

### Examination Practice Questions

**You should have:**

A ruler, protractor, compasses, a pen, pencil, eraser, calculator.  
For some questions, you may need tracing paper.

### Instructions

- Use **black** ink or ball-point pen.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators may be used.**

### Information

- The marks for each question are shown in brackets.
- Use the number of marks for each question as a guide as to how much time to spend on each question. As a rough guide, you can multiply the number of marks by 1.2 to see how many minutes you should spend on a question.
- Questions been carefully compiled from or modelled on a variety of past papers and will generally get more challenging as the document progresses. Some of the later questions will go beyond the core grade level for this topic.

### Advice

- Read each question carefully before you start to answer it.
- Don't forget to have fun.
- Check your answers at the end.

Q1.

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Simplify  $\frac{2x+4}{2}$

$$\frac{\cancel{2}(x+2)}{\cancel{2}} \quad M_1$$

$$\frac{x+2}{1} \quad A_1 \quad (2 \text{ marks})$$

Q2.

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Simplify  $\frac{x+1}{x^3+x^2}$

$$\frac{\cancel{x+1}}{x^2(\cancel{x+1})} \quad M_1$$

$$\frac{1}{x^2} \quad A_1 \quad (2 \text{ marks})$$

Q3.

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Simplify  $\frac{x^2+x}{x+1}$

$$\frac{x(\cancel{x+1})}{\cancel{x+1}} \quad M_1$$

$$x \quad A_1 \quad (2 \text{ marks})$$

Q4.

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Simplify  $\frac{5x-15}{x-3}$

$$\frac{5(\cancel{x-3})}{\cancel{x-3}} \quad M_1$$

$$5 \quad A_1 \quad (2 \text{ marks})$$

Q5.

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Simplify  $\frac{x+3}{4x+12}$

$$\frac{\cancel{x+3}}{4(\cancel{x+3})} \quad \text{M1}$$

$$\frac{1}{4}$$

(2 marks)

Q6.

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Simplify fully  $\frac{8(x-4)}{(x-4)^2}$

$$\frac{8}{x-4}$$

$$\frac{8}{x-4}$$

(1 mark)

Q7.

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Simplify fully  $\frac{4(y+3)^2}{(y+3)^2}$

$$4(y+3)$$

OR  $4y+12$

$$4(y+3)$$

(1 mark)

Q8.

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Simplify fully  $\frac{(x+10)^2}{(x+10)^4}$

$$x+10$$

$$x+10$$

(1 mark)

Q9.

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Simplify fully  $\frac{2(x-3)}{(x-3)(x+3)}$

$$\frac{2(x-3)}{x+3}$$

M1

A1

$$\frac{2(x-3)}{x+3}$$

(2 marks)

Q10.

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Simplify fully  $\frac{(7x-1)(7x-1)}{(7x-1)(x-5)}$

$$\frac{7x-1}{x-5}$$

(1 mark)

Q11.

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Simplify fully  $\frac{x^2-4x}{x^2+x-20}$

$$\frac{x(x-4)}{(x-4)(x+5)}$$

M1

M1

A1

$$\frac{x}{x+5}$$

(3 marks)

Q12.

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Simplify fully  $\frac{1-x}{x^2-3x+2}$

$$\frac{1-x}{(x-2)(x-1)}$$

$$\frac{1-x}{(2-x)(1-x)}$$

M1

M1

A1

$$\frac{1}{2-x}$$

(3 marks)

Q13.

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Simplify fully  $\frac{x^2 + 4x - 5}{x^2 + 5x}$ 

$$\frac{\cancel{(x+5)}(x-1)}{x\cancel{(x+5)}}$$

$$\frac{x-1}{x}$$

(3 marks)

Q14.

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Simplify fully  $\frac{2x^2 + 9x - 5}{x^2 + 2x - 15}$ 

$$\frac{\cancel{(x+5)}(2x-1)}{\cancel{(x+5)}(x-3)}$$

$$\frac{2x-1}{x-3}$$

(3 marks)

Q15.

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Simplify fully  $\frac{3x^2 - 2x - 8}{3x^2 - 12}$ 

$$\frac{(3x+4)\cancel{(x-2)}}{3(x^2-4)}$$

$$3(x+2)\cancel{(x-2)}$$

$$\frac{3x+4}{3(x+2)}$$

(3 marks)

Q16.

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Simplify fully  $\frac{2x^2-3x-14}{2x^2-8}$ 

$$\frac{(2x-7)(\cancel{x+2})}{2(\cancel{x+2})(x-2)}$$

DOTS

$$\frac{2x-7}{2(x-2)}$$

(2 marks)

Q17.

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Simplify fully  $\frac{2x^2-13x+20}{2x-8}$ 

$$\frac{(2x-5)(\cancel{x-4})}{2(\cancel{x-4})}$$

$$\frac{2x-5}{2}$$

(3 marks)

Q18.

