

SCM 373 Final Exam

Instructor: Kuang, Wenyi

Last Name: _____

First Name: _____

PID: _____

By signing this document, I pledge, on my honor, that I have not given or received any unauthorized assistance on this examination. I understand that by violating this pledge I may receive a score of zero (0) on this exam.

Signature: _____

Guidelines:

1. Attempt to cover your answers at all times.
2. Do not mark your answers in the margins of the exam.
3. Do not talk with others during the exam. All questions should be directed towards the instructor.
4. Only the following materials are allowed:
 - a. This examination paper
 - b. An approved calculator – either a five function, scientific, or a cleared graphing calculator
 - c. Writing implements
 - d. Water/Soda/beverage bottle

The use of unapproved paper, technology (mobile phones, tablets, and laptops etc.), and other resources is prohibited. Their use may result in a **zero** grade for this examination.

Please write your answers directly on the exam paper.

A Field Trip to Meijer

After screening applicants' CVs and conducting the first round interviews, Meijer further invites some students to their company for a field trip to closely observe and test the applicant's capabilities so as to place them into different appropriate SCM related positions, if they can pass Meijer's tests. You are one of the students being invited.

Head office meeting

The trip starts with a meeting in Meijer's head office meeting room. Meijer's SCM stuff are having a meeting discussing their basic operational issues.

There has been a heated discussion regarding whether the company should restructure the logistics department to be under the management of SCM department. Those who favored the merge argued that "logistics management can be considered to be part of supply chain management".

1. The underlined argument is:

- A. True
- B. False

Those who favored the merge further argued that logistics, in its simplest form, "is just another term for transportation and is only concerned with the distribution of products".

2. The underlined argument is:

- A. True
- B. False

The supply chain manager then summed up the discussion by saying "In my opinion, logistics management integrates inbound logistics with outbound logistics. By putting logistics department under the control of SCM department, we can further integrate our supply chain processes to provide better customer service".

3. The underlined argument is:

- A. True
- B. False

Part of Meijer's 2020 plan is to expand into international markets to boost revenue as well as profits. The challenge imposed on SCM department is how to manage

the complicated global supply chain. Internal discussions regarding how to manage the total cost have been overwhelming. One group insists that “In managing global supply chain, unless both inventory carrying cost and transportation cost can be minimized simultaneously, no optimum total landed cost could be achieved”.

4. The underlined argument is:

- A. True
- B. False

In line with Meijer’s expansion into global markets, its exposure to global suppliers will increase, resulting in more imported products. One question raised here is “How if those products imported are not sold and Meijer wants to redirect them to other Meijer’s stores in other countries”.

5. Fortunately, you know the solution, Meijer can utilize _____.
The benefits to adopt this strategy is 1) _____ ,
2) _____ , 3) _____ ,
4) _____ . (5 points)

Warehouse Tour

In line with the overseas expansion plan, there is also a plan to expand the number of US domestic warehouses to cover as many consumers as possible. Accordingly, warehouse stuff raised various concerns and questions. You summarized your meeting with the warehouse team and found that there have emerged five different streams of discussions (listed in question 6).

6. Which statement would NOT represent a strategic warehousing decision?
- A. How could productivity in the shipping department be increased?
 - B. Should warehousing be owned, leased, rented, or some combination of these options?
 - C. Should the warehousing function be contracted out to a third-party provider?
 - D. How should Meijer consolidate branch warehouses into a fewer number of facilities?
 - E. Should Meijer install new material handling equipment or continue to hire more labor?

Since Christmas is around the corner, you saw that the warehouse is a little bit overloaded and overflowed. One of the students suggests that “when conducting resource level planning during a warehouse design, Meijer should always plan”

based on the peak (Maximum) level” so there won’t be problems of overloading or overflowing in the warehouse.

7. The underlined statement is:

- A. True
- B. False

8. With Christmas around the corner, Meijer is also planning for “seasonal storage” Remembering that the economic benefits of running a warehouse is to *save money* by using a storage point, how can you justify that “seasonal storage”, which increases the volume of stock hence increases inventory holding cost, can still save money?

