

Name: _____



KAMBALA

MATHEMATICS

YEAR 9 ADVANCED

HALF-YEARLY EXAMINATION

MAY 2002

Time Allowed: 1½ hours plus 5 minutes reading time

INSTRUCTIONS:

- This examination contains three sections:
 - Section A (15 marks): 15 Multiple choice questions
 - Section B (20 marks): 20 Short answer questions
 - Section C (50 marks): 5 Multi-part free response questions each of 10 marks
- Allow approximately 15 minutes for Section A. Answer on the multiple choice answer sheet provided.
- Allow approximately 20 minutes for Section B. Answer all questions in Section B on the examination paper.
- Allow approximately 50 minutes for Section C. Answer all questions on the paper provided. Label your questions carefully and show all necessary working.
- Marks may be deducted for careless or badly arranged work.

SECTION A: Answer on the answer sheet provided [15 marks]

1. $\frac{1}{\pi}$ is closest to

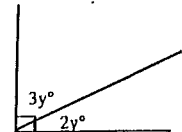
- (A) 0.318 (B) 0.159 (C) 0.5 (D) 0.637

2. 86% of \$289 is:

- (A) \$336.05 (B) \$248.54 (C) \$40.46 (D) \$50.88

3. In the diagram, $y =$

- (A) 54 (B) 36
(C) 28 (D) 18

4. The value of $5 - 4 \times 3^2$ is:

- (A) 9 (B) -31 (C) -139 (D) 7

5. When simplified, the expression $5x + 3 - 2x + 7x - 4$ becomes:

- (A) $14x + 7$ (B) $10x^2 - 1$ (C) $10x - 1$ (D) $x = 0.7$

6. The inequality $x \leq -5$ can be represented by:

- (A) (B)

(C) (D)

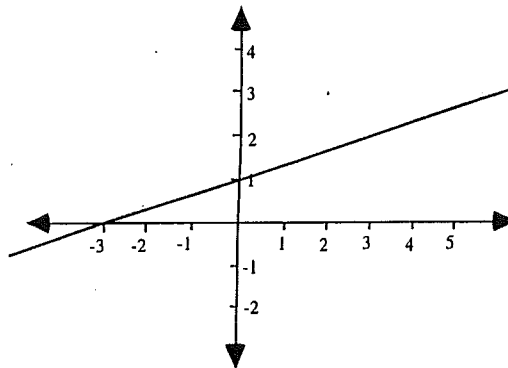
7. The ratio 18 : 72 is equivalent to
- (A) 1 : 4 (B) 9 : 72 (C) 3 : 6 (D) none of these

8. When fully factorised, $3a^2b - 6ab =$
- (A) $3a(b - 2b)$ (B) $3a^2(b - 2ab)$ (C) $3ab(a - 2)$ (D) $3(a^2b - 2ab)$

9. $5^{-\frac{1}{2}} \times 5^{\frac{3}{2}} =$
- (A) 25 (B) 0 (C) 5 (D) 1

10. Choose the true statement about the line sketched in the diagram.

- (A) The y intercept is -3
- (B) The gradient is 3
- (C) The gradient is $\frac{1}{3}$
- (D) The line passes through the point (2,3)



- 11: When $x = -1$, $2x^3 - (3x)^3 =$

- (A) -29 (B) 7 (C) 19 (D) 25

- 12: $a + b + c \times 2$ is equal to

- (A) $a + \frac{b}{c} \times 2$ (B) $\frac{a+b}{c} \times 2$ (C) $a + \frac{b}{c \times 2}$ (D) $\frac{a+b}{c \times 2}$

- 13: Which expression is equivalent to z^8

- (A) $\sqrt{z^{64}}$ (B) $z^4 \times z^2$ (C) $(z^2)^4$ (D) $z^{16} + z^2$

- 14: $\frac{2x^2}{5} - \frac{3x^2}{4} =$

- (A) $\frac{-x^2}{9}$ (B) $\frac{-7x^2}{9}$ (C) $\frac{-7x^2}{20}$ (D) $\frac{-x^2}{20}$

- 15: If $z < 0 < w$ then:

- (A) z is negative and w is negative (B) z is negative and w is positive
- (C) z is positive and w is negative (D) z is positive and w is positive

end of multiple choice section

Section B Answer in the spaces provided [20 marks]

1. Find 3^0

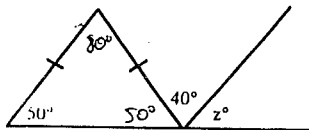
2. Find 3^{-2} as a fraction

3. Calculate $(3 \times 10^5) + (8 \times 10^{-4})$

4. A *Boysgermis* bacteria is found to be 2.5×10^{-7} metres long. How many of them would be needed end to end to stretch a metre?

