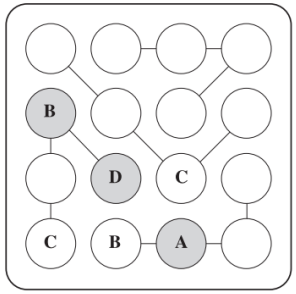
Logic Review

Practice Questions | **Notes**

1. The goal of a particular puzzle is to fill the circles in grid with the letters A, B, C, and D so that no letters are repeated in any row, column, or set of connected circles.

The three entries in the grey circles were given to start the puzzle. Jerome has already completed three entries shown in the white circles, but he has made an error.



Identify and explain the error Jerome made in his solution to the puzzle.

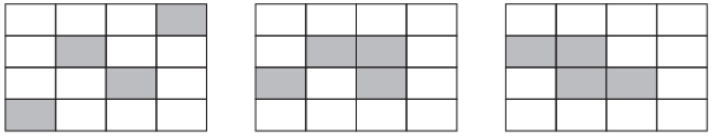
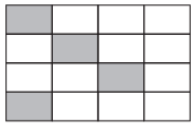
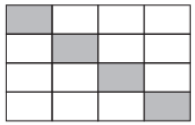
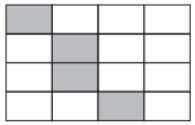
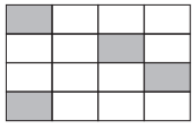
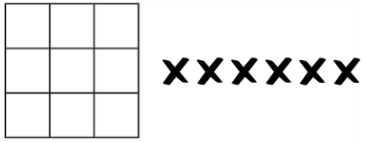
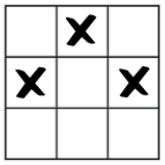
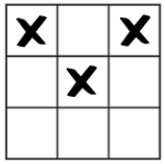
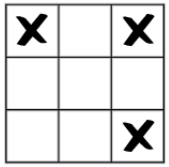
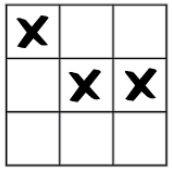
Incorrect entry: row 3, column 3

2. The goal of a two player game is to create a line of four adjacent rectangles using the same letter. To play, each player takes turns placing their first initial somewhere on a six-by-six grid. Margaret and Gerda have started playing this game, as shown on the grid below.

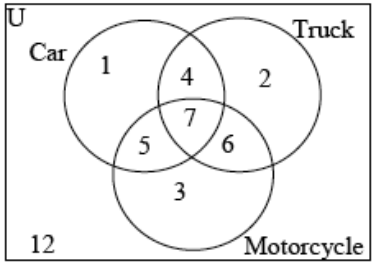
Row \ Column	1	2	3	4	5	6
1	G					
2		G				
3			G	G		
4			M	M	G	
5		M				
6	M	M	G			

It is Margaret's turn, and she determines that she can guarantee a win by placing the letter M in the rectangle at
Row: ___
Column: ___

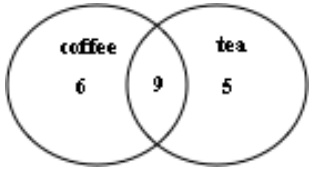
Row: 4
Column: 2

3. A pattern of pictures is shown below. In Step 2, each shaded square has stayed in the same place as in Step 1 **or** moved to a square horizontally, vertically, or diagonally adjacent to its location in Step 1. The shaded square undergoes the same movement in each subsequent step.  **Step 1** **Step 2** **Step 3** Which of the following pictures is next in the pattern? **A.**  **B.**  **C.**  **D.** 	A
4. To solve a particular logic puzzle, an X must be placed in six of the squares in the grid shown below so that no three Xs line in a vertical, horizontal, or diagonal line.  Which of the following opening placements for the first three Xs could lead to a successful solution for this logic puzzle? **A.**  **B.**  **C.**  **D.** 	A

Set Theory Review: Chapter 1

Practice Questions	Notes
1. When an Internet search returns with a statement such as *"no results match your search criteria"*, this is equivalent to: A) a subset. B) disjoint sets. C) an empty set. D) universal sets.	C
2. If *A* represents the set of factors for 28 and *B* represents the set of factors for 63, A ∩ B is: A) $A \cap B = \{7\}$ B) $A \cap B = \{1,7\}$ C) $A \cap B = \{2,3,4,9,14,21,28,63\}$ D) $A \cap B = \{1,2,3,4,7,9,14,21,28,63\}$	B
3. *Use the following information to answer the question.* The students in a math class were surveyed to determine the types of vehicles owned by the parents of the students. The results are shown.  How many of the students' parents own a truck and a motorcycle? _____	13

4. The Venn diagram below shows the results of a questionnaire regarding what type of hot drink people had today:



Using the information provided in the diagram:

i. What does the number 5 represent?

A) Number of people who had only tea today.

B) Number of people who had only coffee today

C) Number of people who had neither coffee nor tea today.

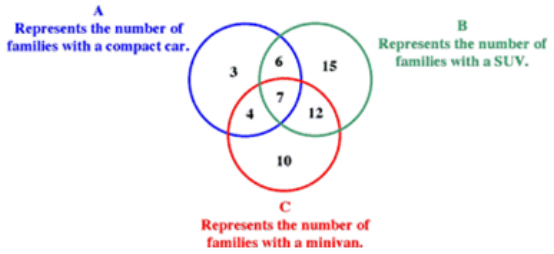
D) Number of people who had both coffee and tea today.

ii. How many people had tea? _____

i) A
ii) 14

5. *Use the following information to answer the question.*

The Venn diagram shown below shows the number of people owning various types of cars:



If 60 families were surveyed to construct this Venn diagram, what percent, to the nearest percent, of families responded that they own a minivan or an SUV? _____

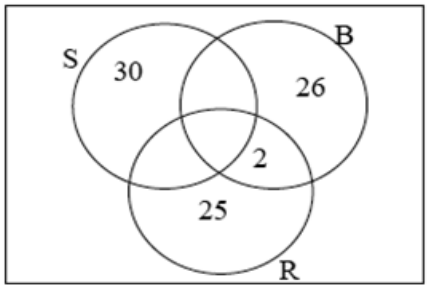
90

6. *Use the following information to answer the question.*

A teacher gave her students to following scenario:

A group of people was asked what sports they have played. 30 had played soccer, 26 had played baseball, 25 had played rugby, 6 had played soccer and baseball, 9 had played soccer and rugby, 7 had played baseball and rugby, and 5 had played all three sports.

The teacher then asked her students to create a Venn diagram to represent the situation. Erica began to fill in the diagram as follows:



Based on her work in the Venn diagram above, Erica:

A) is on the right track in her solution.

