

*Duration: 2 hours. Calculators are NOT permitted.*

*To pass the exam, you need 12 correct answers.*

*Record each answer by ticking the corresponding box in the answer form.*

**1.** Factor 378 into primes

[a]  $2 \cdot 189$

[b]  $2 \cdot 3 \cdot 63$

[e] not in the list

[c]  $2^3 \cdot 47$

[d]  $2^3 \cdot 3^2 \cdot 7$

**2.** Determine the least common multiple  $x$  of 24 and 126

[a]  $100 \leq x < 250$

[b]  $250 \leq x < 500$

[e] not in the list

[c]  $500 \leq x < 1000$

[d]  $1000 \leq x < 3000$

**3.** Determine the integer nearest to  $\frac{1723}{13}$

[a] 121

[b] 122

[e] not in the list

[c] 131

[d] 132

4. Evaluate

$$\frac{5}{30} - \frac{1}{7} \times \left[ \left( 4 - \frac{18}{27} \right) \div \frac{8}{3} + \left( \frac{3}{8} \right)^2 \times \left( \frac{7}{4} \times \frac{7}{9} + \frac{5}{12} \right) \right]$$

[a]  $\frac{19}{27}$

[b]  $-\frac{67}{72}$

[e] not in the list

[c]  $-\frac{1}{21}$

[d]  $\frac{5}{42}$

5. Estimate  $x = 7\sqrt{3} + 1$

[a]  $11 < x < 12$

[b]  $12 < x < 13$

[e] not in the list

[c]  $13 < x < 14$

[d]  $14 < x < 15$

6. Simplify

$$\left( \frac{-ab^2c^3}{cb^3} \right)^3 \left( \frac{a^5}{-b^7c} \right)^{-2}$$

[a]  $-\frac{a^{13}c^4}{b^{17}}$

[b]  $\frac{a^{13}c^4}{b^{17}}$

[e] not in the list

[c]  $-\frac{b^{11}c^8}{a^7}$

[d]  $-\frac{b^{12}c^7}{a^4}$

7. Compute the remainder of the following division

$$(-x^4 + 3x^2 + 2x - 1) \div (x^2 + 2)$$

[a]  $2x - 3$

[b]  $2x + 11$

[e] not in the list

[c]  $3x + 2$

[d]  $2x - 11$

8. When  $9y^2 - x^2y^2 - 9z^2 + (xz)^2$  is factored completely, one of the factors is

[a]  $x + y$

[b]  $x - y$

[e] not in the list

[c]  $3 - y$

[d]  $3 + y$

9. Add and simplify

$$\frac{1}{y^2 - 2y - 15} + \frac{3}{y^2 - 10y + 25}$$

[a]  $\frac{4y + 4}{(y + 3)(y - 5)^2}$

[b]  $\frac{3y + 10}{(y + 3)(y - 5)}$

[e] not in the list

[c]  $\frac{4y - 2}{(y + 3)(y - 5)^2}$

[d]  $\frac{4y - 14}{(y + 3)(y - 5)^2}$

10. Simplify

$$-\frac{2}{3x^2} \left[ \left( x^2 - \frac{1}{3}y \right)^2 - \frac{1}{9}y^2 \right]^2 - \frac{1}{9}x^2y \left( 8x^2 - \frac{8}{3}y \right).$$

[a]  $\frac{2}{3}x^6$

[b]  $-\frac{2}{3}x^6$

[e] not in the list

[c]  $-\frac{2}{9}x^4(3x^2 + 8y)$

[d]  $\frac{2}{9}x^4(3x^2 - 8y)$

11. Compute  $f\left(-\frac{1}{a^3}\right)$ , where

$$f(x) = \frac{x^2 - x - 1}{x - 1}$$

[a]  $\frac{1 - a^3 - a^6}{a^6 - a^3}$

[b]  $\frac{1 + a^3 - a^6}{a^3 - 1}$

[e] not in the list

[c]  $\frac{1 - a^3 - a^6}{1 + a^3}$

[d]  $\frac{-1 - a^3 + a^6}{a^3(a^3 + 1)}$

12. Simplify

$$\frac{1}{\sqrt{5}} \frac{\sqrt{30} - \sqrt{12}\sqrt{15}}{(\sqrt{2} - \sqrt{3})^2}$$

to the form  $m + n\sqrt{d}$ , where  $m, n$  and  $d$  are integers.

[a]  $-42 - 7\sqrt{6}$

[b]  $-18 - 7\sqrt{6}$

[e] not in the list

[c]  $6 + \sqrt{30}$

[d]  $18 - \sqrt{12}$

13. Simplify  $\sqrt{x^2 - x^3} - \sqrt{4 - 4x}$

[a]  $(x - 2)\sqrt{1 - x}$

[b]  $\sqrt{x^2(1 - x) - 4(1 - x)}$

[e] not in the list

[c]  $(|x| - 2)\sqrt{1 - x}$

[d]  $|x + 2|\sqrt{1 - x}$

14. Solve the inequality

$$\frac{2(3 - x)}{3} - \frac{5(1 - 2x)}{6} < \frac{4 - 2x}{2} + 1.$$

[a]  $\frac{11}{12} > x$

[b]  $x > -\frac{11}{6}$

[e] not in the list

[c]  $\frac{1}{2} < x$

[d]  $-x < \frac{33}{24}$

15. Solve

$$4x - \frac{x^2 - 9}{x + 3} = \frac{6}{3x - 1}.$$

[a]  $\frac{2 \pm \sqrt{7}}{3}$

[b]  $\frac{-1 \pm \sqrt{10}}{3}$

[e] not in the list

[c]  $\frac{7 \pm \sqrt{94}}{15}$

[d]  $\frac{2}{3}$  and  $-\frac{4}{3}$

*End of examination paper*