- A. It saves money because of the expected huge volume so we can deliver in consolidated loads to get cheaper shipping rate.
- B. It saves money because the cost of additional storage and inventory holding cost is less than loss of sales.
- C. It saves money by increasing the utilization of warehouse storage area.
- D. It saves money by streamlining operational fluctuations in demand forecasting.

Atop the resource planning and warehouse expansion plan, someone in the warehouse team also initiated a discussion centering upon how to efficiently store different categories of products in the warehouse.

9. To be best of your knowledge, _____ can be used to segment the products. (0.5 point)

In contrast to the proposal of expanding the number of warehouses domestically, some warehouse stuff argued that Meijer should reduce the number of warehouses. Their argument is that:

10. Per _____ law, if Meijer reduces its number of warehouses, its inventory holding cost, especially safety stock holding cost, should also be reduced. (1 point)

However, you immediately spotted one fatal mistake in the above argument, that is, this argument doesn’t take into account of the different categories of products.

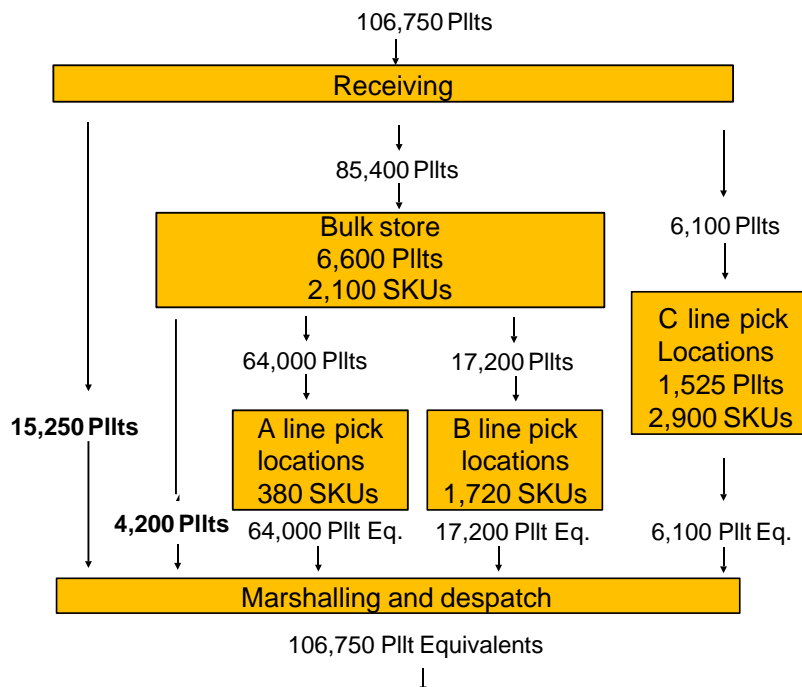
11. This law (as was identified in question 10) is most suitable to be applied for:

- A. Fast moving items
- B. Medium moving items
- C. Slow moving items
- D. Low value items

12. While you were still touring around the warehouse, you noticed that some pallets received were broken apart and products were taken from those pallets, mixed with existing products sitting in the warehouse, and then packed for outbound delivery. This is a:

- A. In Transit Mix
- B. Cross Docking
- C. Cannot tell based on the info given
- D. Break Bulk

The warehouse team also presented the following graph of “Year in the life of a warehouse”, you found that there are 15,250 pallets go directly from “Receiving” to “marshalling and dispatch”.



13. What is the most possible and appropriate explanation for these 15,250 pallets in terms of logistics operation?

- A. These are products for In-transit mixing operations.
- B. These are products for Cross Docking operations.
- C. These are products reserved for certain customers.
- D. These products are unimportant products.

When it comes to the discussion of selecting warehouse storage system for the potential new warehouses, there are two streams of discussions: One stream proposed to choose ASRS. Their argument is that “ASRS can be used for both palletized and non-palletized goods” hence it will achieve efficiency.

