MATHEMATICS

Stage 5

Number and Algebra, Algebraic Techniques
- Distributive Laws

Number and Algebra, Equations
- Linear

Number and Algebra
- Indices

Number and Algebra, Linear Relationships
- Cartesian Plane

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Exam Equivalent Time: 39 minutes *(based on allocation ~1.25 min/mark)*

norWEST CHRISTIAN COLLEGE
STRENGTH OF PURPOSE

Worked Solutions

1. **D** Linear (227339) **Core A**

If $x = -2$,

$$2(-2) - 3 = -7$$
$$4(-2) + 1 = -7$$

$\therefore x = -2$ satisfies both.

$\Rightarrow A$

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2. **B** Indices (002644) **Path B** **HSC**

$$\frac{6x^2y}{3} \div \frac{2y}{5} = \frac{6x^2y}{3} \times \frac{5}{2y}$$
$$= \frac{30x^2y}{6y}$$
$$= 5x^2$$

ALGEBRA TIP: When you divide by a fraction, invert the divisor and multiply as shown in the Worked Solution.

$\Rightarrow A$

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3. **A** Cartesian Plane (010503) **Path C** **HSC**

$$2x - 3y = 8$$
$$3y = 2x - 8$$
$$y = \frac{2}{3}x - \frac{8}{3}$$
$$m = \frac{2}{3}$$

$\therefore m_{\text{perp}} = -\frac{3}{2}$ $(m_1m_2 = -1$ for $\perp$ lines$)$

Equation of line $m = -\frac{3}{2}$ through $(2, 0)$:

$$y - y_1 = m(x - x_1)$$
$$y - 0 = -\frac{3}{2}(x - 2)$$
$$y = -\frac{3}{2}x + 3$$
$$2y = -3x + 6$$
$$3x + 2y = 6$$

$\Rightarrow B$

Worked Solutions

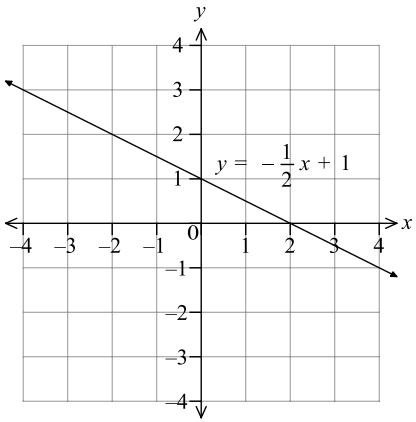
4. B Cartesian Plane (228191) Core B

$y - 1 = -\frac{1}{2}x \quad \Rightarrow \quad y = -\frac{1}{2}x + 1$

y-intercept $= 1$, gradient $= -\frac{1}{2}$

x-intercept occurs when $y = 0$:

$0 = -\frac{1}{2}x + 1 \quad \Rightarrow \quad x = 2$



5. B Cartesian Plane (228429) Path C

$(2, -3)$, $(-5, 4)$

Using the distance formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(2 - (-5))^2 + (-3 - 4)^2}$$
$$= \sqrt{49 + 49}$$
$$= \sqrt{98}$$
$$= 9.899\ldots$$
$$= 9.9 \text{ units (nearest tenth)}$$

6. B Indices (226565) Path C

$$\frac{6\sqrt{3} - \sqrt{5}}{2\sqrt{5}} = \frac{6\sqrt{3} - \sqrt{5}}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$
$$= \frac{\sqrt{5}\left(6\sqrt{3} - \sqrt{5}\right)}{2 \times 5}$$
$$= \frac{6\sqrt{15} - 5}{10}$$
$$= -\frac{1}{2} + \frac{3}{5}\sqrt{15}$$

$\therefore a = -\frac{1}{2}, \ b = \frac{3}{5}$

7. B Indices (226467) Core A

$$\frac{(12x)^0}{4} \times \frac{5x}{3} = \frac{1}{4} \times \frac{5x}{3}$$
$$= \frac{5x}{12}$$

8. B Cartesian Plane (228384) Path C

Line goes through $(-3, 4)$ and $(2, -3)$.

Using the gradient formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$
$$= \frac{-3 - 4}{2 - (-3)}$$
$$= -\frac{7}{5}$$

9. B Indices (005374) Path B HSC

$$\frac{4x^2}{3y} \div \frac{xy}{5} = \frac{4x^2}{3y} \times \frac{5}{xy}$$
$$= \frac{20x^2}{3xy^2}$$
$$= \frac{20x}{3y^2}$$

Mean mark 33%.
MARKER'S COMMENT: Remember to "invert and multiply" when dividing a fraction by a fraction (see Worked Solution).

10. B+ Distributive Laws (226209) Path B

$$\begin{aligned} -a^2+3a+10 &= -\left(a^2-3a-10\right) \\ &= -(a-5)(a+2) \\ &= (5-a)(a+2) \end{aligned}$$

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11. B+ Distributive Laws (226288) Path C

$$\begin{aligned} 5b^3-5b &= 5b\left(b^2-1\right) \\ &= 5b(b+1)(b-1) \end{aligned}$$

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12. B+ Indices (226472) Path B

$$\begin{aligned} \frac{16x^5}{2x^{-3}} &= 8x^{5-(-3)} \\ &= 8x^8 \end{aligned}$$

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13. A Distributive Laws (226293) Path C

$$\begin{aligned} 2x^2-6xy-3x+9y &= 2x(x-3y)-3(x-3y) \\ &= (2x-3)(x-3y) \end{aligned}$$

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14. A Indices (226632) Path B

$$\begin{aligned} \frac{1}{a}+\frac{1}{b}-\frac{c}{ab} &= \frac{b}{ab}+\frac{a}{ab}-\frac{c}{ab} \\ &= \frac{b+a-c}{ab} \end{aligned}$$

Reciprocal of $x = x^{-1}$

$\therefore$ Reciprocal of $\dfrac{b+a-c}{ab} \Rightarrow \left(\dfrac{b+a-c}{ab}\right)^{-1} = \dfrac{ab}{a+b-c}$