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Simplify fully  $\frac{3x^2-x-2}{x^2-1}$ 

$$\frac{(3x+2)(\cancel{x-1})}{(x+1)(\cancel{x-1})}$$

$$\frac{3x+2}{x+1}$$

(3 marks)

Q19.

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Simplify fully  $\frac{3x^2-x-10}{x^2-4}$ 

$$\frac{(3x+5)(\cancel{x-2})}{(x+2)(\cancel{x-2})}$$

M1 (circled in red) and M1 (circled in blue)

$$\frac{3x+5}{x+2}$$

A1 (circled in red)

(3 marks)

Q20.

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Simplify fully  $\frac{4x^2-25}{2x^2-x-10}$ 

$$\frac{(2x+5)(\cancel{2x-5})}{(\cancel{2x-5})(x+2)}$$

M1 (circled in red) and M1 (circled in blue)

$$\frac{2x+5}{x+2}$$

A1 (circled in red)

(3 marks)

Q21.

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Simplify fully  $\frac{4x^2-25}{8x^2-22x+5}$ 

$$\frac{(2x+5)(\cancel{2x-5})}{(4x-1)(\cancel{2x-5})}$$

M1 (circled in red) and M1 (circled in blue)

$$\frac{2x+5}{4x-1}$$

A1 (circled in red)

(3 marks)

Simplify fully  $\frac{10x^2+23x+12}{4x^2-9}$

$$\frac{(5x+4)(2x+3)}{(2x+3)(2x-3)}$$

$$\frac{5x+4}{2x-3}$$

$M_1$

$M_1$

$A_1$

$$\frac{5x+4}{2x-3}$$

(3 marks)

Simplify fully  $\frac{3x^2-6xy}{4x^2-8xy-3xy+6y^2}$

$$\frac{3x(x-2y)}{(4x-3y)(x-2y)}$$

$$\frac{3x}{4x-3y}$$

$M_1$

$A_1$

$$\frac{3x}{4x-3y}$$

(3 marks)

Simplify fully  $\frac{2^n-1}{4^n-1}$

$$\frac{2^n-1}{(2^n+1)(2^n-1)}$$

$$\frac{1}{2^n+1}$$

$M_1$

$M_1$

$A_1$

$$\frac{1}{2^n+1}$$

(3 marks)

Prove that, for all positive values of  $n$

$$\frac{(n+2)^2 - (n+1)^2}{2n^2 + 3n}$$

is equal to  $\frac{a}{b}$

Where  $a$  and  $b$  are integers or variables to be found.

$$n^2 + 4n + 4 - (n^2 + 2n + 1)$$

$$= 2n + 3$$

$$\frac{2n + 3}{n(2n + 3)}$$

$$\frac{1}{n}$$

(3 marks)

Find an expression for the gradient of the line joining point A(6,9) to point B(4p, 4p<sup>2</sup>).

Give your answer in its simplest form.

$$\frac{4p^2 - 9}{4p - 6} = \frac{(2p+3)(2p-3)}{2(p-3)}$$

$$\frac{2p+3}{2}$$

(3 marks)

# QUESTIONS FROM MATHEMATICAL COMPETITIONS

Q1.

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Which of the expressions below is equivalent to:

$$(x \div (y \div z)) \div ((x \div y) \div z)$$

Tick the correct answer.

$$\begin{aligned} & \left( x \div \frac{y}{z} \right) \div \left( \frac{x}{y} \div z \right) \\ &= x \times \frac{z}{y} \div \frac{x}{y} \times \frac{1}{z} \\ &= \frac{xz}{y} \div \frac{x}{yz} = \frac{xz}{y} \times \frac{yz}{x} = z^2 \end{aligned}$$

1

$\frac{1}{xyz}$

$x^2$

$y^2$

$z^2$

Q2.

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When the expression  $\frac{(2^2-1) \times (3^2-1) \times (4^2-1) \times (5^2-1)}{(2 \times 3) \times (3 \times 4) \times (4 \times 5) \times (5 \times 6)}$  is simplified, which of the following is obtained?

Tick the correct answer.

$$\begin{aligned} & \frac{(3)(8)(15)(24)}{(6)(12)(20)(30)} \\ &= \frac{8640}{43200} = \frac{864}{4320} = \frac{432}{2160} = \frac{1}{5} \end{aligned}$$

A  $\frac{1}{2}$

B  $\frac{1}{3}$

C  $\frac{1}{4}$

D  $\frac{1}{5}$

E  $\frac{1}{6}$

What is the positive difference between the numerator and the denominator when the expression shown is written as a single fraction in its simplest form?

$$\frac{n}{n+1 - \frac{n+2}{n+3}} \times \frac{(n+3)}{(n+3)}$$

Tick the correct answer.

$$\frac{\overset{2n+2}{n(n+3)}}{\underset{1n+2}{(n+1)(n+3)} - \underset{2n}{(n+2)}} = \frac{\overset{2}{n^2} + \overset{1}{3n}}{\overset{2}{n^2} + \overset{1}{3n} + 1}$$

THIS IS THE  
DIFFERENCE!