ANSWER KEY

GRADE 11 CST MATH
MIDYEAR EXAM REVIEW
SECTION 3: LONG ANSWER QUESTIONS

Note:

- You have seen all of these questions before. Your midyear exam will contain 3 long answer questions based on the types of questions in this package.
- Answer key posted on website (thomsonmachigh.weebly.com)
- Please come see me ASAP if you do not understand any of these

optimize

19. Below are systems of inequalities that represent the constraints of a given situation.

$x \geq 0$ ✓
$y \geq 0$ ✓
$6x \leq x + y$
$-2y \geq 4x - 11$
$y \leq 10$

$6x = x + y$
$-x \quad -x$
$5x = y$

$5(0) = y$ $\quad$ $5(1) = y$
$0 = y$ $\quad$ $5 = y$
$(0,0)$ $\quad$ $(1,5)$

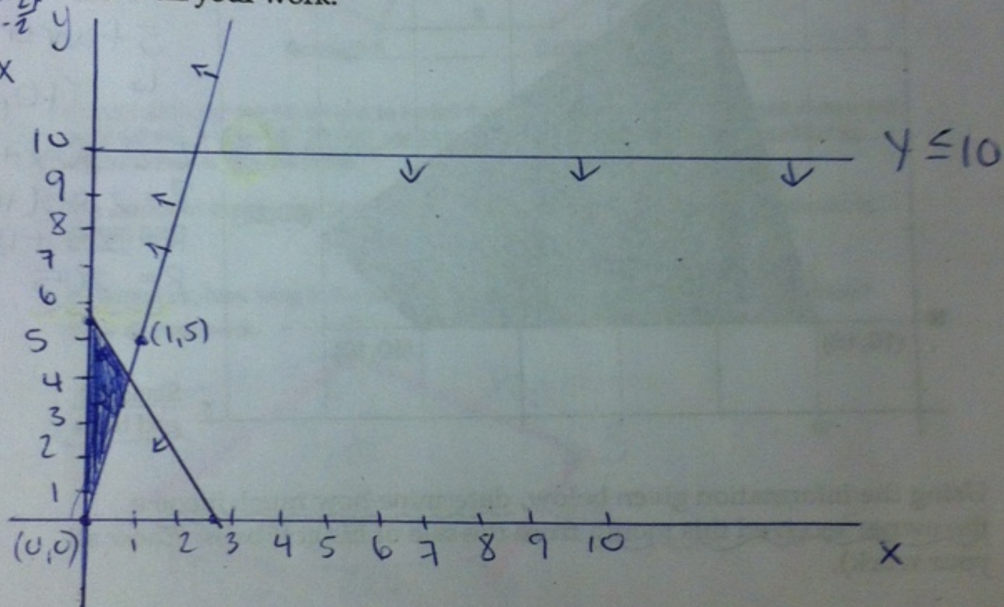
$\frac{-2y}{-2} = \frac{4x - 11}{-2}$
$y = -2x + 5.5$

$y = -2(0) + 5.5$
$(0, 5.5)$

$0 = -2x + 5.5$
$\frac{-5.5}{-2} = \frac{-2x}{-2}$
$2.75 = x$

Graph and the shade solution set for these systems of inequalities on the Cartesian plane provided in your answer booklet.

Show all your work.



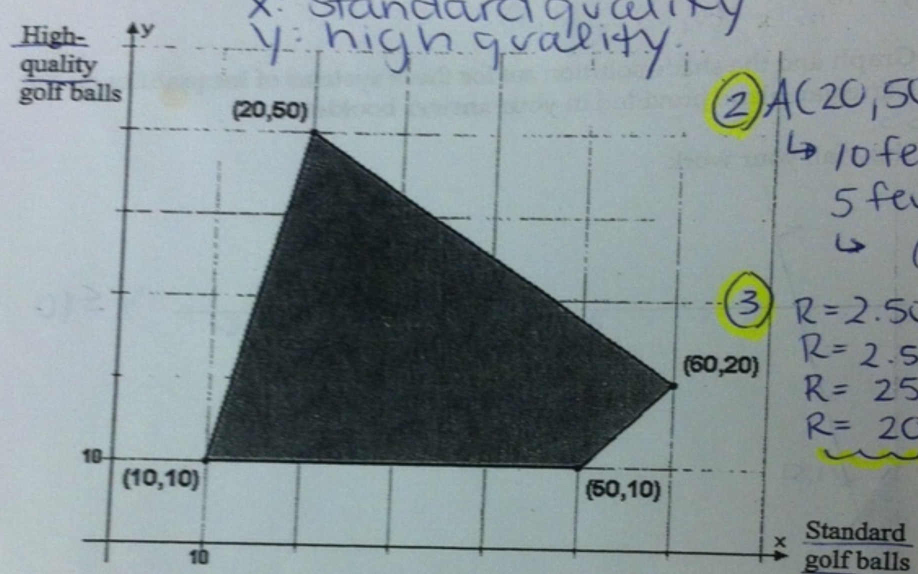
NOTE: These are the absolute hardest inequalities you would ever have to graph. I just wanted you to practice. On your exam they will give you the Cartesian plane and the inequalities will be easier than this.

