	
Mathematics 2201 Common Mathematics Assessment Sample 2013	
Name:	_____ <i>Key</i> _____
Mathematics Teacher:	_____

28 Selected Response
 13 Constructed Response

28 marks
 42 marks

FINAL

70 Marks

TIME: 2 HOURS

NOTE

Diagrams are not necessarily drawn to scale.

*40% M.C.
 60% L.A.*

FORMULAE

$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$	$a^2 = b^2 + c^2 - 2bc \cos A$	$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$
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$\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$	$z = \frac{x - \mu}{\sigma}$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
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Selected Response: Choose the appropriate response on the answer sheet or SCANTRON.

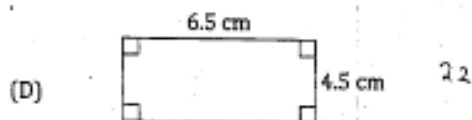
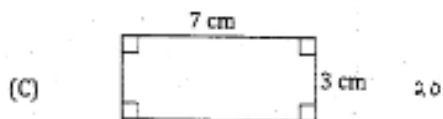
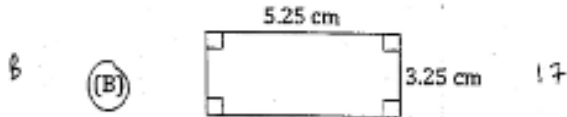
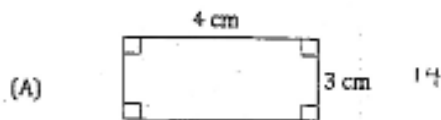
1. Lisa draws four parallelograms and measures all sides. She writes the statement "The opposite sides of a parallelogram are equal" in her notebook. Which term best describes her statement?

A (A) conjecture
 (B) counterexample
 (C) deductive reasoning
 (D) inductive reasoning

2. What is the missing seventh term in the given sequence? {1, 1, 2, 3, 5, 8, ?, 21}

C (A) 11
 (B) 12
 (C) 13
 (D) 14

3. Which figure is a counterexample to the statement below?
 "The perimeter of a rectangle is never an odd number."



4. If $\angle 1 = \angle 2$ and $\angle 1 = \angle 3$, which property proves that $\angle 2 = \angle 3$?

C (A) commutative
 (B) supplementary angles
 (C) transitive
 (D) vertically opposite angles

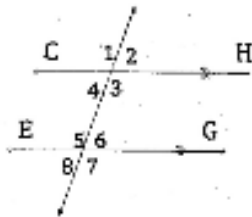
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5. What is the sum of the interior angles of a convex polygon with 14 sides?

- (A) 2160° $14(180) - 360$
 (B) 2340° $14(180) - 360$
 (C) 2520° $14(180)$
 (D) 2880° $14(180)$

6. An incorrect solution is provided to the question below. In which step did the **first** error occur?

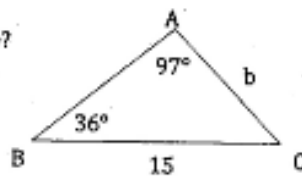
Question: Given $CH \parallel EG$ and $\angle 1 = 120^\circ$, what is the measure of $\angle 7$?



- Solution:
 Step 1: $\angle 1 = \angle 3$ ✓
 Step 2: $\angle 3 = \angle 6$
 Step 3: $\angle 7 = 180^\circ - \angle 6$
 Step 4: $\angle 7 = 180^\circ - 120^\circ = 60^\circ$

