High School Mathematics Test 2015

Year 10

Factorisation

Non Calculator

Skills and Knowledge Assessed:

- Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)
- Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)
- Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)

Name_____

Section 1 Short Answer Section

Write all working and answers in the spaces provided on this test paper.

1. Factorise $3m + 18$.

   .....

2. Factorise $12k + 32$.

   .....

3. Factorise $11m^2 - 22m$.

   .....

4. Factorise $-5g^2 - 15gt$.

   .....

5. Factorise $48d^2e - 32d$.

   .....

6. Factorise $25ur + 55ur^2$.

   .....

7. Factorise $45y^3z^3 - 40xy^2z^4$.

   .....

8. Factorise $54a^3b + 30a^3b^2$.

   .....

9.	Factorise $12e^2g - 18eg + 6e^3g^2$. ……
10.	Factorise $a(r + 8) - 6(r + 8)$. ……
11.	Factorise $2p^2 + 6pe - 7(p + 3e)$. ……
12.	Factorise $2a^2 + am + 2ak + mk$. ……
13.	Factorise $a^2 + 12a + 32$. ……
14.	Factorise $y^2 - y - 20$. ……
15.	Factorise $s^2 - 14s + 45$. ……
16.	Factorise $m^2 + 5m - 36$. ……
17.	Factorise $v^2 - 100$. ……
18.	Factorise $a^2 - 14a + 49$. ……
19.	Factorise $2m^2 - 15m + 27$. …… ……

20.	Factorise $12e^2 + 5e - 2$. …… ……
21.	Factorise $6p^2 - 17p + 7$. …… ……
22.	Factorise $3x^3y^2 - 12xy^4$. …… ……

High School Mathematics Test 2015

Year 10

Factorisation

Calculator Allowed

Name_____

Section 2 Multiple Choice Section

Mark all your answers on the accompanying multiple choice answer sheet, not on this test paper. You may do any working out on this test paper. Calculators are allowed for this section.

