Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Mathematics

StemUp Model Solution

Unit M7 Paper 1
(Non-Calculator)
Higher Tier



[GMC71]

GMC71

THURSDAY 6 JUNE, 9.15am–10.30am

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

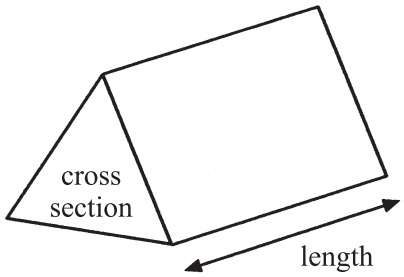
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all seventeen** questions.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.

INFORMATION FOR CANDIDATES

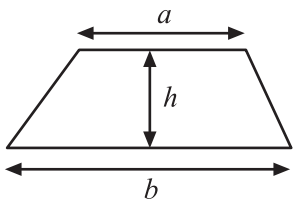
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

Formula Sheet

Volume of prism = area of cross section × length

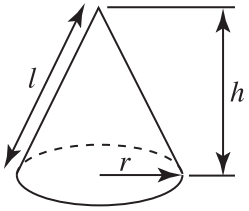


Area of trapezium = $\frac{1}{2}(a+b)h$



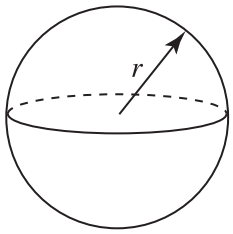
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

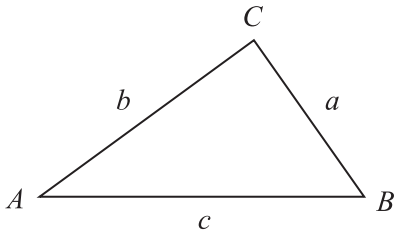


Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



In any triangle *ABC*



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

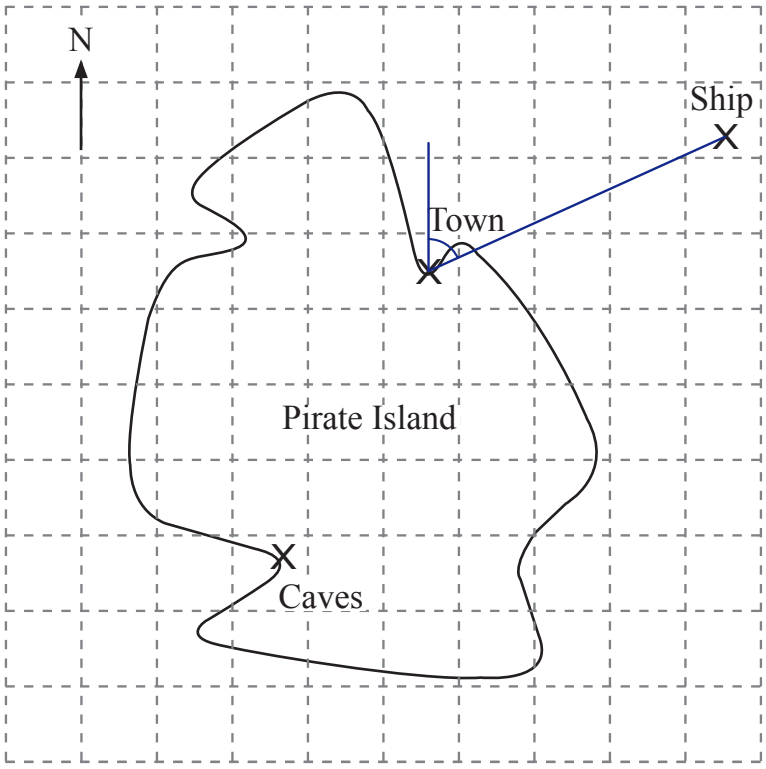
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$

1



SCALE
1 cm = 2 km

Measure and write down the bearing of the ship from the town.