B) made an error by assuming 30 played soccer only.

C) misread the question and should have put a 7 in place of the 2.

D) cannot complete the questions because the information given is contradictory.

B

7. If $U = \{0,1,2,3,4,5,6,7,8,9\}$ $A = \{0,1,2,3\}$ and $B = \{1,2,3,4\}$, then which of the following statements is **false**?

A) $A \subseteq B$

B) $A \cap B = \{1,2,3\}$

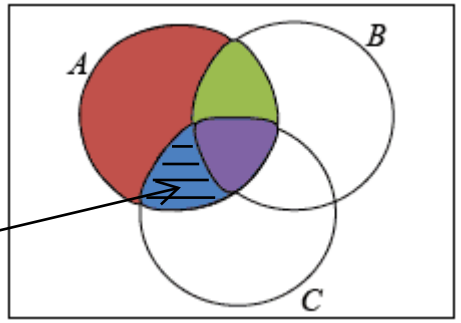
C) $A \cup B = \{0,1,2,3,4\}$

D) $A' = \{4,5,6,7,8,9\}$

A

8. *Use the following information to answer the question.*

A Venn diagram is shown.



The **blue** shaded section of the diagram represents:

A) A or B and not C.

B) A or C and not B.

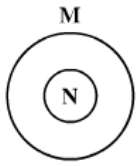
C) A and B and not C.

D) A and C and not B.

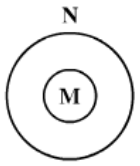
D

9. Which of the following illustrates $M \cap N = \emptyset$?

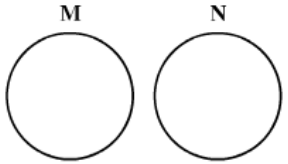
A.



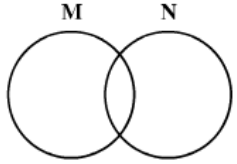
B.



C.



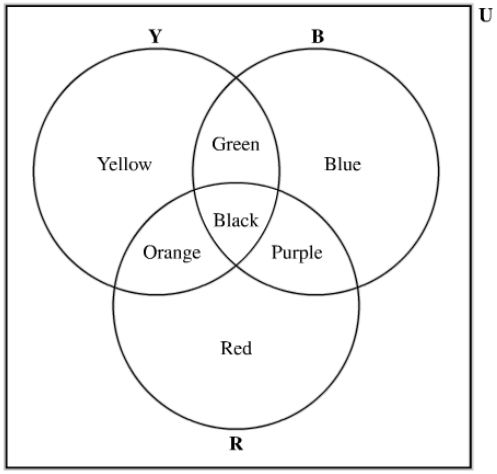
D.



C

10. *Use the following information to answer the question.*

The universal set of the primary and secondary colours in art contains the colours yellow, blue, red, orange, green, purple, and black, as shown below.



If R is the set of colours that contain red, then all of the colours in the complement of R, R', are

A. yellow and blue
B. orange and purple
C. yellow, green, and blue
D. orange, black, and purple

C

11. There are 35 students in John's homeroom class. There are 5 students who take English and Biology, and 7 students who take neither of these subjects. There are 3 more students taking English only than there are students taking Biology only.

The number of students in John's homeroom who take Biology only is
A. 10
B. 13
C. 15
D. 20

A

12. Students in a particular high school were surveyed to determine the courses in which they were currently enrolled. The table below represents the data that were collected.

Courses Enrolled	Number of Students
Math only	28
Art only	33
Math and Art	17
Neither course	20

i. The number of students in the universal set is
A. 61
B. 64
C. 78
D. 98

ii. The number of students taking Art is ___.

iii. The number of students **not** taking Math is ___.

iv. The number of students taking Math or Art is
A. 17
B. 61
C. 78
D. 98

i. D
ii. 50
iii. 53
iv. C

13. Which of the following rows includes two groups that are disjoint sets?

Row	Group 1	Group 2
A.	People who drink coffee	People who do not drink tea
B.	People who have a home phone line	People who have a cellular phone line
C.	People who are left-handed	People who own a computer
D.	People who live in Calgary	People who do not live in Alberta

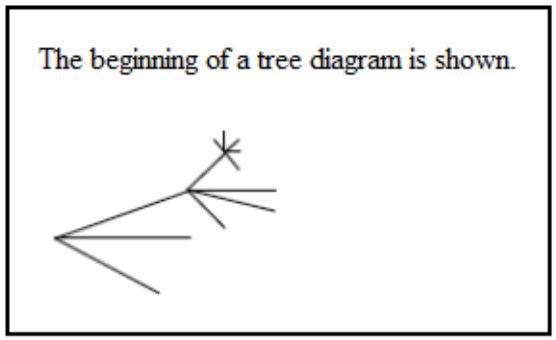
D

14. A group of 100 students were surveyed about movies that they have seen. • 2 people saw all three movies • 12 people saw "Metal Man" and "The Princely Groom" • 53 people saw "Metal Man" • 10 people saw "Metal Man" and "Quick and Angry" • 18 people saw "The Princely Groom" only • 23 people saw "The Princely Groom" and "Quick and Angry" • 6 people did not see any of these movies i. The number of students who saw "The Princely Groom" is A. 18 B. 20 C. 51 D. 53 ii. The number of students who saw "Metal Man" and "Princely Groom" but **not** "Quick and Angry" is ___. iii. The number of students who saw "Metal Man" only is A. 20 B. 33 C. 51 D. 53 iv. The number of students who saw "Metal Man" or "Quick and Angry" is A. 10 B. 43 C. 76 D. 98	i. C ii. 10 iii. B iv. C
15. Vehicles with a sunroof are represented by *S* and vehicles with a hands-free phone system are represented by P. Which of the following vehicle descriptions illustrates $(S \cap P)'$? A. A sunroof or a hands-free phone system B. A sunroof and not a hands-free-phone system C. Not a sunroof or not a hands-free phone system D. Not a sunroof and not a hands-free phone system	C

Counting Methods: Chapter 2

Practice Questions	Notes
1. How many Canadian Postal codes are possible if any letter can be used (and repeated), but all digits must be unique? A) 17 576 000 B) 12 654 720 C) 15 600 000 D) 11 232 000	B
2. A restaurant lists 6 meat dishes, 3 fish dishes and 2 vegetable dishes as main courses. i. How many different single main dishes can be ordered? A) 36 B) 11 C) 20 D) 12 ii. How many dishes can be ordered if each must have 1 meat and 1 vegetable? _____	i. B ii. 12
3. How many 5-letter permutations of the letters of the word **MANUSCRIPT** begin with **A**, end in **I** and otherwise contain only consonants (with no repetitions of letters)? A) 56 B) 30240 C) 336 D) 210	D

