A level Mathematics

Year 12 into Year 13 SIL

Instructions.

Hand in your completed SIL to your teacher in the first lesson of Y13

Part 1 ç Compulsory

Complete three retrieval papers (Paper 1, 2 and 3)

Use the worked solutions provided by your teacher to mark your own work and keep a record of your scores (together with any questions/problems that you need to ask about) in the tables below.

Paper 1:

Qu	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Score																	
Max																	

Year 12 into 13 SIL Practice Paper 1 (101 marks)

1.

2. Find in exact form the unit vector in the same direction as $\mathbf{a} = 4\mathbf{i} - 7\mathbf{j}$.

(Total 3 marks)

3.

4. $$f(x) = x^3 - 4x^2 - 35x + 20.$$

Find the set of values of x for which $f(x)$ is increasing.

5.

6.

7. Show that $\int_2^8 \frac{3}{x}\,dx = \ln 64$.

8. Find

$\int 8e^{-2x}\,dx$, **(i)**

(ii) $\int (4x+5)^{\frac{1}{2}}\,dx$.

[5]

9. $\frac{dy}{}$

[2] **(ii)** $y = \ln($

$3 + 2x^2)$.

[2] (iii) $y = \dfrac{x}{2x+1}$.

10. $\dfrac{x^2+4}{x+2}$

11.

Solve, for $0 \leqslant \theta < 360°$, the equation

$$2\tan^2\theta + \sec\theta = 1,$$

your answers to 1 decimal place, giving your

(6)

12.

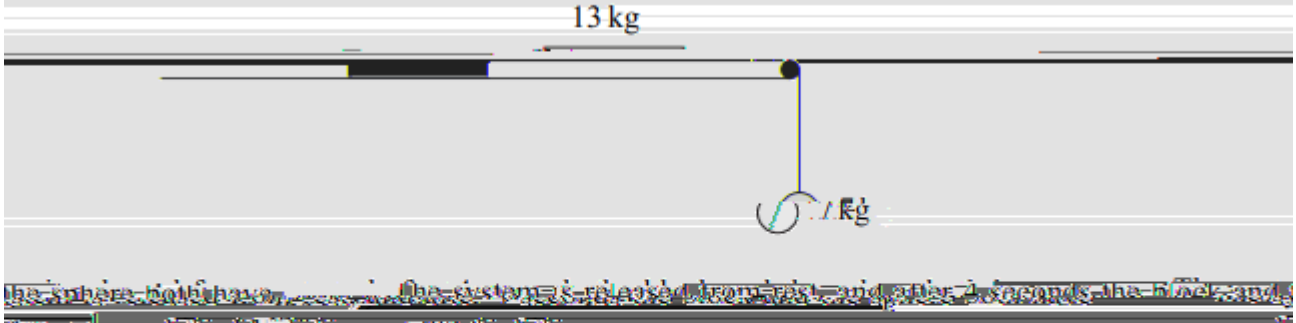
(a) Express $\dfrac{5x+3}{(2x-3)(x-2)}$ in partial fractions.

(3)

$$\int_{6}^{} \frac{5x+3}{}$$

13.

14. The diagram shows a block, of mass 13 kg, on a rough horizontal surface. It is attached by a string that passes over a smooth peg to a sphere of mass 7 kg, as shown in the diagram.



the sphere hits the ... the system is released from rest and after 2 seconds the string breaks and the ... the block has not reached the peg.

... speed.

State two assumptions that you should make about the string in order to model the ... (2 marks)

... modelling the sphere and the block. ... (2 marks)

(b) Show that the acceleration of the spheres is ... (3 marks)

(c) Find the tension in the string. (3 marks)

... (3 marks)

15.	
16.	

Year 12 into 13 SIL Practice Paper 2 (99 marks)

1.

$\log_{11}(2x-1) = 1 - \log_{11}(x+4)$.

Find the value of x showing detailed reasoning.

(Total 6 marks)

2.

A particle P of mass 6 kg is moving under the action of two forces F_1 and F_2 which are the only forces acting on P.

$F_1 = (8\mathbf{i} - 10\mathbf{j})$ N and $F_2 = (p\mathbf{i} + q\mathbf{j})$ N, p and q are constants.

The acceleration of P is $\mathbf{a} = (3\mathbf{i} - 2\mathbf{j})$ m s^{-2}

(a) Find, to 1 decimal place, the angle between the acceleration and $\mathbf{i}$.

