

3rd TERM GENERAL EXAM

Remember: in each question, write the steps you have taken to reach the solution. (1 point each question)

1. Work out and simplify: $\frac{\frac{1}{3} + \frac{2}{3} \cdot \left(\frac{5}{2} - 1\right)}{\left(1 - \frac{3}{2}\right)^2} =$

2. Calculate, using the rules for powers :

a) $\left(\frac{3^5 \cdot 9^2}{27^3}\right)^2 =$ b) $\left(-\frac{1}{2}\right)^{-8} \cdot \left(\frac{1}{4}\right)^5 =$

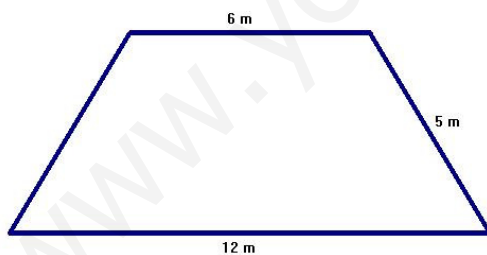
3. Solve: $\frac{(x-1)^2}{2} - \frac{(x+1)^2}{4} = 4 - x$

4. Calculate the sum to 40 terms of an arithmetic progression whose first and eighth terms are 5 and 12.

5. Solve by graphing and using another method the simultaneous equation:

$$\left. \begin{array}{l} y - x = 8 \\ x + 2y = 10 \end{array} \right\}$$

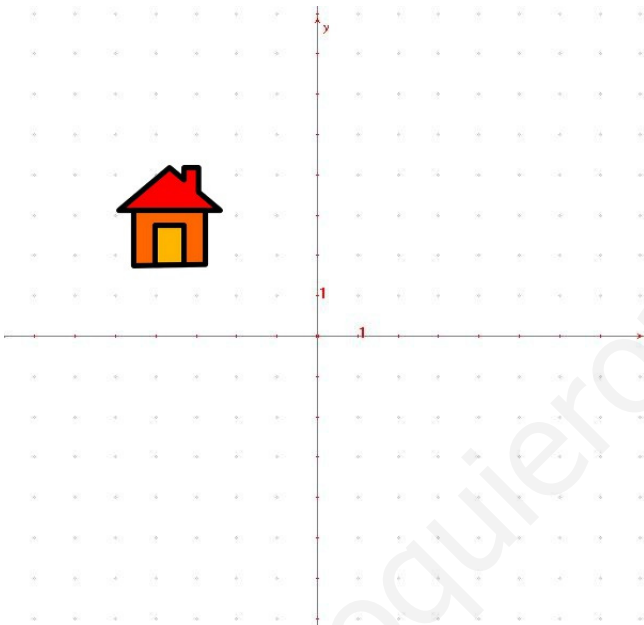
6. Find the area of the following trapezium:



7. A swimming pool is 8 m long, 6 m wide and 1.5 m deep. The water resistant paint needed for the pool costs \$6 per square metre.

- How much will it cost to paint the interior surfaces of the pool?
- How many litres of water will be needed to fill it? (1 litre = 1 dm³)

8. The prize of 1 kg of flour is €1.50.
- What is the equation of the function *amount purchased* \rightarrow *cost of purchase*? Draw a graph of it.
 - Give the slope and explain the significance.
9. Two years ago Carlos' age was triple the age of his son Alberto, but in twelve years his age will only be double that of Alberto. Calculate their ages.
10. Look at the house's picture and answer:



Will the house be up or down according to the following movements?

- A symmetry over OX axis
- A symmetry over OY axis
- a 120° clockwise rotation about $(1, -1)$.
- a translation by the vector $\vec{u} = (9, -5)$

SOLUTION

1. Work out and simplify:

$$\frac{\frac{1}{3} + \frac{2}{3} \cdot \left(\frac{5}{2} - 1\right)}{\left(1 - \frac{3}{2}\right)^2} = \frac{\frac{1}{3} + \frac{2}{3} \cdot \frac{5-2}{2}}{\left(\frac{2-3}{2}\right)^2} = \frac{\frac{1}{3} + \frac{2 \cdot 3}{3 \cdot 2}}{\left(-\frac{1}{2}\right)^2} = \frac{\frac{1}{3} + 1}{\frac{1}{4}} = \frac{4}{3} \div \frac{1}{4} = \frac{16}{3}$$