4. How many license plates are possible, which contain 4 letters followed by three numbers if no repetitions of letters are allowed? A) 456 976 000 B) 17 576 000 C) 358 800 000 D) 725 000	C
5. $n!$ = _____ A) $\frac{(n-r)!}{r!}$ B) $n(n-1)(n-2)\times\ldots\times(n-r+1)$ C) $n(n-1)(n-2)\times\ldots\times 3\times 2\times 1$ D) $\frac{r!}{(n-r)!}$	C
6. i. Determine the number of 4-digit numbers that can be created using the digits 0 to 9 without repetition. ii. Determine the number of six-digit odd numbers that can be created using the digits 0 to 9 without repetition.	i. $9\cdot9\cdot8\cdot7 = 4536$ ii. $8\cdot8\cdot7\cdot6\cdot5\cdot5 = 67\,200$

7. The value of $\frac{95!}{93!}$ is _____.	8930
8.  A tree diagram is created to display the number of outfits possible from 3 pairs of pants, 4 shirts, and 5 pairs of socks. How many of the smallest branches will there be? _____	60
9. A contractor needs 4 carpenters. The union hall sends the contractor 4 females and 6 males for the contractor to choose from. In how many ways can the contractor pick his work crew if there must be either 2 or 3 females on the work crew? A) 114 B) 2160 C) 45 D) 60	A

10. *Use the following information to answer the question.*

A local restaurant offers milkshakes in 20 different flavours. The owner has decided to offer customers the choice of blending two different flavours together to create more flavour options.

The total number of different possible two-flavour blended milkshakes is

A. 40
B. 190
C. 380
D. 400

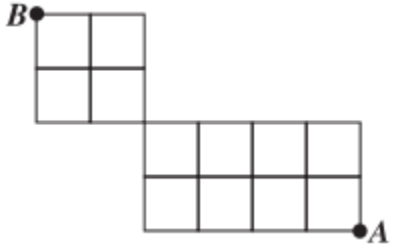
B

11.

Julian is planning a trip from Calgary to Denver. The map below shows the different flight options from a particular airline.

If Julian must fly with this airline, then how many different flight options are possible?

8

12. Determine the number of distinct arrangements of all the letters in the word TATOO.	30
13. Determine the number of different possible routes that Tyler can travel from Point A to Point B if he travels only north or west. i.  ii.  	i. 15 ii. 90

Probability: Chapter 3

Practice Questions	Notes
1. A box contains 10 music CDs and 7 movie DVDs. You pick from the box without looking. What is the probability of choosing a movie DVD? A) 1/7 B) 1/10 C) 1/17 D) 7/17	D
2. Determine the probability of drawing four 8's and one 2 from a standard deck of 52 cards A) $P = \frac{2}{54\,145}$ B) $P = \frac{1}{649\,740}$ C) $P = \frac{1}{2\,598\,960}$ D) $P = \frac{1}{3\,116\,100}$	B
3. Determine the probability, to the nearest tenth, of randomly selecting an outfit with black pants, given 5 pairs of different coloured pants (one of which is black), 6 different shirts and 3 belts to choose from. _____	0.2

4. An insurance company studies crime records, and determines that in any given year, the probability of a house burglary in Community A is 0.2, whereas the probability of this happening in Community B is 0.15. Mr. Smith lives in Community A, and Mr. Jones lives in Community B. What is the probability that just one of the two men will be burglarized this year? A) 0.03 B) 0.29 C) 0.32 D) 0.68	B
5. A box has 3 red marbles, 5 green marbles, and 2 blue marbles in it. What is the probability of first drawing a red marble out of the box, not replacing it, then drawing a green marble? A) 0.185 B) 0.80 C) 0.167 D) 0.15	C
6. What is the probability of rolling a sum of 7 from rolling a pair of fair dice, in decimal form? A) 0.06 B) 0.16 C) 0.17 D) 0.25	C
7. Two cards are drawn from an ordinary deck of cards. Find the probability that both are face cards (King, Queen, Jack) if the first card drawn is not replaced before the second is drawn. A) 3/13 B) 1/13 C) 9/169 D) 11/221	D

8. For two events, P(A)=$\frac{1}{4}$ and P(B)=$\frac{1}{3}$. Assuming that the events are mutually exclusive, what is P(A or B)? A) 0.08333 B) 0.14286 C) 0.58333 D) 0.50000	C
9. The odds in favour of a basketball player getting a free-throw in are 5:3. i) Determine the probability of the player getting a shot in (to the nearest hundredth). _____ ii) How many of the next 13 shots will the player likely sink? _____	i) 0.625 ii) 8
10. A sample space is a _____ A) set of all possible outcomes B) set of favourable outcomes. C) set of unfavourable outcomes. D) set of relative frequencies.	A

11. *Use the following information to answer the question.*

Three Experiments and Related Events

I Experiment I involves rolling a fair die once. Event X is rolling a 2. Event Y is rolling a 6.

II Experiment II involves randomly selecting one number from 1 to 10 inclusive. Event X is selecting an odd number. Event Y is selecting a number that is prime.

III Experiment III involves randomly choosing one marble from a bag. Event X is choosing a red marble. Event Y is choosing a green marble.

The mutually exclusive events are described in experiments

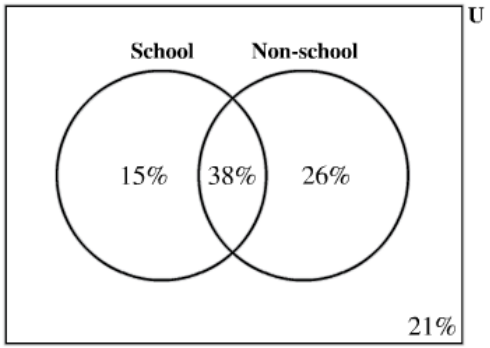
A. I and II only
B. I and III only
C. II and III only
D. I, II, and III

B

12. *Use the following information to answer the question.*

A survey of Alberta students was used to estimate the percentage of students who participate in school and non-school athletics, as well as the percentage who do not participate in any athletics. The results of the survey are shown in the Venn diagram below.

Participation in School and Non-School Athletics



The odds in favour of randomly selecting an Alberta student who participates in school athletics are

A. 15 : 64
B. 15 : 85
C. 53 : 26
D. 53 : 47

D

13. *Use the following information to answer the question.*

An automobile association collected data on the probability of an accident occurring at different time periods over the course of a day. It also collected separate data on the probability of an accident occurring in each month of the year. These data are shown in the two tables below.

