

Grade 12 Essential

Quiz Debrief

Week 4

23-04-27

**GRADE 12 ESSENTIAL
WEEKLY QUIZ 23-04-27**

Name: _____

Date: _____

CLOSED BOOK. Use yours and / or my Study Notes ('cheat sheet')
Round all decimal and percent answers to nearest 0.01 unless otherwise indicated.

Time Limit: ~~40'~~ 50' (Should be way less time than that!)

Show work, show method! Pretend teaching your 14 year old niece or nephew. Plus, part marks are available.

Each individual question is worth two marks.

Use separate paper and attach if need more work space.

SELECTED FORMULAE

$$PR = \frac{B + \frac{1}{2}(E)}{n} * 100$$

← At back of quiz

Depreciated value = original value * annual retained value percentage^{years}
(exponential !)

Price of new car with taxes = (Car total price – trade in)* tax factor

Loan amount = final price of car with taxes – down payment

$$\bar{x} = \frac{\sum x}{n} \quad \bar{x}_{weighted} = \frac{\sum x_i * w f_i}{\sum w f_i}$$

↙ Cheat sheet

STATISTICS

And whatever else is on our and...

Mean. $\bar{x} = \frac{\sum x_i}{n}$; sum up all the data and divide by the data set size, n

Weighted Mean: $\frac{\sum (x_1 * w f_1 + x_2 * w f_2 + x_3 * w f_3 + \dots)}{(w f_1 + w f_2 + w f_3 + \dots)} = \frac{\sum x_i f_i}{\sum w f_i}$

Median, \tilde{x} . Line data up in ascending order, find the data value at the middle place.
Middle place = $\frac{(n+1)}{2}$. Eg: n= 17 data → middle place is the 9th place. With 20 data → middle place is the mean between the 10th and 11th place, value in 10 and a 'halfth' place.

Percentile Rank. $PR = \frac{B + 1/2 E}{N} * 100$; round up!; where B is the number of scores below, E is the number equal; and N is the total number.

Final New Vehicle Price = (Dealer price after eco fees, freight, options, etc – Trade in)* tax factor

Exponential Decay (depreciation) of a car's value:

Final Value = Original Value * (1 - annual depreciation rate)^{years}. Original Value does not include taxes. Eg: \$30,000 * 0.85^{12 years} = \$4267.25 for 15% depreciation after 12 yrs

Monthly Loan Payment = *table value* * $\frac{\text{borrowed amount}}{1,000}$

Overall Cost of Car = Total Loan Payments + Down Payment

Interest Paid = Total Loan Amount Paid Back – Amount Borrowed

1. **Statistics.** Calculate the mean, median, mode, and range of the following sets of data.

a. {3, 7, 2, 2, 15, 4}

$\bar{x} \equiv$ Mean: 5.5

$\tilde{x} \equiv$ Median: (3.5)

Mode: (2) is more common data value
most frequent

→ Range: $X_{\max} - X_{\min} = 15 - 2 = 13$

$$\bar{x} = \frac{\sum x}{n} = \frac{33}{6} = 5.5$$

Calculate \tilde{x} {~~2~~, ~~2~~, 3, 4, ~~7~~, ~~15~~} 3.5

middle place $(6+1)/2 = 3\frac{1}{2}$ place
3rd place 4th place

b. {6.3, 8.2, 7.5, 4.1, 11.6, 10.3, 3.5}

Mean: $\bar{x} = \frac{\sum x}{n} = \frac{51.5}{7} = 7.36$

Median: $\tilde{x} = 7.5$

Mode: "Nil" \equiv no solution

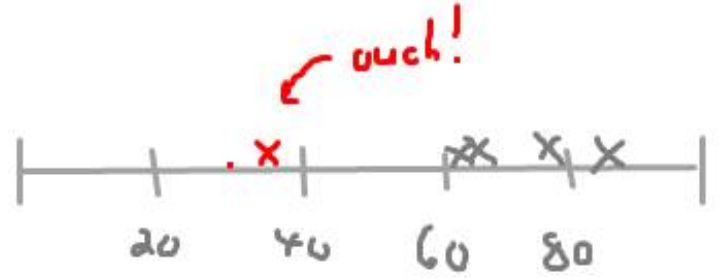
Range: $X_{\max} - X_{\min} = 11.6 - 3.5 = 8.1$

Calculate \tilde{x} {⁰~~3.5~~, ¹~~4.1~~, ²~~6.3~~, 4 ³~~7.5~~, ~~8.2~~, ~~10.3~~, ~~11.6~~}

$\frac{7+1}{2} = 4 \rightarrow$ want 4th data value!