- (A) 1
 (B) 2
 (C) 3
 (D) 4

7. What is the length of side b ?



$$\frac{b}{\sin 36^\circ} = \frac{15}{\sin 97^\circ}$$

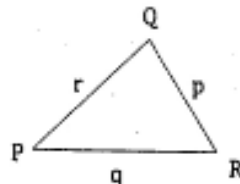
$$b \sin 97^\circ = 15 \sin 36^\circ$$

$$b = \frac{15 \sin 36^\circ}{\sin 97^\circ}$$

- (A) 8.9
 (B) 11.1
 (C) 18.7
 (D) 25.3

8. Which expression is equal to $\sin Q$?

- (A) $\frac{q}{r \sin R}$
 (B) $\frac{r}{q \sin R}$
 (C) $\frac{q \sin R}{r}$
 (D) $\frac{r \sin R}{q}$



$$\frac{q}{\sin Q} = \frac{p}{\sin P} = \frac{r}{\sin R}$$

$$r \sin Q = q \sin R$$

$$\sin Q = \frac{q \sin R}{r}$$

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9. Simplify completely: $12\sqrt{40} - 7\sqrt{10}$
- (A) $5\sqrt{30}$
 (B) $17\sqrt{10}$
 (C) $19\sqrt{30}$
 (D) $41\sqrt{10}$

$$12\sqrt{4 \cdot 10} - 7\sqrt{10}$$

$$24\sqrt{10} - 7\sqrt{10}$$

$$17\sqrt{10}$$

10. Simplify completely: $\frac{5\sqrt{15}}{2\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$
- (A) $\frac{5\sqrt{10}}{4}$
 (B) $\frac{15\sqrt{10}}{4}$
 (C) $\frac{5\sqrt{90}}{12}$
 (D) $\frac{10\sqrt{90}}{24}$

$$\frac{5\sqrt{9 \cdot 10}}{2 \cdot 10} = \frac{5\sqrt{9 \cdot 10}}{20} = \frac{15\sqrt{10}}{20}$$

$$= \frac{3\sqrt{10}}{4}$$

11. Simplify completely: $\sqrt{27x^2}$
- (A) $3x\sqrt{3}$
 (B) $3x^2\sqrt{3}$
 (C) $9x\sqrt{3}$
 (D) $9x^2\sqrt{3}$

$$\sqrt{9 \cdot 3 \cdot x^2}$$

$$3x\sqrt{3}$$

12. Write $2y\sqrt[3]{3y}$ as an entire radical.

- (A) $\sqrt[3]{12y^3}$
 (B) $\sqrt[3]{24y^2}$
 (C) $\sqrt[3]{24y^4}$
 (D) $\sqrt[3]{54y^4}$

$$\sqrt[3]{3y \cdot 2^2 \cdot y^3}$$

$$\sqrt[3]{4y^4}$$

13. Brad was asked to simplify $2\sqrt[3]{64x^6}$ but did not complete a correct solution. Which step contains his **first** error?

Solution:

Step 1: $2 \cdot \sqrt[3]{64} \cdot \sqrt[3]{x^6}$
 Step 2: $2 \cdot 8 \cdot \sqrt[3]{x^3} \cdot \sqrt[3]{x^3}$
 Step 3: $2 \cdot 8 \cdot x \cdot \sqrt[3]{x^3}$
 Step 4: $18x\sqrt[3]{x^3}$

$$\sqrt[3]{64} = 4$$

- (A) 1
 (B) 2
 (C) 3
 (D) 4

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14. What are the restrictions on the variable for $\frac{1}{\sqrt{x-1}}$?

- (A) $x \leq 1$
- (B) $x \geq 1$
- (C) $x < 1$
- (D) $x > 1$

$$x - 1 > 0$$

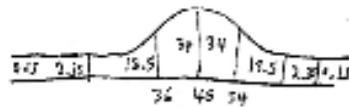
$$x > 1$$

15. Which set of data has the lowest standard deviation?

- (A) {0.1, 0.2, 0.3, 0.4, 0.5}
- (B) {3.5, 3.6, 3.7, 3.8, 3.9}
- (C) {4.4, 5, 5, 6}
- (D) {9, 9, 9, 9, 9}

16. The ages of participants in a curling bonspiel are normally distributed with a mean of 45 years and a standard deviation of 9 years. What percent of the curlers are between 36 and 54 years of age?