14. The underlined statement is:

- A. True
- B. False

The discussion with the warehouse team went on to order picking. Someone in the team also mentioned order picking technology. At this moment, you remembered the MSU store you've visited.

15. MSU store adopts an order picking technology called _____ (0.75 points). The dominant storage system in MSU store is _____ (0.75 points).

Order picking rules, however, are also important in a warehouse operation to achieve efficiency.

16. In designing order picking rules for a warehouse, which of the following are **NOT** correct?

- A. Maximum movement of pickers and replenishers.
- B. Full product range in smallest possible area to minimize the movement of picking staff.
- C. Minimum congestion at picking face is desired.
- D. Segregation of order picking from bulk storage activities and replenishment.

Meeting the Transportation Team

The field trip moves on. Meeting with transportation team starts with a discussion of the selection of 3PLs. Economies of scale and economies of scope etc. were mentioned frequently during the discussion but it seemed that there was a confusion in the crowd regarding the definition of the terminology. Hence, you gave two examples to illustrate.

17. UPS is a leading worldwide logistics company. In the early years of its operations, due to its limited customer base, the published tariff of UPS was very high. With the expansion of its customer base, UPS was able to reduce its rate step by step. Which of the following concept can be used to explain this phenomenon from a logistics perspective?

- A. Economies of scale
- B. Economies of scope
- C. Economies of density
- D. Economies of capacity utilization

18. In its infant stage, UPS was only able to provide overnight document delivery services. However, with time going on and with the customer demand increasing, UPS now provides a one stop total logistics solution, ranging from express, air freight, and warehouse to ocean freight etc., increasing its service scope while lowering its cost. Which of the following concepts can be used to explain this phenomenon from a logistics perspective?
- A. Economies of scale and Economies of density
 - B. Economies of density and Economies of capacity utilization
 - C. Economies of scale and Economies of capacity utilization
 - D. Economies of scope and Economies of density

After a glance at UPS rate for Meijer, you noticed that UPS adopts a flat rate regardless of the distance travelled. To the best of your knowledge, you reckon that this is not a reasonable quotation because of the tapering principle.

19. What is *tapering principle* in transportation?
- A. The cost curve increases at a decreasing rate as a function of distance.
 - B. The transportation cost decreases with the increase of distance.
 - C. The cost curve starts from a non-zero point due to fixed costs.
 - D. Cost curve increases as a function of distance.

To improve its transportation efficiency, Meijer also resorted to some 4PL companies for a total transportation solution. A major difference between 3PL and 4PL is that 3PL is asset based while 4PL is non asset based.

20. The underlined statement is:

- A. True
- B. False

Reviewing UPS' quarterly performance, you came across one abbreviation of "AFTK". AFTK stands for Available Freight Ton Kilometers. It is a revenue measure of a flight's freight carrying capacity. It is calculated by multiplying the number of ton of freight on an aircraft by the distance travelled in kilometers.

21. The underlined statement is:

- A. True
- B. False

UPS quarterly performance report for Meijer also mentioned that UPS is a member of **Cargo iQ**.

22. Which statement about Cargo iQ is correct?

- A. Some of the answers.
- B. It is a quality management system for the worldwide air cargo industry.
- C. The objective of Cargo iQ is to improve the efficiency of air cargo, enhancing customer service levels and reducing operational costs.
- D. Its essence is to re-engineer the transportation process from shipper to consignee.
- E. Cargo 2000 is an old name for Cargo iQ.
- F. All of the answers.

Meeting the Inventory team

(15 points: Only one blank weighs 2 points. All the remaining blanks weigh 1 point each)

The meeting with inventory management team requires you to present some preliminary solutions to Meijer's current inventory management practice. For the ease of calculation, please stick to the following assumptions:

Assume 365 days/52 weeks per annum, and 30 days/4 weeks per month.