Accident Occurrence by Time of Day

24-h Clock Time Period	Probability of An Accident Occurring
23:00 – 02:59	0.074
03:00 – 06:59	0.061
07:00 – 10:59	0.180
11:00 – 14:59	0.241
15:00 – 18:59	0.286
19:00 – 22:59	0.158
Total	**1.000**

Accident Occurrence by Month

Month	Probability of An Accident Occurring
January	0.105
February	0.094
March	0.072
April	0.075
May	0.066
June	0.073
July	0.073
August	0.068
September	0.072
October	0.079
November	0.089
December	0.134
Total	**1.000**

Assuming that they are independent events, the probability, to the nearest hundredth, that a randomly selected accident will occur in the time period 15:00 – 18:59 in December is _____.

0.04

14. Based on previous performance, the probability of a particular baseball team winning any game is $\frac{4}{5}$. What is the probability that the team will win 1 game and lose 1 game during the next 2 games?

0.32

15. A recent survey determined that 85% of a population watches TV at least once a day, 35% of the population uses a computer at least once a day, and 25% of the population do both. What is the probability that a person chosen at random from the population watches TV at least once a day or uses a computer at least once a day?	0.95
16. The probability of Brenda getting hit in a baseball game is 0.345. The probability of Brenda or Deborah getting hit during the game is 0.617. The probability of both Brenda and Deborah getting hits during the game is 0.224. Determine the probability of Deborah getting a hit in the game.	0.496

Rational Expressions and Equations: Chapter 4

Practice Questions	**Notes**
1. A non-permissible value for a rational expression is a value for the variable that makes the: A) numerator equal to zero. B) expression equal to zero. C) denominator equal to zero. D) numerator and denominator both equal to zero.	C
2. Simplify the following expression $\frac{18ab + 21b}{6ab^2}$ A) $\frac{6a + 7}{2ab}$ B) $\frac{6ab + 7b}{2ab^2}$ C) 5 D) $\frac{3ab + 21b}{b}$	A

3. Sam is given two rational expressions with an operation symbol between the two. To perform the operation, Sam erases the operation symbol and the second rational expression and replaces the second rational expression with its reciprocal. Assuming Sam has begun to correctly perform the given operation, the student should replace the original operation symbol with: A) + B) – C) × D) ÷	C
4. Which of the following rational equations has non-permissible values of 0, 3 and 5? A) $\frac{1}{x}+3=\frac{5}{x}$ B) $\frac{3}{x}-\frac{2}{x-5}=\frac{x-3}{2}$ C) $\frac{2}{7}-\frac{3}{x-3}=\frac{x}{x-5}$ D) $\frac{x-2}{x^2}-\frac{3}{x-3}+\frac{2}{x-5}=\frac{7}{x}$	D

5. The non-permissible values of x for the expression $\frac{x+3}{x-4} \div \frac{x}{x-3}$ are A) -3, 0, 3, and 4 B) 0, 3, and 4 C) 0 and 4 D) 3 and 4	B
6. The result of $\frac{4x^2+1}{x-3} - \frac{3x^2+10}{x-3}$, in simplified form, is: A) $x + 3, x \neq 3$ B) $x - 3, x \neq 3$ C) $\frac{1}{x-3}, x \neq 3$ D) $\frac{x^2+11}{x-3}, x \neq 3$	A
7. When adding $\frac{x^2+3}{x-5} + \frac{2x^2-9}{x-5}$: A) add the numerators only. B) add the numerators and add the denominators. C) express both expressions with a denominator of $(x - 5)^2$ and then add the numerators only. D) multiply the numerator of each expression by $(x - 5)$ and then add the numerators and denominators.	A

8. When subtracting rational expressions with different binomial denominators of the form $x - a$, the lowest common denominator is the: A) sum of the binomials. B) product of the binomials. C) quotient of the binomials. D) difference between the binomials.	B
9. What **could** be the solutions to the rational equation shown below, where *a*, *b*, *c*, *d*, *e*, and *f* are natural numbers? $\frac{a}{x-b} - \frac{c}{x+d} = \frac{e}{f}$ A) $x = b, e$ B) $x = -b, -d$ C) $x = c, -d$ D) $x = a, d$	D
10. The simplified product of $\frac{2n^4p}{3m} \cdot \frac{6m^6}{3n^2p^2}$ can be represented by $\frac{An^Bm^C}{3p}$ where A, B, and C represent single digit numbers. In the simplified product $\frac{An^Bm^C}{3p}$, the value of **A** is_____ **B** is _____ **C** is _____	4 2 5

11. Determine the solution of the equation $\frac{3}{x+2}-\frac{1}{x}=\frac{1}{5x}$, to the nearest tenth. _____

1.3

12. *Use the following information to answer the next question.*

> The speed of a train is five times as great as the speed of a scooter. The scooter takes 4 hours longer than the train to travel 400 km.

If the speed of the scooter is given by *x*, which of the following equations correctly models the given scenario?

A) $\frac{400}{6x}=4$

B) $\frac{400}{x}-\frac{400}{5x}=4$

C) $\frac{400}{x}+\frac{400}{5x}=4$

D) $\frac{400}{5x}-\frac{400}{x}=4$

B

13. Use the following information to answer the question.

Ken made an error in the simplification of the rational expression $\frac{2x+10}{2x^2-50}$, $x \neq -5, 5$. His simplification of the expression is shown below.

Step 1 $\frac{{}^{1}\cancel{2}(x+5)}{{}^{1}\cancel{2}(x^2-25)}$

Step 2 $\frac{1(x+5)}{1(x+5)(x-5)}$

Step 3 $\frac{1\cancel{(x+5)}}{1\cancel{(x+5)}(x-5)}$

Step 4 $(x-5), x \neq -5, 5$

The step in which Ken made his error is

A. Step 1
B. Step 2
C. Step 3
D. Step 4

D

14. The area of a rectangle can be modelled by the ration equation $\frac{4x}{x-1} \bullet \frac{x+4}{x+1} = 16,$ where $x > 1.$

Determine the solution for x to this equation.

2

15.

When the rational expression $\frac{2x+4}{x^2-4}$ is simplified, the equivalent expression can be written in the form $\frac{2}{A}, x \neq B$.

Expressions for A and B that would correctly complete the simplified form can be selected from the table below.

Code	Possibilities for A
1	$x-2$
2	$x+2$
3	x

Code	Possibilities for B
4	-2
5	0
6	$-2, 2$
7	$-2, 0, 2$

To form a correct equivalent expression, the code for AB is ___.

16

16.

In parallel circuits, the total resistance of a circuit is determined by using the formula $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_1}$, where R_T is the total resistance, R_1 is the resistance of one branch of the parallel circuit, and R_2 is the resistance of the other branch of the parallel circuit.

