9M1 Rational Numbers and Algebra Topic Test Name_____

Calculators may be used.

All necessary working must be shown to gain full marks.

1. Express $\frac{1}{3}$ as:

a) a decimal

b) a percentage

2. Convert 12·5% to:

a) a decimal

b) a fraction in simplest form

3. Convert 0·225 to:

a) a percentage

b) a fraction in simplest form.

4. Write the following decimals in ascending order.

0·303, 0·333, 0·003, 0·330, 0·033

5. Express 44 as a percentage of 80

6. a) Decrease 720 by 12·5%

b) I f 6% of my prizemoney is $90.

Find the value of the prize?

7. What is the overall percentage change after a percentage increase of 25% is followed by a percentage decrease of 10%?

8. Convert the speed of 40km/h to m/s.

9. Round these numbers to three significant figures.

a) 3·0576 b) 69 817

10. How many significant figures in 0·0307?

11. Convert $0\dot{7}\dot{2}$ to a simple fraction.

(Working must be shown)

Let x =

12. Find a cubic number which is also a square number?

13. Find a number whose factors are

1,2,3,4,6,9,12,18,36

14. List two examples of numbers where the square root of the number is also a square number.

_____

15. Write a 6 digit palindromic number.

16. Complete the number patterns:

a) 1 , 8, 27, _____, _____, _____, _____,

b) 1 , 1, 2, 3, 5, 8, _____, _____, _____

17. Write the next two consecutive even numbers

$2n$, _____, _____

18. Evaluate when $a = -3$, $b = 6$ and $c = 9$

a) $5a^2$ =

b) $\sqrt{b^2 - 4ac}$ =

19. Simplify

a) 5p+9y−p +3y = _____

b) $5x^2y + 3yx^2 =$ _____

c) $2ab \times 4bc =$ _____

d) $\frac{4y^2}{3x} \times \frac{3x}{8y}$ =

e) $\frac{6e^3f}{15h} \div \frac{2e}{5h} =$

f) $\frac{7x}{2} + \frac{2x}{3} =$

g) $\frac{2x+1}{4} - \frac{x-1}{5} =$

20. Write an algebraic expression for :

a) 4 less than the product of of n and 9

b) the average of a, b, and c

21. Expand and simplify if possible

a) $(p + 5)(p + 3) =$

=

b) $(2m - 3)(3m - 8) =$

=

c) $(10 - 3y)(2 + y) =$

=

22. Expand these perfect squares

a) $(y+5)^2 =$

b) $(4x-3)^2 =$

c) $\left(m+\frac{5}{2}\right)^2 =$

23. Complete these perfect squares

a) $(p - \_\_\_\_\_)^2 = \_\_\_\_ - 12p + 36$

b) $(\_\_\_\_\_)^2 = 9x^2 + \_\_\_\_\_ + 100$

c) $(\_\_\_\_\_)^2 = h^2 + 22h + \_\_\_\_\_$

24. Expand and simplify if possible

a) $(y+5)(y+3)(y-1)$

25. Use the difference of two squares method to expand

a) $(d-5)(d+5) =$

b) $(3y+11)(3y-11) =$

26. Expand and simplify:

a) $(p+3)^2 - (p-2)(p+2)$

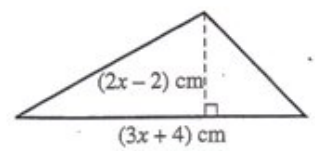
b) $2(9x-2y)^2$

27. Factorise

a) $4x + 8 =$

b) $9x^2y - 3xy^2 =$

28.



$A = \frac{1}{2}bh,$

Write an expanded expression for the area

YEAR 9 Algebra Extension
May 2007

Answer in the space provided.
Calculators may be used.

