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DIPLOMA IN
MATHEMATICS
N3 MATH EXAM PAPER

N3 Math Exam Paper

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FACTORS AND FRACTIONS

N3 Exam-Papers: Factors & Fractions – Questions

1. Factorise the following expressions as far as possible in prime factors:

1.1. $x(3x - 2) - y(3y + 2)$

1.2. $4n^{4p} + 3n^{2p} - 1$

2. Factorise the following expression completely:

$$2x^3 + x^2 - 5x + 2$$

3. Simplify the following expression:

$$\frac{x-1}{x+1} - \frac{2x-1}{3-x} + \frac{2x^2-7x-17}{x^2-2x-3}$$

4. Make use of the factor theorem to prove that $x+7$ is a factor of the function $f(x) = x^3 - 39x + 70$

5. Factorise the following two expressions as far as possible in prime factors:

5.1. $p^2 - 4m^2 + 4m - 1$

5.2. $12a^2 - 27b^2$

6. Simplify the following expression:

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

7. Simplify: $\frac{2x^2 + 11x - 13}{x-1}$

8. Simplify: $\frac{8^{3x} \cdot 4^{3x}}{2^{15x-2}}$

9. Factorise the following expression as far as possible in prime factors:
 $6x^2 - 42 - 9x$

10. Simplify the following algebraic fractions: $\frac{m^2 - 16}{(m-4)^2} \div \frac{m^2 + 2m}{m^2 - 2m - 8} \times \frac{m^2 + 4m}{m^2 + 8m + 16}$

11. Simplify: $\frac{x-3}{x^2-3x-4} + \frac{x-1}{2+x-x^2}$
12. Use the factor theorem to prove that $2x+1$ is a factor of $f(x) = 6x^3 - 5x^2 - 12x - 4$.
13. Simplify: $\frac{3x^2-7x+2}{2x^2-5x-3} \div \frac{x^2+x-6}{x^2-9}$
14. If $16x^3 - px^2 + 12x + 3$ is divided by $2x+1$, the remainder is -7 . Determine the value of p .
15. Solve for x : $\frac{4}{x-2} + \frac{2x-3}{4-x^2} = \frac{5}{x+2}$
16. Factorise the following expressions in prime factors as far as possible:
- 16.1. $m^{36} - 3m^{18} - 10$
- 16.2. $3x^2(4y-3) - 3x(3-4y)$
17. Simplify the following algebraic fractions: $\left(2x-3+\frac{7}{x+3}\right) \div \left(x+1-\frac{3}{2x+1}\right)$
18. Determine the value of m if $f(x) = 6x^3 + 4x^2 + mx + 3$ gives a remainder of 6 when divided by $2x+1$.
19. If 2 is one solution of the equation $2x^2 + px + 2 = 0$, determine the value of p and the other solution.
20. Factorise the following as far as possible in prime factors $3(1+2k)^2 - 8(1+2k) - 3$
21. Determine the smallest value of k for which the expression $x^3 + 5x^2 - k(x-4)$ is exactly divisible by $x-k$
22. Simplify the following expression:
- $$\frac{a^2+a-6}{a^2-9} \div \frac{a^2-3a+2}{a^2-a} \times \frac{a-3}{a}$$
23. Factorise the following as far as possible in prime factors:
- $$9x^2 + 12xy + 4y^2 - 25c^2$$
24. Simplify the following algebraic fractions:

$$24.1. \frac{2a-2b}{3a+3b} \div \frac{a^2-2ab+b^2}{a^2-b^2}$$

$$24.2. \frac{2x-3}{2x^2-x-3} - \frac{4x+5}{4x^2+9x+5}$$

25. Prove that $2x+1$ is a factor of the function $f(x) = 8x^3 + 4x^2 - 2x - 1$ and hence factorise the expression completely.

26. Determine the factors of the following function if $x-1$ is one of the factors.

$$f(x) = x^3 + 3x^2 - x - 3$$

27. Factorise the following expressions as far as possible in prime factors

$$27.1. x^2(x-1) + (1-x)$$

$$27.2. a^2 + 2a - 3 + ab - b$$

28. Simplify the following:

$$\frac{a^2 - b^2}{2a - b} \div \frac{a^2 - 2ab + b^2}{4a^2 - b^2} \times \frac{a - b}{a + b}$$

29. Make use of the factor theorem to prove that $x+7$ is a factor of the function

$$f(x) = x^3 - 39x + 70$$

30. Factorise the following two expressions as far as possible in prime factors:

$$30.1. p^2 - 4m^2 + 4m - 1$$

$$30.2. 12a^2 - 27b^2$$

31. Simplify the following expression:

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

32. Determine the value of p if $x-2$ is a factor of the following function:

$$f(x) = 2x^3 + px^2 - 4x + 5$$

33. Factorise as far as possible in prime factors:

33.1. $x^2 - y^2 - 2x - 2y$

33.2. $2x^2 - 3 - \frac{2}{x^2}$

34. Simplify: $\frac{p^2 - 121}{p^2 - 4} \times \frac{p - 2}{2p + 22} \div \frac{2p - 22}{p^2 + 2p + 11(p + 2)}$

35. Factorise the following: $xy^2 - y + p(1 - xy)$

36. When $f(x) = 2x^3 + 4qx^2 - 3q^2x - 2$ is divided by $x - q$, the remainder is 10. Calculate the value of q .

37. Simplify the following expression: $\frac{3a + 6}{2a^2 + a - 1} \div \frac{a^2 - 4}{2a^2 + a - 1} \times \frac{3a - ax + 2x - 6}{9 - 3x}$

38. Factorise the following expressions as far as possible in prime factors:

38.1. $x(3x - 2) - y(3y + 2)$

38.2. $4n^{4p} + 3n^{2p} - 1$

39. Factorise the following expression completely: $2x^3 + x^2 - 5x + 2$

40. Simplify the following expression: $\frac{x - 1}{x + 1} - \frac{2x - 1}{3 - x} + \frac{2x^2 - 7x - 17}{x^2 - 2x - 3}$

