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National
Qualifications
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Mark

SQ29/N5/01

**Mathematics
Paper 1
(Non-Calculator)**

Date — Not applicable

Duration — 1 hour



* S Q 2 9 N 5 0 1 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

Total marks — 40

You may NOT use a calculator.

Attempt ALL questions.

Use blue or black ink. Pencil may be used for graphs and diagrams only.

Write your working and answers in the spaces provided. Additional space for answers is provided at the end of this booklet. If you use this space, write clearly the number of the question you are attempting.

Square-ruled paper is provided at the back of this booklet.

Full credit will be given only to solutions which contain appropriate working.

State the units for your answer where appropriate.

Before leaving the examination room you must give this booklet to the Invigilator.

If you do not, you may lose all the marks for this paper.



* S Q 2 9 N 5 0 1 0 1 *

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

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

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

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

Volume of a pyramid: $V = \frac{1}{3} Ah$

Standard deviation: $s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.



* S Q 2 9 N 5 0 1 0 2 *

1. Evaluate

$$2\frac{3}{8} \div \frac{5}{16}$$

2

2. Multiply out the brackets and collect like terms

$$(2x+3)(x^2-4x+1)$$

3

3. Two forces acting on a rocket are represented by vectors \mathbf{u} and \mathbf{v} .

$$\mathbf{u} = \begin{pmatrix} 2 \\ -5 \\ -3 \end{pmatrix} \text{ and } \mathbf{v} = \begin{pmatrix} 7 \\ 4 \\ -1 \end{pmatrix}$$

Calculate $|\mathbf{u} + \mathbf{v}|$, the magnitude of the resultant force.

Express your answer as a surd in its simplest form.

3





MARKS	DO NOT WRITE IN THIS MARGIN
3	
2	

4. Solve the equation

$$2x^2 + 7x - 15 = 0.$$

3

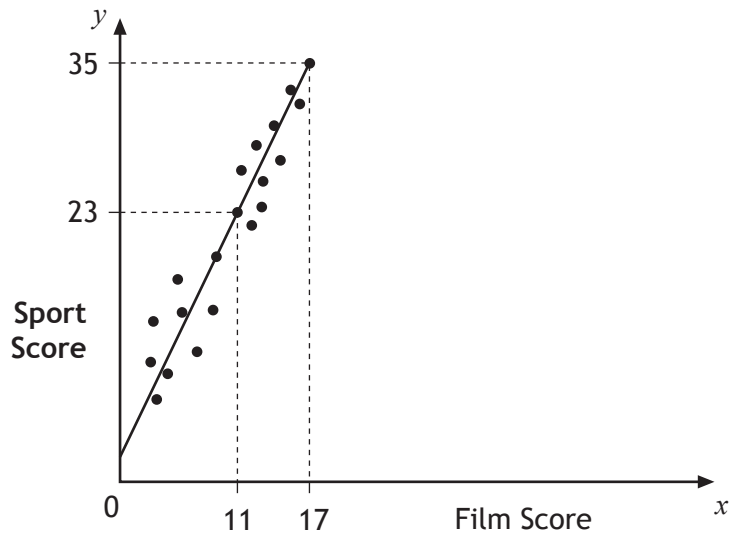
5. Express $\frac{4}{\sqrt{6}}$ with a rational denominator in its simplest form.

2



* S Q 2 9 N 5 0 1 0 4 *

6. Teams in a quiz answer questions on film and sport.
This scattergraph shows the scores of some of the teams.



A line of best fit is drawn as shown.

- (a) Find the equation of this straight line. 3

- (b) Use this equation to estimate the sports score for a team with a film score of 8. 1

Total marks 4



MARKS DO NOT WRITE IN THIS MARGIN

7. (a) Multiply out the brackets and simplify:

$$x^{\frac{1}{2}} \left(x^{-\frac{3}{2}} + x^{-\frac{1}{2}} \right).$$

2

(b) Find the exact value of this expression when $x = 6$.

1

Total marks 3

8. Change the subject of the formula $p = \frac{mv^2}{2}$ to v .

3



MARKS DO NOT
WRITE IN
THIS
MARGIN

9. A parabola has equation $y = x^2 - 8x + 19$.

(a) Write the equation in the form $y = (x - p)^2 + q$.

2

(b) Sketch the graph of $y = x^2 - 8x + 19$, showing the coordinates of the turning point and the point of intersection with the y -axis.