Here are some facts:

Product A

Monthly Demand	312 units
Unit Price	\$32
Cost to order	\$25
Annual holding rate	18%
Lead Time	14 days
Target service level	97.5%
Standard deviation of demand	30 units/month
Current stock on hand	1997 units

Product B

Monthly Demand	250 units
Unit Price	\$3.30
Cost to order	\$30
Annual holding rate	20%
Lead Time	14 days
Target service level	96%
Standard deviation of demand	8 units/month
Review period	3 weeks
Current stock on hand	1034 units

23. For **product A**, You are proposing to use fixed quantity policy to present your results (*please round your results to the nearest integer*).

EOQ = _____ Units

Safety Stock = _____ Units

Average Stock Level = _____ Units

Order frequency = _____ times per annum

IBO (Interval between Orders) = _____ days

Inventory turns = _____ times per annum

Re-order Point = _____ Units

Time taken to reach your proposed inventory level = _____ days

Total Annual Inventory Cost = _____ dollars (**2 points**)

24. For **product B**, you are planning to use fixed interval policy to present your results (*please round your results to the nearest integer*).

Safety stock = _____ Units

Target Stock Level = _____ Units

Average Stock Level = _____ Units

Inventory turns = _____ times per annum

Time taken to reach your proposed inventory level = _____ Days

Meeting the Procurement Team

You are looking forward to meeting with the procurement team because you always wanted to work in sourcing and procurement. How exciting! The first thing you noticed is that there are two bills of lading on the meeting room table. The bills of lading are for sea freight shipments from China to US. One of your cohort said: if it's shipment from China to US, then from a practical cost control perspective, it is always better to ask for FOB price from suppliers.

25. The underlined statement is:

- A. True
- B. False

Another cohort made another comment: if it's shipment from China to US, CIF is always better than FOB if both quotations are the same (in terms of monetary value).

26. The underlined statement is:

- A. True
- B. False

27. A further glance at the bill of lading reveals an incoterm named DDP which makes you ponder: what is DDP?

- A. DDP is the same as DDU.
- B. DDP is an old name for DAP.
- C. DDP is a new incoterm.
- D. It is probably a typo. There exists no incoterm such as DDP in global trading history.

Further discussion with the procurement team shows that Meijer uses a lot of incoterms in their daily procurement activities.

28. What do Incoterms address?

- A. international contracts
- B. ownership of the merchandise
- C. international purchase rules
- D. none of the above

The procurement team also mentioned that due to the changes in HS code re-classification, some imported products will result in a higher duty due to the change of customs tariff. One of your cohort commented: Duty is part of Tax while Tariff shares the same meaning with Duty.

29. The underlined statement is:

- A. True
- B. False

Another topic discussed with the procurement team is how to compare quotations from suppliers, which is considered to be a fundamental task in any procurement position. Here are two quotations Meijer received from two suppliers bidding for the exact same product, but with different payment terms: Supplier A quotes \$35/unit, Net 30 Days; Supplier B quotes \$36.15/unit, Net 90 Days.

30. Which supplier would you choose (assume 20% Annual Cost of Capital)? *Keep two digits only after the decimal point for comparison purpose.*

- A. Supplier B
- B. Supplier A
- C. Supplier A and Supplier B are equivalent
- D. Cannot tell based on the information given

The last topic with procurement team involves supplier capacity allocation. Knowing that you have learnt allocation problems at MSU, Meijer asked you to solve the following allocation problem using **Vogel's approximation methodology** based on the given table.

\$130 means it costs 130 dollars to deliver one unit (of product) from supplier 1 to Depot 1. Both demand and capacity are in units.

31. Allocation (5 points)

From	To				Capacity
	Depot 1	Depot 2	Depot 3	Depot 4	
Supplier 1	\$130	\$205	\$255	\$118	450
Supplier 2	\$245	\$118	\$246	\$274	600
Supplier 3	\$169	\$135	\$120	\$175	500
Demand	450	200	300	300	

The main task is to find what is the total cost for your proposed allocation matrix?

Total cost = _____ dollars.

Please show your work below.