- (A) 34%
- (B) 68%
- (C) 95%
- (D) 99%



17. The heights of all students in a class were measured. It was later discovered that the tape measure used was inaccurate and 5 mm had to be added to each person's height. Which calculation would stay the same based on the new height measures?

- (A) central tendency
- (B) mean
- (C) median
- (D) standard deviation

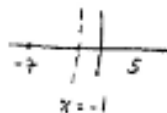
18. What are the domain and range for $y = 3(x - 1)^2 + 4$?

- (A) $x \in R$ and $y \leq 4$
- (B) $x \in R$ and $y \geq 4$
- (C) $x \leq 1$ and $y \in R$
- (D) $x \geq 1$ and $y \in R$

$$(1, 4)$$

19. A quadratic function has an x-intercept at $(-7, 0)$ and an axis of symmetry at $x = -1$. What is the other x-intercept?

- (A) $(-13, 0)$
- (B) $(-4, 0)$
- (C) $(5, 0)$
- (D) $(9, 0)$



20. If $(-1, 3)$ is the vertex of $y = 2x^2 + bx + 5$, what is the value of b ?

- (A) -12
- (B) -4
- (C) 4
- (D) 12

$$3 = 2(-1)^2 + b(-1) + 5$$

$$3 = 2 - b + 5$$

$$b = 4$$

$$\text{or } x = \frac{-b}{2a}$$

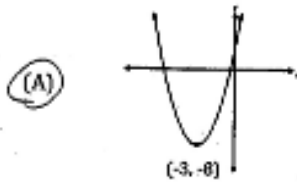
$$-1 = \frac{-b}{2(2)}$$

$$-b = -4$$

$$b = 4$$

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21. The function $y = x^2 + 6x + 1$ has an axis of symmetry at $x = -3$. Which graph best models this function?

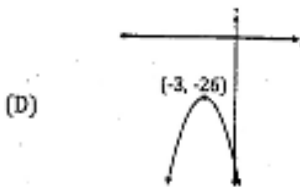
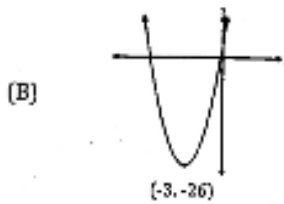


$$y = (-3)^2 + 6(-3) + 1$$

$$y = 9 - 18 + 1$$

$$y = -8$$

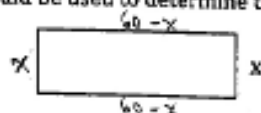
A



22. Which represents a quadratic function with no x-intercepts?

- (A) $y = -(x-1)^2$ ~~1/60~~
 (B) $y = -(x-1)^2 + 3$ ~~1/60~~
 (C) $y = (x+1)^2 - 3$ ~~1/60~~
 (D) $y = (x+1)^2 + 3$ ~~1/60~~

23. A gardener has 120 m of fencing to mark off a rectangular vegetable garden. Which function could be used to determine the dimensions that will result in the maximum area?



$$\frac{120 - 2x}{2}$$

$$60 - x$$

- (A) $A = x(x - 60)$
 (B) $A = x(x - 120)$
 (C) $A = x(60 - x)$
 (D) $A = x(120 - x)$

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24. Which function has zeros of -3 and 7?

- C
 (A) $f(x) = (x-3)(x-7)$
 (B) $f(x) = (x-3)(x+7)$
 (C) $f(x) = (x+3)(x-7)$
 (D) $f(x) = (x+3)(x+7)$

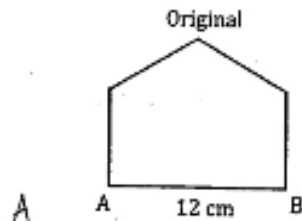
25. What are the roots of the quadratic equation $x^2 + 6x - 16 = 0$?