①	$R=2.50x+4.00y$	R
A(20,50)	$2.50(20)+4.00(50)$	250
B(60,20)	$2.50(60)+4.00(20)$	230
C(50,10)	$2.50(50)+4.00(10)$	165
D(10,10)	$2.50(10)+4.00(10)$	65

21. A sport store sells two types golf balls: standard quality balls for $2.50 each and high quality balls for $4 each. $R=2.50x+4.00y$

The number of standard quality balls and high quality balls the owner can sell each month is represented by the polygon if constraints below.

x: standard quality
y: high quality



② A(20,50)
↳ 10 fewer x,
5 fewer y
↳ (10,45)

③ $R=2.50x+4.00y$
$R=2.50(10)+4.00(45)$
$R=25+180$
$R=205$

Using the information given below, determine how much income the owner received this month from the sale of his golf balls. (Show all your work).

① • Last month, the owner maximized his profit. FIND MAX.

② • This month, 10 fewer standards quality balls were sold (when compared to last month).
• This month, the owner sold 5 fewer high quality golf balls than he did last month. MAKE THESE ADJUSTMENTS TO THE MAX.

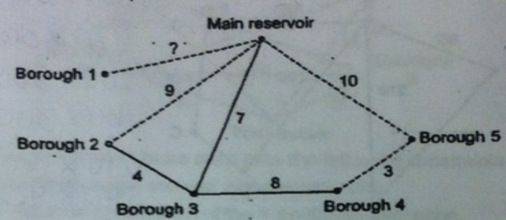
③ ↳ looking for R with the new coordinates.

ANS: Income this month was $205.

A water treatment plant must serve a city's 5 boroughs from its main reservoir. Pipes must be installed to carry the water from the main reservoir to the different boroughs.

In the graph below, one of the vertices represents the main reservoir and the others represent the boroughs. The edges correspond to the pipes that could be installed. The value associated with each edge indicates the length, in kilometres, of the corresponding pipe.

$9 \times 80 = 720$
$10 \times 80 = 800$
$3 \times 80 = 240$
$4 \times 110 = 440$
$7 \times 110 = 770$
$8 \times 110 = 880$

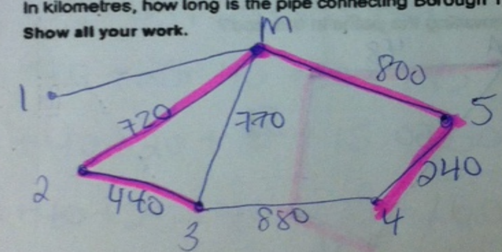


It costs $80 000 per kilometre to install the pipes represented by edges drawn with dotted lines. It costs $110 000 per kilometre to install the pipes represented by edges drawn with solid lines.

The minimum installation cost to connect all 5 boroughs to the main reservoir is $2 680 000.

In kilometres, how long is the pipe connecting Borough 1 to the main reservoir?

Show all your work.



$720 + 440 + 800 + 240 = 2200$

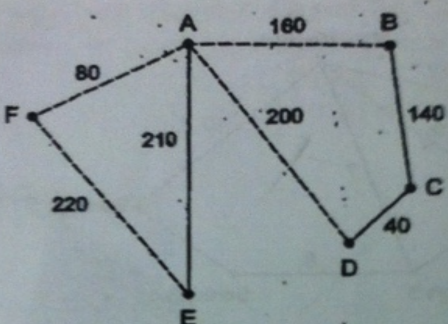
$2680 - 2200 = 480$

$480,000 \div 80,000 = 6$

The pipe connecting Borough 1 to the main Reservoir is 6km long.

A contractor was hired to renovate some of the paths in a zoo in order to increase visitor satisfaction.

In the graph below, vertices A, B, C, D, E and F represent the different areas of the zoo. The edges represent the paths that can be renovated. The number on each edge indicates the length, in metres, of the corresponding path.