1. Factorise $5y - 25$.

   A. $5(y + 5)$ B. $5(y - 5)$ C. $5y(y - 5)$ D. $5(y^2 - 5)$

2. Factorise $a^2 - 12a$.

   A. $a(a - 6)$ B. $a^2(a - 12)$ C. $a(1 - 12a)$ D. $a(a - 12)$

3. Factorise $3u - 12u^2$.

   A. $3(u - 4)$ B. $3(1 - 4u)$ C. $3u(1 - 4u)$ D. $3u^2(1 - 4u)$

4. Factorise $12z^2 - 18z$.

   A. $6(2z^2 - 3)$ B. $6z(2z - 3)$ C. $6z(2z + 3)$ D. $12z(z - 3)$

5. Factorise $21a^2b - 49a^2b^2$.

   A. $7a^2b(3 - 7b)$ B. $7a^2b(3b - 7)$
   C. $7a^2(3b - 7b)$ D. $7ab(3a - 7b)$

6. Factorise $2a(a + b) - 5(a + b)$.

   A. $(a + b)(2a - 5)$ B. $(a + b)(2a + 5)$
   C. $(a + 5)(2a - b)$ D. $(a - b)(2a - 5)$

7. Factorise $ab + ac - db - dc$

A. $(a + d)(b - c)$ B. $(a - c)(b + d)$
C. $(a - d)(b + c)$ D. $(a - b)(d + c)$

8. Factorise $9r^2 - 6pr - 6r + 4p$

A. $(3r - 2p)(3r + 2)$ B. $(3r - 2p)^2$
C. $(3r + 2p)(3r - 2)$ D. $(3r - 2p)(3r - 2)$

9. Factorise $p^2 + 11p + 30$.

A. $(p + 5)(p + 6)$ B. $(p + 4)(p + 7)$
C. $(p + 9)(p + 2)$ D. $(p + 3)(p + 10)$

10. Factorise $b^2 - 6b - 55$.

A. $(b - 9)(b + 3)$ B. $(b - 11)(b + 5)$
C. $(b - 1)(b + 55)$ D. $(b - 12)(b + 6)$

11. Factorise $g^2 - 15g + 56$.

A. $(g - 8)(g - 7)$ B. $(g - 4)(g - 14)$
C. $(g + 8)(g - 7)$ D. $(g - 9)(g - 6)$

12. Factorise $c^2 + c - 90$.

A. $(c - 6)(c + 15)$ B. $(c - 10)(c + 11)$
C. $(c - 10)(c + 9)$ D. $(c - 9)(c + 10)$

13. Factorise $36k^2 - 25r^2$.

A. $(5k - 6r)(6k + 5r)$ B. $(6k - 5r)(6k + 5r)$
C. $(6k - 5r)^2$ D. $(6k + 5r)^2$

14. Factorise $3c^2 - c - 14$.

A. $(3c + 2)(c - 7)$ B. $(3c + 2)(c - 7)$

C. $(3c - 7)(c + 2)$ D. $(3c + 7)(c - 2)$

15. Factorise $10a^2 + 23a - 5$.

A. $(2a + 1)(5a + 1)$ B. $(5a + 1)(2a - 5)$

C. $5(2a - 1)(a + 1)$ D. $(5a - 1)(2a + 5)$

16. Factorise $8z^2 + 4z - 60$.

A. $4(2z - 3)(z + 5)$ B. $(4z - 5)(2z + 12)$

C. $4(2z - 5)(z + 3)$ D. $8(z - 5)(z + 3)$

High School Mathematics Test 2015

Year 10

Factorisation

Calculator Allowed

Name_____

Section 3 Longer Answer Section

Write all working and answers in the spaces provided on this test paper.

Marks

1. Simplify the following algebraic fractions, by first factorising.

(a) $\dfrac{6m^2 + 3mn}{16m + 8n}$. **2**

……

……

(b) $\dfrac{2r+6}{5} \times \dfrac{10}{4r^2 + 12r}$. **2**

……

……

2. Simplify the following algebraic fractions, by first factorising.

(a) $\dfrac{3x^2 + 16x + 5}{x^3 + 5x^2}$. **2**

……

……

(b) $\dfrac{x^2 + 3x}{x^2 + x - 2} \times \dfrac{x^2 - x - 6}{x^2 - 9}$ **3**

……

……

(c) $\dfrac{w^2 + 10w + 25}{3w^2 + 6w} \div \dfrac{w^2 + 3x - 10}{w^2 - 4}$ **3**

……

……

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Multiple Choice Answer Sheet

Factorisation

Name _____

Completely fill the response oval representing the most correct answer.

1.	A ⬭	B ⬭	C ⬭	D ⬭
2.	A ⬭	B ⬭	C ⬭	D ⬭
3.	A ⬭	B ⬭	C ⬭	D ⬭
4.	A ⬭	B ⬭	C ⬭	D ⬭
5.	A ⬭	B ⬭	C ⬭	D ⬭
6.	A ⬭	B ⬭	C ⬭	D ⬭
7.	A ⬭	B ⬭	C ⬭	D ⬭
8.	A ⬭	B ⬭	C ⬭	D ⬭
9.	A ⬭	B ⬭	C ⬭	D ⬭
10.	A ⬭	B ⬭	C ⬭	D ⬭
11.	A ⬭	B ⬭	C ⬭	D ⬭
12.	A ⬭	B ⬭	C ⬭	D ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭
16.	A ⬭	B ⬭	C ⬭	D ⬭