In a particular parallel circuit, one branch has 3 ohms more resistance than the other. This can be modelled by the equation

$$\frac{1}{R_T} = \frac{1}{x} + \frac{1}{x+3}$$

where x is the resistance of the unknown branch.

An expression for the total resistance, R_T, of this circuit in terms of x is

A. $R_T = \frac{5}{x+3}$

B. $R_T = \frac{2}{2x+3}$

C. $R_T = \frac{2x+3}{x+3}$

D. $R_T = \frac{x(x+3)}{2x+3}$

D

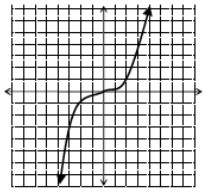
Polynomial Functions: Chapter 5

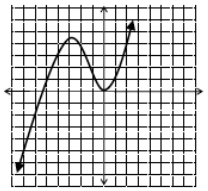
Practice Questions | **Notes**

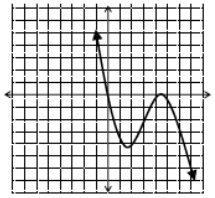
1. A student was given the following information about a function:

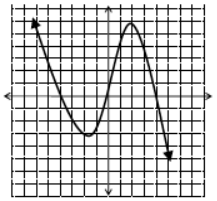
I.	It is cubic.
II.	It has a negative leading coefficient.
III.	It has one zero going through the point of origin.
IV.	It has one double zero.

Based on the criteria provided, which of the following graphs could represent the function described?

A) 

C) 

B) 

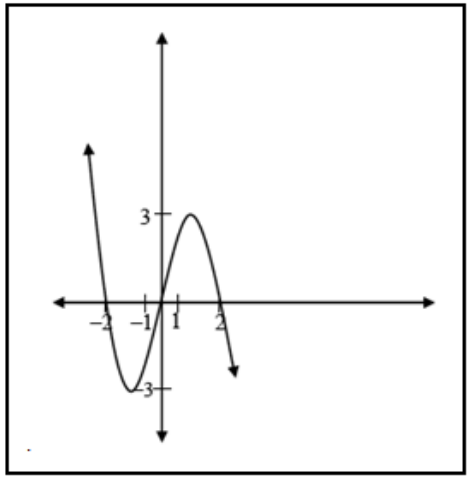
D) 

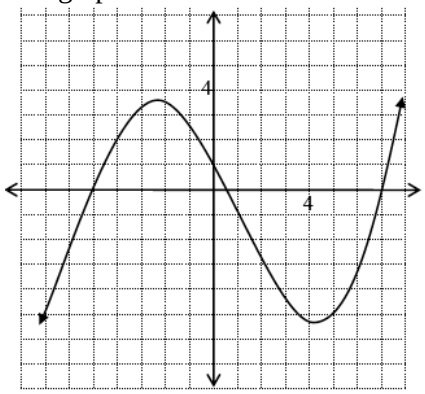
B

2. For the graph of which of the following functions would it be possible to have no x-intercepts?

A) $y = ax^3, a \neq 0$
B) $y = ax + b, a \neq 0$
C) $y = ax^2 + bx + c, a \neq 0$
D) $y = ax^3 + bx^2 + cx + d, a \neq 0$

C

3. State the roots for the function $f(x) = (x - 4)(2x - 7)(x + 1)$ A) $x = -1$, $x = \frac{7}{2}$ and $x = 4$ B) $x = 1$, $x = \frac{7}{2}$ and $x = 4$ C) $x = -1$, $x = -\frac{7}{2}$ and $x = 4$ D) $x = -1$, $x = \frac{7}{2}$ and $x = -4$	A
4. The partial graph of a third-degree polynomial function is shown  The domain of the function is: A) $x \in R$ B) $-2 \le x \le 2$ C) $-3 \le x \le 3$ D) $x \le -2, x \ge 2$	A

5. The graph of a function is shown.  The equation of the function could be: A) $p(x) = (x + 5)(2x - 1)(x - 7)$ B) $p(x) = \frac{1}{35}(x + 5)(2x - 1)(x - 7)$ C) $p(x) = (x - 5)(2x + 1)(x + 7)$ D) $p(x) = \frac{1}{35}(x - 5)(2x + 1)(x + 7)$	B
6. The motion of a motorized vehicle along a straight path is given by the function $m = t^3 - 24t^2 + 24t + 8$, where m is the displacement of the vehicle in millimeters and t is the time in seconds, $t \geq 0$. To the nearest tenth of a second, the second time the vehicle has a displacement of zero is _____.	22.9

7. *Use the following information to answer the question.*

A ball is launched vertically upward from a height of 5 ft, with an initial velocity of 96 ft/s. The height of the ball above the ground for the first 5 seconds is shown in the table below.

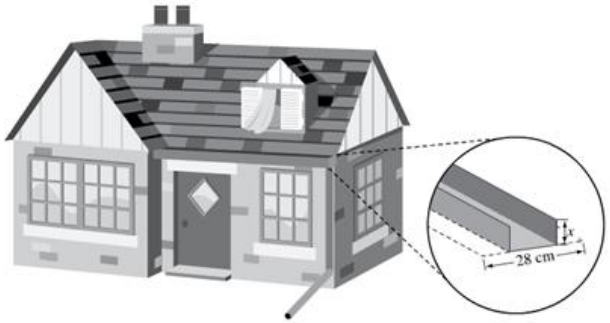
Time (s)	Height (ft)
0	5
1	86
2	134
3	150
4	134
5	86

These data could be **most appropriately** modelled using

A) Linear regression
B) Exponential Regression
C) Sinusoidal Regression
D) Quadratic Regression

D

8. A rain gutter is made from sheets of aluminum that are 28 cm wide. The first step in forming the rain gutter is to turn the edges up to form right angles, as shown in the diagram below.



The cross sectional are formed by the turned up edges affects the water flow. This cross sectional area, *A*, can be modelled using the function

$A = x(28 - 2x)$

Where x is the height of the turned up edges.

To the nearest centimetre, the height of the turned up edge, x, that will maximize the cross-sectional area is _____ cm.

7

9. A hockey arena seats 1600 people. The cost of a ticket is $10. At this price, every ticket is sold. To obtain more revenue, the arena management plans to increase the ticket price. A survey was conducted to estimate the potential revenue for different ticket prices, as shown below.

Ticket Price ($)	Potential Revenue ($)
10	16 000
15	19 500
20	20 300
25	14 750
30	5 500

The data above can be modelled by a quadratic regression function of the form

$y = ax^2 + bx + c$

Where x is the ticket price, in dollars, and y is the potential revenue, in dollars.

Find the regression function that models this data.

Determine the ticket price that would maximize the revenue.