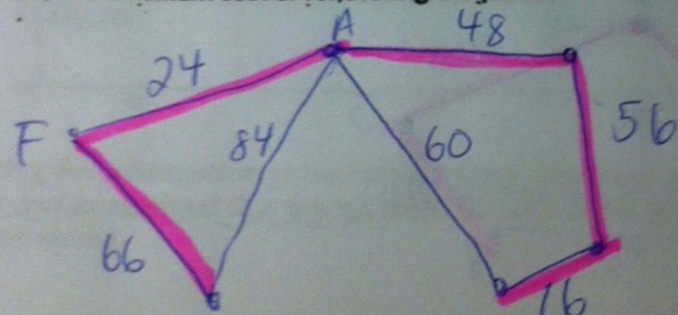


$80 \times 300 = 24{,}000$
$220 \times 300 = 66{,}000$
$200 \times 300 = 60{,}000$
$160 \times 300 = 48{,}000$
$210 \times 400 = 84{,}000$
$40 \times 400 = 16{,}000$
$140 \times 400 = 56{,}000$

It costs $300 per metre to renovate the paths represented by dotted lines and $400 per metre to renovate the paths represented by solid lines.

To reduce the cost, management decided to renovate the fewest possible number of paths. In addition, visitors must be able to reach all the areas by taking only renovated paths.

What is the minimum cost of renovating the paths in this zoo?

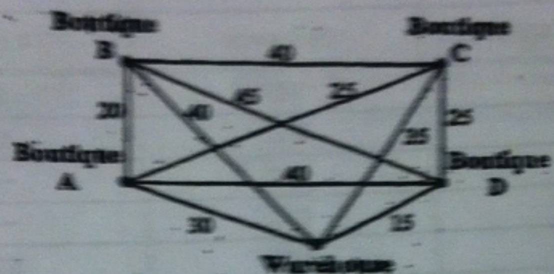


$66 + 24 + 48 + 56 + 16 = 210$

Min cost is $210,000.

7. Louise delivers merchandise for a chain of boutiques.

The edges of the following graph represent the different routes Louise can take. The number on each edge indicates the time in minutes needed to get from one place to another.



① WCDBAW
② WBCDAW
③ WCBADW
④ WBCADW

In choosing her route, Louise must take the following constraints into account:

- Her route must begin and end at the warehouse.
- She is required to visit each of the 4 boutiques only once.
- She must go to Boutiques B and C before going to Boutique A.
- She must go to Boutique C before going to Boutique D.
- She wants to minimize the time it takes to make all her deliveries.

Which route should Louise take?

Show all your work.

① 35 + 25 + 45 + 20 + 30 = 155

② 40 + 40 + 25 + 40 + 30 = 175

③ 35 + 40 + 20 + 40 + 15 = 150

④ 40 + 40 + 25 + 40 + 15 = 160

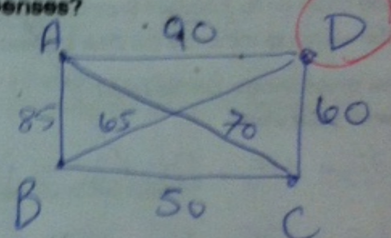
Ans: WCBADW is the shortest route at 150 minutes.

Sam is planning a trip to Alberta, where he will be visiting cities A, B, C and D. To get from one city to another, he will travel by bus or by train. The following table shows the cost of getting from one city to another depending on the mode of transportation.

TRAVEL BETWEEN CITIES	BUS FARE	TRAIN FARE
A and B	$85	$90
A and C	$85	$70
A and D	$90	—
B and C	$50	—
B and D	$65	$75
C and D	—	$60

Sam will begin and end his trip in City D.

What are Sam's total minimum travel expenses?
Show all your work.



① DCBAD: 60+50+85+90=285
② DCABD: 60+70+85+65=280
③ DBACD: 65+85+70+60=280
④ DACBD: 90+70+50+65=275

Note: There are more paths that you could come up with here but they are just the reverse of each other like ② and ③

ANS: Sam's minimum travel expenses: $275.