NAME: _____

1. Evaluate the following if $a=-3, b=8$ and $c=-6$.

a) $(b-a)(b+c)$ (2 marks)

b) $\dfrac{b-2c}{a-1}$ (2 marks)

2. Take the sum of t^2-t+4 and $2t^2+17t+9$ from $4t^2+9t+20$. (2 marks)

3. Expand and simplify the following:

a) $8u(u-2)-5u(7-u)$ (2 marks)

b) $3(x-7)-(x+4)$ (2 marks)

4. Factorise fully:

a) $4a^2+10a^2bc$ (1 mark)

b) $2x^2+2xy-6x$ (1 mark)

c) $-mn-km$ (1 mark)

d) $y(2s+3)-z(2s+3)$ (1 mark)

5. Simplify the following algebraic fractions:

a) $\dfrac{5k}{12n}+\dfrac{7k}{8n}$ (2 marks)

b) $\dfrac{7e-1}{8}-\dfrac{2e-5}{3}$ (2 marks)

c) $\dfrac{44r}{35pq}\times\dfrac{10p}{99rs}$ (2 marks)

d) $\dfrac{8e}{21f^2}\div\dfrac{24e^2}{35f}$ (2 marks)

e) $\dfrac{a^2+2a}{21x-21y}\times\dfrac{14x-14y}{5a+10}$ (2 marks)

Hint: factorise first

6. Expand and simplify:

a) $(1+2g)(9-2g)$ (2 marks)

b) $2(c+3)(c+2)$ (2 marks)

c) What expression should $(n+3)$ be multiplied by to give $n^2+10n+21$ (1 mark)

d) $(a+1)(a+2)(a-3)$ (2 marks)

7. Expand these perfect squares:

a) $(2c+5)^2$ (1 mark)

b) $(7j-6k)^2$ (1 mark)

c) $(x+\frac{3}{2})^2$ (2 marks)

8. Complete these perfect squares:

a) $(a-6)^2 = a^2 - 12a + \_\_\_\_\_$ (1 mark)

b) $(d+4)^2 = d^2 + \_\_\_\_\_ + 16$ (1 mark)

c) $(\_\_\_\_)^2 = t^2 + 22t + \_\_\_\_\_$ (2 marks)

9. Expand and simplify:

$2x(9x-2y)^2$ (2 marks)

10. Expand:

a) $(k-8)(k+8)$ (1 mark)

b) $(ab-6c)(ab+6c)$ (2 marks)

11. Expand and simplify:

$(x-5)^2+(x+4)(x-4)$ (2 marks)

12. Use a perfect square expansion to evaluate

107^2 (no calc. working must be shown)

(2 marks)

YEAR 9 Algebra Extension
May 2007

Answer in the space provided.
Calculators may be used.

NAME: ANSWERS

1. Evaluate the following if $a = -3, b = 8$ and $c = -6$.

a) $(b-a)(b+c)$ (2 marks)

$= (8+3)(8-6)$

$= 11 \times 2$

$= 22$

b) $\dfrac{b-2c}{a-1}$ (2 marks)

$= \dfrac{8-2(-6)}{-3-1}$

$= \dfrac{20}{-4} = -5$

2. Take the sum of $t^2 - t + 4$ and $2t^2 + 17t + 9$ from $4t^2 + 9t + 20$. (2 marks)

$3t^2 + 16t + 13$

$4t^2 + 9t + 20 - (3t^2 + 16t + 13)$

$= t^2 - 7t + 7$

3. Expand and simplify the following:

a) $8u(u-2) - 5u(7-u)$ (2 marks)

$= 8u^2 - 16u - 35u + 5u^2$

$= 13u^2 - 51u$

b) $3(x-7) - (x+4)$ (2 marks)

$= 3x - 21 - x - 4$

$= 2x - 25$

4. Factorise fully:

a) $4a^2 + 10a^2bc$ (1 mark)

$= 2a^2(2 + 5bc)$

b) $2x^2 + 2xy - 6x$ (1 mark)

$= 2x(x + y - 3)$

c) $-mn - km$ (1 mark)

$= -m(n + k)$

d) $y(2s+3) - z(2s+3)$ (1 mark)

$= (2s+3)(y-z)$

5. Simplify the following algebraic fractions:

a) $\dfrac{5k}{12n} + \dfrac{7k}{8n}$ (2 marks)

$= \dfrac{10k}{24n} + \dfrac{21k}{24n}$

$= \dfrac{31k}{24n}$

b) $\dfrac{7e-1}{8} - \dfrac{2e-5}{3}$ (2 marks)