(3)

(b) Find the values of p and q.

(3)

(c) Find the magnitude of the resultant force R of the two forces F_1 and F_2. Simplify your answer fully.

(3)

3.

(a) Sketch the graph of $y = 8^x$ stating the coordinates of any points where the graph crosses

(1)

(ii) Describe the transformation which transforms the graph $y = 8^{x-1}$ to the graph $y = 8^{x-1} + 5$.

(1)

4.	
5.	
6.	

9.	Solve, for $0 \leqslant \theta < 180°$, the equation $2 \cot \theta - 9 \operatorname{cosec} \theta = 3,$ giving your answers to 1 decimal place. **(6)**
10.	$f(x) = (3 - 2x)$ [illegible], $\quad \lvert x \rvert < \frac{3}{2}$. Find the binomial expansion of f(x), in ascending powers of x, as far as the term in x^3. Give each coefficient as a simplified fraction. **(5)**
11.	$f(x) = \dfrac{4-2x}{(2x+1)(x+1)(x+3)} = \dfrac{A}{(2x+1)} + \dfrac{B}{(x+1)} + \dfrac{C}{(x+3)}$ (a) Find the values of the constants A, B and C. **(4)** (b) (i) Hence find $\int f(x)\, dx$. **(3)** (ii) [illegible] $\int_0^2$ [illegible] **(3)**
12.	A block of mass 5 kg slides down a rough plane inclined at 40° to the horizontal. [illegible] [illegible] (d) In reality, air resistance does act on the block. State how this would [illegible]

13.

A car of mass 1600 kg tows a trailer of mass 400 kg on a straight horizontal road. The

(a) Find the acceleration of the car.

[3 marks]

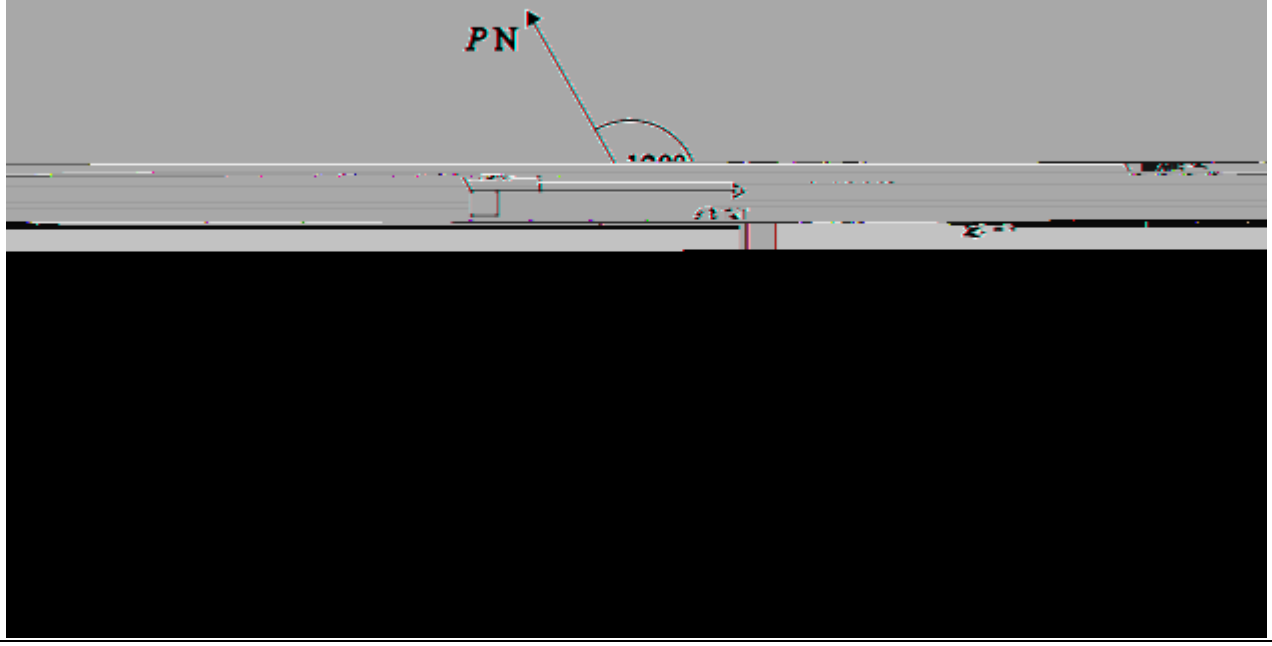
(i) Find the tension in the tow bar.

