Name: SUGGESTED ANSWER KEY

Teacher: HP

DO NOT OPEN THE EXAMINATION PAPER UNTIL
YOU ARE TOLD BY THE SUPERVISOR TO BEGIN

Newfoundland & Labrador English School District

Mathematics 2201

COMMON FINAL EXAM
June 2014

Value: 70 Marks
Duration: 2 Hours

General Instructions

Part I – Selected Response (35 marks)
Answer ALL questions in this section. Select the letter of the correct response from those provided and shade the letter on the computer scorable card and/or place the letter in the blank provided on the Selected Response Answer Sheet.

Part II - Constructed Response (35 marks)
Answer ALL questions completely and show workings in the space provided.

NOTE:
- **DIAGRAMS ARE NOT NECESSARILY DRAWN TO SCALE**
- **FORMULA SHEET AND Z-SCORE TABLE ARE PROVIDED**

Student Checklist

- ✓ Write your name and your teacher's name on this exam and on the Part I answer sheet.
- ✓ Check the exam to ensure that there are no missing pages.

Part I - Total Value: 35 marks

Shade the letter of the correct response on the computer scorable card and/or place the letter in the blank provided on the Selected Response Answer Sheet.

1. What is the **6th** term in the sequence $\{5,9,13,\ldots\}$?

   (A) 21

   ✓(B) 25

   (C) 29

   (D) 37

2. Which statement demonstrates using inductive reasoning to show that the product of two odd numbers is an odd number?

   ✓ (A) $(5)(7) = 35$ and $(9)(7) = 63$

   (B) $(6)(8) = 48$ and $(4)(6) = 24$

   (C) $(2x)(2y) = 4xy$

   (D) $(2x+1)(2y+1) = 4xy + 2x + 2y + 1 = 2(2xy + x + y) + 1$

3. Which statement is correct regarding the conjecture that could be made, based on the table below?

Multiples of 5	15	35	40	60
Sum of Digits	6	8	4	6

   (A) The sum of the digits of a multiple of 5 is an odd number. This conjecture is valid.

   (B) The sum of the digits of a multiple of 5 is an odd number. This conjecture is not valid.

   (C) The sum of the digits of a multiple of 5 is an even number. This conjecture is valid.

   ✓ (D) The sum of the digits of a multiple of 5 is an even number. This conjecture is not valid.

4. Brad, Lucy, Michelle and Patrick ran a race. Michelle and Brad finished before Lucy. Brad finished after Michelle. Brad and Lucy finished before Patrick. Who took second place?

   ✓ (A) Brad

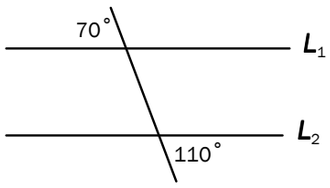
   (B) Lucy

   (C) Michelle

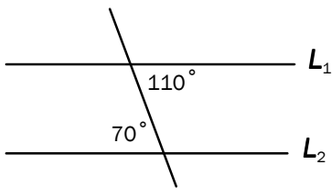
   (D) Patrick

5. In which diagram is line L_1 parallel to line L_2?

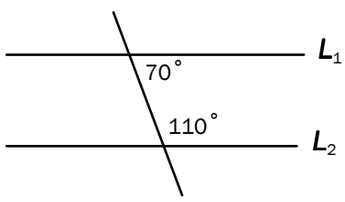
(A)



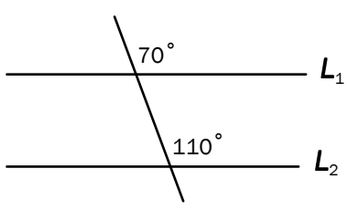
(B)



✓ (C)



(D)



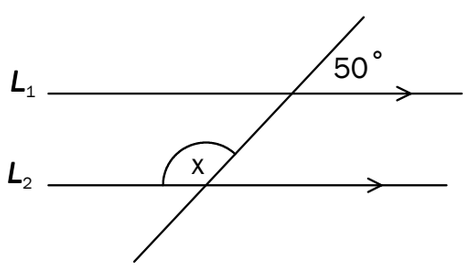
6. If $L_1 \parallel L_2$ in the diagram below, what is the value of ***x***, in degrees?

