Taxi vs Rideshare

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Teacher Notes & Answers

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TI-30XPlus MathPrint™ | Worksheet | Student | 20 min

Gathering the Data

Which option provides the cheaper travel option: Taxi or Rideshare. The answer depends on so many variables, so we explore this problem through the eyes of Rachel who needs to get a ride to and from her house to a friend's party.

Part 1:

Rachel plans to leave for the party late in the afternoon. She checks the taxi fare estimator and finds the following:

Flag Fall: $4.20

Distance Rate: $1.60

Daytime Rates

The local ride share company uses the following algorithm to generate a trip price:

Flag Fall: $9.00

Distance Rate: $1.30

Daytime Rates

Question: 1.

Using the taxi option, how much will it cost Rachel to travel the following distances:

i) 10km **Answer:** 1.6 x 10 + 4.2 = $20.20

ii) 20km **Answer:** 1.6 x 20 + 4.2 = $36.10

Question: 2.

Explain why Rachel's 20km trip is not double the price of the 10km trip.

Answer: Cost and distance are not directly proportional; the flag fall doesn't change and is therefore not doubled alongside the distance.

Question: 3.

Using the ride-share option, how much will it cost Rachel to travel the following distances:

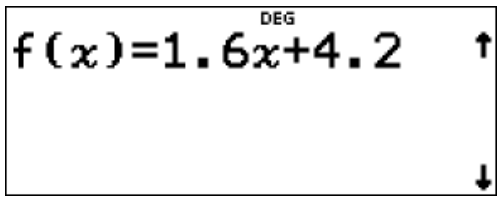
iii) 10km **Answer:** 1.3 x 10 + 9 = $22.00

iv) 20km **Answer:** 1.3 x 20 + 9 = $35.00

Based on her initial findings, the best solution appears to depend on how far she needs to travel. Rachel decides to explore further using her calculator.

Rachel defines the rule for the taxi fare in f(x):

expr-eval table A 1



Use: clear var x^{yzt}_{abcd} for the variable x.

Press: enter to confirm the taxi rule.

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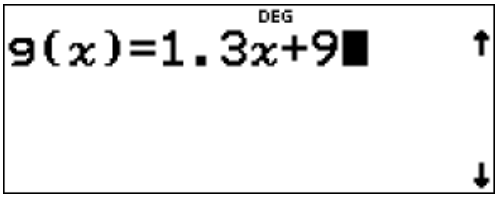
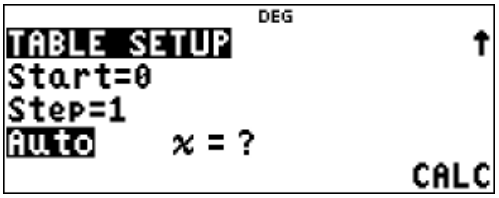
Enter the rule for the ride-share option in g(x).



Match the table setup options shown opposite and proceed to the table by selecting **CALC** (bottom right of screen).

Use the navigation keys to move up or down through the list.

Check your answers for Questions 1 & 3 for the travel costs for the taxi and ride-share options.



Note: Taxi fares also include a wait time calculator which means if you get stuck in traffic the meter continues to run, typically $0.50 per minute. In comparison, ride-share companies include a surge fee which increases prices depending on the time of day, availability of drivers and the corresponding demand for rides.

Question: 4.

If the party is 18km from Rachel's house, which is the cheapest option: taxi or ride-share?

Answer: Taxi: $33.00 vs Ride-share: $32.40 ∴ Ride-share is slightly cheaper for the 18km distance.

Question: 5.

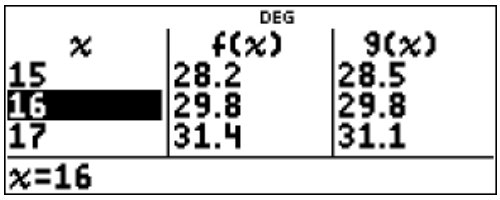
Scroll through the list and determine the distance where the taxi and ride-share options are the same.

Answer: At 16km both fares are the same: $29.80. (Taxi) 1.6 x 16 + 4.20 = 1.3 x 16 + 9 = (Ride-share)

Question: 6.

Use algebra to show that the answer to Question 5 is correct.

Answer: $1.6x + 4.2 = 1.3x + 9 \Rightarrow 0.3x = 4.8. \therefore x = 16.$



Part 2:

Rachel plans to leave the party around midnight. At this time of day, prices for taxis and ride-share options are different.

Flag Fall: $5.20

Distance Rate: $1.60

Evening Rates

The local ride share company uses the following algorithm to generate a trip price:

Flag Fall: $12.00

Distance Rate: $1.30

Evening Rates

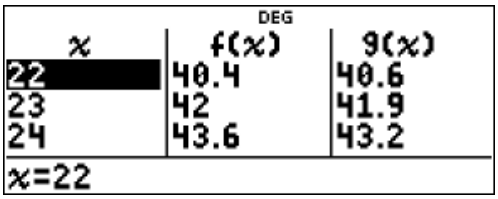
Question: 7.

Use your calculator to estimate the distance where taxis and ride-share options are the same price.

Answer: Students need to edit the formulas in f(x) and g(x) then generate the table of values (opposite).

f(x) < g(x) … taxi < ride-share at 22km

f(x) > g(x) … taxi > ride-share at 23km



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Question: 8.

Use algebra to determine the 'exact' distance where taxis and ride-share options are the same price.

Answer: $1.6x + 5.2 = 1.3x + 12 \Rightarrow 0.3x = 6.8$. $\therefore x \approx 22.67$km (Price: \$41.67).

Question: 9.

Taxi fares also include a wait time fee, typically \$0.50 per minute, so if you get stuck in traffic the fare may go up considerably. Ride-share prices also vary based on demand and driver availability, essentially becoming an auction, this is referred to as 'surging'. If Rachel wants to use the same service (taxi or ride-share) to and from the party, discuss which might be the best option taking all the information into consideration.

Answer: Answers will vary but should be based on supporting data.

- Ride-share: Prices are known prior to accepting a ride. (Predictable)
- Ride-share: In the event of a traffic jam/hazard, passengers are not paying extra.
- Ride-share: Prices are generally cheaper for longer distances.
- Taxi: Prices are generally cheaper for short distances, assuming no traffic jams.
- Taxi: At common pick up points, taxis are already present (no wait time)
- Taxi: Don't fluctuate in price during surge periods.

Teacher Notes:

The focus of this activity is not in the generation of the function to describe the costs, rather using the rules to generate tables and understand that just because a taxi or ride-share is cheaper for one trip, that won't necessarily be the case for all trips.

The inclusion of a graph to analyse the activity is left to the teacher's discretion.

Another point worthy of discussion is the driver's perspective. If a taxi is stuck in traffic how might this impact their overall hourly rate of payment say compared to the situation where they could have been driving with an average speed of 40km/h. Also note that a car idling in traffic will use less fuel per hour than one travelling at 40km/h which adds to the complexity of the model. Compare this with the ride-share driver who has already agreed upon a price and will get paid the same amount regardless of the time taken to complete the journey.

Flag-fall: This term comes from the original taxi meters:

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