



Name: _____

Year 11 2023 Mathematics Standard 2 Assessment Task 1

Investigative Assignment with Validation Task

Task number: 1

Weighting: 30%

Due Date: Thursday
09/03/23

Outcomes assessed:

- MS 11-1 uses algebraic and graphical techniques to compare alternative solutions to contextual problems
- MS 11-6 makes predictions about everyday situations based on simple mathematical models
- MS 11-9 uses appropriate technology to investigate, organise and interpret information in a range of contexts
- MS 11-10 justifies a response to a given problem using appropriate mathematical terminology and/or calculations

Nature and description of the task:

Students are given a portfolio of questions as a Preparation Activity that are to be completed in provided answer booklet. Answers should be clearly numbered and completed in order. Answers booklets are to be turned in on the 9th of March 2023.

On the 9th of March 2023, you will receive a selection of similar questions to the Preparation Activity below to complete in an in-class Validation Task. The final mark for this assessment will be the mark you receive in the in-class Validation task.

Non-Completion of Task:

If you know you are going to be away on the day of the Validation Task and are unable to complete it on the due day, then you must have supportive documentation. *Zero marks will apply if the Assessment Task is completed late, unless an Illness/ Misadventure or Application for Extension form has been submitted.*

Part 1 Preparation Activity – investigate/attempt each of the following questions in preparation for the in-class Validation Task.

- If $m = 3$ and $n = 5$, evaluate the following expressions.
 - $m + n$
 - $4m + 2n$
 - $6(m + 4)$
- If $m = 3$, $n = 5$ and $p = -3$ evaluate the following expressions.
 - $4m^2 - 2n$
 - $\frac{m+n}{2}$
 - $\sqrt{m^2 + n^2 + (n + p)}$
- Solve the following equations.
 - $4a = 24$
 - $\frac{c}{3} = 21$
 - $2d - 6 = 14$
 - $\frac{e+7}{2} = 15$
 - $3(f - 2) = 24$
 - $\frac{3(g+4)}{5} = 6$
- Use inverse operations to solve the following equations.
 - $5w - 2 = 3w + 8$
 - $4e + 3 = 5e - 7$
 - $3 - r = 2r + 9$
- Solve the following equations.
 - $4x + 3 = 27$
 - $4(x - 1) = 12$
 - $5 + \frac{x}{2} = 12$
 - $\frac{x-4}{3} = 5$
- Solve the following equations.
 - $2x - 4 = 8x - 20$
 - $4(2 - x) = -3(x + 4)$
 - $\frac{x-4}{3} + 4 = \frac{x+7}{2}$
 - $\frac{5x}{4} - 3 = \frac{x}{2} + 6$
- The area of a circle (A) in cm^2 can be found using the formula $A = \pi \times r^2$, where $\pi = 3.142$ (approximately) and r is the radius of the circle in cm. Use this formula to calculate the area of a circle with a radius of 15 cm, correct to 2 decimal places.
- The cost of taking a taxi (C) in dollars includes an initial fixed charge of \$3.50 plus \$2 per km. The equation for this is $C = 2k + 3.50$, where k is the distance travelled in km. How much would it cost to travel:
 - 22 km?
 - Ben paid \$28.50 for his ride. How many kilometres did he travel in this taxi?

9. You have agreed to take on a babysitting job for your mother's friend. She says she will pay you according to the following formula:

$$P = 10 + 8h$$

where P is the pay for one evening's babysitting (\$) and h is the number of hours spent babysitting on that evening.