Do question 2 or 3, not both. If you do both the better will be marked

2. **Weighted Mean.** Eva has the following marks on her first four quizzes. 67%, 78%, 62% and 84%. On her Final Exam though she 'threw it under the bus' and got a 35%. To pass the course she needs at least a 70%. The Final Exam had a weight factor of **three times** that of any quiz.



- a. determine Eva's course average (mean mark) **before** the Final Exam.
- b. determine Eva's course average (weighted mean) **after** the Final Exam.
- c. Eva needs a course average of **at least** 70% to pass, determine the mark she would have needed on the Final Exam to get that bare minimum 70% course average.

72.75%

$$a) \bar{x} = \frac{\sum x}{n} = \frac{291}{4} = 72.75\%$$

$$b) \bar{x}_{\text{weighted}} = \frac{\sum x_i \cdot w_i}{\sum w_i} = \frac{(67 \cdot 1 + 78 \cdot 1 + 62 \cdot 1 + 84 \cdot 1 + 35 \cdot 3)}{(1 + 1 + 1 + 1 + 3)}$$

$$= \frac{396}{7} = 56.57\% \text{ Final mark! ouch!}$$

c) She really needed overall 70%! What did she need for just the Final Exam?

$$70 = \frac{(67 \cdot 1 + 78 \cdot 1 + 62 \cdot 1 + 84 \cdot 1 + x \cdot 3)}{7}$$

$$70 = \frac{291 + 3 \cdot x}{7} \quad ; \quad 7 \cdot 70 = \frac{(291 + 3x)}{7} \cdot 7 \quad ; \quad 490 = 291 + 3x$$

$$199 = 3x$$

$$\therefore x = \frac{199}{3} = 66.33\%$$

She needed, 66.33% or better on the final exam →

Do question 2 or 3, not both. If you do both the better will be marked

3. **Percentile Rank.** Karen is applying for admission to a prestigious course for college. There are 320 people trying to get onto the course. The College only accepts the top 25% of applicants based on an admissions test. Karen gets a score of 67 out of 80 on the test. There were 280 people that had a score lower than Karen's. Karen and three others had the same test score of 67.

Below ↙ Equal ↘

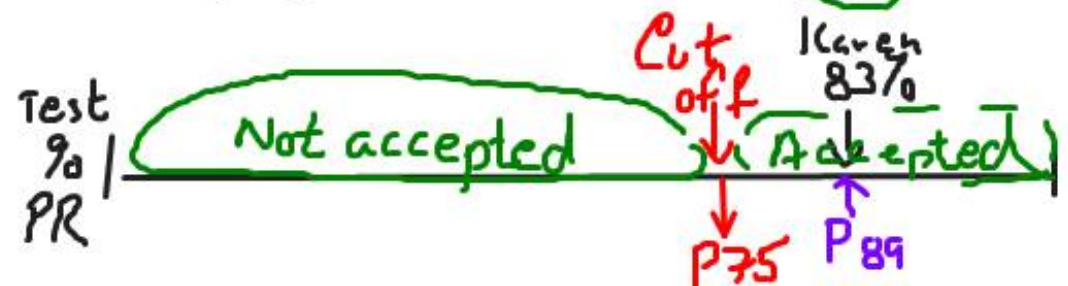
$$PR = \frac{B + \frac{1}{2}(E)}{n} \cdot 100$$

total # ↗

- Determine Karen's Test score as a percentage
- Determine Karen's Percentile Rank
- sketch a simple diagram that explains the situation and explain if she will be accepted on to the course.

a) $67/80 = 0.8375 = 83.75\%$ Her mark on test!

b) How does she compare? $PR = \frac{B + \frac{1}{2}E}{n} \cdot 100 = \frac{280 + \frac{1}{2}(4)}{320} \cdot 100 = \frac{282}{320} \cdot 100 = 88.13 \rightarrow 89$



4. **Problem Solve.** Eight years ago, I was half my mom's age. I am 26 now. How old is my mom today?