5. How many cms in 8.265 kms?

6. What is the value of z in the diagram?



7. $\frac{5}{2\sqrt{a}} = \frac{5a^{-\frac{1}{2}}}{2}$ True or false?

8. Simplify $3a(a-2) + 4(3-a^2)$

9. Evaluate $\sqrt{\frac{3+2\frac{1}{4}}{3-1\frac{1}{4}}}$ to 3 decimal places

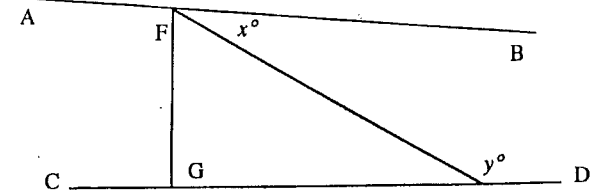
10. Write the expression $\sqrt[3]{x}$ in the form $x^{\frac{p}{q}}$

11. Write 0.0086742 in scientific notation correct to 3 significant figures

12. Zdenka works as a maths coach and spends 18% of her earnings on a new *Mobius 18* CD which costs \$28.80. How much money does she earn?

13. Simplify $\frac{3x}{4} - \frac{5x}{3}$

14. The angles marked x and y add to 180° . What can be said about the lines AB and CD and why?



15. On the number line below, indicate the solution to the inequality $\frac{2x}{3} < 4$



16. Expand $(x-3)(x+3)$

17. Find a fraction that is in between $\frac{3}{5}$ and $\frac{1}{2}$

18. If $x^y = 3$ find the value of x^{3y}

19. Circle the one statement below that is **NOT** true:

(A) $(a+b)(a-b) = a^2 - b^2$

(B) $5p - 21 = -6$
 $\therefore p = -3$

(C) $49^0 + \sqrt{49} = 8$

(D) $-4(2-p) = 4p - 8$

20. 10 white, 10 green and 10 violet marbles of identical size and texture are placed in a bag. Without looking, how many marbles must you take out to be certain you have 3 marbles of different colours?

Section C

[50 marks]

- Answer on the paper provided
- Marks may be deducted for careless or badly arranged work

Question 1: Start a new page

[10 marks]

- (a) Simplify the following:

(i) $8(x-1) - 3x + 1$

[1]

(ii) $25^{-\frac{1}{2}}$ leaving your answer as a simple fraction

[1]

(iii) $\frac{2^{-2}x^5}{3^{-1}x^{-2}}$ leaving your answer with positive indices

[2]

- (b) Expand the grouping symbols and simplify:

(i) $(x-1)(x-5)$

[2]

(ii) $(3x-2)(2x-1)$

[2]

- (c) Find the value of S in the formula $S = \frac{n(a+2b)}{2}$
when $a = 3$, $b = -4$ and $n = 6$

[2]

Question 2: Start a new page

[10 marks]

Solve:

(i) $8(x-1) = 3(x+1)$

[2]

(ii) $\frac{3x-4}{4} = 5$

[2]

(iii) $\frac{2x-1}{3} - 2 = \frac{5-x}{2}$

[3]

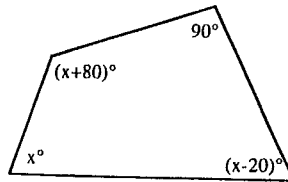
(iv) $2x-5 > 3(2-x)$

[3]

Question 3: Start a new page

[10 marks]

- (a) Form an equation and find the value of x in the quadrilateral given below [3]



- (b) The light from the newly discovered star *Kninus Kambalae* takes 15 years to reach Earth. If light travels at 300 000 kilometres a second, how far is *Kninus Kambalae* from Earth (to 3 significant figures in scientific notation). Assume there are 365 days in a year for the calculation. [3]

- (c) Find the value of x in the following:

(i) $3^x = \frac{1}{27}$ [1]