2. Calculate, using the rules for powers :

a)
$$\left(\frac{3^5 \cdot 9^2}{27^3}\right)^2 = \frac{3^{10} \cdot 9^4}{27^6} = \frac{3^{10} \cdot (3^2)^4}{(3^3)^6} = \frac{3^{10} \cdot 3^8}{3^{18}} = 1$$

b)
$$\left(-\frac{1}{2}\right)^{-8} \cdot \left(\frac{1}{4}\right)^5 = \left(-\frac{2}{1}\right)^8 \cdot \left(\frac{1}{2^2}\right)^5 = \frac{2^8}{1^8} \cdot \frac{1^5}{2^{10}} = \frac{1}{2^2}$$

3. Solve:
$$\frac{(x-1)^2}{2} - \frac{(x+1)^2}{4} = 4 - x \rightarrow \frac{2(x^2 - 2x + 1)}{4} - \frac{x^2 + 2x + 1}{4} = \frac{16 - 4x}{4}$$

$$\frac{2x^2 - 4x + 2}{4} - \frac{x^2 + 2x + 1}{4} = \frac{16 - 4x}{4} \rightarrow 2x^2 - 4x + 2 - x^2 - 2x - 1 = 16 - 4x$$

$$x^2 - 2x - 15 = 0 \rightarrow x = \frac{2 \pm \sqrt{4 + 60}}{2} = \begin{cases} 5 \\ -3 \end{cases}$$

4. Calculate the sum to 40 terms of an arithmetic progression whose first and eighth terms are 5 and 12.

$$a_1 = 5, a_8 = 12 \rightarrow a_8 = a_1 + 7d \rightarrow 12 = 5 + 7d \rightarrow d = 1$$

$$a_{40} = a_1 + 39d = 5 + 39 \cdot 1 = 44 \rightarrow S_{40} = \frac{(a_1 + a_{40})40}{2} = \frac{49 \cdot 40}{2} = 980$$

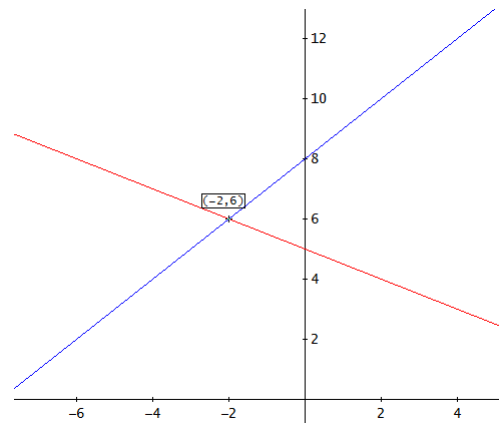
5. Solve by graphing and using another method the simultaneous equation:

$$\left. \begin{array}{l} y - x = 8 \\ x + 2y = 10 \end{array} \right\} \rightarrow y = x + 8 \rightarrow x + 2(x + 8) = 10 \rightarrow 3x + 16 = 10 \rightarrow 3x = -6 \rightarrow x = -2$$

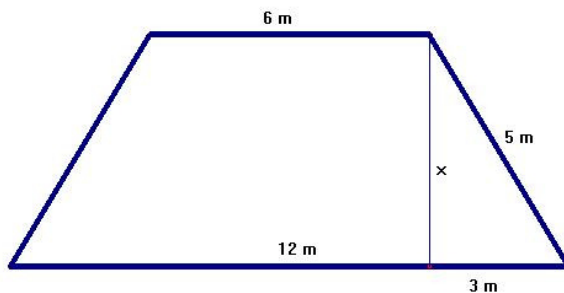
$$y = x + 8 = -2 + 8 = 6 \rightarrow \text{Solution: } x = -2,$$

$$y = 6$$

$$\left. \begin{array}{l} y - x = 8 \\ x + 2y = 10 \end{array} \right\} \rightarrow \left. \begin{array}{l} y = x + 8 \\ y = \frac{-x + 10}{2} \end{array} \right\}$$