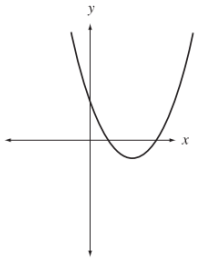
$y = -91x^2 + 3125x - 6340$

$17.17

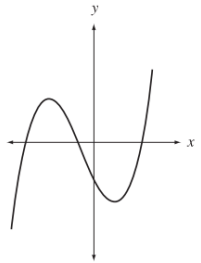
10.

Which of the following graphs is **most likely** the graph of a cubic function?

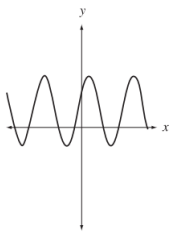
A.



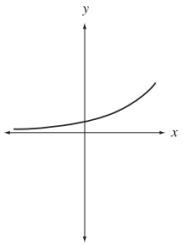
B.



C.



D.



B

11.

The rate at which snow fell on a driveway on a particular day can be modelled by

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

where y represents the rate of snowfall in cubic feet per hour, and x represents the time in hours.

To estimate the length of time that snow fell on this particular day, a student should determine the

A. y-intercept

B. x-coordinate of the vertex

C. y-coordinate of the vertex

D. difference between the x-intercepts

D

12.

Water is being pumped into a 15-gallon tank. Once the volume of water in the tank reaches a certain amount, the tank begins to drain and continues draining until the water is completely gone. The volume of water in the tank can be modelled by the function

$$y = -2t^2 + 5t + 7$$

where y represents the volume of water in the tank in gallons and t represents the time in hours after noon on a particular day.

To determine the volume of water in the tank at noon, the characteristic of the graph of the function that should be analyzed is the

A. y-intercept

B. positive t-intercept

C. t-coordinate of the vertex

D. y-coordinate of the vertex

A

The maximum volume of water in the tank, to the nearest tenth of a gallon, is _____ gallons.

10.125

Which of the following rows describes the **most appropriate** domain and range of the function in this context?

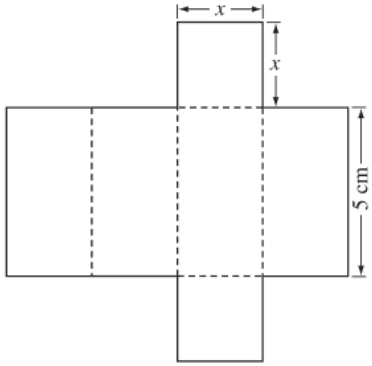
SE

Row	Domain	Range
A.	$t \in R$	$y \leq 10.125$
B.	$t \in R$	$0 \leq y \leq 10.125$
C.	$0 \leq t \leq 3.5$	$y \leq 10.125$
D.	$0 \leq t \leq 3.5$	$0 \leq y \leq 10.125$

D

13.

A rectangular cardboard box can be created by cutting out a pattern with the dimensions shown below and then folding the cardboard along the dotted lines.



The surface area and the volume of this box can be found using the formulas

Surface Area	$A = 2x^2 + 20x$
Volume	$V = 5x^2$

If the numerical values of the surface area and the volume of this cardboard box are the same, then the value of x, to the nearest tenth of a centimetre, is

A. 2.0 cm
B. 2.9 cm
C. 4.0 cm
D. 6.7 cm

D

Exponential Functions: Chapter 6

Practice Questions	**Notes**
1. Solve $4^{5-x} = \frac{1}{256}$ for x A) 2 B) 4 C) 6 D) 9	D
2. Solve $3^{(4x+3)} = 81^{-3}$ A) -1.5 B) -2.5 C) -3.75 D) -5	C
3. To begin solving the equation $3^{x-2} = 4^{x-2}$, A) express both powers with a common base. B) take the logarithm of both sides of the equation. C) express both sides of the equation in exponential form. D) divide both sides of the equation by 3 and then subtract the exponents.	B
4. Which of the following equations could be used to algebraically solve the exponential equation $3^{x-1} = 9^{x-3}$? **A.** $3^{(x-1)} = 3^{(2x-3)}$ **B.** $3^{(x-1)} = 3^{(2x-6)}$ **C.** $9^{(2x-1)} = 9^{(x-3)}$ **D.** $9^{(2x-2)} = 9^{(x-3)}$	B

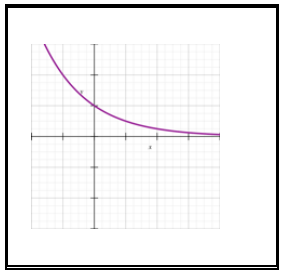
5. The point $P\ (x, 0.91)$ lies on the graph of the function $y = \left(\frac{3}{7}\right)^x - 4$. The value of x is:

A) –0.25
B) –1.88
C) –3.49
D) –3.54

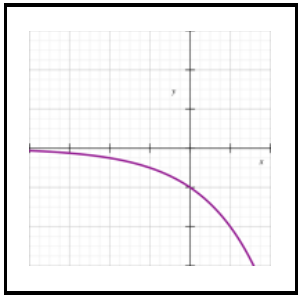
B

6. Which of the following graphs is $y = -2^x$

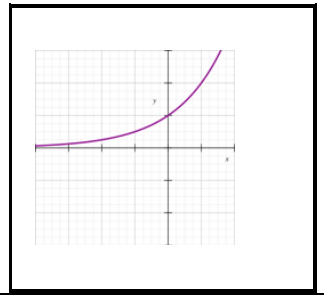
A)



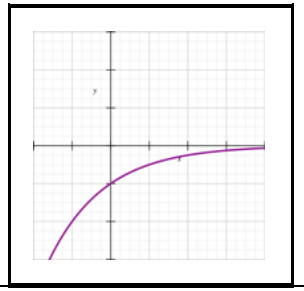
C)



B)



D)



C

7. *Use the following information to answer the question.*

From 1997 to 2008, the population of a particular town grew at an average rate of 5.4%/a. During this 11-year period, its population, P, can be modelled by the exponential function

$$P = x(1 + r)^n$$

where x is the population in 1997, r is the average annual growth rate, and n is the number of years since 1997. In 2008, the population was 14 030.

According to the model, the population of this town in 1997 was approximately

A) 121
B) 828
C) 1210
D) 7867

D

8. *Use the following information to answer the question.*

The 2010 earthquake in Haiti measured 7.0 on the Richter scale. In 2004, an earthquake off Indonesia measuring 9.1 on the same scale caused a tsunami. In order to compare the relative intensities, I, of these two earthquakes, the following formula may be used:

$$I = \frac{10^m}{10^n}$$

where m and n are the Richter scale values of each earthquake.

Compared to the earthquake in Haiti, the earthquake off Indonesia, to the nearest whole number, was _____ times stronger.