(A) 50

(B) 65

(C) 100

✓ (D) 130



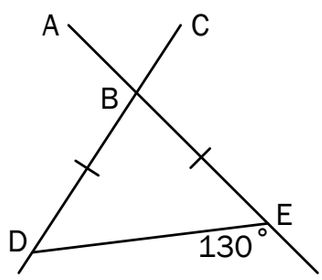
7. In the diagram below, what is the measure of ∠ABC, in degrees?

(A) 50

(B) 60

✓ (C) 80

(D) 130



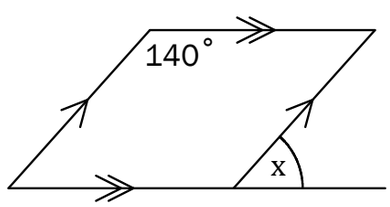
8. In the diagram below, what is the value of ***x***, in degrees?

✓ (A) 40

(B) 80

(C) 110

(D) 140



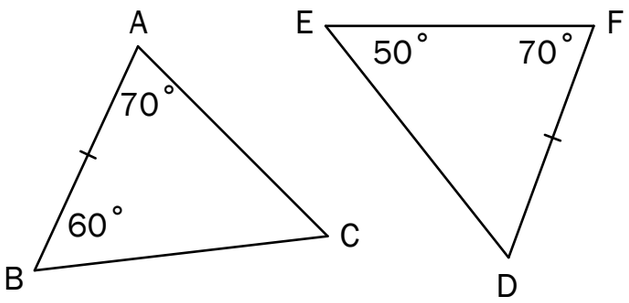
9. What is the congruence statement for the pair of congruent triangles below?

✓ (A) $\Delta ABC \cong \Delta FDE$

(B) $\Delta ACB \cong \Delta FDE$

(C) $\Delta BAC \cong \Delta EDF$

(D) $\Delta BCA \cong \Delta EFD$



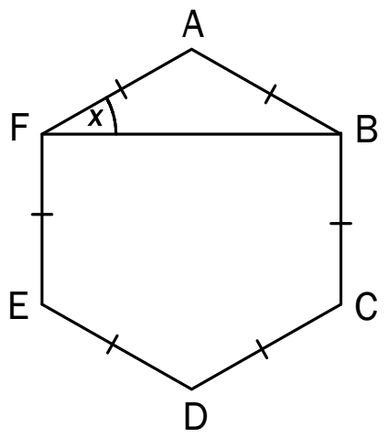
10. In regular hexagon ABCDEF below, what is the measure of angle ***x***, in degrees?

✓ (A) 30

(B) 60

(C) 90

(D) 120



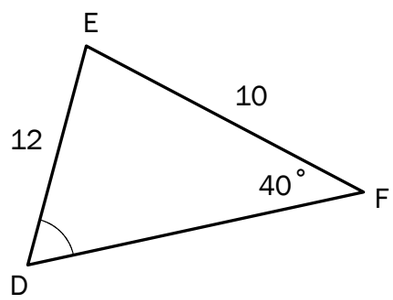
11. If $f = 12$, $\angle F = 40^\circ$, and $d = 10$ in ΔDEF, what is the measure of $\angle D$, to the nearest degree?

✓ (A) 32

(B) 40

(C) 50

(D) 73



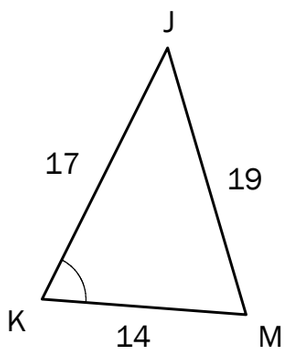
12. If $j = 14$, $k = 19$ and $m = 17$ in ΔJKM, what is the measure of $\angle K$, to the nearest degree?