Answer 066 ° [2]

2 **(a)** Fill in the next two terms of this sequence.

14, 13, 11, 8, 4, −1 [2]

−1 −2 −3 −4 −5

(b) Write down the name of the numbers in the sequence below.

1, 8, 27, 64, ...

Answer Cube numbers [1]

[Turn over

3 Tom bought a full bag of coal.

After one week the bag was $\frac{2}{3}$ full.

During the next week he used $\frac{1}{4}$ of the remaining coal.

What fraction was left in the bag?

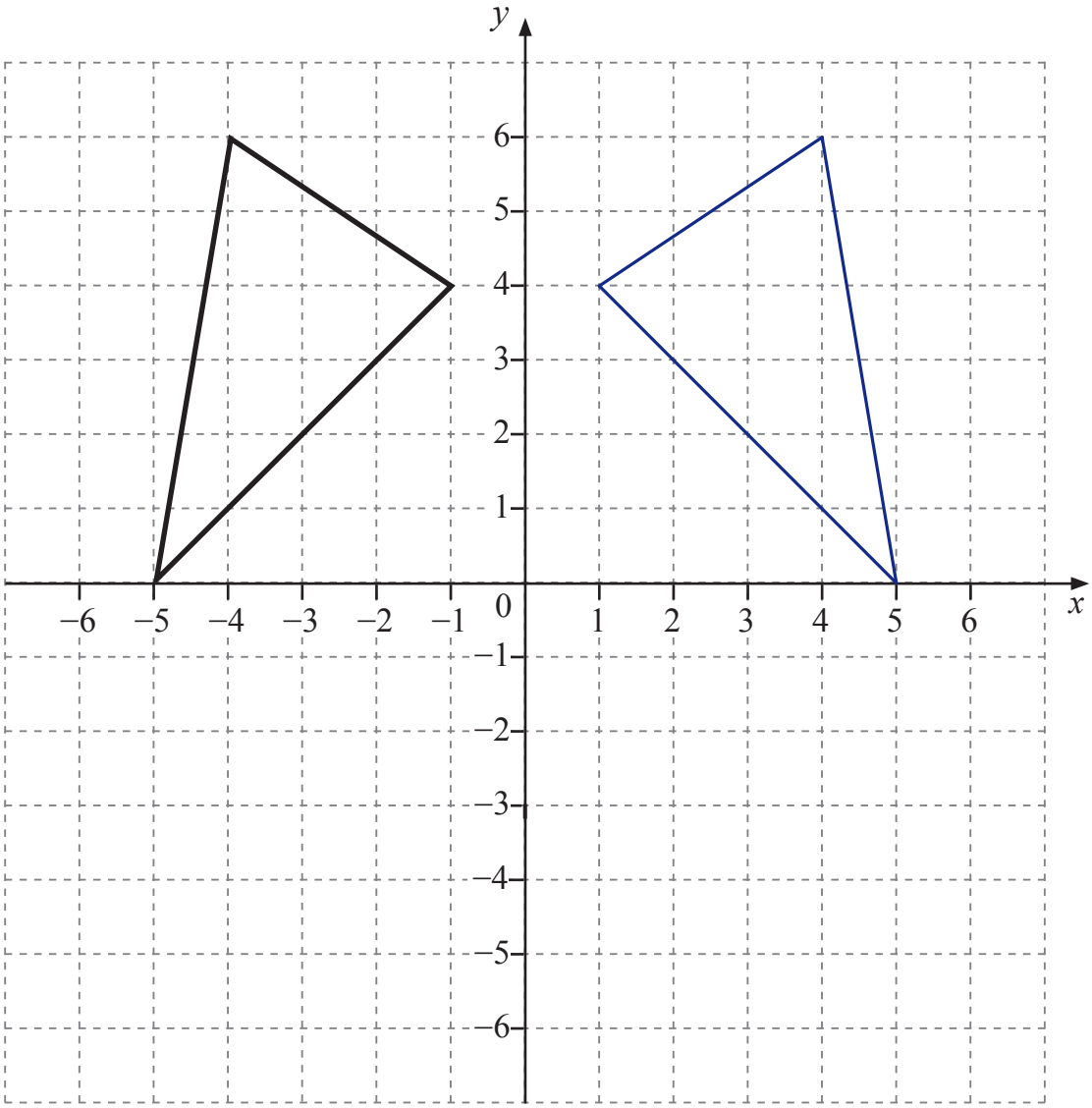
Left after week 1 = $\frac{2}{3}$

Used $\frac{1}{4}$, so $\frac{3}{4}$ of it is left