126

9. *Use the following information to answer the question.* Ahmed invested $1 000 for four years into an account that pays 3%/a, compounded annually. Which of the following functions models the value, V, of Ahmed's investment in four years time? **A.** $V = 1\,000(1.03)^4$ **B.** $V = 1\,000(0.03)^4$ **C.** $V = 1\,000(1.03)(4)$ **D.** $V = 1\,000(0.03)(4)$	A
10. The value of a particular car is decreasing at an average rate of 18%/a. The initial value of the car was $29 300. Which of the following exponential functions could be used to model the value of the car, $v(t)$, after t years? **A.** $v(t) = 5\,274(0.82)^t$ **B.** $v(t) = 5\,274(1.18)^t$ **C.** $v(t) = 29\,300(0.82)^t$ **D.** $v(t) = 29\,300(1.18)^t$ ***SE***	C
11. Sam deposits $100 into a savings account that pays 2.4%/a, compounded annually. A function that models the growth of the deposit is $y = 100(1.024)^x$ where y is the value of the investment, in dollars, and x is the number of years since the deposit was made. Determine how long, to the nearest year, that it will take for the investment to be worth at least $180.	25 years

12.

The half-life of carbon-14 is approximately 5 730 years. As a sample of carbon-14 decays, the percentage of carbon-14 remaining, P, at any time during the process can be modelled by the function

$$P = 100\left(\frac{1}{2}\right)^{\left(\frac{t}{5\,730}\right)}$$

where t is the approximate age of the sample, in years.

To the nearest year, determine the approximate age of the carbon-14 when 33% of the original amount remains in the sample.

9165 years

13.

A researcher discovered mould growing in a Petri dish in her laboratory. When first observed, the mould covered only 3% of the dish's surface. Every 24 h, the surface area of the mould doubles in size, as shown in the table below.

Time (h)	Area covered (%)
0	3
24	6
48	12
72	24

Write an exponential regression equation to model the growth of the mould over time.

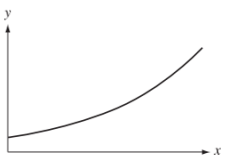
Determine the length of time, to the nearest tenth of an hour, that it will take for the Petri dish to be completely covered with mould.

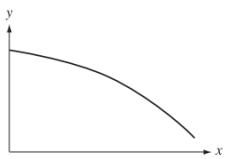
$y = 3(1.02930237\ldots)^x$

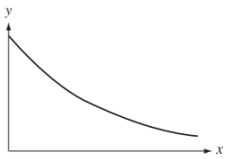
121.4 h

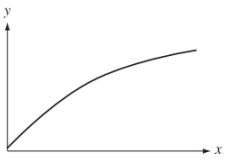
14.

A painting was purchased in 2012 for $10 000. If the painting appreciates in value at 5%/a, then which of the following graphs best models the value of this painting for the next 40 years?

A. 

B. 

C. 

D. 

A

Logarithmic Functions: Chapter 7

Practice Questions	**Notes**
1. Write $\log_b x = y$ in its equivalent exponent form. A) $y = x^b$ B) $x = b^y$ C) $b = x^y$ D) $y = b^x$	B
2. When the equation $23^x = 29$ is written in logarithmic form, the value of the base is _____.	23
3. Written as a single logarithm, the expression $2\log_a x - 3\log_a y + 4\log_a z$ can be expressed as _____. A) $\log_a(x^2z^4y^3)$ B) $\log_a\left(\frac{x^2z^4}{y^3}\right)$ C) $\log_a\left(\frac{x^2y^3}{z^4}\right)$ D) $\log_a\left(\frac{x^2}{y^3z^4}\right)$	B

4. The quotient law of logarithms states that $\log_5\left(\frac{18}{7}\right)$ = _____. A) $\log_5 11$ B) $\log_5 25$ C) $\log_5 18 + \log_5 7$ D) $\log_5 18 - \log_5 7$	D
5. The *x* intercept of the graph of the function $y = log_{\frac{1}{3}}x$ is: A) $x = 1$ B) $c = \frac{1}{3}$ C) $x = -1$ D) $x = -\frac{1}{3}$	A
6. The value of $\log_{25}625$ is _____.	2

7. *Use the following information to answer the question.*

When objects of different masses are compared without a scale, to be perceived the difference in mass must be large enough. For example, when held in a person's hands, different masses within 5 g of 100 g will seem to be the same. The 5 g difference is known as the Minimum Perceivable Difference.

For heavier objects, the Minimum Perceivable Difference increases. The Minimum Perceivable Differences for various masses are shown in the table below.

Mass (g)	Minimum Perceivable Difference (g)
100	5
200	10
400	15
800	20

These data can be modelled by a logarithmic regression function of the form

$$y = a + b \ln x$$

where x is the mass of the object, in grams, and y is the Minimum Perceivable Difference in mass, in grams.

Determine a logarithmic regression function of the form $y = a + b \ln x$ to model these data. Round values of a and b to the nearest tenth.

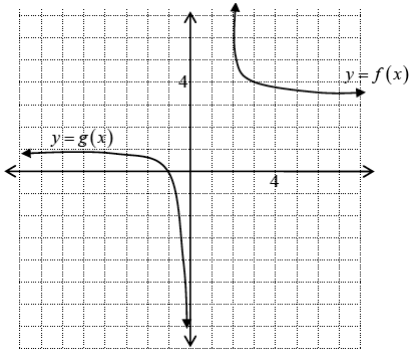
Based on the regression equation, determine the Minimum Perceivable Difference, to the nearest gram, for an object with a mass of 2 100 g.

y = -28.2 + 7.2*lnx*
27 g

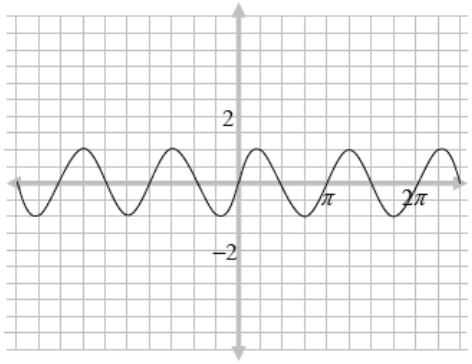
8. Which of the following equations is equivalent to $4^{x+2} = 16$