- B
 (A) $x = -8, x = -2$
 (B) $x = -8, x = 2$
 (C) $x = 8, x = -2$
 (D) $x = 8, x = 2$
- $(x+8)(x-2) = 0$

26. Which has a unit rate of \$0.16/apple?

- D
 (A) 20 apples for \$3.00 0.15
 (B) 25 apples for \$4.25 0.17
 (C) 30 apples for \$4.95 0.165
 (D) 35 apples for \$5.60 0.16

27. The pentagon shown is transformed by a scale factor of $\frac{1}{4}$. What is the length of the image of side AB?



- (A) 3 cm
 (B) 9 cm
 (C) 15 cm
 (D) 48 cm

$$k = \frac{d.m}{a.m}$$

$$\frac{1}{4} = \frac{x}{12}$$

$$4x = 12$$

$$x = \frac{12}{4}$$

$$x = 3$$

28. A partially inflated heart-shaped balloon is 15 cm wide and has a volume of 1600 cm³. If air is added until the balloon is 30 cm wide, what is the new volume?

- D
 (A) 3200 cm³
 (B) 6400 cm³
 (C) 9600 cm³
 (D) 12 800 cm³

$$k = \frac{d.m}{a.m}$$

$$k = \frac{30}{15} = 2$$

$$k^3 = \frac{V_{new}}{V_{original}}$$

$$2^3 = \frac{x}{1600}$$

$$\frac{8}{1} = \frac{x}{1600}$$

$$x = 12800$$

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Constructed Response:

Answers to be written on this paper in the space provided. Show all workings.

29. Use **both** inductive and deductive reasoning to show that the sum of two odd integers is an even number. 4 marks

Inductive Reasoning

$$S = 3 + 5 = 8$$

$$S = 7 + 9 = 16$$

$$S = 11 + 13 = 24$$

Deductive Reasoning

Let 1st odd integer = $2x+1$

Let 2nd odd integer = $2y+1$

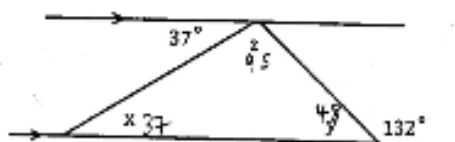
$$\text{Sum} = (2x+1) + (2y+1)$$

$$\text{Sum} = 2x + 2y + 2$$

$$\text{Sum} = 2(x+y+1)$$

↑
even

30. Find the measure of each indicated angle. Justify your answer. 3 marks

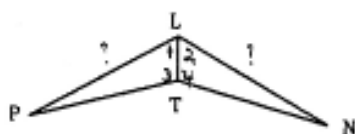


Angle Measure	Justification
$x = 37^\circ$	Alternate Interior Angles
$y = 48^\circ$	Supplementary Angles
$z = 95^\circ$	All angles in a triangle sum to 180°

31. Use either a paragraph or two-column format to complete the given proof. 3 marks

Given: LT bisects $\angle PLN$
 $\angle PTL = \angle NTL$

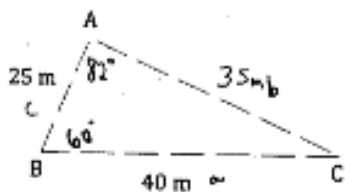
Prove: $LP = LN$



Statements	Justification
1. LT bisects $\angle PLN$	1. Given
A 2. $\angle 1 = \angle 2$	2. Definition of bisect
S 3. $LT = LT$	3. Common Side
A 4. $\angle 3 = \angle 4$	4. Given
5. $\triangle LTP \cong \triangle LTN$	5. ASA \cong
6. $LP = LN$	6. Corresponding parts of Congruent Triangles are congruent