$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12} = \frac{1}{2}$

Answer $\frac{1}{2}$ [2]

4 Reflect the triangle shown in the ***y*-axis**.



[1]

[Turn over

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5 **(a)** Calculate the size of angle x.

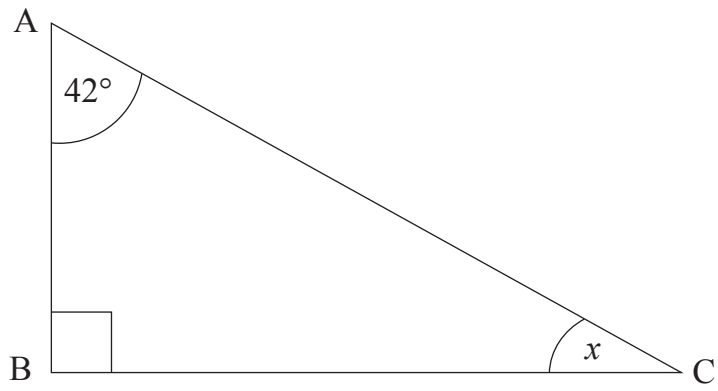
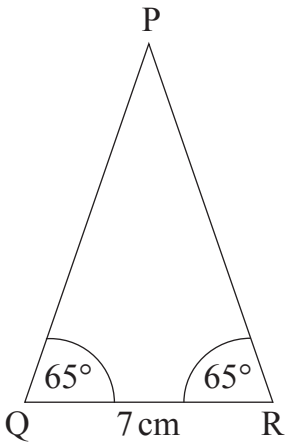


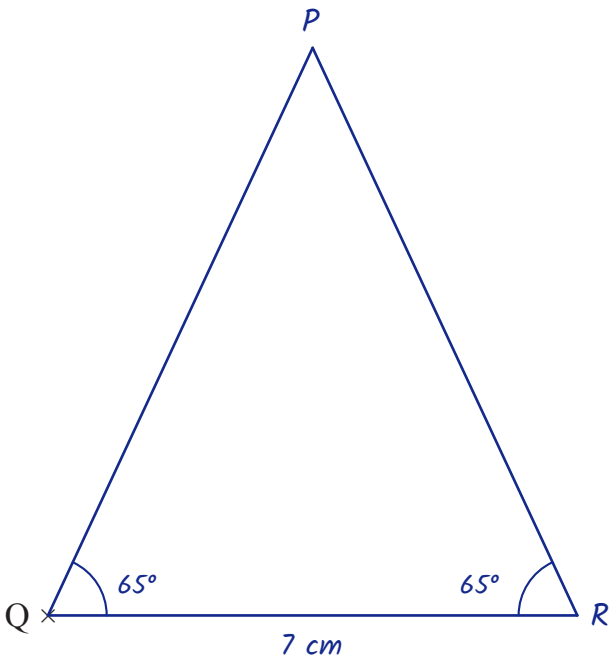
diagram not drawn accurately

180 − 90 − 42 = 48

Answer 48 ° [2]

(b) Make an accurate drawing of the triangle sketched below.