3

Total marks 5



* S Q 2 9 N 5 0 1 0 7 *

10. Brian and Bob visit a ski resort. Brian buys 3 full passes and 4 restricted passes. The total cost of his passes is £185.

(a) Write down an equation to illustrate this information.

1

(b) Bob buys 2 full passes and 3 restricted passes.

The total cost of his passes is £130.

Write down an equation to illustrate this information.

1

(c) Find the cost of a restricted pass and the cost of a full pass.

3

Total marks 5

11. Express

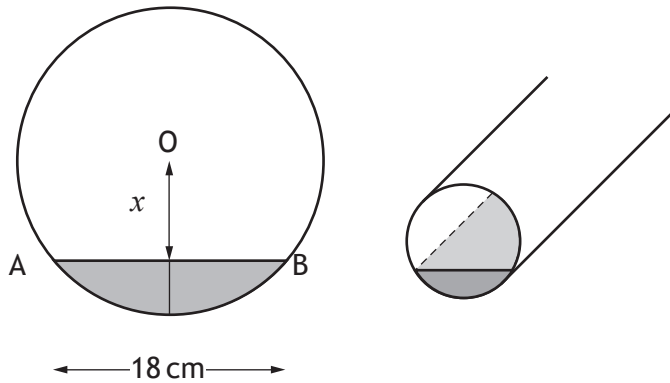
$$\frac{4}{x+2} - \frac{3}{x-4}, \quad x \neq -2, x \neq 4$$

as a single fraction in its simplest form.

3



12. A cylindrical pipe has water in it as shown.



The depth of the water at the deepest point is 5 centimetres.

The width of the water surface, AB, is 18 centimetres.

The radius of the pipe is r centimetres.

The distance from the centre, O, of the pipe to the water surface is x centimetres.

(a) Write down an expression for x in terms of r . 1

(b) Calculate r , the radius of the pipe. 3

Total Marks 4

[END OF SPECIMEN QUESTION PAPER]