(A) 45

(B) 60

(C) 68

✓ (D) 75



13. Simplify and order from least to greatest: $2\sqrt{20}$, $\sqrt[3]{64}$, $\sqrt{121}$

✓ (A) 4 , $4\sqrt{5}$, 11

(B) 4 , 11 , $8\sqrt{5}$

(C) 8 , $4\sqrt{5}$, 11

(D) 8 , 11 , $8\sqrt{5}$

14. Simplify: $\sqrt{6}\left(\sqrt{2}+3\sqrt{5}\right)$

(A) $2\sqrt{3}+3\sqrt{10}$

✓ (B) $2\sqrt{3}+3\sqrt{30}$

(C) $4\sqrt{3}+9\sqrt{10}$

(D) $4\sqrt{3}+3\sqrt{30}$

15. Simplify: $\dfrac{\sqrt{5}}{\sqrt{15}}$

(A) $\dfrac{2\sqrt{5}}{15}$

(B) $\dfrac{4\sqrt{5}}{15}$

✓ (C) $\dfrac{\sqrt{3}}{3}$

(D) $\dfrac{5\sqrt{3}}{3}$

16. What are the restrictions on the variable in the expression $\sqrt{5x-3}$?

(A) $x > -\dfrac{3}{5}, x \in R$

(B) $x \geq -\dfrac{3}{5}, x \in R$

(C) $x > \dfrac{3}{5}, x \in R$

✓ (D) $x \geq \dfrac{3}{5}, x \in R$

17. Simplify: $\left(\sqrt{8x^2}\right)\left(\sqrt{3x^3}\right)$

✓ (A) $2x^2\sqrt{6x}$

(B) $2x^4\sqrt{6x}$

(C) $4x^2\sqrt{6x}$

(D) $4x^4\sqrt{6x}$

18. What is $2x\sqrt[3]{5}$ written as an entire radical?

(A) $\sqrt[3]{10x}$

(B) $\sqrt[3]{20x^2}$

✓ (C) $\sqrt[3]{40x^3}$

(D) $\sqrt[3]{100x^2}$

19. An advertisement for a new toothpaste states that 80% of users reported having better dental checkups. The results of the poll used to collect the data are accurate within 4 percentage points 9 times out of 10. What is the confidence interval?

(A) $71\% - 89\%$

✓ (B) $76\% - 84\%$

(C) $81\% - 99\%$

(D) $86\% - 94\%$

20. In Canada, IQ scores are normally distributed with a mean of 100 and a standard deviation of 15. What percent of the population would be expected to have an IQ lower than 85?

(A) 9%

✓ (B) 16%

(C) 84%

(D) 91%

21. Environment Canada compiled data on the number of millimetres of rain that fell at St. John's airport each day of April 2013, and reported it in the frequency table below. How many days had less than 80 mm of rain?

Rainfall (mm)	Frequency
$0-20$	4
$20-40$	3
$40-60$	7
$60-80$	13
$80-100$	1
$100-120$	2

(A) 13

(B) 14

✓ (C) 27

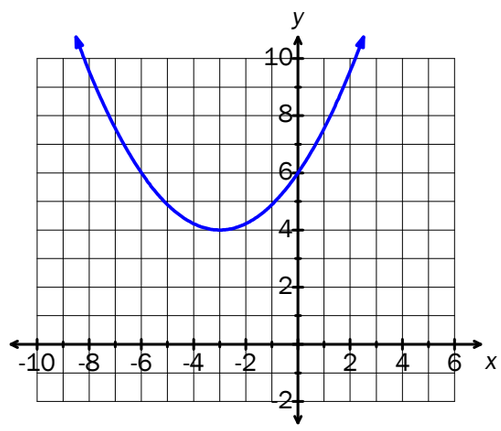
(D) 28

22. At Harbour High School, 95% of the students weigh between 62 kg and 90 kg. Assuming that the data is normally distributed, what are the mean and standard deviation?

	Mean (kg)	Standard Deviation (kg)
(A)	69	7
✓ (B)	76	7
(C)	76	14
(D)	83	14

23. What are the domain and range for the quadratic function graphed below?

	Domain	Range
(A)	$\{x \in R\}$	$\{y \mid y \le 4, y \in R\}$
✓ (B)	$\{x \in R\}$	$\{y \mid y \ge 4, y \in R\}$
(C)	$\{x \mid x \le 4, x \in R\}$	$\{y \in R\}$
(D)	$\{x \mid x \ge 4, x \in R\}$	$\{y \in R\}$



24. What is the *y*-intercept for the graph of $y = -(x+1)^2 - 3$?

✓ (A) -4

(B) -3

(C) -2

(D) -1

25. What is the vertex of the quadratic function $f(x)=(x-2)(x+10)$?

✓ (A) $(-4,-36)$

(B) $(-4,-12)$

(C) $(4,16)$

(D) $(4,28)$

26. What is the equation of the axis of symmetry for the graph of $y=-x^2+2x-5$?

(A) $x=-5$

(B) $x=-1$

✓ (C) $x=1$

(D) $x=5$

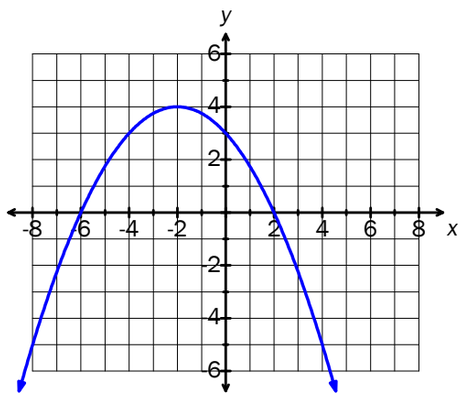
27. Which equation describes the quadratic function graphed below?