$= \dfrac{3(7e-1)}{24} - \dfrac{8(2e-5)}{24}$

$= \dfrac{21e - 3 - 16e + 40}{24}$

$= \dfrac{5e+37}{24}$ → $\boxed{\dfrac{5e+37}{24}}$

c) $\dfrac{44t}{35pq} \times \dfrac{18p}{99ts}$ (2 marks)

$= \dfrac{8}{63qs}$

d) $\dfrac{8e}{21f^2} \div \dfrac{24e^2}{35f}$ (2 marks)

$= \dfrac{8e}{21f^2} \times \dfrac{35f}{24e^2}$

$= \dfrac{5}{9ef}$

e) $\dfrac{a^2+2a}{21x-21y} \times \dfrac{14x-14y}{5a+10}$ (2 marks)

Hint: factorise first

$= \dfrac{a(a+2)}{21(x-y)} \times \dfrac{14(x-y)}{5(a+2)}$

$= \dfrac{2a}{15}$

48

24

6. Expand and simplify:

a) $(1+2g)(9-2g)$ (2 marks)

$= 9 - 2g + 18g - 4g^2$

$= 9 + 16g - 4g^2$

b) $2(c+3)(c+2)$ (2 marks)

$= 2(c^2 + 5c + 6)$

$= 2c^2 + 10c + 12$

c) What expression should $(n+3)$ be multiplied by to give $n^2 + 10n + 21$ (1 mark)

$(n+7)$

d) $(a+1)(a+2)(a-3)$ (2 marks)

$= (a^2 + 3a + 2)(a-3)$

$= a^3 + 3a^2 + 2a - 3a^2 - 9a - 6$

$= a^3 - 7a - 6$

7. Expand these perfect squares:

a) $(2c+5)^2$ (1 mark)

$= 4c^2 + 20c + 25$

b) $(7j-6k)^2$ (1 mark)

$= 49j^2 - 84jk + 36k^2$

c) $(x+\frac{3}{2})^2$ (2 marks)

$= x^2 + 3x + \frac{9}{4}$

8. Complete these perfect squares:

a) $(a-6)^2 = a^2 - 12a + \underline{36}$ (1 mark)

b) $(d+4)^2 = d^2 + \underline{8d} + 16$ (1 mark)

c) $(\underline{t+11})^2 = t^2 + 22t + \underline{121}$ (2 marks)

9. Expand and simplify:

$2x(9x-2y)^2$ (2 marks)

$= 2x(81x^2 - 36xy + 4y^2)$

$= 162x^3 - 72x^2y + 8xy^2$

10. Expand:

a) $(k-8)(k+8)$ (1 mark)

$= k^2 - 64$

b) $(ab-6c)(ab+6c)$ (2 marks)

$= a^2b^2 - 36c^2$

11. Expand and simplify:

$(x-5)^2 + (x+4)(x-4)$ (2 marks)

$= x^2 - 10x + 25 + x^2 - 16$

$= 2x^2 - 10x + 9$

12. Use a perfect square expansion to evaluate 107^2 (no calc. working must be shown)

(2 marks)

$107^2 = (100+7)^2$

$= 10000 + 1400 + 49$

$= 11449$

Topic test 2 Algebra

- Time allowed: 45 minutes.
- Part A: 20 multiple-choice questions (40 marks)
- Part B: 8 free-response questions (60 marks)

Name: _____

Part A

20 multiple-choice questions

2 marks each: 40 marks

Circle the correct answer.

1 Simplify $5x - 3y + 6y - x$.

A $5 + 3y$ B $4x - 9y$

C $6x + 9y$ D $4x + 3y$

2 If $a = -3$, then evaluate $4a - 2$.

A -14 B -9

C -1 D 10

3 Which is the correct formula for this table?

m	5	6	7	8	9
t	15	17	19	21	23

A $t = m + 10$ B $t = 3m - 1$

C $t = 2m + 5$ D $t = 5m + 2$

4 Simplify $3ku \times 4ru$.

A $7kru$ B $7kru^2$

C $12kru^2$ D $12kru$

5 Expand $-2(3t - 4)$.

A $-5t + 8$ B $-5t - 6$

C $-6t + 8$ D $-6t - 6$

6 If p is an odd number, then the next ***even*** number is:

A $p + 1$ B. $p + 2$

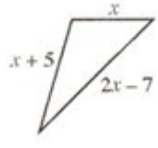
C $2p + 1$ D $3p$

7 Simplify $6a \div a$.

A $5a$ B 6

C $6a$ D a

8 The perimeter of this triangle is:



A $3x - 2$

B $3x + 12$

C $4x - 2$

D $4x + 2$

9 The sum of the angles in degrees in a shape with n sides is given by the formula $A = 180(n - 2)$. What is the sum of the angles in a hexagon (6 sides)?