Meeting the Customer Service Team

One of the biggest complaints raised by customer service department is that some satisfied customers whose expectations are met (according to customer satisfaction survey) are still keeping walking away.

32. Why might meeting and exceeding customer expectations still fail to lock in customers?

- A. All of the answers.
- B. Some of the answers.
- C. Customers may be satisfied but not loyal due to cheaper prices etc.
- D. The expectations Meijer tries to exceed is not what customers actually need.
- E. There might be gaps when Meijer tries to deliver its designed service system to exceed customer expectations.
- F. Customer may feel a gap between delivered service and expected service.

Frustrated by the constant loss of satisfied customers, customer service department suggests that Meijer should strive to offer increased product variety to customers while adopt shorter order cycle times with suppliers (so as to ensure the availability of the variety).

33. In general, when firms offer their customers shorter order cycle times and increased product variety, this action has the following impact on total logistics costs. It:

- A. Increases total logistics costs.
- B. Reduces total logistics costs.
- C. Has no impact on total logistics costs.
- D. Only affects service levels, not costs.

This proposal triggered another heated discussion in the customer service department. In the end, all the parties agreed that Meijer needs to consider the total cost ownership concept and trade off concept to examine this proposal further.

34. What is the essence of trade off concept in logistics?

- A. To minimize total logistics cost give certain customer service level.
- B. To optimize the cost of each department given certain customer service level.
- C. To find the cost structure which can provide the best customer service.
- D. To reduce the number of trade-offs between key logistics cost elements.

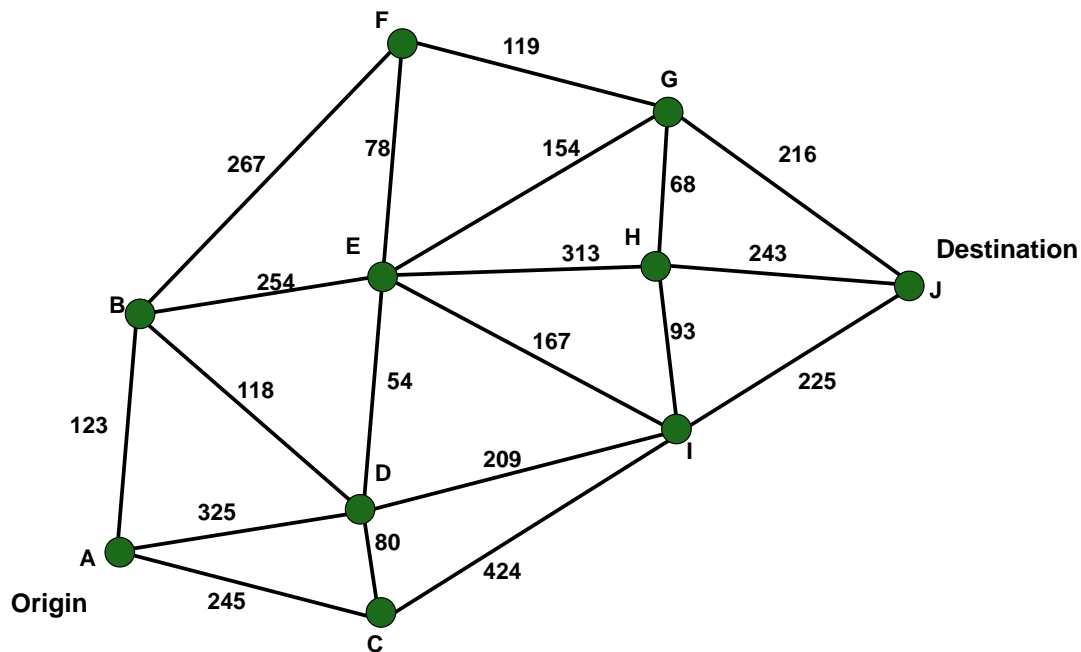
To sum up, you added the following:

35. Customer service involves maximizing _____ and _____ utilities to Meijer's suppliers, intermediate customers, and final customers.
- A. Time, possession
 - B. Possession, form
 - C. Form, place
 - D. Time, place
 - E. Place, possession

Meeting the Sales Team

Meeting with the sales team is very short. The sales persons are only concerned with how they can make their daily visits to customers more efficient. Here are several scenarios they want you to solve.