✓ (A) $y=-\frac{1}{4}x^2-x+3$

(B) $y=-\frac{1}{2}x^2-x+4$

(C) $y=\frac{1}{4}x^2-x+3$

(D) $y=\frac{1}{2}x^2-x+4$



28. Which describes the quadratic function $y=x^2-2x-3$?

✓ (A) It has a minimum value of -4 at $x=1$.

(B) It has a maximum value of -4 at $x=1$.

(C) It has a minimum value of 0 at $x=-1$.

(D) It has a maximum value of 0 at $x=-1$.

29. Which quadratic function has zeros $x = 3$ and $x = -6$?

(A) $f(x) = (x - 3)(x - 6)$

✓ (B) $f(x) = (x - 3)(x + 6)$

(C) $f(x) = (x + 3)(x - 6)$

(D) $f(x) = (x + 3)(x + 6)$

30. Which quadratic equation has a root of $x = -3$?

(A) $x^2 - 3 = 0$

(B) $x^2 + 3 = 0$

✓ (C) $x^2 - 9 = 0$

(D) $x^2 + 9 = 0$

31. How many *x*-intercepts would the function $y = -2(x - 1)^2 + 3$ have?

(A) 0

(B) 1

✓ (C) 2

(D) 3

32. Which is the better buy?

(A) 3 L of apple juice for $9.99

✓ (B) 8 L of apple juice for $20.88

(C) 12 L of apple juice for $37.44

(D) 24 L of apple juice for $64.80

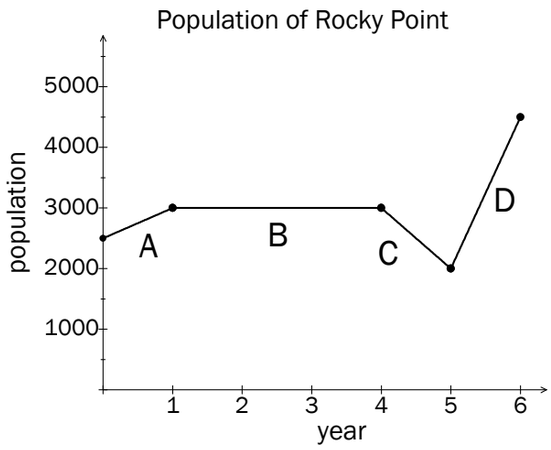
33. Which segment of the graph below represents the greatest rate of population increase?

(A) A

(B) B

(C) C

✓ (D) D



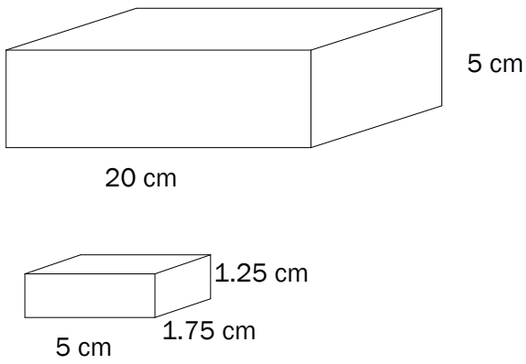
34. The length and height of a tissue box, in the shape of a rectangular prism, are 20 cm and 5 cm, respectively. A similar rectangular prism has length 5 cm, width 1.75 cm, and height 1.25 cm. What is the width, to the nearest tenth of a cm, of the original tissue box?

(A) 0.4

(B) 4.0

(C) 5.8

✓ (D) 7.0



35. A spherical balloon with an initial volume of 14 000 cm^3 was leaking air. What was its volume, to the nearest cm^3, when the dimensions had been reduced by a factor of $\frac{1}{4}$?

✓ (A) 219

(B) 875

(C) 3500

(D) 896 000

Part II - Total Value: 35 marks

Answer ALL questions and show workings in the space provided.

Value

3 36. Use deductive reasoning to prove that the product of an odd number and an even number is even.