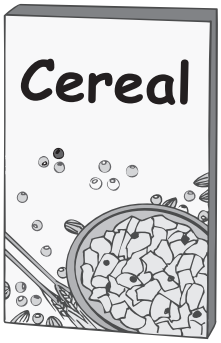


[3]

6 A machine fills boxes of breakfast cereal.

Each box should weigh 375 g.

Jason takes 100 boxes and tests the accuracy of the machine by weighing them.



Weight (g)	Less than 375	Exactly 375	More than 375
Number of boxes	9	58	33

(a) What is the probability that one of the boxes taken by Jason weighs less than 375 g?

Answer $\frac{9}{100}$ [1]

(b) The machine fills 5000 boxes.

Calculate the number of boxes you would expect to weigh less than 375 g.

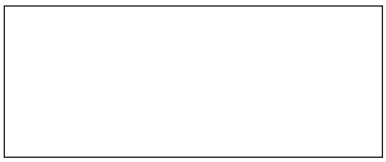
$\frac{9}{100} \times 5000 = 9 \times 50 = 450$

Answer 450 [2]

[Turn over

7





The two rectangles above have the same area.

Using estimation, work out an estimate for the length, L, of the second rectangle.

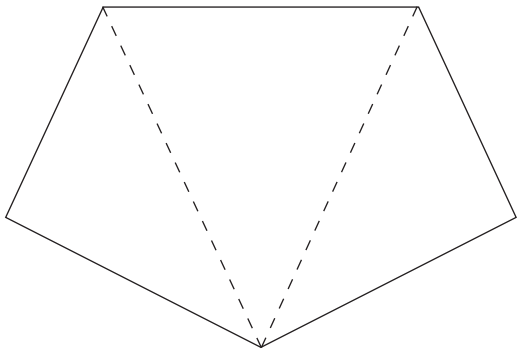
197 ≈ 200, 33 ≈ 30, 54 ≈ 50

Area ≈ 200 × 30 = 6000

L ≈ 6000 ÷ 50 = 120

Answer L= 120 cm [2]

8



(a) (i) What is the total of all the angles in the three triangles shown?

Answer 540 ° [1]

(ii) What is the sum of the interior angles of a five-sided polygon?

Answer 540 ° [1]

(b) What is the sum of the interior angles of a seven-sided polygon?

540 + 180 + 180 = 900

Answer 900 ° [2]

9 Rewrite $4 + x = 9 - y$ to make y the subject.

Give your answer in its simplest form.

4 + y = 9 − x

y = 9 − x − 4

y = 5 − x

Answer $y =$ 5 − x [2]

[Turn over

10 **(a)** Write the binary number 10101 as a decimal number.