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32. Peter uses exactly 100 m of string to stake out the triangular plot shown in his back garden. Find the measures of all three angles, to the nearest degree. 4 marks



$$100 - 25 - 40$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{35^2 + 25^2 - 40^2}{2(35)(25)}$$

$$\cos A = \frac{1225 + 625 - 1600}{1750}$$

$$\cos A = \frac{250}{1750}$$

$$A = 82^\circ$$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin 82}{40} = \frac{\sin B}{35}$$

$$35 \sin 82 = 40 \sin B$$

$$\frac{35 \sin 82}{40} = \sin B$$

$$60^\circ = B$$

$$LC = 180 - 60 - 82$$

$$C = 38^\circ$$

33. Simplify: $(3\sqrt{2} - \sqrt{10})^2$ 3 marks

$$(3\sqrt{2} - \sqrt{10})(3\sqrt{2} - \sqrt{10})$$

$$9\sqrt{4} - 3\sqrt{20} - 3\sqrt{20} + \sqrt{100}$$

$$9(2) - 6\sqrt{20} + 10$$

$$18 - 6\sqrt{45} + 10$$

$$28 - 6(2)\sqrt{5}$$

$$28 - 12\sqrt{5}$$

34. State the restrictions on x, solve the equation, and check for extraneous roots. 4 marks

$$4 - \sqrt{2x+1} = 9$$

$$4 - 9 = \sqrt{2x+1}$$

$$-5 = \sqrt{2x+1}$$

$$(-5)^2 = (\sqrt{2x+1})^2$$

$$25 = 2x+1$$

$$\frac{24}{2} = \frac{2x}{2}$$

$$12 = x$$

$$2x+1 \geq 0$$

$$2x \geq -1$$

$$x \geq -\frac{1}{2}$$

Check

$$4 - \sqrt{2(12)+1} \stackrel{?}{=} 9$$

$$4 - \sqrt{25} \stackrel{?}{=} 9$$

$$4 - 5 \stackrel{?}{=} 9$$

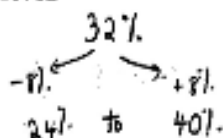
$$-1 \neq 9$$

Restrictions: $x \geq -\frac{1}{2}$

Solution: no solution

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35. In a pre-election survey in St. John's, 32% of those surveyed were undecided about their choice for mayor. The survey is considered accurate within 8 percentage points, 99 times out of 100. If there are 102 000 eligible voters in St. John's, state the **range** of the number of people who are undecided and the **confidence level**. 2 marks



$$102000 \times 0.24 = 24480$$

$$102000 \times 0.40 = 40800$$

Range 24480 - 40800

Confidence Level 99%

36. A manufacturer produces tires that have an average thickness of 179 mm, with a standard deviation of 0.9 mm. To be classified as "supreme quality", tires must have a thickness between 177.8 mm and 180.7 mm. What percent, to the nearest whole number, of the total production can be rated as "supreme quality" tires? 3 marks

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{x - \mu}{\sigma}$$

$$z = \frac{177.8 - 179}{0.9}$$

$$z = \frac{180.7 - 179}{0.9}$$

$$97.06\% - 9.18\%$$

$$z = \frac{-1.2}{0.9}$$

$$z = \frac{1.7}{0.9}$$

$$87.88\%$$

$$z = -1.33$$

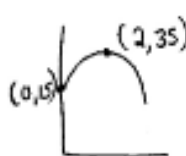
$$z = 1.89$$

$$\therefore \textcircled{88\%}$$

$$9.18\%$$

$$97.06\%$$

37. A model rocket is launched from its launch pad which is 15 m above the ground. It takes 2 seconds for the rocket to reach a maximum height of 35 m. Algebraically determine the quadratic function in the form $y = a(x - h)^2 + k$, that models the path followed by the rocket, and use it to determine the height of the rocket at 3.5 s. 3 marks



$$y = a(x - 2)^2 + 35$$

$$15 = a(0 - 2)^2 + 35$$

$$15 = 4a + 35$$

$$-20 = 4a$$

$$-5 = a$$

$$y = -5(x - 2)^2 + 35$$

$$y = -5(3.5 - 2)^2 + 35$$

$$y = -5(1.5)^2 + 35$$

$$y = -11.25 + 35$$

$$y = 23.75$$

Function $y = -5(x - 2)^2 + 35$

Height 23.75 m

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38. Algebraically determine the **vertex** and **x-intercepts** for the function $y = -x^2 - 4x + 5$. Sketch the graph, labelling all key points.