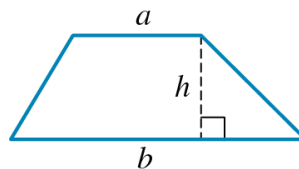
- a. On the first evening, you babysat for 4 hours. How much money did you earn?
 - b. On another occasion, you earned a total of \$66. How long did you spend babysitting?
10. A local courier company uses the formula $C = 3.5h + 5$, where h is the number of kilometres and C is the cost of the delivery in dollars, to calculate the total delivery cost.
- a. Calculate the cost of a delivery for a journey of 18 km.
 - b. Rearrange the rule to make h the subject of the formula.
 - c. If the cost of a delivery is \$43.50, calculate how many kilometres the delivery was from the courier company base.
11. The formula to calculate the body mass index is $B = \frac{m}{h^2}$, where m is the mass in kilograms and h is the height in metres.
- a. Calculate a person's body mass index if they weigh 58 kg and are 176 cm tall. Give your answer correct to 3 decimal places.
 - b. Rearrange the formula to make m the subject.
 - c. Calculate the weight of a person, 196 cm tall, whose body mass index is 19.5. Give your answer correct to the nearest kilogram.
12. The simple interest formula is given by $I = PRN$, where P is the principal, R the rate of interest per year as a decimal, and N the number of years of the investment.
- a. What interest would you earn if you invested \$15 000 at 3.2% for 2 years?
 - b. Calculate the interest earned on an investment of \$8500 at 2.8% for 15 months?
 - c. Change the subject of the formula to R , the rate of interest per annum.
 - d. Your investment of \$5600 for 18 months earned \$210 in interest. Find the rate of interest as a percentage on your investment.
13. Three children are spaced three years apart in ages. Let the youngest child be x years old.
- a. What are the ages of the other two children in terms of x ?
 - b. If the oldest is three times as old as the youngest, how old are the three children?
14. Three brothers get an average of \$25 pocket money per week. The eldest brother gets \$5 more than the middle brother, while the youngest gets \$2 less than the middle brother. How much money does each brother get?
15. The distance, D km, travelled at a speed of s km/h for t hours is given by the formula $D = st$.
- a. Calculate the distance travelled at 90 km/h for:
 - i. 2.5 hours
 - ii. 90 minutes.
 - b. Calculate the average speed if a car travels 240 kilometres in:
 - i. 3 hours
 - ii. 150 minutes.
 - c. Find the time needed to travel a distance of 890 kilometres at an average speed of:
 - i. 75 km/h
 - ii. 60 km/h.
16. Calculate the blood alcohol content of a male weighing 95 kg who consumed 4 standard drinks over a period of 2 hours. Give your answer to 3 decimal places.
17. If a female, weighing 63 kg, consumes 2 glasses of wine, each equivalent to 1.3 standard drinks, over a period of 3 hours, calculate her blood alcohol content to 2 decimal places.

- 18.
- Calculate the blood alcohol content, to 3 decimal places, for a 78 kg male who has consumed 2 standard drinks over a period of 90 minutes.
 - How long would he need to wait, without drinking alcohol, for his blood alcohol content to register zero?
19. Use Fried's formula to calculate the dosage of medication to be given to a 17-month-old infant if the recommended adult dose is 35 mL. Give your answer to the nearest mL.
20. The adult dosage for a certain medication is 250 mg. Andrew is 15 years old and weighs 54 kg. Calculate the dosage, to the nearest 10 mg, that should be given to Andrew using:
- Young's formula
 - Clark's formula.
21. For the equation $2(3x - 7) = 10$, the value of x is:
- $-\frac{11}{6}$
 - 5
 - $\frac{17}{5}$
 - 4
 - $-\frac{2}{3}$

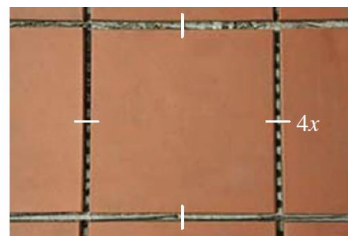
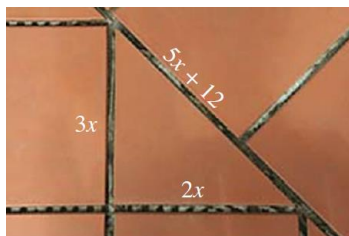
22. An equation of motion is given by $v = u + at$. Rearrange this formula to make t the subject:

23. The area of the trapezium shown is given by the formula $A = \frac{1}{2}h(a + b)$. Rearrange the formula to make:

- a the subject of the formula
- b the subject of the formula
- h the subject of the formula.



24. A tile manufacturer produces tiles that have the following side lengths. All measurements are in centimetres.



- Write an expression for the perimeter of each shape.
- Calculate the value of x for which the perimeter of the triangular tile is the same as the perimeter of the square tile.