[3 marks]

(ii) Find P.

14.

Three forces of magnitude 40 N, P N and Q N all act in a horizontal plane. These



Year 12 into 13 SIL Practice Paper 3 (105 marks)

1.

2.

of q. (a) the vector $\overrightarrow{AB}$ in terms

(2)

3.

A fish tank in the shape of a cuboid is to be made from 1600 cm^2 of glass

me, V cm^3, of the fish tank is given by $V = 400x - \frac{x^3}{4}$. (a) Show that the volu

(5)

4.

that $k = 3$, (a) show t

(2)

a equation of the line through A and B, (b) find a

(3)

(Total 9 marks)

5.

6.

7.

8.

9. Solve, for $0 \leqslant \theta < 2\pi$, the equation

$$3\sec^2\theta + 3\sec\theta = 2$$

You must show all your working. Give your answers in terms of π.

(6)

10.

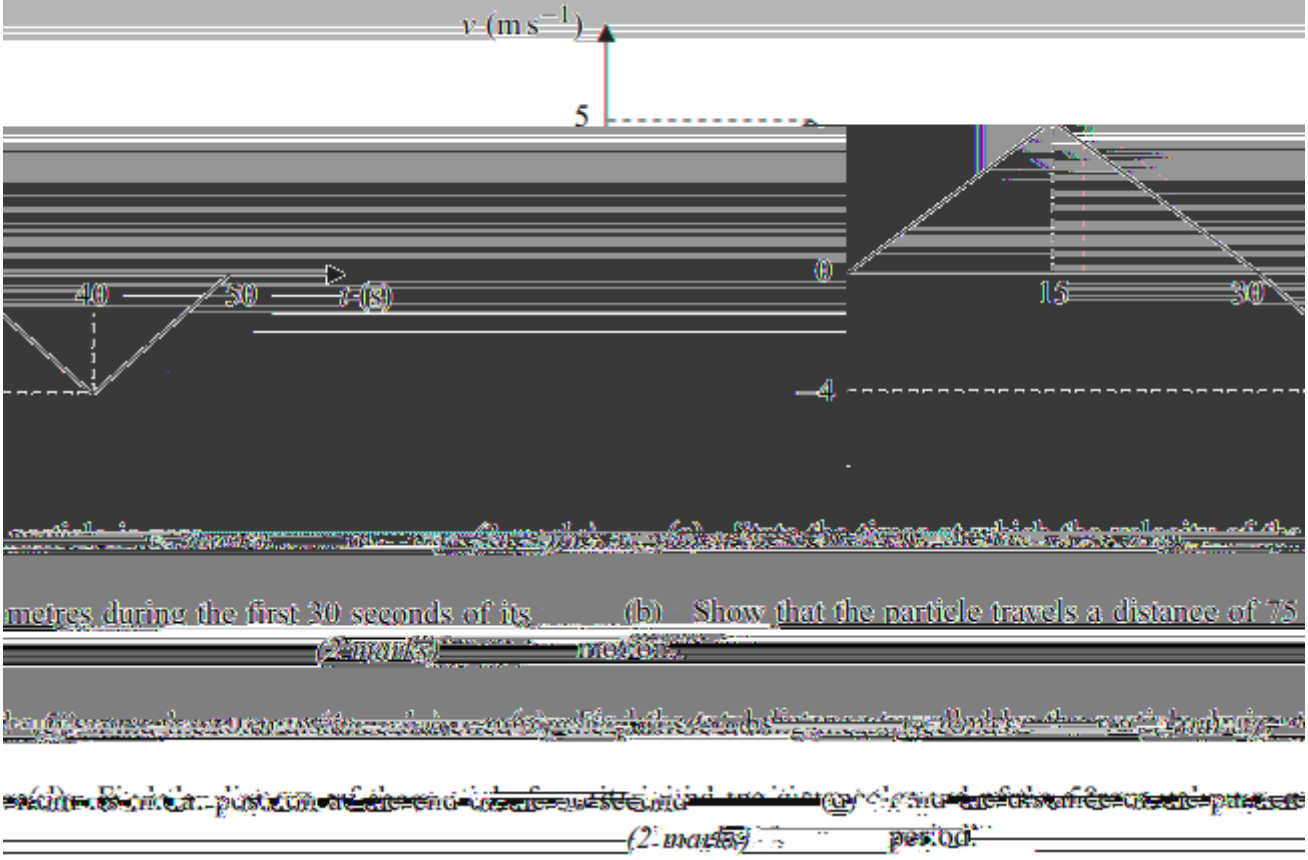
$$\frac{1}{x+8}$$

ascending powers of x

(4)

11.