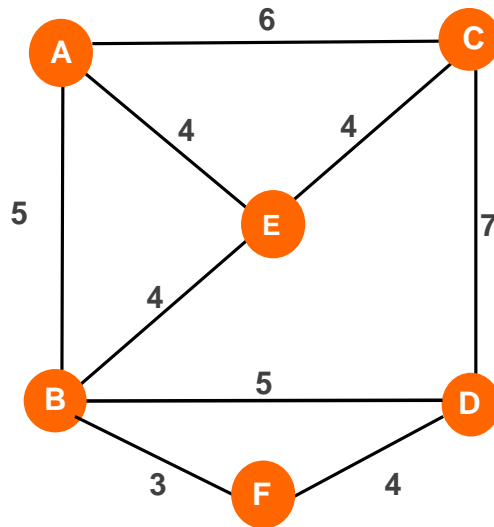
36. The following map represents one sales representative's territory. Today the sales person wants to travel from Location A (Meijer's office) to Location J (customer). This sales person needs your help to find the shortest path and the miles travelled (5 points, 2.5 points for each blank). Please show your work on the next page.



Shortest path: _____ .

Miles travelled: _____ .

37. The following is another sales person's territory. A, B, C, D, E, and F are the customers' locations. This sales person wants to know the shortest distance he needs to travel to cover **each road** (edges as shown on the map) **at least once** (5 points) starting from A and coming back to A.



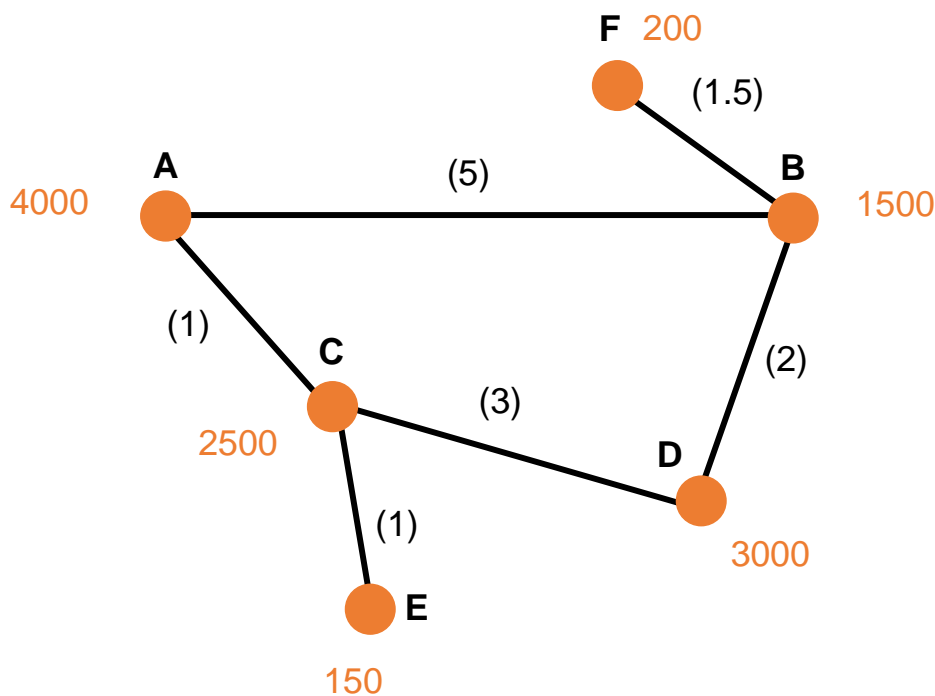
The total distance to be travelled to **cover each road at least once** is:

_____ Miles. Please show your work below.

Meeting the Strategy Team

The strategy team sits at the core of the corporate office. In terms of SCM, this team is in charge of Meijer's future business plans such as opening new stores, restructuring Meijer's fulfillment centers and its own manufacturing factories.

