

Further Maths transition work

Due in first further maths lesson, 88 marks available

The point of this work is for you to write full solutions, not just answers. You should aim to write them in such a way that someone else would be able to read what you have written, be able to follow your train of thought and be convinced about your answer. If a question requires you to solve a quadratic equation, please use one of the algebraic methods (i.e. factorising, completing the square or using the quadratic formula).

Please write on your own A4 paper.

Here is an example of a question and complete solution

1. (a) Find the value of $16^{-\frac{1}{4}}$

(b) Simplify $x(2x^{-\frac{1}{4}})^4$

Your answer

$$Q1a) \quad 16^{-\frac{1}{4}} = \frac{1}{16^{\frac{1}{4}}} = \frac{1}{\sqrt[4]{16}} \quad \boxed{= \frac{1}{2}}$$

$$b) \quad x(2x^{-\frac{1}{4}})^4 = x(2^4 \cdot x^{-\frac{1}{4} \times 4})$$
$$= x(16x^{-1})$$

$$= x\left(\frac{16}{x}\right)$$

$$= \frac{16x}{x}$$

$$\boxed{= 16}$$

- 1 p and q are two numbers such that $p > q$

When you subtract 5 from p and subtract 5 from q the answers are in the ratio 5 : 1

When you add 20 to p and add 20 to q the answers are in the ratio 5 : 2

Find the ratio $p : q$

Give your answer in its simplest form.

(5)

- 2 n is an integer.

Prove algebraically that the sum of $\frac{1}{2}n(n+1)$ and $\frac{1}{2}(n+1)(n+2)$ is always a square number.

(3)

- 3 Solve algebraically the simultaneous equations

$$x^2 + y^2 = 25$$

$$y - 3x = 13$$

(5)

- 4 Sketch the graph of

$$y = 2x^2 - 8x - 5$$

showing the coordinates of the turning point and the exact coordinates of any intercepts with the coordinate axes.

(5)

- 5 The point A has coordinates $(1, 7)$ and the point B has coordinates $(9, 3)$

The line l is the perpendicular bisector of AB

(a) Find an equation of l

(5)

The line l crosses the x -axis at the point C

(b) Find the area of the triangle ABC

(5)

6 Find the set of values for x for which

(a) $5x - 10 > 4x - 7$ (1)

(b) $2x^2 - 11x + 5 < 0$ (3)

(c) **both** $5x - 10 > 4x - 7$ **and** $2x^2 - 11x + 5 < 0$ (1)

7. The line L has equation $y = 5 - 2x$.

(a) Show that the point $P(3, -1)$ lies on L . (1)

(b) Find an equation of the line perpendicular to L , which passes through P . Give your answer in the form $ax + by + c = 0$, where a , b and c are integers. (4)

8. (a) Write $\sqrt{45}$ in the form $a\sqrt{5}$, where a is an integer. (1)

(b) Express $\frac{2(3 + \sqrt{5})}{(3 - \sqrt{5})}$ in the form $b + c\sqrt{5}$, where b and c are integers. (5)

9 Show that $\frac{1}{2x^2 + x - 15} \div \frac{1}{3x^2 + 9x}$ simplifies to $\frac{ax}{bx + c}$ where a , b and c are integers. (3)

10 (a) Write $\frac{4x^2 - 9}{6x + 9} \div \frac{2x}{x^2 - 3x}$ in the form $\frac{ax + b}{cx + d}$ where a , b , c and d are integers. (3)

(b) Express $\frac{3}{x + 1} + \frac{1}{x - 2} - \frac{4}{x}$ as a single fraction in its simplest form. (3)

11. Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4

(3)

12 $a = \sqrt{8} + 4$

$$b = \sqrt{8} - 4$$

$(a - b)(a + b)$ can be written in the form $y\sqrt{4y}$

Find the value of y

Show your working clearly.

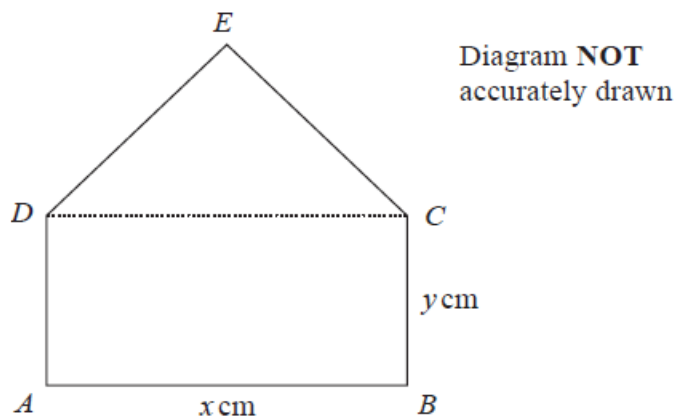
$$y = \dots\dots\dots$$

(3)

13 Make t the subject of $n^2 = \frac{4d + t^3}{t^3}$

(4)

- 14 $ABCED$ is a five-sided shape.



$ABCD$ is a rectangle.

CED is an equilateral triangle.

$$AB = x \text{ cm} \quad BC = y \text{ cm}$$

The perimeter of $ABCED$ is 100 cm.

The area of $ABCED$ is $R \text{ cm}^2$

Show that $R = \frac{x}{4} \left(200 - [6 - \sqrt{3}]x \right)$ (3)

15.

Factorise fully $(x + 5)^4 + (x + 5)^3$

Do not attempt to expand brackets.

(2)

16

Factorise fully $(y + 2)^4 - (y + 2)^3(y - 1)$

Do not attempt to expand brackets.

(3)

17

Solve $x^{\frac{2}{3}} = 2\frac{7}{9}$

(3)

18

Solve $\sqrt[3]{(42 - 3\sqrt{x})} = 3$

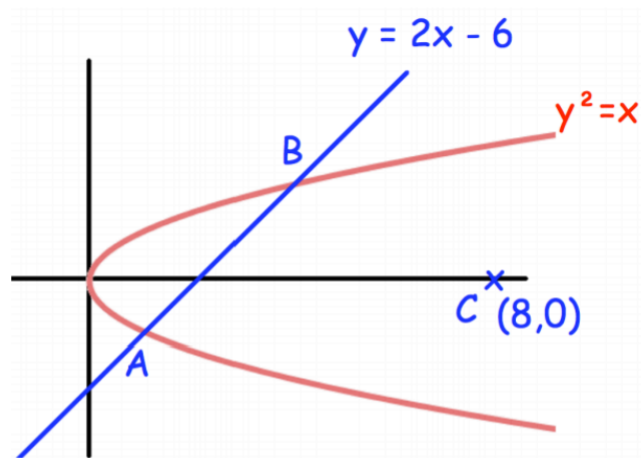
(3)

19

Solve $4^{3x+1} \times 32^{1.2x} = 16^{11-x}$

(5)

Shown is the curve $y^2 = x$ and the line $y = 2x - 6$



The curve and the line meet at the points A and B.
The point C is (8, 0)

Show ABC is a right angled triangle.

(6)