant velocity to deceleration. Or: have train accelerating and/or decelerating at a variable rate Do not accept e.g. Comments on air resistance or resistive forces, straightness of track, horizontal track, friction, length of train, mass of train, not having train moving with constant velocity.	B1

8.

	Multiply out and differentiate wrt time (or use of product rule i.e. must have two terms with correct structure)	M1
	$v = 2t^3 - 6t^2 + 4t$	A1
a	$2t^3 - 6t^2 + 4t = 0$ and solve: $2t(t - 2)(t - 1) = 0$	dM1
	$t = 0$ or $t = 1$ or $t = 2$; any two	A1
	All three	A1
	Find x when $t = 0, 1, 2$ and 4: $(0, \frac{1}{2}, 0, 32)$	M1
c	Distance = $\frac{1}{2} + \frac{1}{2} + 32$	M1
	33	A1
c	$x = \frac{1}{2}t^2(t - 2)^2$	M1
	$\frac{1}{2}$ a perfect square so $x \geq 0$ i.e. never negative	A1cso

9.

a	Equation of motion for Q	M1
	$0.5g - T = 0.5a$	A1
	Equation of motion for P	M1
	$T = 0.9a$	A1
	$1.4a = 0.5g \Rightarrow a = 3.5$	A1
c	$0.5 = \frac{1}{2} \times 3.5 \times t_1^2$ or they may find v first and then use $v = 3.5t_1$	M1
	$t_1 = 0.534(522\dots)$ Allow 0.53, 0.54, 0.534, or better, or any surd form eg $\frac{\sqrt{14}}{7}$	A1
	$v = 3.5t_1$ or $v = \sqrt{2 \times 3.5 \times 0.5}$ or $0.5 = \frac{(0+v)}{2} \times t_1$ ($v = 1.8708\dots$)	M1
	$t_2 = \frac{1.8 - 0.5}{v}$	M1
	Complete strategy to solve the problem by finding the sum of the two times $t_1 + t_2$	dM1
	1.2 (s) or 1.23 (s)	A1
c	For example: • rope being light • rope being inextensible • pulley being smooth • pulley being small • balls being particles	B1