16 8 4 2 1
1 0 1 0 1
16 + 4 + 1 = 21

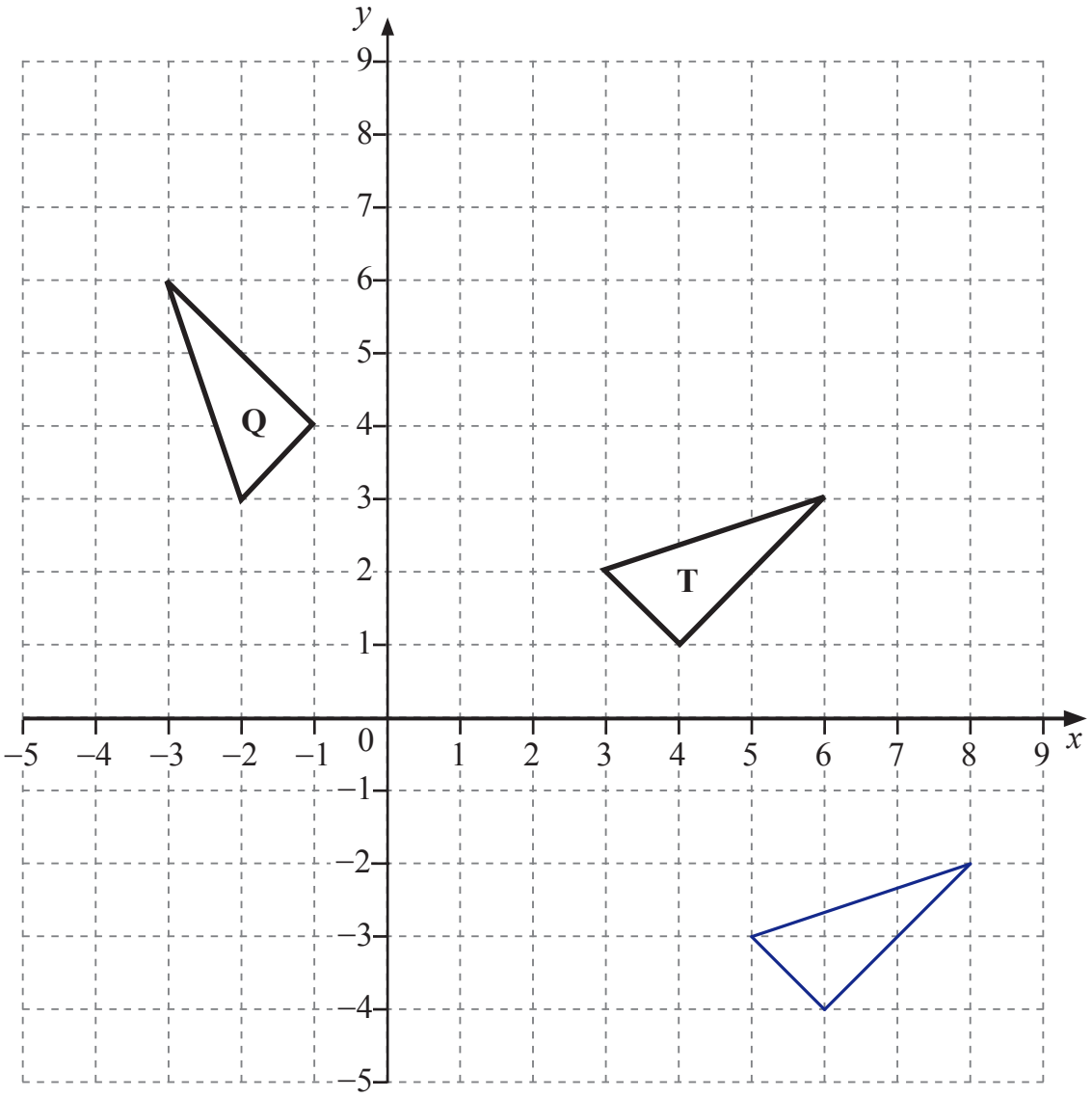
Answer 21 [1]

(b) Write the decimal number 26 as a binary number.

26 = 16 + 8 + 2
16 8 4 2 1
1 1 0 1 0

Answer 11010 [1]

11



(a) Describe fully the **single** transformation which maps triangle **T** onto triangle **Q**.

Answer *Rotation of 90° anticlockwise about (0, 0)* [3]

(b) On the grid, draw the image of triangle **T** after a translation $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$. [2]

[Turn over

12 A six-sided dice is rolled 800 times.

The table below shows the relative frequency of scoring a six after different numbers of rolls.

Number of rolls	Relative frequency of a six
100	0.3
200	0.26
300	0.27
500	0.23
800	0.25

(a) How many times was a six scored after 300 rolls?

Show how you obtained your answer.

$300 \times 0.27 = 81$

Answer 81 [2]

(b) Which relative frequency from the table gives the best estimate of the probability of scoring a six when this dice is rolled?

Explain your answer.

Answer 0.25

Reason it has the most rolls (800); the bigger the sample size, the more reliable the estimate [2]

(c) How many sixes would you expect to get if a **fair** six-sided dice was rolled 300 times?