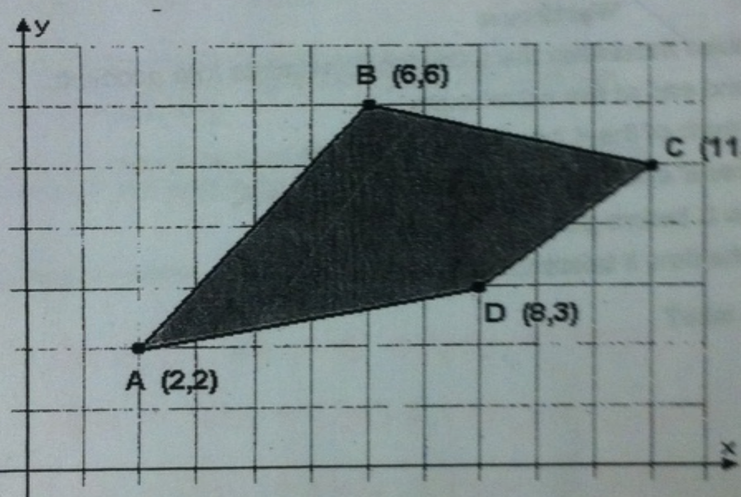
·OPTION A

	$R = 8x + 11y$	R
A(2,2)	8(2) + 11(2)	38
B(6,6)	8(6) + 11(6)	114
C(11,5)	8(11) + 11(5)	143 ←
D(8,3)	8(8) + 11(3)	97

OPTION B

	$R = 10x + 10y$	R
A(2,2)	10(2) + 10(2)	40
B(6,6)	10(6) + 10(6)	120
C(11,5)	10(11) + 10(5)	160 ←
D(8,3)	10(8) + 10(3)	110

23. Hasna works at two different clothing manufacturers (Company A and Company B). There are different constraints that limit the number of hours she can work per week. These constraints are represented by the polygon of constraints given below:



Where x: number of hours she can work in Company A
y: number of hours she can work in Company B

Option A : $R = 8x + 11y$
Company A is paying Hasna \$8/hour and Company B is paying her \$11/hour.

Option B : $R = 10x + 10y$
After a small disagreement on the salary, both employers decide to pay Hasna a fixed hourly rate of \$10/hour.

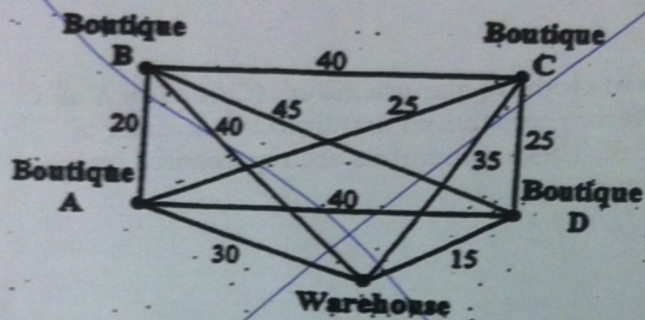
Which hourly rate allows Hasna to maximize her income?

ANS : Option B at \$10/hour for both allows her to maximize at C(11,5) with \$160.

#2

1. Louise delivers merchandise for a chain of boutiques.

The edges of the following graph represent the different routes Louise can take. The number on each edge indicates the time in minutes needed to get from one place to another.



Repeat question sorry!

In choosing her route, Louise must take the following constraints into account:

- Her route must begin and end at the warehouse.
- She is required to visit each of the 4 boutiques only once.
- She must go to Boutiques B and C before going to Boutique A.
- She must go to Boutique C before going to Boutique D.
- She wants to minimize the time it takes to make all her deliveries.

Which route should Louise take?

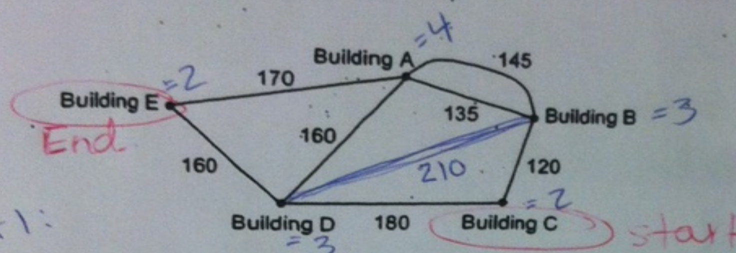
Show all your work.

#4

All 5 buildings in the botanical gardens are connected by paths. Visitors may begin their tour in any building they choose.

In the graph below, the vertices correspond to the buildings. The edges correspond to existing paths. The value associated with each edge indicates the length, in metres, of the corresponding path.

→ Buildings D and B have add degrees. So we add the new path between them to make the mall even.



Part 1:

The director of the botanical gardens decides to open a new path so that visitors may choose to begin and end their visit in the same building and walk each path only once. This new path is 210 metres long.

→ Euler cycle. Need all even degrees.

Part 2: When the new path is open, Carl goes to the botanical gardens and visits all of the buildings. He begins in Building C and ends in Building E. During his visit, Carl uses only 4 paths.

What is the maximum distance, in metres, that Carl can walk on these paths?

Show all your work.

① CDBAE: 180 + 210 + 145 + 170 = 705

② CBDAE: 120 + 210 + 160 + 170 = 660

③ CBA$_2$DE: 120 + 145 + 160 + 160 = 585

ANS → Max distance is 705 metres