A 720° B 270°

C 1078° D 360°

10 Which expression below means 'the number 4 less than y'?

A $y - 4$ B. $4 - y$

C $\frac{y}{4}$ D $\frac{4}{y}$

11 Which one of these is *not* a factor of $5ab^2$ and $10b^2$?

A $2a$ B b

C $5b$ D b^2

12 Simplify $\frac{6de^2}{3de}$.

A 2 B $2e$

C $3e$ D $\frac{2}{e}$

13 Simplify $\frac{2u}{5} \times \frac{u}{8}$.

A $\frac{u^2}{20}$ B $\frac{3u}{13}$

C $\frac{11u}{40}$ D $\frac{u^2}{40}$

14 Factorise $3a^2 + 24a$.

A $3(a^2 + 8)$ B $3a(a + 8)$

C $3(a^2 + 12)$ D $3a(a + 12)$

15 If $f = 3$ and $g = -1$, then evaluate $f^2 + g^2$.

A 5 B 8

C 10 D 7

16 Simplify $\frac{5m}{2} + \frac{4m}{3}$.

A $\frac{9m^2}{5}$ B $\frac{9m}{5}$

C $\frac{23m}{6}$ D $\frac{3m}{2}$

17 Expand and simplify: $3(3d - 7) - 2(d + 4)$.

A $4d - 4$ B $7d + 13$

C $7d - 16$ D $7d - 29$

18 Simplify $\frac{4xy \times 15x}{6y}$.

A $10xy$ B $10x$

C $10x^2$ D $10x^2y^2$

19 Simplify $\frac{r}{4} \div \frac{r}{2}$.

A $\frac{r^2}{8}$ B $\frac{1}{8}$

C $\frac{1}{2}$ D 2

20 The change (in dollars) from \$100 after buying n books at \$6 each can be written as:

A $6(100 - n)$ B $\frac{100 - n}{6}$

C $6n - 100$ D $100 - 6n$

Part B

8 free-response questions

60 marks

Show working where appropriate.

21 (12 marks) Simplify:

a $3n + p + 4n + p$

b $2u - 3 - u - 3$

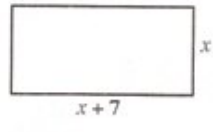
c $-3r + 5u + 4r + u$

d $4m - 5m + 7d - 2m$

e $-5k \times 4p$

f $-2rt \times (-9t)$

22 (4 marks) For this rectangle, write a simplified algebraic expression for:



a its perimeter

b its area

23 (10 marks) if $a = 8$ and $b = -5$, evaluate:

a $2a + b$

b $3a^2$

c $\frac{10 - b}{5}$

d $\frac{1}{2}ab$

e $\sqrt{2(a - 2b)}$

24 (6 marks) Write an expression for:

a Liz's age in t years if she is 15 this year

b the number of days in k weeks

c increasing the product of p and 5 by 7.

25 (8 marks) Simplify:

a $(4x)^2$ **b** $\frac{-14u}{2u}$

c $\frac{18rt^2}{4t}$ **d** $\frac{30d^2e}{45de^2}$

26 (6 marks) Expand (and simplify if needed):

a $c(3c + 5)$

b $-2(10x - 4)$

c $2(k + 4) + 3(k - 1)$

27 (8 marks) Factorise:

a $8b + 28$

b $18a - 3$

c $4mn - 10n^2$

d $-3ab - 21$

28 (6 marks) Simplify:

a $\frac{2m}{3} - \frac{m}{5}$

b $\frac{5x^2}{2y} \times \frac{4}{15x}$

c $\frac{3de}{10} \div \frac{6e}{2}$

END OF TEST.