

# Grade 7–9 Challenge

Mixed practice paper · Calculator allowed

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Total: **34 marks**

## Instructions

- Answer all questions in the spaces provided.
- Show all working. Marks may be awarded for method.
- Diagrams are not drawn to scale.
- Calculators may be used unless a question says otherwise.

### 1 Probability (tree diagram)

3 marks

A bag contains 3 red counters and 5 blue counters. Two counters are taken at random without replacement. Work out the probability that both counters are red.

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### 2 Algebraic fractions

2 marks

Simplify  $\frac{x^2 - 25}{x + 5}$ .

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**3 Functions**

4 marks

$$f(x) = 3x - 3 \text{ and } g(x) = x^2 + 1.$$

(a) Work out  $fg(2)$ .(b) Find  $f^{-1}(x)$ .

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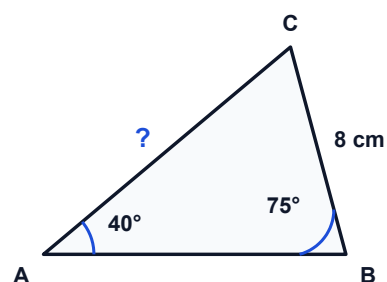
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**4 Sine rule**

3 marks

In triangle ABC, angle A =  $40^\circ$ , angle B =  $75^\circ$  and side a = 8 cm.  
Work out the length of side b. Give your answer to 3 significant figures.



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**5 Surds**

2 marks

Rationalise the denominator of  $4/\sqrt{2}$ . Give your answer in its simplest form.

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**6** Venn diagrams

3 marks

In a class of 40 students, 15 study French, 18 study Spanish and 6 study both. Work out the number of students who study neither.

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**7** Quadratic formula

3 marks

Solve  $x^2 + 4x - 11 = 0$ . Give your answers to 3 significant figures.

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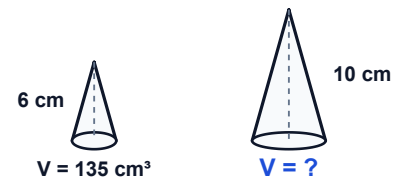
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**8** Similar shapes

3 marks

Two mathematically similar cones have heights 6 cm and 10 cm. The volume of the smaller cone is  $135 \text{ cm}^3$ . Work out the volume of the larger cone.



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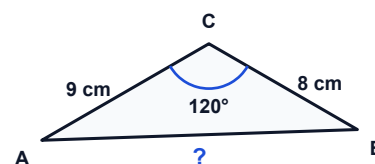
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**9** Cosine rule

3 marks

In triangle ABC, side  $a = 8$  cm, side  $b = 9$  cm and angle  $C = 120^\circ$ . Work out the length of side  $c$ . Give your answer to 3 significant figures.



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**10** Completing the square

3 marks

Write  $x^2 + 10x + 27$  in the form  $(x + p)^2 + q$ .

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**11** Direct & inverse proportion

3 marks

$y$  is inversely proportional to  $x$ . When  $x = 6$ ,  $y = 3$ . Work out  $y$  when  $x = 2$ .

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**12** Bounds

2 marks

A number  $x$  is rounded to 1 decimal place to give 4.7. Write down the lower and upper bounds of  $x$ .

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