25. Let x be a number.
- Write an expression to represent five more than x ?
 - Write an expression to represent four times the result of five more than x .
 - Four times five more than a number is equal to five less than twice the number. What is the number?
26. Let x be a number.
- What are the next two consecutive numbers after x ?
 - The sum of these three consecutive numbers is 81.
 - Write an equation to represent this information.
 - What are the three numbers?
27. The surface area of a sphere, A , is given by the formula $A = 4\pi r^2$, where r is the radius of the sphere. A globe of the world is approximately spherical, with a diameter of 45 cm.
- State the radius of the globe.
 - Calculate the surface area of the globe, giving your answer to the nearest 100.
 - The globe is to be protected with a special clear paint finish. The cost of the special finish is \$5.67 per 100 cm² or part thereof. Find the cost, to the nearest 5 cents of protecting the globe.
28. The formula for the volume, V , of a sphere is $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere. The formula for the volume, V , of a cylinder is $V = \pi r^2 h$, where r is the radius and h the height of the cylinder.
- A cylindrical container is 20 cm high and has a radius of 15 cm. Find the volume of the container to the nearest cm³.
 - A spherical ball has a radius of 5 cm. Find the volume of the ball to the nearest cm³.
 - The container from part **a** is full of water. Four of the balls from part **b** are dropped into the container, resulting in water spilling out of the container. How much water, to the nearest litre, will remain in the container?
29. Suzanna, 23 years old and weighing 56 kg, has consumed 2 standard drinks in 50 minutes.
- Is she able to drive legally? Explain your answer.
 - How long would she need to wait, without drinking alcohol, for her blood alcohol content to be zero? Give your answer to the nearest minute.
30. It has taken Nick 90 minutes to reach a zero blood alcohol reading.
- Calculate his blood alcohol content, to 3 decimal places, when he stopped consuming alcohol.
 - Nick weighs 86 kg and had been drinking previously for 2.5 hours. How many standard drinks had he consumed? Give your answer to 1 decimal place.
31. The typical weight of a 10-year-old girl is 33 kg with a height of 138 cm. The adult dosage of a certain medication is 425 mg.
- Calculate the dosage for the child, to the nearest mg, using:
 - Fried's formula
 - Young's formula
 - Clark's formula.
 - Can any of these formulae be used? Justify your answer.

32. Two six-year-olds, Angelina and Leonard, are prescribed the same medication. The adult dosage for this medication is 100 mL. Angelina weighs 19 kg and Leonard weighs 22 kg.
- Calculate their dosages, to the nearest mL, using:
 - Young's formula
 - Clark's formula.
 - Comment on the results found in part **a**.
33. Francis is 9 years of age, weighs 28 kg and is 133 cm tall. He has been given a 45 mL dose of medication.
- Calculate the adult dosage, to the nearest mL, using:
 - Young's formula
 - Clark's formula.
 - Comment on the results found in part **a**.
 - Would it have been suitable to use Fried's formula to calculate the adult dosage? Justify your answer.
34. Stopping distance is the distance required to bring a moving vehicle to a stop from the moment the breaks are applied. The formula to calculate the stopping distance, d metres, when travelling at a speed of v m/s is:

$$d = \frac{v^2}{2\mu g}$$

where μ is the coefficient of friction between the wheels and the road surface and g is gravitational force, where $g = 9.8 \text{ m/s}^2$

Calculate the stopping distances under the following conditions. Give your answers to 2 decimal places.

- A car is travelling at a speed of 50 km/h on a dry road with $\mu=0.8$.
 - Road and weather conditions, such as rain, change the value of μ .
 - If $\mu=0.45$, find the stopping distance when travelling at a speed of 100 km/h.
 - If $\mu=0.15$, find the stopping distance when travelling at a speed of 100 km/h.
 - Comment on your findings in part **b**.
35. Identify the step that has an error in solving the equation $2(3x - 7) = 10$.
- $6x - 14 = 10$
 - $6x = 10 - 14$
 - $6x = -4$
 - $x = -\frac{4}{6}$
36. Monica completes 200 laps around a velodrome at an average speed of 51 km/h. Each lap is 350 m. Calculate the time he took for his whole workout, to the nearest minute.