(ii) $\frac{8^{x-2}}{2^{-5}} = 16$ [3]

Question 4: Start a new page

[10 marks]

- (a) A line has equation $y = \frac{2}{3}x - 2$

- (i) What is the gradient m of the line? [1]
 (ii) What is its y intercept? [1]
 (iii) Does it go through the point (6,2)? Explain your answer. [1]
 (iv) Sketch the line on a suitably labelled set of axes. [2]

- (b) The formula $V = \frac{4\pi R^3}{3}$ gives the volume V of a sphere with radius R . Change the formula so that R becomes the subject of the formula. [2]

- (c) The equation $\frac{4x-1}{3} = 3$ has the solution $x = \frac{5}{2}$.

By changing **one number** in the original equation, write an equation that has a solution of $x = \frac{10}{3}$. Show your solution of the new equation. [3]

Question 5: Start a new page

[10 marks]

- (a) Tim was checking his friend Katherine's working in an equation problem, and thought he had found a mistake, so he did it himself. Katherine's working is shown below in *Column 1*, and Tim's in *Column 2*.

Column 1
Katherine's working

$$\frac{3x-1}{4} + 3 = 7$$

$$(3x-1) + 3 = 28 \quad \text{line 1}$$

$$3x + 2 = 28 \quad \text{line 2}$$

$$3x = 26 \quad \text{line 3}$$

$$x = \frac{26}{3} \quad \text{line 4}$$

Column 2
Tim's working

$$\frac{3x-1}{4} + 3 = 7$$

$$\frac{3x-1}{4} = 4 \quad \text{line a}$$

$$\frac{3x}{4} = 5 \quad \text{line b}$$

$$3x = 20 \quad \text{line c}$$

$$x = \frac{20}{3} \quad \text{line d}$$

Both Katherine and Tim have made a mistake in their working. Indicate the line in which each one made the error and explain what the mistake they made was. [4]

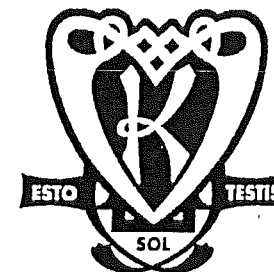
(b) Find the value of $1 - \frac{1}{1 - \frac{1}{1 - \frac{1}{11}}}$ [2]

(c) A Maths teacher gives out Mars bars to those students who successfully solve his problem of the week questions. By the end of Term 2 he had given out 18 Mars bars altogether, although no two of the five students who won them received the same number of bars. One student got the same number as three of the others combined. How were the Mars bars distributed among the five students? Could they have been distributed in more than one way? [2]

(d) A six digit number is formed by repeating a three digit number, for example 321321 or 121121 or 302302

11 is one of the factors of all such numbers.

What is the largest factor of all such numbers? [2]



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14/15

SECTION A: Answer on the answer sheet provided [15 marks]

1. $\frac{1}{\pi}$ is closest to

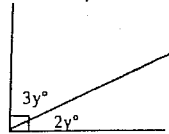
- (A) 0.318 (B) 0.159 (C) 0.5 (D) 0.637

2. 86% of \$289 is:

- (A) \$336.05 (B) \$248.54 (C) \$40.46 (D) \$50.88

3. In the diagram, $y =$

- (A) 54 (B) 36
(C) 28 (D) 18



4. The value of $5 - 4 \times 3^2$ is:

- (A) 9 (B) -31 (C) -139 (D) 7

5. When simplified, the expression $5x + 3 - 2x + 7x - 4$ becomes:

- (A) $14x + 7$ (B) $10x^2 - 1$ (C) $10x - 1$ (D) $x = 0.7$

6. The inequality $x \leq -5$ can be represented by:

- (A) (B) (C) (D)

7. The ratio 18 : 72 is equivalent to

- (A) 1 : 4 (B) 9 : 72 (C) 3 : 6 (D) none of these

8. When fully factorised, $3a^2b - 6ab =$

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

9. $5^{\frac{1}{2}} \times 5^{\frac{3}{2}} =$

- (A) 25 (B) 0 (C) 5 (D) 1

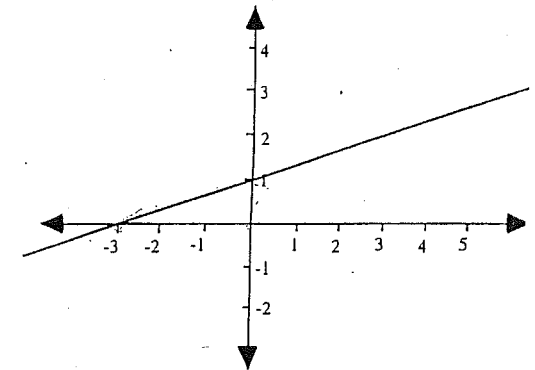
10. Choose the true statement about the line sketched in the diagram.