12.



metres during the first 30 seconds of its motion.

(2 marks)

(b) Show that the particle travels a distance of 75

period.

13.	
14.	

Year 12 into 13 SIL Extension Paper 1 (62 marks)

1

$$y = \frac{5x^2 + 10x}{(x+1)^2} \qquad x \neq -1$$

(a) Show that $\frac{dy}{dx} = \frac{A}{(x+1)^n}$ where A and n are constants to be found. **(4)**

(b) Hence deduce the range of values for x for which $\frac{dy}{dx} < 0$ **(1)**

2

An arithmetic sequence has first term a and common difference d

(a) Show that $4a + 70d = 4a^2 + 20ad + 25d^2$

4 marks

3

Three points A, B and C have coordinates A(8, 17), B(15, 16) and C(*x*, 2)

(a) Show that angle ABC is a right angle.

3 marks

(b) A, B and C lie on a circle.

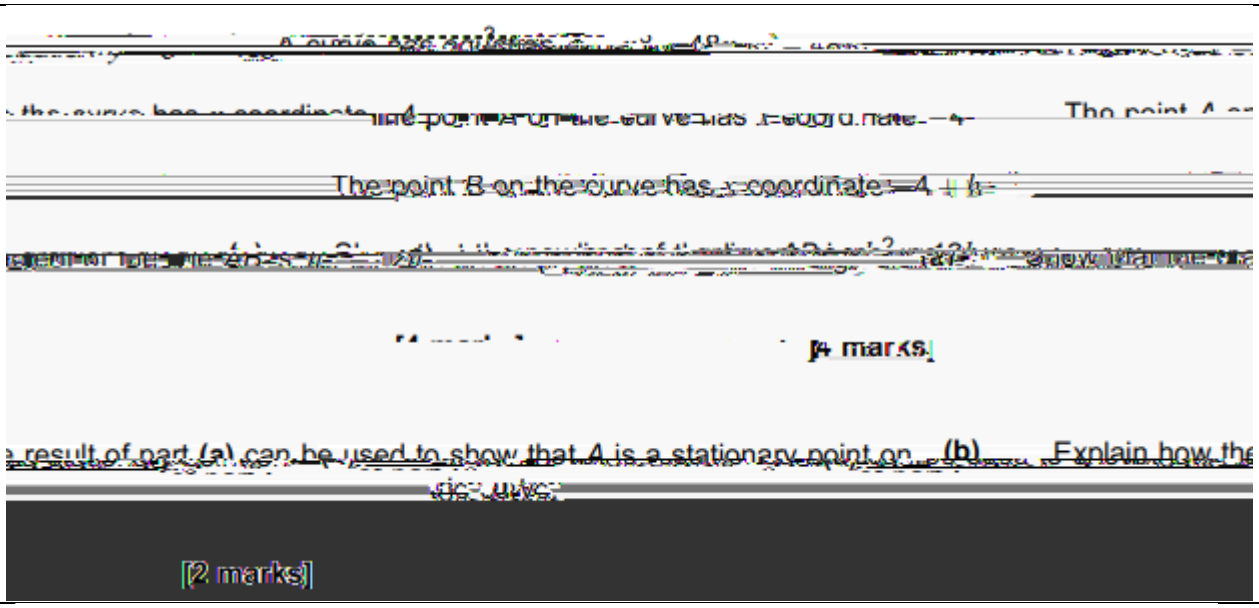
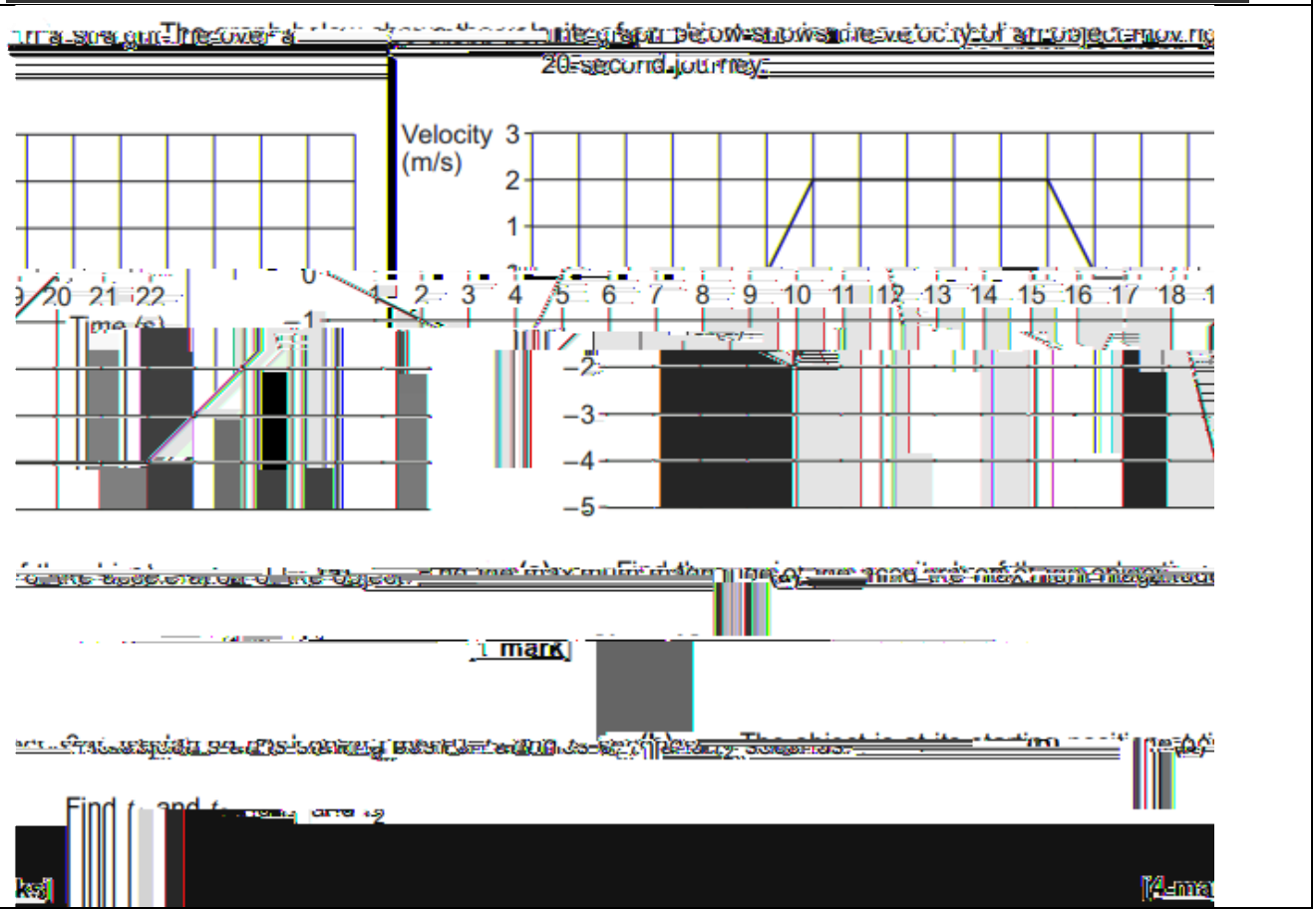
AC is a diameter of the circle.

(b) (i) Explain why

[1 mark]

(b) (ii) Determine whether the point D(−8, −2) lies inside the circle, on the circle or outside

[4 marks]