$300 \times \frac{1}{6} = 300 \div 6 = 50$

Answer 50 [2]

13 Solve

$$12 - n > 4n - 3$$

$12 - n > 4n - 3$

$12 + 3 > 4n + n$

$15 > 5n$

$3 > n$

Answer $n < 3$ [2]

14 John has six shirts, eight ties and five cravats.

John is going out to dinner and he must choose a shirt **and** either a tie or a cravat to wear.

How many different combinations has John got to choose from?

Shirt and tie: $6 \times 8 = 48$

Shirt and cravat: $6 \times 5 = 30$

Total $= 48 + 30 = 78$

Answer 78 [3]

[Turn over

15 Find the value of

(a) $3^0 + 4^0$

$3^0 + 4^0 = 1 + 1 = 2$

Answer 2 [1]

(b) 2^{-3}

$2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

Answer $\frac{1}{8}$ [1]

16 A one gram bag of seed contains half a million seeds.

If each seed weighs the same, calculate the weight, in grams, of one seed.

Give your answer in standard form.

$1 \div 500\,000 = \frac{1}{500\,000} = \frac{1}{5 \times 10^5}$

$= 0.2 \times 10^{-5}$

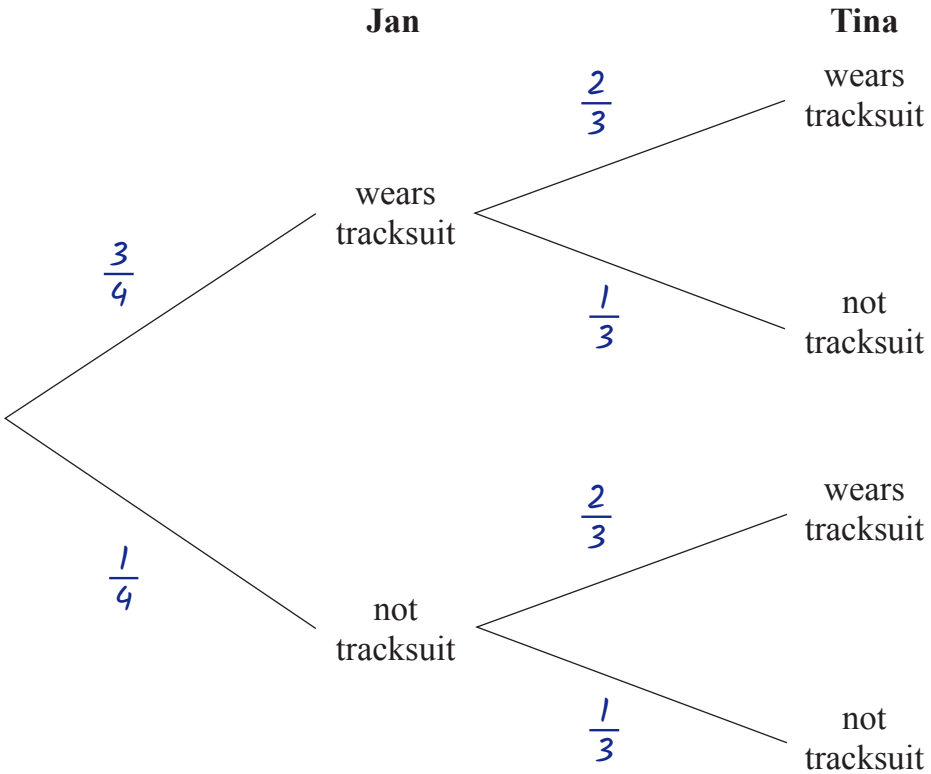
$= 2 \times 10^{-6}$

Answer 2×10^{-6} g [3]

17 When Jan goes to the gym, the probability that she wears a tracksuit is $\frac{3}{4}$

When Tina goes to the gym, the probability that she wears a tracksuit is $\frac{2}{3}$

Complete the tree diagram.



[3]

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
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Total Marks	

Examiner Number

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