(A) The y intercept is -3

(B) The gradient is 3

(C) The gradient is $\frac{1}{3}$

(D) The line passes through the point (2,3)



11. When $x = -1$, $2x^3 - (3x)^3 =$

- (A) -29 (B) 7 (C) 19 (D) 25

$(-1)^3 = -1$
 $2(-1)^3 = -2$
 $(3(-1))^3 = (-3)^3 = -27$
 $-2 - (-27) = -2 + 27 = 25$

12: $a+b+c \times 2$ is equal to $\frac{b}{c} \times 2 + c$

- ✓ (A) $a + \frac{b}{c} \times 2$ (B) $\frac{a+b}{c} \times 2$ (C) $a + \frac{b}{c \times 2}$ (D) $\frac{a+b}{c \times 2}$

13: Which expression is equivalent to z^4

- (A) $\sqrt{z^{64}}$ (B) $z^4 \times z^2$ ✓ (C) $(z^2)^4$ (D) $z^{16} + z^2$

14: $\frac{2x^2}{5} - \frac{3x^2}{4} = \frac{8x^2}{20} - \frac{15x^2}{20} = -\frac{7x^2}{20}$

- (A) $\frac{-x^2}{9}$ (B) $\frac{-7x^2}{9}$ ✓ (C) $\frac{-7x^2}{20}$ (D) $\frac{-x^2}{20}$

15: If $z < 0 < w$ then:

- (A) z is negative and w is negative
 (B) z is negative and w is positive ✓
 (C) z is positive and w is negative
 (D) z is positive and w is positive

end of multiple choice section

Section B Answer in the spaces provided 18/20 [20 marks]

1. Find 3^0 ✓

2. Find 3^{-2} as a fraction ✓

3. Calculate $(3 \times 10^5) + (8 \times 10^4)$ ✓

4. A *Boysgermis* bacteria is found to be 2.5×10^{-7} metres long. How many of them would be needed end to end to stretch a metre? ✓

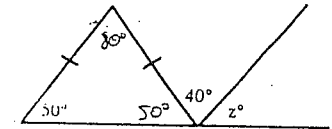
4,000,000 ✓

5. How many cms in 8.265 kms? ✓

826500 ✓

6. What is the value of z in the diagram? ✓

90° ✓



7. $\frac{5}{2\sqrt{a}} = \frac{5a^{-\frac{1}{2}}}{2}$ True or false? ✓

True ✓

8. Simplify $3a(a-2) + 4(3-a^2)$

$3a^2 - 6a + 12 - 4a^2$
 ~~$12a^2 - 6a$~~
 $12 - a^2 - 6a$ ✓

9. Evaluate $\sqrt{\frac{3+2\frac{1}{2}}{3-1\frac{1}{4}}}$ to 3 decimal places

1.773 ✓

10. Write the expression $\sqrt[3]{x}$ in the form $x^{\frac{p}{q}}$

$x^{\frac{1}{3}}$ ✓

11. Write 0.0086742 in scientific notation correct to 3 significant figures

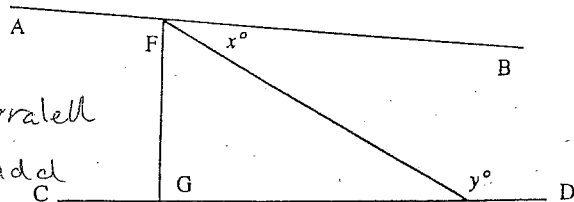
8.67×10^{-3}

12. Zdenka works as a maths coach and spends 18% of her earnings on a new Mobius 18 CD which costs \$28.80. How much money does she earn?