6. Find the area of the following trapezium:



$$5^2 = 3^2 + x^2 \rightarrow x^2 = 25 - 9 = 16$$

$$x = 4$$

$$A = \frac{(B+b) \cdot x}{2} = \frac{18 \cdot 4}{2} = 36\text{m}^2$$

7. A swimming pool is 8 m long, 6 m wide and 1.5 m deep. The water resistant paint needed for the pool costs \$6 per square metre.

a) How much will it cost to paint the interior surfaces of the pool?

$$A = 2 \times (8 \times 1.5) + 2 \times (6 \times 1.5) + 6 \times 8 = 90\text{m}^2$$

$$\text{Price: } 6 \times 90 = 540 \rightarrow \text{Cost: } \$540$$

b) How many litres of water will be needed to fill it? (1 litre = 1 dm³)

$$v = 6 \times 8 \times 1.5 = 72\text{m}^3 = 72000\text{dm}^3 = 72000 \text{ litres}$$

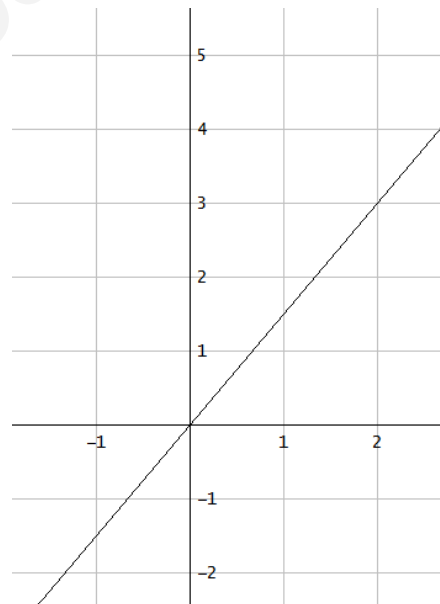
8. The prize of 1 kg of flour is €1.50.

a) What is the equation of the function *amount purchased* → *cost of purchase*? Draw a graph of it.
 $y = 1.5x$

b) Give the slope and explain the significance.

$$\text{Slope: } m = 1.5$$

It is the price per kilogramme



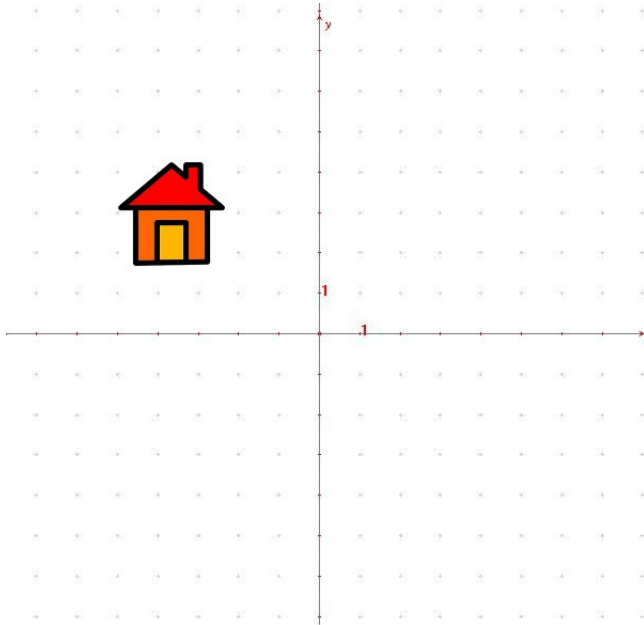
9. Two years ago Carlos' age was triple the age of his son Alberto, but in twelve years his age will only be double that of Alberto. Calculate their ages.

	Two years ago	In twelve years
Carlos	$3x$	$3x + 14$
Alberto	x	$x + 14$

$$3x + 14 = 2(x + 14) \rightarrow 3x - 2x = 28 - 14 \rightarrow x = 14$$

Solution: Alberto is 16 years old and Carlos 44

10. Look at the house's picture and answer:



Will the house be up or down according to the following movements?

- A symmetry over OX axis: DOWN
- A symmetry over OY axis: UP
- a 150° clockwise rotation about (1, -1): DOWN
- a translation by the vector $\vec{u} = (9, -5)$: UP