3 marks

Vertex

$$x = \frac{-b}{2a}$$

$$= \frac{4}{2(-1)}$$

$$= \frac{4}{-2}$$

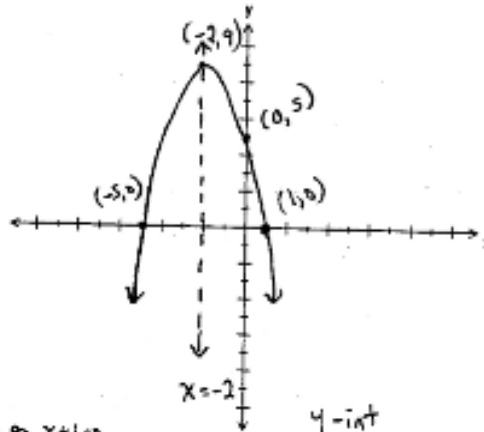
$$= -2$$

$$y = -(-2)^2 - 4(-2) + 5$$

$$y = -4 + 8 + 5$$

$$y = 9$$

$V(-2, 9)$

x-int

$$0 = -x^2 - 4x + 5$$

$$0 = x^2 + 4x - 5$$

$$0 = (x - 1)(x + 5)$$

$x - 1 = 0$ or $x + 5 = 0$
 $x = 1$ $x = -5$

y-int

$$y = -(0)^2 - 4(0) + 5$$

$$y = 5$$

39. Solve the given equation. State the solution(s) in exact form.

3 marks

$$12x = -5x^2 - 1$$

$$5x^2 + 12x + 1 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-12 \pm \sqrt{(12)^2 - 4(5)(1)}}{2(5)}$$

$$x = \frac{-12 \pm \sqrt{144 - 20}}{10}$$

$$x = \frac{-12 \pm \sqrt{124}}{10}$$

$$x = \frac{-12 \pm \sqrt{4 \cdot 31}}{10}$$

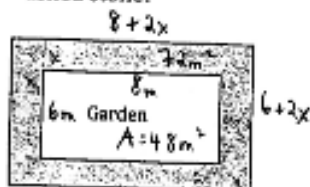
$$x = \frac{-12 \pm (2\sqrt{31})}{10} = \frac{-6 \pm \sqrt{31}}{5}$$

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40. Use a quadratic function to model and solve the given problem:

4 marks

A landscaper is designing a 6 m by 8 m rectangular garden that will then be surrounded by a uniform border of crushed stone. She has enough crushed stone to cover 72 m^2 . What is the width of the border if she uses all of the crushed stone?



$$(8 + 2x)(6 + 2x) - 48 = 72$$

$$48 + 16x + 12x + 4x^2 - 48 = 72$$

$$4x^2 + 28x - 72 = 0$$

$$x^2 + 7x - 18 = 0$$

$$(x - 2)(x + 9) = 0$$

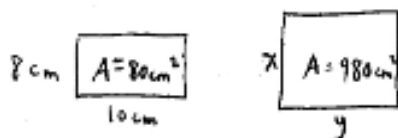
$$x - 2 = 0 \quad \text{or} \quad x + 9 = 0$$

$$x = 2 \text{ m} \quad x = -9 \text{ ext}$$

The border will be 2m wide.

41. Nicole designed a rectangular crest that was 8 cm by 10 cm for her school's jacket. The crest was then enlarged to create a poster that had an area of 980 cm^2 . What are the dimensions of the poster?

3 marks



$$k^2 = \frac{A_{\text{image}}}{A_{\text{original}}}$$

$$k = \frac{d.m}{a.m}$$

$$k = \frac{d.m}{a.m}$$

$$k^2 = \frac{980}{80}$$

$$3.5 = \frac{x}{8}$$

$$3.5 = \frac{y}{10}$$

$$k^2 = 12.25$$

$$x = 28 \text{ cm}$$

$$y = 35 \text{ cm}$$

$$k = \sqrt{12.25}$$

28 cm x 35 cm

$$k = 3.5$$