ADDITIONAL SPACE FOR ANSWERS

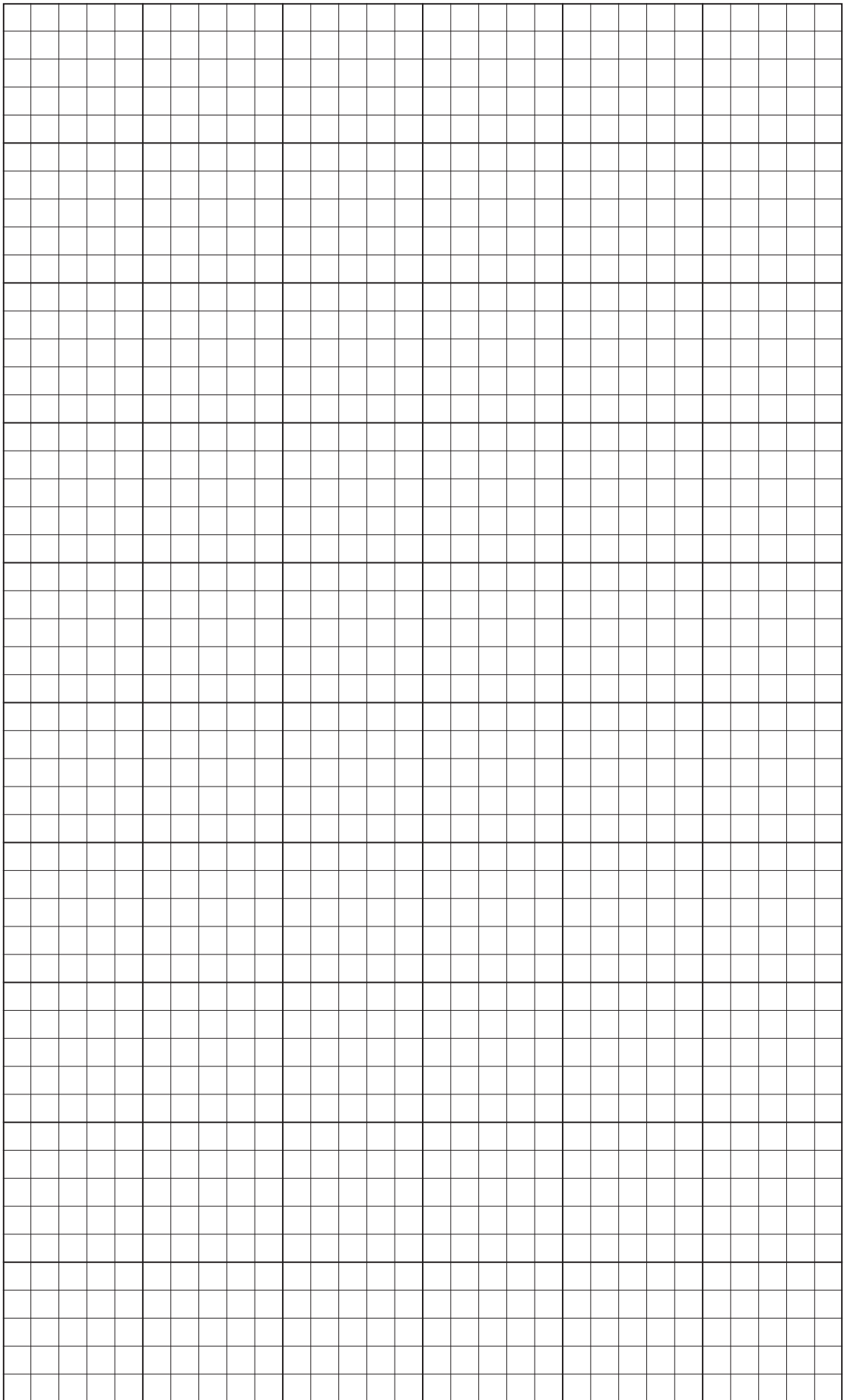


* S Q 2 9 N 5 0 1 1 0 *

ADDITIONAL SPACE FOR ANSWERS



* S Q 2 9 N 5 0 1 1 1 *



* S Q 2 9 N 5 0 1 1 2 *



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Marking Instructions

These Marking Instructions have been provided to show how SQA would mark this Specimen Question Paper.

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Part One: General Marking Principles for National 5 Mathematics

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question. The marking schemes are written to assist in determining the 'minimal acceptable answer' rather than listing every possible correct and incorrect answer.

- (a) Marks for each candidate response must always be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question.
- (b) Marking should always be positive, ie marks should be awarded for what is correct and not deducted for errors or omissions.
- (c) Credit must be assigned in accordance with the specific assessment guidelines.
- (d) Candidates may use any mathematically correct method to answer questions except in cases where a particular method is specified or excluded.
- (e) Working subsequent to an error must be followed through, with possible credit for the subsequent working, provided that the level of difficulty involved is approximately similar. Where, subsequent to an error, the working is easier, candidates lose the opportunity to gain credit.
- (f) Where transcription errors occur, candidates would normally lose the opportunity to gain a processing mark.
- (g) Scored out or erased working which has not been replaced should be marked where still legible. However, if the scored out or erased working has been replaced, only the work which has not been scored out should be judged.
- (h) Unless specifically mentioned in the specific assessment guidelines, do not penalise:
 - Working subsequent to a correct answer
 - Correct working in the wrong part of a question
 - Legitimate variations in solutions
 - Bad form
 - Repeated error within a question

Part Two: Specific Marking Instructions for each question

Question		Marking scheme Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
1		<p>Ans: $7\frac{3}{5}$</p> <ul style="list-style-type: none"> •¹ start simplification and know how to divide fractions •² consistent answer 	2	<ul style="list-style-type: none"> •¹ $\frac{19}{8} \times \frac{16}{5}$ •² $7\frac{3}{5}$ or $\frac{38}{5}$
2		<p>Ans: $2x^3 - 5x^2 - 10x + 3$</p> <ul style="list-style-type: none"> •¹ three terms correct •² remaining terms correct •³ collect like terms 	3	<ul style="list-style-type: none"> •¹ eg $2x^3 - 8x^2 + 2x$ •² eg $3x^2 - 12x + 3$ •³ $2x^3 - 5x^2 - 10x + 3$
3		<p>Ans: $7\sqrt{2}$</p> <ul style="list-style-type: none"> •¹ add vectors correctly •² find magnitude •³ express as surd in simplest form 	3	<ul style="list-style-type: none"> •¹ $\begin{pmatrix} 9 \\ -1 \\ -4 \end{pmatrix}$ •² $\sqrt{98}$ •³ $7\sqrt{2}$
4		<p>Ans: $x = -5, x = 1.5$</p> <ul style="list-style-type: none"> •¹ one correct factor •² correct factorisation •³ solve equation 	3	<ul style="list-style-type: none"> •¹ $x + 5$ or $2x - 3$ •² $(x + 5)(2x - 3)$ •³ $x = -5, x = 1.5$