OMG! These are important!!

	-8		$\times \frac{1}{2}$		+8	
mom Today	→	mom 8 yr ago	→	me 8 yr ago	→	me now (want 26)
<u> </u>		<u> </u>		<u>$\frac{1}{2} = \text{mom 8 yrs ago}$</u>		<u> </u>
X 30		22		$\frac{1}{2} \cdot 22 = 11$		19 → X
X 40 ?		32		$\frac{1}{2} \cdot 32 = 16$		24 X BET
(44)		36		$36/2 = 18$	+ 8 =	26 close
						→ Yes

→ 44 works mom is (44)

Let's check again!

LOGIC: Mom is 44 now so 8 years ago she was 36, so I would have been 18 back then, so I would be 26 now!
Yes! 44 works!

4. **Problem Solve.** Eight years ago, I was half my mom's age. I am 26 now. How old is my mom today?

OMG!

↑
"x"
↙ mom's age 8 years ago

$$\frac{1}{2} \cdot (x - 8) = (26 - 8)$$

↑
mom's age now

~~~~~  
my age 8 years ago

↻  
↘

$$\frac{1}{2} \cdot (x - 8)$$
$$\frac{1}{2}x - 4 = 18$$

+4                    +4

$$1 \cdot \frac{1}{2} \cdot x = 22 \cdot 2$$

$$x = 44$$

**Do NOT  
WATCH  
THIS PART  
Unless you  
care**

**Applied  
& Pre-cal**



**BONUS QUESTIONS** (one mark each individual question)

1. A new car originally sold for \$52,000. It depreciates year after year at a rate of 23% year after year.

*Loses 23% => Keep 77%*

- a. **Determine** the value of the car after 8 years using the formula.
- b. **State** how many years (give or take half a year) will the car be worth \$30,000. ('State' means not necessary to show work)

$52,000 - \frac{23}{100} \cdot 52,000 = 40,040$  End year 1

$40,040 - \frac{23}{100} \cdot 40,040 = 30,830.80$  End yr 2

$30,830.80 - \frac{23}{100} \cdot 30,830.80 = 23,739.72$  End yr 3

|                                                      |                                            |
|------------------------------------------------------|--------------------------------------------|
| $52000 - \frac{23}{100} \cdot 52000$                 | <input type="text" value="40040"/>         |
| $40040 - \frac{23}{100} \cdot 40040$                 | <input type="text" value="30830.8"/>       |
| $30830.8 - \frac{23}{100} \cdot 30830.8$             | <input type="text" value="23739.716"/>     |
| $23739.72 - \frac{23}{100} \cdot 23739.72$           | <input type="text" value="18279.5644"/>    |
| $18279.5644 - \frac{23}{100} \cdot 18279.5644$       | <input type="text" value="14075.279966"/>  |
| $14075.279966 - \frac{23}{100} \cdot 14075.279966$   | <input type="text" value="10837.9633906"/> |
| $10837.9633906 - \frac{23}{100} \cdot 10837.9633906$ | <input type="text" value="8345.23350492"/> |

Keep going for 8 lines **OR**

Exponent  
↓  
8

$52,000 \cdot 0.77^8 = \$6,425.83$

6425.83

## BONUS QUESTIONS (one mark each individual question)

1. A new car originally sold for \$52,000. It depreciates year after year at a rate of 23% year after year.

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$$52,000 - \frac{23}{100} \cdot 52,000 = 40,040 \text{ End year 1}$$

$$40,040 - \frac{23}{100} \cdot 40,040 = 30,830.80 \text{ End yr 2}$$

$$30,830.80 - \frac{23}{100} \cdot 30,830.80 = 23,739.72 \text{ End yr 3}$$



Keep going  
for 8 lines (OR)

Exponent

$\downarrow$   
8

$$52,000 \cdot 0.77^8 = \$6,425.83$$

2. The car you bought sells for \$54,000. You trade in your older car and the dealer gives you \$2,500 for it. Then the dealer applies the 7% PST and the 5% GST. So, then you give the dealer \$2,600 as a down payment and arrange a loan for the remaining balance owing. The loan is at 15% for 7 years. (Use an App or website if you know how. If you use an App or website given a hand-drawn screen shot)

- a. Determine the monthly loan payment.
- b. Determine your monthly payments if you had gotten a more favourable loan at 4.5% for 5 years.

a) 
$$\begin{matrix} \text{Price} & \text{Trade} & & \text{\$ OWE Dealer} \\ 54,000 & - 2,500 & = & \$ 51,500 \end{matrix}$$