\$160 ✓

13. Simplify $\frac{3x}{4} - \frac{5x}{3} = -\frac{11x}{12}$ ✓

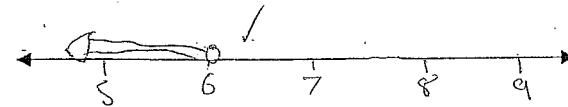
14. The angles marked x and y add to 180° . What can be said about the lines AB and CD and why?



They are parallel because x and y add to 180° , therefore they can be said to be co-interior. Since x and y are co-interior, then AB and CD must be parallel.

15. On the number line below, indicate the solution to the inequality $\frac{2x}{3} < 4$

$2x < 12$
 $x < 6$ ✓



16. Expand $(x-3)(x+3)$

$x^2 - 9$ ✓

17. Find a fraction that is in between $\frac{3}{5}$ and $\frac{1}{2}$

$\frac{6}{10}$ $\frac{5}{10}$
 $\frac{11}{20}$ ✓

18. If $x^y = 3$ find the value of x^{3y}

$(x^y)^3 = 3^3 = 27$ ✓

19. Circle the one statement below that is NOT true:

(A) $(a+b)(a-b) = a^2 - b^2$

(B) $5p - 21 = -6$
 $\therefore p = -3$

(C) $49^\circ + \sqrt{49} = 8$

(D) $-4(2-p) = 4p - 8$

20. 10 white, 10 green and 10 violet marbles of identical size and texture are placed in a bag. Without looking, how many marbles must you take out to be certain you have 3 marbles of different colours?

23 4

$\frac{25}{203} \times 30$
 $= 3.69$
 ≈ 4

Section C

- Answer on the paper provided
- Marks may be deducted for careless or badly arranged work

46
50
v. Good!
[50 marks]

Question 1: Start a new page [10 marks]

(a) Simplify the following:

(i) $8(x-1) - 3x + 1 = 8x - 8 - 3x + 1 = 5x - 7$ [1]

(ii) $25^{-\frac{1}{2}}$ leaving your answer as a simple fraction $\frac{1}{\sqrt{25}} = \frac{1}{5}$ [1]

(iii) $\frac{2^{-2}x^5}{3^{-1}x^{-2}}$ leaving your answer with positive indices $\frac{\frac{1}{4}x^5}{\frac{1}{3}x^2} = \frac{3x^3}{4}$ [2]

(b) Expand the grouping symbols and simplify:

(i) $(x-1)(x-5) = x^2 - 5x - x + 5 = x^2 - 6x + 5$ [2]

(ii) $(3x-2)(2x-1) = 6x^2 - 3x - 4x + 2 = 6x^2 - 7x + 2$ [2]

(c) Find the value of S in the formula $S = \frac{n(a+b)}{2}$ [2]

when $a=3$, $b=-4$ and $n=6$
 $2S = 18 - 48$
 $2S = -30$
 $S = -15$

Question 2: Start a new page [10 marks]

Solve:

(i) $8(x-1) = 3(x+1)$ $8x - 8 = 3x + 3$ $5x = 11$ $x = \frac{11}{5}$ [2]

(ii) $\frac{3x-4}{4} = 5$ $3x - 4 = 20$ $3x = 24$ $x = 8$ [2]

(iii) $\frac{2x-1}{3} - 2 = \frac{5-x}{2}$ $2x - 1 - 6 = 5 - x$ $2x - 7 = 5 - x$ $3x = 12$ $x = 4$ [3]

(iv) $2x - 5 > 3(2-x)$ $2x - 5 > 6 - 3x$ $5x > 11$ $x > \frac{11}{5}$ $x > 2\frac{1}{5}$ [3]

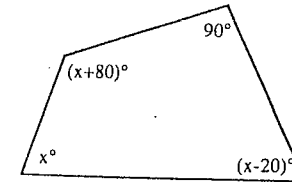
$\frac{4x-2}{6} - \frac{12}{6} = \frac{15-3x}{6}$
 $4x - 2 - 12 = 15 - 3x$
 $4x - 14 = 15 - 3x$
 $7x = 29$
 $x = \frac{29}{7}$

Question 3:

Start a new page

[10 marks]

(a) Form an equation and find the value of x in the quadrilateral given below [3]



$x + (x+80) + (x-20) + 90 = 270$
 $3x + 60 = 270$
 $3x = 210$
 $x = 70$

(b) The light from the newly discovered star *Kninus Kambalae* takes 15 years to reach Earth. If light travels at 300 000 kilometres a second, how far is *Kninus Kambalae* from Earth (to 3 significant figures in scientific notation). Assume there are 365 days in a year for the calculation. [3]

