



**Athena**  
**Sixth Form College**

## **Further Mathematics Summer Transition**

**Total Score    /12**

## Baseline Questions

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### Question 1

Simplify

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

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### Question 2

Simplify fully

$$\frac{3x^2-x-14}{9x^2-4} \div \frac{x+2}{3x^2+2x}$$

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### Question 3

The line  $l$  is a tangent to the circle  $x^2+y^2 = 40$  at the point  $A$ .  $A$  is the point  $(2,6)$ .

The line  $l$  crosses the  $x$ -axis at the point  $P$ .

Work out the area of triangle  $OAP$ .

.....  $units^2$

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**Question 4**

$$(3 + \sqrt{c})(2\sqrt{c} - 3) = 1 + k\sqrt{c}$$

where  $c$  and  $k$  are prime numbers.

Find the value of  $c$  and the value of  $k$ .

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**Question 5**

Write  $2x^2 + 16x + 35$  in the form  $a(x + b)^2 + c$ , where  $a$ ,  $b$  and  $c$  are integers.

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**Question 6**

It can be shown that  $x^2 - 4x - 3 \equiv (x - 2)^2 - 7$

Hence, or otherwise, write down the coordinates at which  $y = x^2 - 4x - 3$  has its minimum value.

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**Question 7**

Prove directly that the sum of any three consecutive integers is divisible by 3.

Input note: let  $n$  be an integer, and express the sum in the form  $3(\dots)$

Sum = .....

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**Question 8**

The function  $f$  is such that  $f(x) = \frac{2x}{3x+5}$

The function  $g$  is such that  $g(x) = \frac{3}{x+4}$

Solve the equation  $f(x) = g(x)$

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**Question 9**

The straight line  $L_1$  has equation  $y = 6 - 2x$  The straight line  $L_2$  is perpendicular to  $L_1$  and passes through the point  $(4,7)$

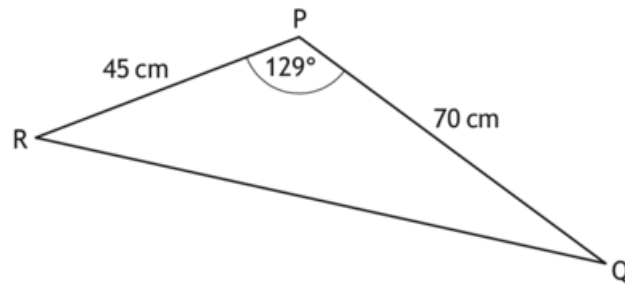
Find the coordinates of the point where the line  $L_2$  crosses the  $x$ -axis.

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### Question 10

The diagram shows triangle PQR.



PR = 45 centimetres PQ = 70 centimetres Angle QPR =  $129^\circ$

Calculate the area of triangle PQR.

.....  $\text{cm}^2$

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### Question 11

A triangle has sides of length 8 cm, 10 cm and 14 cm.

Work out the size of the largest angle of the triangle.

Give your answer correct to 1 decimal place.

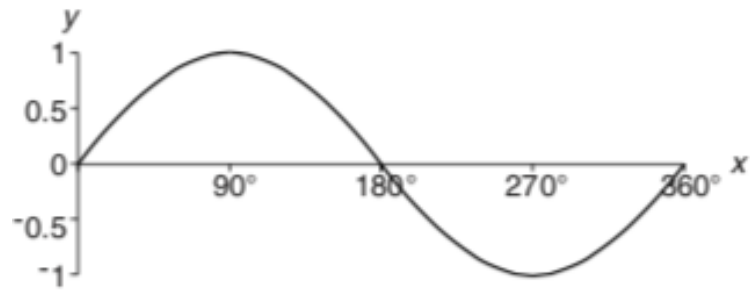
.....  $^\circ$

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**Question 12**

Solve, to the nearest degree,  $\sin x = 0.53$  where  $0^\circ \leq x \leq 360^\circ$ .

Use your calculator and the graph below to help you.



$$x = \text{.....}^\circ$$

$$x = \text{.....}^\circ$$

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