Let 2n = an even #

2n + 1 = an odd #

Product = $2n(2n + 1)$

$= 4n^2 + 2n$

$= 2(2n^2 + n)$

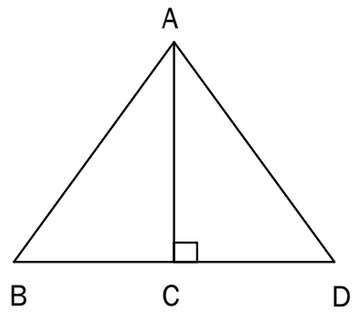
Since $2(2n^2 + n)$ is divisible by 2, the product must be an even number

37. Use either a paragraph or two-column format to complete the given proof:

Given: $\overline{AC} \perp \overline{BD}$

C is the midpoint of BD

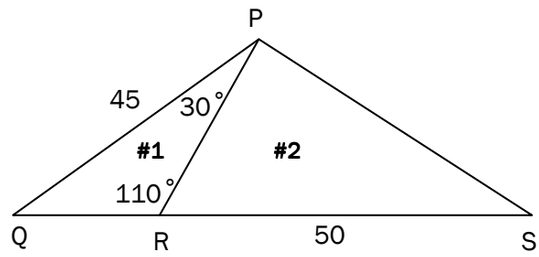
Prove: $\overline{AB} \cong \overline{AD}$



Statements	Reasons
1. $AC \perp BD$	1. Given
2. $\angle ACB = \angle ACD = 90^\circ$	2. $\perp$ lines form congruent 90° angles
3. C is the midpoint of BD	3. Given
4. BC = CD	4. Definition of midpoint
5. AC = AC	5. Common side
6. $\Delta ABC \cong \Delta ADC$	6. SAS
7. $AB \cong AD$	7. Corresponding parts of congruent triangles

Value

4 38. In the diagram below, $\angle QPR = 30^\circ$, $\angle PRQ = 110^\circ$, $\overline{PQ} = 45$, and $\overline{RS} = 50$. Determine the lengths of $\overline{PR}$ and $\overline{PS}$, to the nearest tenth.



$\Delta\#1: \quad \angle Q = 180^\circ - 110^\circ - 30^\circ = 40^\circ$

$$\frac{\sin 110^\circ}{45} = \frac{\sin 40^\circ}{PR}$$

$$PR = \frac{45 \sin 40^\circ}{\sin 110^\circ}$$

PR = 30.8

****

$\Delta\#2: \quad \angle PRS = 180^\circ - 110^\circ = 70^\circ$

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

$r^2 = 30.8^2 + 50^2 - 2(30.8)(50)\cos 70^\circ$

$r^2 = 2395.22$

$r = \sqrt{2395.22}$

$r = 48.9$

PR = 30.8

PS = 48.9

3 39. Solve algebraically and check for extraneous roots: $2 + \sqrt{x+1} = 4$

$2 + \sqrt{x+1} = 4$ Restr. $x \geq -1$

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

$\sqrt{x+1} = 2$

$\left(\sqrt{x+1}\right)^2 = 2^2$

$x + 1 = 4$

$x = 4 - 1$

$x = 3$

Check:

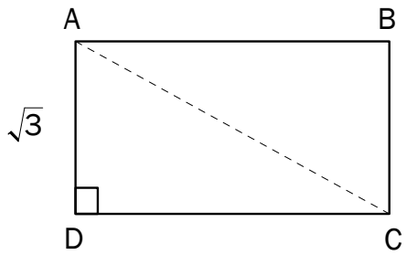
$LS = 2 + \sqrt{3+1}$ $\quad RS = 4$

$= 2 + 2$

$= 4$ valid

Value

3 40. The area of rectangle ABCD is $\sqrt{15}$ and the length of AD is $\sqrt{3}$. Determine the lengths of DC and AC, in simplest form.



$$DC = \frac{\text{Area}}{\text{width}} = \frac{\sqrt{15}}{\sqrt{3}} = \sqrt{\frac{15}{3}} = \sqrt{5}$$

$$\left(\sqrt{3}\right)^2 + \left(\sqrt{5}\right)^2 = (AC)^2$$
$$3 + 5 = (AC)^2$$
$$8 = (AC)^2$$
$$\sqrt{8} = AC$$
$$2\sqrt{2} = AC$$

DC = $\underline{\sqrt{5}}$

AC = $\underline{2\sqrt{2}}$

4 41. Stewart's Snacks claims that their boxes of crackers have a mean mass of 500 g with a standard deviation of 25 g. They promise to refund the purchase price of $2.50 to customers if their box of crackers has a mass less than 454 g. What is the maximum amount of money that Stewart's Snacks could be expected to refund to customers if there are 1 million boxes sold per year?