1.41×10^{14}
 $1.41912 \times 10^{14} \sim 1.42 \times 10^{14}$

(c) Find the value of x in the following:

(i) $3^x = \frac{1}{27}$ $x = -3$ [1]

(ii) $\frac{8^{x-2}}{2^{-5}} = 16$ $8^{x-2} = 16 \times 2^{-5} = 16 \times \frac{1}{32} = \frac{1}{2}$ $8^{x-2} = 2^{-1}$ $2^{3(x-2)} = 2^{-1}$ $3(x-2) = -1$ $3x - 6 = -1$ $3x = 5$ $x = \frac{5}{3}$ [3]

Question 4:

Start a new page

[10 marks]

(a) A line has equation $y = \frac{2}{3}x - 2$

- (i) What is the gradient m of the line? [1]
- (ii) What is its y intercept? [1]
- (iii) Does it go through the point $(6,2)$? Explain your answer. [1]
- (iv) Sketch the line on a suitably labelled set of axes. [2]

(b) The formula $V = \frac{4\pi R^3}{3}$ gives the volume V of a sphere with radius R . Change the formula so that R becomes the subject of the formula. [2]

$3V = 4\pi R^3$
 $R = \sqrt[3]{\frac{3V}{4\pi}}$

(c) The equation $\frac{4x-1}{3} = 3$ has the solution $x = \frac{5}{2}$. $4x - 1 = 9$ $4x = 10$
 By changing one number in the original equation, write an equation that has a solution of $x = \frac{10}{3}$. Show your solution of the new equation.

~~20~~ $\frac{20}{6}$ $3x = 10$ ~~3~~ $\frac{3x-1}{3} = 3$ $3x-1 = 9$ $3x = 10$ $x = \frac{10}{3}$

Question 5:

Start a new page

[10 marks]

(a) Tim was checking his friend Katherine's working in an equation problem, and thought he had found a mistake, so he did it himself. Katherine's working is shown below in Column 1, and Tim's in Column 2.

Column 1
Katherine's working

$$\frac{3x-1}{4} + 3 = 7$$

(3x-1) + 3 = 28 line 1 ✓

3x + 2 = 28 line 2

3x = 26 line 3

$x = \frac{26}{3}$ line 4

Column 2
Tim's working

$$\frac{3x-1}{4} + 3 = 7$$

$\frac{3x-1}{4} = 4$ line a

$\frac{3x}{4} = 5$ line b ✓

3x = 20 line c

$x = \frac{20}{3}$ line d

Both Katherine and Tim have made a mistake in their working. Indicate the line in which each one made the error and explain what the mistake they made was.

Katherine — Timed 7 by 4, ~~instead she should have~~ ^{forgot to multiply 3 by 4} ~~minused 3 to both sides~~ [4]

Tim — minused one from both sides, he should have timed 4 by the denominator. ✓ 9

(b) Find the value of $1 - \frac{1}{1 - \frac{1}{1 - \frac{1}{11}}}$ [2]

$1 - \frac{1}{1 - \frac{1}{1 - \frac{1}{11}}}$
 $1 - \frac{1}{1 - \frac{1}{10}}$
 $1 - \frac{1}{\frac{9}{10}}$
 $1 - \frac{10}{9}$
 $-\frac{1}{9}$

(c) A Maths teacher gives out Mars bars to those students who successfully solve his problem of the week questions. By the end of Term 2 he had given out 18 Mars bars altogether, although no two of the five students who won them received the same number of bars. One student got the same number as three of the others combined. How were the Mars bars distributed among the five students? Could they have been distributed in more than one way? [2]

~~2, 1, 3, 4, 8~~
~~1, 3, 4, 8~~
~~2, 1, 3, 4, 8~~
 a) 8, 4, 3, 1, 2 ✓
 b) ~~9, 4, 3, 1, 1~~
 no ✓

(d) A six digit number is formed by repeating a three digit number, for example 321321 or 121121 or 302302

11 is one of the factors of all such numbers.

What is the largest factor of all such numbers? [2]

1001

$29211 \times 11 = 321321$

$90909 \times 11 = 999999$

1, 2, 9,

10