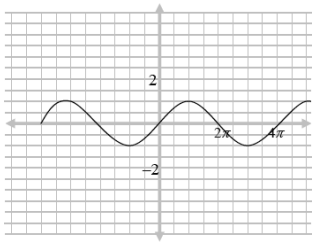
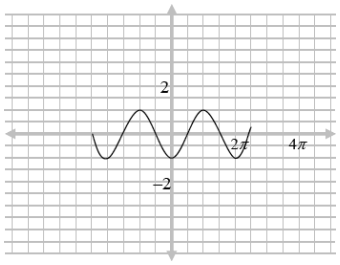
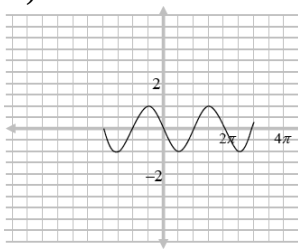
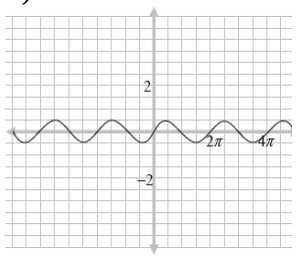
A. $\log_{(x+2)} 4 = 16$
B. $\log_{(x+2)} 16 = 4$
C. $\log_4 (x + 2) = 16$
D. $\log_4 16 = x + 2$

D

9. A culture of bacteria triples every hour. How long does it take the bacteria culture to grow from 245 cells to 89 425 cells, to the nearest hundredth? _____	5.37
10. The graphs of two functions are shown. The equation of the function $y = f(x)$ could be:  A) $y = \log(x - 2) + 4$ B) $y = \log(x + 2) + 4$ C) $y = -\log(x - 2) + 4$ D) $y = -\log(x + 2) + 4$	C
11. The pH of a solution can be determined using the formula $$\text{pH} = -\log_{10}[H_3O^+]$$ where $[H_3O^+]$ is the concentration of hydronium ions in the solution. The pH of a particular solution is 6.6. If the concentration of hydronium ions in the solution is doubled, the new pH of the solution, to the nearest tenth, will be _____.	6.3

Sinusoidal Functions: Chapter 8

Practice Questions	**Notes**
1. The graph of a sinusoidal function is shown.  Compared to the graph of $y = \sin x$, the given graph differs only in: A) period. B) phase shift. C) amplitude. D) vertical displacement.	A
2. Which of the following functions has a median value of 4? A) $y = 4\sin(2x + 1) – 5$ B) $y = 2\sin(x – 5) + 4$ C) $y = \sin(5x + 4) + 2$ D) $y = –5\sin(4x + 2) + 1$	B

3. Which of following functions has the largest maximum value? A) $y = 3\sin(4x + 3) + 1$ B) $y = 2\sin(2x + 1) + 2$ C) $y = -3\sin(2x + 1) + 4$ D) $y = -2\sin(5x - 3) + 6$	D
4. The graph of which of the following functions corresponds to $y = -\cos x$? A)  B)  C)  D) 	B

5. The average daily temperature of Montreal, in °F, for each of the months of the year is shown in the table below. January is month 1, February is month 2, etc.

Month	Average Daily High Temperature in °F	Month	Average Daily High Temperature in °F
1	22	7	80
2	25	8	77
3	36	9	67
4	52	10	51
5	66	11	41
6	75	12	28

The data cane be modelled by an equation in the form $y = a\sin(bx) + d$, where *x* is the month number and *y* is the average daily high temperature. To the nearest hundredth, the value of *a* is _____, *b* is _____,c is _____, and *d* is _____.

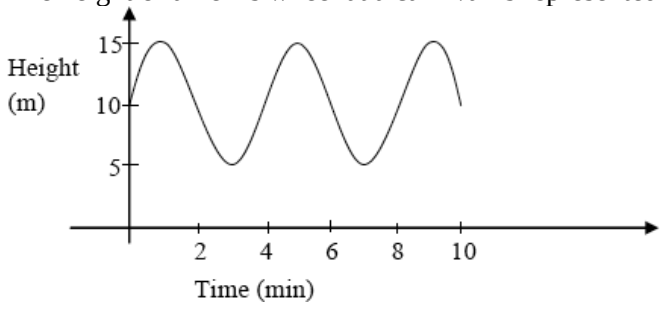
If scientists predict that the average daily temperature in °F will increase by 1.2 °F each month, what characteristic of the graph of the sinusoidal regression function would change?
A. amplitude
B. median value
C. period
D. phase shift

a = 29.08
b = 0.51
c = -2.02
d = 50.77

B

SE

6. The height of a Ferris wheel at a carnival is represented in the graph provided.



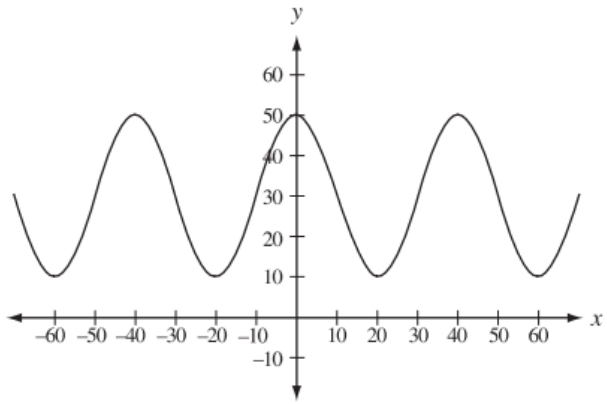
To the nearest metre, what is the diameter of the Ferris wheel? _____

10

7. The time of sunrise in a Maritime city is given by the equation above, where n is the nth day of the year and t is the time after midnight, in hours. $t = 1.89\sin(0.017n - 1.377) + 6.41$ If John leaves for work at 7:45 am, for how many days in the year will he leave before the sun rises? A) 92 B) 116 C) 249 D) 273 At what time will the sun rise on October 22 (day 295)? A) 7:02am B) 6:37am C) 5:51am D) 5 : 31am	A D
8. The height above the ground of a rider on a Ferris wheel can be modelled by the sinusoidal regression function $h = 6\sin(1.05t - 1.57) + 8$ where h is the height of the rider above the ground, in metres, and t is the time, in minutes, after the ride starts. According to the sinusoidal regression function, the maximum height of the rider above the ground is **A.** 2 m **B.** 6 m **C.** 8 m **D.** 14 m When the rider is at least 11.5 m above the ground, she can see the rodeo grounds. During each rotation of the Ferris wheel, the length of time that the rider can see the rodeo grounds, to the nearest tenth of a minute, is _____ min.	D 1.8 min

9.

The graph of a sinusoidal function is shown below.



The amplitude of the sinusoidal function is ___***i***___ *units and the median is* ___***ii***___ *units.*

i. 20
ii. 30

10.

The height of a pendulum, h, in inches, above a table top t seconds after the pendulum is released can be modelled by the sinusoidal regression function

$$h = 2\sin(3.14t - 1) + 5$$

The height of the pendulum at the moment of release, to the nearest tenth of an inch, is _____ in.

3.3 in