High School Mathematics Test 2015

Year 10 — Factorisation — Non Calculator

Section 1 Short Answer Section

ANSWERS

No.	WORKING	ANSWER
1.	$3m + 18 = 3(m + 6)$	$3(m + 6)$
2.	$12k + 32 = 4(3k + 8)$	$4(3k + 8)$
3.	$11m^2 - 22m = 11m(m - 2)$	$11m(m - 2)$
4.	$-5g^2 - 15gt = -5g(g + 3t)$	$-5g(g + 3t)$
5.	$48d^2e - 32d = 16d(3ed - 2)$	$16d(3ed - 2)$
6.	$25ur + 55ur^2 = 5ur(5 + 11r)$	$5ur(5 + 11r)$
7.	$45y^3z^3 - 40xy^2z^4 = 5y^2z^3(9y - 8xz)$	$5y^2z^3(9y - 8xz)$
8.	$54a^3b + 30a^3b^2 = 6a^3b(9 + 5b)$	$6a^3b(9 + 5b)$
9.	$12e^2g - 18eg + 6e^3g^2 = 6eg(2e - 3 + e^2g)$	$6eg(2e - 3 + e^2g)$
10.	$a(r + 8) - 6(r + 8) = (r + 8)(a - 6)$	$(r + 8)(a - 6)$
11.	$2p^2 + 6pe - 7(p + 3e) = 2p(p + 3e) - 7(p + 3e)$ $= (2p - 7)(p + 3e)$	$(2p - 7)(p + 3e)$
12.	$2a^2 + am + 2ak + mk = a(2a + m) + k(2a + m)$ $= (2a + m)(a + k)$	$(2a + m)(a + k)$

13.	$a^2 + 12a + 32 = (a + 4)(a + 8)$	$(a + 4)(a + 8)$
14.	$y^2 - y - 20 = (y - 5)(y + 4)$	$(y - 5)(y + 4)$
15.	$s^2 - 14s + 45 = (s - 9)(s - 5)$	$(s - 9)(s - 5)$
16.	$m^2 + 5m - 36 = (m - 4)(m + 9)(m - 4)(m + 9)$	$(m - 4)(m + 9)$
17.	$v^2 - 100 = (v - 10)(v + 10)$	$(v - 10)(v + 10)$
18.	$a^2 - 14a + 49 = (a - 7)(a - 7) = (a - 7)^2$	$(a - 7)^2$
19.	$2m^2 - 15m + 27 = 2m^2 - 6m - 9m + 27$ $= 2m(m - 3) - 9(m - 3)$ $= (2m - 9)(m - 3)$	$(2m - 9)(m - 3)$
20.	$12e^2 + 5e - 2 = 12e^2 + 8e - 3e - 2$ $= 4e(3e + 2) - (3e + 2)$ $= (3e + 2)(4e - 1)$	$(3e + 2)(4e - 1)$
21.	$6p^2 - 17p + 7 = 6p^2 - 14p - 3p + 7$ $= 2p(3p - 7) - (3p - 7)$ $= (2p - 1)(3p - 7)$	$(2p - 1)(3p - 7)$
22.	$3x^3y^2 - 12xy^4 = 3xy^2(x^2 - 4y^2)$ $= 3xy^2(x - 2y)(x + 2y)$	$3xy^2(x - 2y)(x + 2y)$

High School Mathematics Test 2015

Year 10 — **Factorisation** — Calculator Allowed

Section 2 Multiple Choice Section

ANSWERS

No.	WORKING	ANSWER
1.	$5y - 25 = 5(y - 5)$	**B**
2.	$a^2 - 12a = a(a - 12)$	**D**
3.	$3u - 12u^2 = 3u(1 - 4u)$	**C**
4.	$12z^2 - 18z = 6z(2z - 3)$	**B**
5.	$21a^2b - 49a^2b^2 = 7a^2b(3 - 7b)$	**A**
6.	$2a(a + b) - 5(a + b) = (2a - 5)(a + b)$	**A**
7.	$ab + ac - db - dc = a(b + c) - d(b + c)$ $= (a - d)(b + c)$	**C**
8.	$9r^2 - 6pr - 6r + 4p = 3r(3r - 2p) - 2(3r - 2p)$ $= (3r - 2p)(3r - 2)$	**D**
9.	$p^2 + 11p + 30 = (p + 5)(p + 6)$	**A**
10.	$b^2 - 6b - 55 = (b - 11)(b + 5)$	**B**
11.	$g^2 - 15g + 56 = (g - 8)(g - 7)$	**A**
12.	$c^2 + c - 90 = (c - 9)(c + 10)$	**D**
13.	$36k^2 - 25r^2 = (6k - 5r)(6k + 5r)$	**B**
14.	$3c^2 - c - 14 = 3c^2 + 6c - 7c - 14$ $= 3c(c + 2) - 7(c + 2)$ $= (3c - 7)(c + 2)$	**C**

