Q1. Rearrange $\dfrac{1}{u} + \dfrac{1}{v} = \dfrac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

....

(Total 2 marks)

Q2.

The time it takes for the pendulum of a clock to swing from one end of its arc to the other and back again is given by the formula

$$T = 2\pi \sqrt{\dfrac{l}{g}}$$

(a) Find the value of l, when

$T = 2$, $\pi = 3.14$ and $g = 9.81$

....

(2)

    (b)   Make *l* the subject of the formula.

....

(3)

(Total 5 marks)

Q3.   Make b the subject of the formula $a = \dfrac{2 - 7b}{b - 5}$

....

(Total 4 marks)

Q4. $\dfrac{1}{u} + \dfrac{1}{v} = \dfrac{1}{f}$

$u = 2^{\frac{1}{2}}$, $v = 3^{\frac{1}{3}}$

(a)   Find the value of f.

....

(3)

(b)   Rearrange $\dfrac{1}{u} + \dfrac{1}{v} = \dfrac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

....

(2)
(Total 5 marks)

M1.

Working	Answer	Mark	Additional Guidance
$\frac{1}{u} = \frac{1}{f} - \frac{1}{v}$ $\frac{1}{u} = \frac{v-f}{fv}$	$u = \frac{fv}{v-f}$	2	**M1** $\frac{1}{u} = \frac{v-f}{fv}$ oe or $vf + uf = uv$ oe or $\frac{1}{u} = \frac{f-v}{fv}$ or $u = \frac{1}{\frac{v-f}{fv}}$ or $u = \frac{1}{\frac{1}{f} - \frac{1}{v}}$ **A1** $u = \frac{fv}{v-f}$ or $u = \frac{-fv}{f-v}$
			Total for Question: 2 marks

M2.

	Working	Answer	Mark	Additional Guidance

| (a) | | | 0.995 | 2 | **M1** for dividing 2 by 2 × 3.14 and squaring |
| | | | | | **A1** for 0.994(96937) cao |

(b)	$T^2 = 4\pi^2 \dfrac{l}{g}$ $\dfrac{T^2}{4\pi^2} = \dfrac{l}{g}$	$l = \dfrac{T^2 g}{4\pi^2}$	3	**M1** for squaring both sides **M1** for dividing by 4π² or multiplying by *g*

Total for Question: 5 marks

M3.

Working	Answer	Mark	Additional Guidance
$a(b-5) = 2-7b$ $ab - 5a = 2 - 7b$ $ab + 7b = 2 + 5a$ $b(a+7) = 2+5a$	$b = \dfrac{2+5a}{a+7}$	4	**M1** for $a(b-5)$ or $ab - 5a$ or $ab - 5$ **M1** for isolating ab and $7b$ on one side to get $ab + 7b$ oe **M1** for correctly factorising b from '$ab + 7b$' (term in ab must be present) **A1** for $b = \dfrac{2+5a}{a+7}$ or $b = \dfrac{-2-5a}{-a-7}$

Total for Question: 4 marks

M4.

	Working	Answer	Mark	Additional Guidance
(a)	$\dfrac{1}{2\frac{1}{2}} + \dfrac{1}{3\frac{1}{3}} = \dfrac{1}{f}$ $\dfrac{2}{5} + \dfrac{3}{10} = \dfrac{1}{f}$ $\dfrac{7}{10} = \dfrac{1}{f}$	$\dfrac{10}{7}$	3	**M1** $\dfrac{1}{2\frac{1}{2}} + \dfrac{1}{3\frac{1}{3}} = \dfrac{1}{f}$ **M1** correct addition of the fractions to get $\dfrac{7}{10}$ oe **A1** for $\dfrac{10}{f}$ oe

(b)	$\dfrac{1}{u} = \dfrac{1}{f} - \dfrac{1}{v}$ $\dfrac{1}{u} = \dfrac{v-f}{fv}$	$u = \dfrac{fv}{v-f}$	2	**M1** $\dfrac{1}{u} = \dfrac{v-f}{fv}$ oe or $vf + uf = uv$ oe or $\dfrac{1}{u} = \dfrac{f-v}{fv}$ or $u = \dfrac{1}{\frac{v-f}{fv}}$ or $u = \dfrac{1}{\frac{1}{f} - \frac{1}{v}}$ **A1** $u = \dfrac{fv}{v-f}$ or $u = \dfrac{-fv}{f-v}$

Total for Question: 5 marks

E1.   This proved to be very tough except for the very best candidates.

Many got to $\dfrac{1}{u} = \dfrac{1}{f} - \dfrac{1}{v}$ but then were not able to progress in any meaningful way.

E3.   Only the best candidates were able to score full marks in this question, but many were able to score 1 mark for clearing the fraction. A common error here was $ab - 5$. Of those who were able to clear the fraction successfully, few realized that they needed to rearrange the equation to isolate the terms in b (many of those who did made errors in signs, e.g. $ab - 7b$). Having got to '$ab + 7b$' few candidates went on to factorise the b, many simply divided 'selectively' by a, e.g. $ab + 7b$ to get $b + 7b = \dfrac{2 + 5a}{a}$. A small number of candidates simply interchanged the letters and sometimes the signs to get $b = \dfrac{2 - 7a}{a - 5}$ or $b = \dfrac{2 + 7a}{a + 5}$ or (each scoring 0 marks).

E4.   Many candidates gained one mark in part (a) for a correct substitution but very few were able to progress any further. Most went on to add 2½ to 3⅓ and then gave either $5\frac{5}{6}$ or the reciprocal of it as the final answer. Some candidates attempted to use a common denominator of 2½ × 3⅓ but frequently made errors in their calculations. A small number of candidates converted the fractions to $\frac{4}{10}$ and $\frac{3}{10}$ respectively and obtained $\frac{7}{10}$ easily but some then forgot to invert.

Many candidates showed considerable working which was often poorly set out and difficult to follow. Only the very best candidates were successful in part (b). Most were unable to manipulate the terms correctly. Some simply inverted everything and $u + v = f$ became $u = f - v$. Others attempted to clear the fractions but forgot to multiply all the terms by f (or v or u). Those who managed to get to $1/u = 1/f - 1/v$ sometimes went on to gain one mark for $u = 1/(1/f - 1/v)$.