6	
7	

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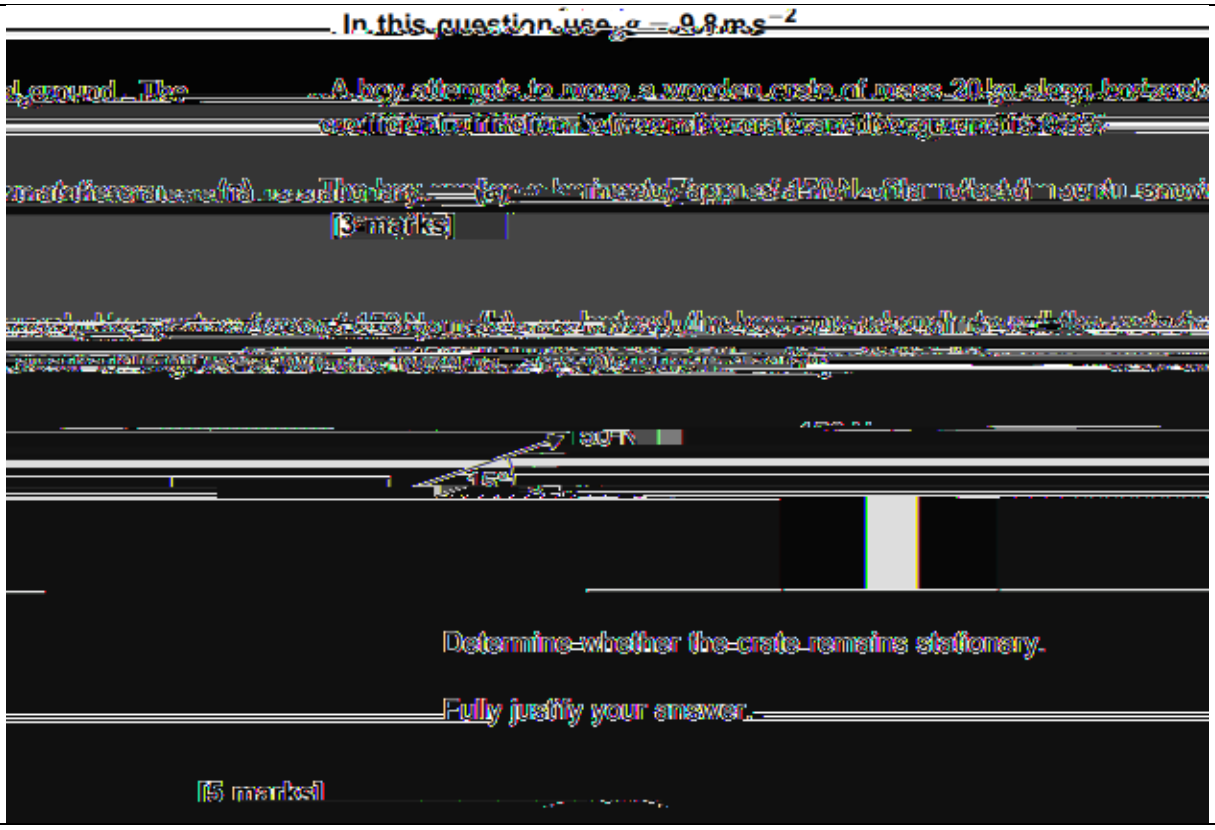
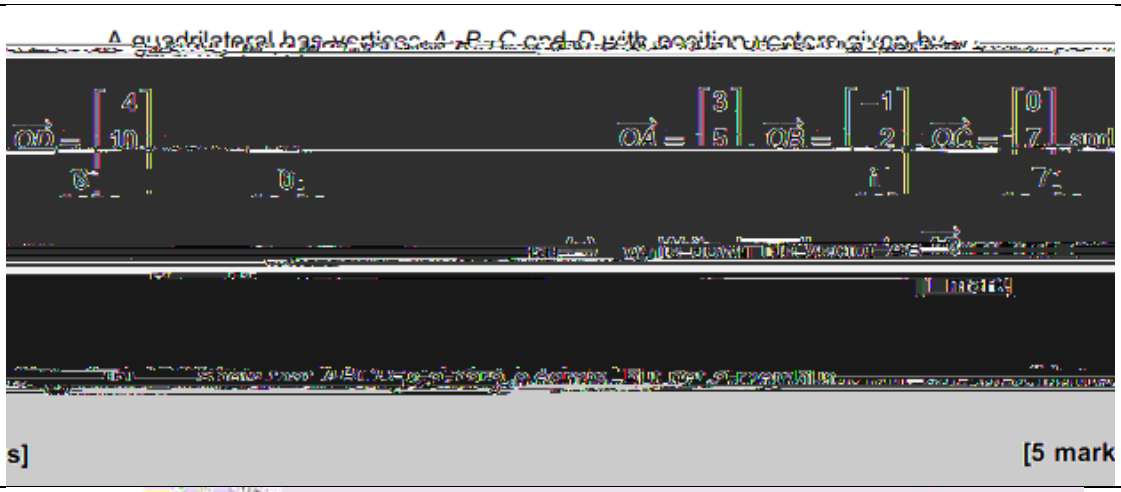
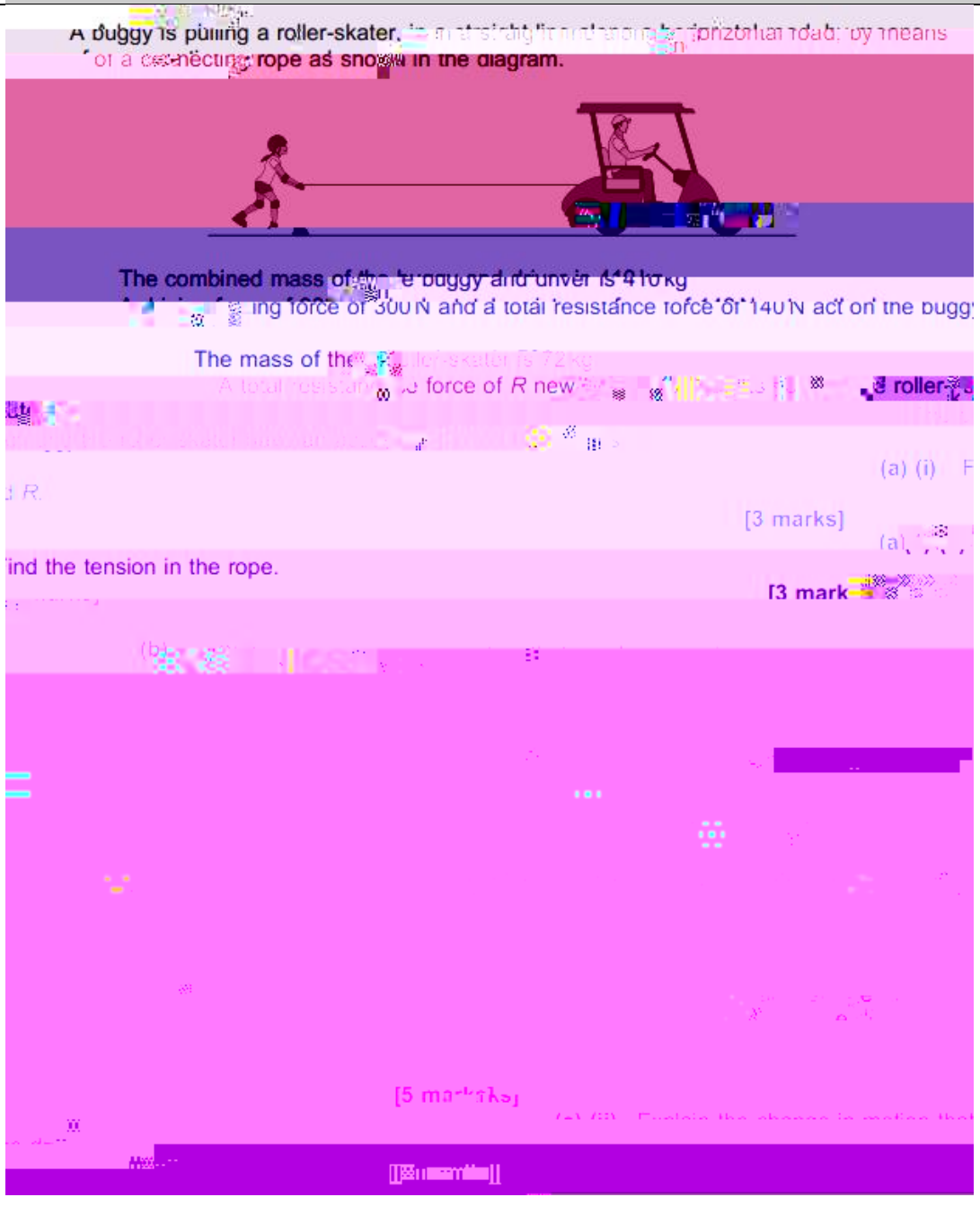

In this question use $g = 9.8\ m\,s^{-2}$
A boy attempts to move a wooden crate of mass 20 kg along a horizontal floor.
[3 marks]
Determine whether the crate remains stationary.
Fully justify your answer.
[5 marks]



s] [5 mark

6


A buggy is pulling a roller-skater,
of a
rope as shown in the diagram.
The combined mass of the buggy and driver is 410 kg
ing force of 300 N and a total resistance force of 140 N act on the buggy
The mass of the
force of R new
roller-
(a) (i)
[3 marks]
ind the tension in the rope.
[3 mark
[5 marks]