38. Meijer is planning to open a new store in Upper Peninsula of Michigan. The first task is to help Meijer find the potential location for the store. Below is the map of the current state of the 6 towns where Meijer intends to open its new store. Using your SCM knowledge, will you be able to advise Meijer **which town** should Meijer select to open its new store? Please show your work and a brief description (1 - 2 sentences) to support your decision. (10 points). Please work on the next page.



Notes:

A, B, C, D, E, F stand for the six towns.

Number in brackets stand for distance in miles.

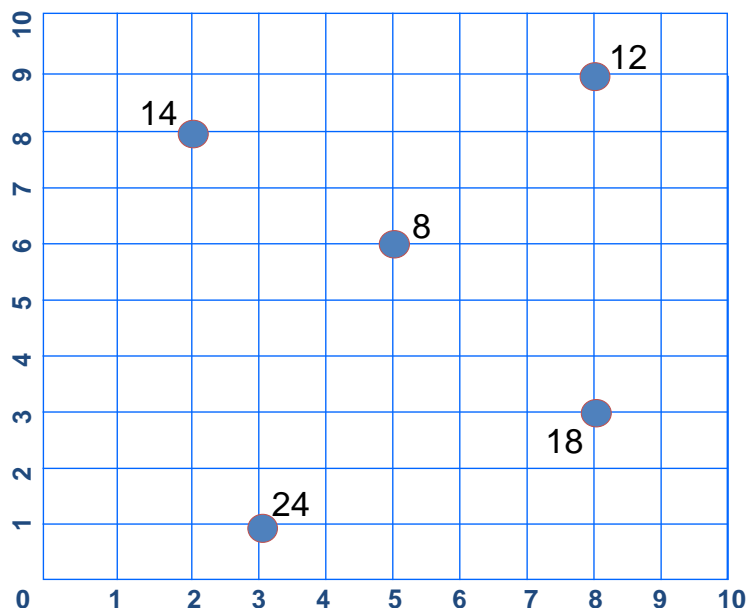
Number next to each town stands for population.

39. With the opening of this new store, Meijer will have altogether 5 stores in Upper Peninsula. Accordingly, Meijer also wants to set up a warehouse in Upper Peninsula to support the order fulfilment of these 5 stores instead of supporting them from Lansing – what Meijer is doing at the moment. Below is a map illustrating the current average daily demand of products (in pallets) for each Meijer store. Assume the map is drawn on a **1:1 scale** in the unit of **miles**. The transportation rate is **12 dollars/pallet/mile**.

Where should Meijer locate its warehouse? Please draw your proposed location on the map with its coordinates. (7 points).

The transportation cost from your proposed warehouse to the store with the demand of 24 is _____ Dollars (3 points). For the simplicity of the calculations, assume all locations shown on the map are *on the same plane, i.e, no need to use Great Circle or Pythagoras formula for this question*.

Please show your work on the next page.



Formula Sheet. Feel free to tear if off.

$$EOQ = \sqrt{\frac{2 \times C_o \times Dmd}{HR \times UC}}$$

$$SS = z \times \sigma_{FE} \times \sqrt{LT}$$

$$ASL = \frac{OQ}{2} + SS$$

$$ASL = \frac{D \times T}{2} + SS$$

$$\text{Target stock level} = D \times (T + LT) + SS$$

$$ROP = \text{Forecast of LT Demand} + SS$$

$$X = \frac{\sum_i V_i R_i X_i}{\sum_i V_i R_i}$$

$$Y = \frac{\sum_i V_i R_i Y_i}{\sum_i V_i R_i}$$

V stands for volume or demand. R stands for transportation rate. X, Y stands for coordinates.

$$TC = \sum_i V_i R_i d_i$$

$$d_i = \sqrt{(X_i - X)^2 + (Y_i - Y)^2}$$

Z Table. Feel free to tear if off.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

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