15.	$10a^2 + 23a - 5 = 10a^2 + 25a - 2a - 5$ $= 5a(2a + 5) - (2a + 5)$ $= (5a - 1)(2a + 5)$	**D**
16.	$8z^2 + 4z - 60 = 4(2z^2 + z - 15)$ $= 4(2z^2 + 6z - 5z - 15)$ $= 4(2z(z + 3) - 5(z + 3))$ $= 4(2z - 5)(z + 3)$	**C**

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Multiple Choice Answer Sheet

Factorisation

Name _____ANSWERS_____

Completely fill the response oval representing the most correct answer.

1.	A ○	B ●	C ○	D ○
2.	A ○	B ○	C ○	D ●
3.	A ○	B ○	C ●	D ○
4.	A ○	B ●	C ○	D ○
5.	A ●	B ○	C ○	D ○
6.	A ●	B ○	C ○	D ○
7.	A ○	B ○	C ●	D ○
8.	A ○	B ○	C ○	D ●
9.	A ●	B ○	C ○	D ○
10.	A ○	B ●	C ○	D ○
11.	A ●	B ○	C ○	D ○
12.	A ○	B ○	C ○	D ●
13.	A ○	B ●	C ○	D ○
14.	A ○	B ○	C ●	D ○
15.	A ○	B ○	C ○	D ●
16.	A ○	B ○	C ●	D ○

High School Mathematics Test 2015

Year 10	Factorisation	Calculator Allowed

Section 3 Longer Answer Section

ANSWERS

		Marks
1.	(a) $\dfrac{6m^2 + 3mn}{16m + 8n} = \dfrac{3m(2m + n)}{8(2m + n)} = \dfrac{3m}{8}$	**2 marks for correct answer** **1 mark for answer with some correct factorisation or cancellation**
	(b) $\dfrac{2r + 6}{5} \times \dfrac{10}{4r^2 + 12r} = \dfrac{2(r + 3)}{5} \times \dfrac{10}{4r(r + 3)} = \dfrac{20}{20r} = \dfrac{1}{r}$	**2 marks for correct answer** **1 mark for answer with some correct factorisation or cancellation**
2.	(a) $\dfrac{3x^2 + 16x + 5}{x^3 + 5x^2} = \dfrac{(3x + 1)(x + 5)}{x^2(x + 5)} = \dfrac{3x + 1}{x^2}$	**2 marks for correct answer** **1 mark for answer with some correct factorisation or cancellation**
	(b) $\dfrac{x^2 + 3x}{x^2 + x - 2} \times \dfrac{x^2 - x - 6}{x^2 - 9} = \dfrac{x(x + 3)}{(x + 2)(x - 1)} \times \dfrac{(x - 3)(x + 2)}{(x + 3)(x - 3)} = \dfrac{x}{x - 1}$	**3 marks for correct answer** **2 marks for otherwise correct answer with minor error** **1 mark for answer with some correct factorisation or cancellation**

	(c) $\frac{w^2 + 10w + 25}{3w^2 + 6w} \div \frac{w^2 + 3x - 10}{w^2 - 4} = \frac{w^2 + 10w + 25}{3w^2 + 6w} \times \frac{w^2 - 4}{w^2 + 3x - 10}$ $= \frac{(w + 5)\cancel{(w + 5)}}{3w\cancel{(w + 2)}} \times \frac{\cancel{(w + 2)}\cancel{(w - 2)}}{\cancel{(w + 5)}\cancel{(w - 2)}}$ $= \frac{w + 5}{3w}$	**3 marks for correct answer** **2 marks for otherwise correct answer with minor error** **1 mark for answer with some correct factorisation or cancellation**