5		<p>Ans: $\frac{2\sqrt{6}}{3}$</p> <ul style="list-style-type: none"> •¹ know how to rationalise denominator •² consistent answer 	2	<ul style="list-style-type: none"> •¹ $\frac{4}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$ •² $\frac{2\sqrt{6}}{3}$
6	a	<p>Ans: $y = 2x + 1$</p> <ul style="list-style-type: none"> •¹ find gradient •² substitute gradient and (11,23) or (17,35) into $y - b = m(x - a)$ or $y = mx + c$ •³ state equation of line in simplest form 	3	<ul style="list-style-type: none"> •¹ $m = 2$ •² eg $y - 23 = 2(x - 11)$ or $23 = 2 \times 11 + c$ •³ $y = 2x + 1$ or $2x - y + 1 = 0$ or equivalent
6	b	<p>Ans: $2 \times 8 + 1 = 17$</p> <ul style="list-style-type: none"> •¹ use equation to calculate sports score 	1	<ul style="list-style-type: none"> •¹ $2 \times 8 + 1 = 17$
7	a	<p>Ans: $x^{-1} + x^0$ or equivalent</p> <ul style="list-style-type: none"> •¹ multiply $x^{1/2} \times x^{-3/2}$ correctly •² multiply $x^{1/2} \times x^{-1/2}$ correctly 	2	<ul style="list-style-type: none"> •¹ x^{-1} •² x^0 or 1
7	b	<p>Ans: $1\frac{1}{6}$</p> <ul style="list-style-type: none"> •¹ find exact value of expression 	1	<ul style="list-style-type: none"> •¹ $1\frac{1}{6}$ or $\frac{7}{6}$
8		<p>Ans: $v = \sqrt{\frac{2p}{m}}$</p> <ul style="list-style-type: none"> •¹ multiply by 2 •² divide by m •³ square root 	3	<ul style="list-style-type: none"> •¹ $mv^2 = 2p$ •² $v^2 = \frac{2p}{m}$ •³ $v = \sqrt{\frac{2p}{m}}$

9	a	<p>Ans: $y = (x - 4)^2 + 3$</p> <ul style="list-style-type: none"> •¹ p correct •² q correct 	2	<ul style="list-style-type: none"> •¹ $y = (x - 4)^2$ •² $y = (x - 4)^2 + 3$
9	b	<p>Ans: insert correct diagram</p> <ul style="list-style-type: none"> •¹ correct shape and position •² coordinates of y-intercept shown •³ coordinates of turning point shown 	3	<ul style="list-style-type: none"> •¹ parabola with minimum turning point in first quadrant •² (0,19) •³ (4,3)
10	a	<p>Ans: $3f + 4r = 185$</p> <ul style="list-style-type: none"> •¹ construct equation 	1	<ul style="list-style-type: none"> •¹ $3f + 4r = 185$
10	b	<p>Ans: $2f + 3r = 130$</p> <ul style="list-style-type: none"> •¹ construct equation 	1	<ul style="list-style-type: none"> •¹ $2f + 3r = 130$
10	c	<p>Ans: restricted pass costs £20 full pass costs £35</p> <ul style="list-style-type: none"> •¹ evidence of scaling •² calculate r or f •³ communicate answer 	3	<ul style="list-style-type: none"> •¹ $6f + 8r = 370$ $6f + 9r = 390$ •² $r = 20$ or $f = 35$ •³ restricted pass costs £20 full pass costs £35
11		<p>Ans: $\frac{x - 22}{(x + 2)(x - 4)}$</p> <ul style="list-style-type: none"> •¹ correct common denominator •² correct numerator •³ simplify 	3	<ul style="list-style-type: none"> •¹ $(x + 2)(x - 4)$ •² $4(x - 4) - 3(x + 2)$ •³ $\frac{x - 22}{(x + 2)(x - 4)}$

12	a	<p>Ans: $r - 5$</p> <ul style="list-style-type: none"> •¹ state expression 	1	<ul style="list-style-type: none"> •¹ $r - 5$
12	b	<p>Ans: 10.6 cm</p> <ul style="list-style-type: none"> •¹ correct use of Pythagoras' theorem •² expand bracket •³ solve equation 	3	<ul style="list-style-type: none"> •¹ $r^2 = (r - 5)^2 + 9^2$ •² $r^2 = r^2 - 10r + 25 + 81$ •³ $r = 10.6$

Total Marks for Paper 1 – 40

[END OF SPECIMEN MARKING INSTRUCTIONS]