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

$$z = \frac{454 - 500}{25}$$
$$z = \frac{-46}{25}$$
$$z = -1.84$$

From z-score table: 0.0329 or 3.29%

Maximum refund possible = 0.0329 ×1 000 000 × $2.50 = $82 250

Value

4 42. A golf ball is hit from the ground and lands on the green after 4 seconds. The maximum height reached by the ball is 20 m.

a) Algebraically determine the function, in the form $y = a(x-h)^2 + k$, that models the path of the ball.

b) Use that function to determine the height of the ball at 2.5 seconds.

$y = a(x-2)^2 + 20$

Sub in (0,0) $0 = a(0-2)^2 + 20$

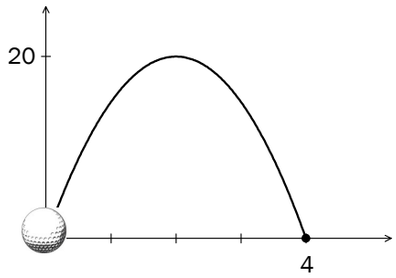
$0 = 4a + 20$

$\frac{-4a}{-4} = \frac{20}{-4}$

$a = -5$

$\therefore y = -5(x-2)^2 + 20$

Vertex (2, 20)



At $x = 2.5$, $y = -5(2.5-2)^2 + 20$

$y = 18.75$

Function $y = -5(x-2)^2 + 20$

Height 18.75 m

4 43. Algebraically determine the **exact** roots, in simplest form:

$3x(x+2) = 2$

$3x^2 + 6x = 2$

$3x^2 + 6x - 2 = 0$

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

$x = \frac{-6 \pm \sqrt{6^2 - 4(3)(-2)}}{2(3)}$

$x = \frac{-6 \pm \sqrt{36 + 24}}{6}$

$x = \frac{-6 \pm \sqrt{60}}{6}$

$x = \frac{-6 \pm \sqrt{4 \times 15}}{6}$

$x = \frac{-6 \pm 2\sqrt{15}}{6}$

$x = \frac{-3 \pm \sqrt{15}}{3}$

Value

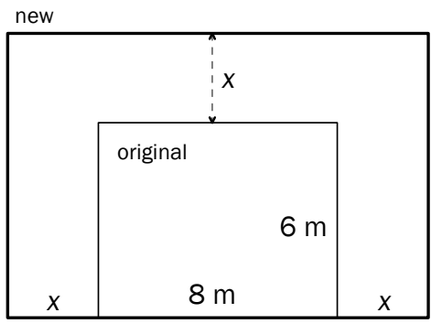
4 44. Mary has a rectangular vegetable garden with dimensions 8 m by 6 m. She wishes to extend her garden as shown in the diagram below, so that the area of her new garden is twice the area of the original. Algebraically determine the dimensions of the new garden.

$\text{Area}_{new} = 2\,\text{Area}_{original} = 2(6\times 8) = 96$

New width = 6 + x
New length = 8 + 2x

$(6+x)(8+2x)=96$
$48+12x+8x+2x^2-96=0$
$2x^2+20x-48=0$
$2(x^2+10x-24)=0$
$\frac{2}{2}(x^2+10x-24)=\frac{0}{2}$
$x^2+10x-24=0$

$(x+12)(x-2)=0$
$x=-12 \qquad x=2$
reject

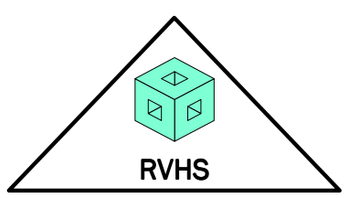


∴ width = 6 + 2 = 8 m

length = 8 + 2(2) = 12 m

3 45. A scale drawing of River View High School's triangular school crest has a base of 8 cm and a height of 5 cm. The principal wants to place a poster of the enlarged crest in the school lobby. If the enlarged crest has an area of 320cm^2, what are the measurements of its base and height?

Area = $\frac{1}{2}bh$
= $\frac{1}{2}(8)(5)$
= 20



Scale factor = k

$k^2=\frac{320}{20}$
$k^2=16$
$k=\sqrt{16}$
$k=4$

Enlarged base = 4(8) = 32 cm
Enlarged height = 4(5) = 20 cm