A Level Maths Baseline Test

You have 1 hour to complete all questions and show your working where applicable. There are 60 marks available. You may use a calculator.

1. Simplify the following expressions.

(a) $\frac{a^2 \times a^5}{a^3}$ (b) $\frac{(3x^2)^3}{x^{-4}}$ (c) $\frac{2y^{1/2}}{(8y^{-3})^{2/3}}$

$= \frac{27x^6}{x^{-4}}$ $= \frac{2y^{1/2}}{4y^{-2}}$

a^4 (1) $27x^{10}$ (1) $\frac{1}{2}y^{5/2}$ (1)

2. Solve the following equations.

(a) $3n^2 \times 4n^3 = 384$ (b) $3 \times \sqrt{27} = 3^x$ (c) $a^{-3/4} = \frac{1}{27}$

$12n^5 = 384$ $3 \times 3^{3/2}$ $a^{3/4} = 27$

$n^5 = 32$ $= 3^{5/2}$ $a^{1/4} = 3$

$n = 2$

$n = 2$ (1) $x = \frac{5}{2}$ (1) $a = 81$ (2)

3. Simplify the following surds. You must show your working.

(a) $\sqrt{72}$ (b) $\sqrt{32} \times \sqrt{45}$ (c) $(2 + \sqrt{5})(1 - \sqrt{5})$

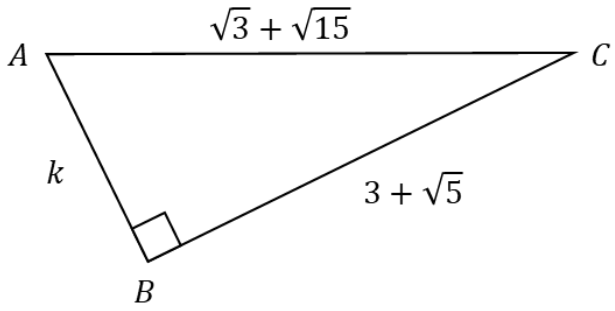
$4\sqrt{2} \times 3\sqrt{5}$

	2	$+\sqrt{5}$
1	2	$+\sqrt{5}$
$-\sqrt{5}$	$-2\sqrt{5}$	-5

$6\sqrt{2}$ (1) $12\sqrt{10}$ (1) $-3-\sqrt{5}$ (2)

[……/12]

4. All measurements on the triangle are in centimetres.
ABC is a right-angled triangle. k is a positive integer.
Find the value of k.
You must show your working.



$k^2 = (\sqrt{3}+\sqrt{15})^2 - (3+\sqrt{5})^2$ (1)
$= 18 + 6\sqrt{5} - (14 + 6\sqrt{5})$
$= 4$ (1)
$k = 2$

(1)
$k =$ ..... 2 ..... (3)

5. Rationalise the denominator of these surds. You must show your working.

(a) $\frac{1}{\sqrt{5}}$

$\frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$\frac{\sqrt{5}}{5}$ (1)

..... (1)

(b) $\frac{6}{2\sqrt{3}}$

$\frac{6}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{6\sqrt{3}}{6}$ (1)

$\sqrt{3}$ (1)

..... (2)

(c) $\frac{5+2\sqrt{3}}{2+\sqrt{3}}$

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

$= \frac{4-\sqrt{3}}{1}$ (1)

$4-\sqrt{3}$ (1)

..... (3)

6. Expand and simplify these expressions.

(a) $4x(xy+3)$

$4x^2y + 12x$ (1)

..... (1)

(b) $(x+3)(2x-4)$

	x	$+3$
$2x$	$2x^2$	$+6x$
-4	$-4x$	-12

(1)

$2x^2 + 2x - 12$ (1)

..... (2)

(c) $(x-3)^2(x+2)$

	x	-3
x	x^2	$-3x$
-3	$-3x$	$+9$

(1)

	x^2	$-6x$	$+9$
x	x^3	$-6x^2$	$+9x$
$+2$	$+2x^2$	$-12x$	$+18$

(1)

$x^3 - 4x^2 - 3x + 18$ (1)

..... (3)

[...../15]

7. Fully factorise these expressions.

(a) $6a^2b - 9ab^3$ (b) $x^2 - x - 42$ (c) $6x^2 + 7x - 3$

① Any correct factor ① $(x \pm 7)(x \pm 6)$

	$2x$	$+3$
$3x$	$6x^2$	$+9x$
-1	$-2x$	-3

①

$3ab(2a+3b^2)$ ② (2) $(x-7)(x+6)$ ② (2) $(3x-1)(2x+3)$ ① (2)

8. Solve the following equations.

(a) $4a + 6 = 8$ (b) $x^2 - 7x + 12 = 0$ (c) $2n^2 + 3n = 11 - n$

$4a = 2$ $(x-3)(x-4) = 0$ ① $2n^2 + 4n - 11 = 0$ ①

$x = \frac{-4 \pm \sqrt{4^2 - 2 \times 2 \times -11}}{2 \times 2}$ ①

$a =$ $\frac{1}{2}$ ① (1) $x =$ 3 or 4 ① (2) $n =$ 1.55 or −3.55 ① (3)

9. (a) Write $x^2 + 10x + 2$ in the form $(x + a)^2 + b$ where a and b are integers.

$(x+5)^2 + 2 - 5^2$ ①

$(x+5)^2 - 23$ ① (2)

(b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = x^2 + 10x + 2$

$(-5, -23)$ ① (1)

10. Given that $f(x) = 2x^2 - 10$,

(a) find $f(-2)$ (b) Solve $f(x) = 8$

$2(-2)^2 - 10$

$2x^2 - 10 = 8$ ①

$2x^2 = 18$ ①

$x^2 = 9$

-2 ① (1) $x =$ 3 or −3 ① (3)

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11. Solve these pairs of simultaneous equations. You must show your working.

(a) $3x - y = -4$
$2x - 3y = 9$

$\times 3$

$9x - 3y = -12$ (1)
$-\ 2x - 3y = 9$

$7x = -21$
$x = -3$ (1)

$3x - y = -4$
$-9 - y = -4$
$y = -5$ (1)

$x =$ -3
$y =$ -5 (3)

(b) $x^2 + y^2 = 17$
$y = x - 3$

$x^2 + (x-3)^2 = 17$ (1)
$2x^2 - 6x - 8 = 0$
$x^2 - 3x - 4 = 0$ (1)
$(x-4)(x+1) = 0$ (1)
$x = 4$ or -1 (1)
$y = 4 - 3 = 1$
$y = -1 - 3 = -4$ (1)

$x =$ 4 or -1
$y =$ 1 or -4 (5)

12. Solve these inequalities. You must show all your working.

(a) $3x - 7 \geq 2$

$3x \geq 9$ (1)

$x \geq 3$ (1) (2)

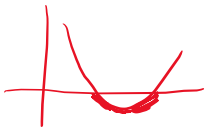
(b) $-7 < 2x + 3 < 1$

$-10 < 2x < -2$ (1)

$-5 < x < -1$ (1) (2)

(c) $x^2 - 7x + 6 < 0$

$(x-1)(x-6) < 0$ (1)



$1 < x < 6$ (1) (2)

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