$\$ 51,500 \cdot 1.12 = \$ 57,680$  with taxes  
 $- 2,600$  you make a cash downpayment  
55,080 still owing, so you take a loan

Do not do a 15% loan, especially for a long time!

$$19.30 \cdot \frac{55,080}{1,000} = \$ 1,063.04 / \text{month monthly payment}$$

| Monthly Vehicle Loan Payments<br>per Thousand Borrowed ← ! |                     |         |         |         |         |         |         |
|------------------------------------------------------------|---------------------|---------|---------|---------|---------|---------|---------|
| Interest Rate                                              | Years to Repay Loan |         |         |         |         |         |         |
|                                                            | 1                   | 2       | 3       | 4       | 5       | 6       | 7       |
| 4.00%                                                      | \$85.15             | \$43.42 | \$29.52 | \$22.58 | \$18.42 | \$15.65 | \$13.67 |
| 4.25%                                                      | \$85.26             | \$43.54 | \$29.64 | \$22.69 | \$18.53 | \$15.76 | \$13.78 |
| 15.00%                                                     | \$90.26             | \$48.49 | \$34.67 | \$27.83 | \$23.79 | \$21.15 | \$19.30 |
| 20.00%                                                     | \$92.63             | \$50.90 | \$37.16 | \$30.43 | \$26.49 | \$23.95 | \$22.21 |
| 25.00%                                                     | \$95.04             | \$53.37 | \$39.76 | \$33.16 | \$29.35 | \$26.94 | \$25.31 |

BTW  $1,063 / \text{month} \cdot 84 \text{ month} \approx \$ 89K$   
 $+ 2.6K$   


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 $\$ 91.6K$   
 For a \$54K car  
 ! Don't do it!

2. The car you bought sells for \$54,000. You trade in your older car and the dealer gives you \$2,500 for it. Then the dealer applies the 7% PST and the 5% GST. So, then you give the dealer \$2,600 as a down payment and arrange a loan for the remaining balance owing. The loan is at 15% for 7 years. (Use an App or website if you know how. If you use an App or website given a hand-drawn screen shot)

b. Determine your monthly payments if you had gotten a more favourable loan at 4.5% for 5 years.

You have a better credit rating, less risk

Loan amount: 55,080 balance owing

$$18.64 \cdot \frac{55,080}{1,000} = \$1,026.69 / \text{month} \text{ monthly payment for 5 years}$$

BTW:  $\$1,027 / \text{month} \cdot 60 \text{ month}$

$$= 61,620$$

$$+ 2,600 \text{ dp}$$

$$\underline{\hspace{1cm}}$$

$$64,220$$

You end up only paying \$64 for your \$54 car

| Monthly Vehicle Loan Payments<br>per Thousand Borrowed |                     |         |         |         |         |         |
|--------------------------------------------------------|---------------------|---------|---------|---------|---------|---------|
| Interest Rate                                          | Years to Repay Loan |         |         |         |         |         |
|                                                        | 1                   | 2       | 3       | 4       | 5       | 6       |
| 4.00%                                                  | \$85.15             | \$43.42 | \$29.52 | \$22.58 | \$18.42 | \$15.65 |
| 4.25%                                                  | \$85.26             | \$43.54 | \$29.64 | \$22.69 | \$18.53 | \$15.76 |
| 4.50%                                                  | \$85.38             | \$43.65 | \$29.75 | \$22.80 | \$18.64 | \$15.87 |
| 4.75%                                                  | \$85.49             | \$43.76 | \$29.86 | \$22.92 | \$18.76 | \$15.99 |

