

G11 entrance examination: Mathematics

Time allowance: 90 min

Instructions: Student is allowed a calculator and a ruler.

Just try your best. Try to answer all the questions to the best of your ability.

1. Simplify the following

a. $(-5x + 6)(2x + 5) - (6x^2 + 6x) - (-13x^2)$

b. $\frac{12a^4 - 6a^2 + 9a}{3a}$

2. Factor the following and find solve for x.

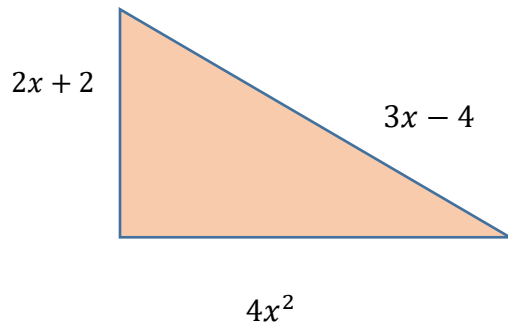
a.

$$x^2 - 4x - 12 = 0$$

b.

$$4(x + 2)^2 - 100 = 0$$

3. Find the simplified algebraic expression for the area for the following shape.



4. Solve the following Equations.

a) $-2x + 6 = 4x - 12$

b) $\frac{x+5}{3} = \frac{x-1}{9}$

c) $\sqrt{2x + 1} = -7$

5. Write the following in simplest radical (surd) form: $(3\sqrt{5})^3$

6. Simplify the following expression using only positive exponents. Show all your work.

a.

$$\frac{(a^{-3})^2}{(a^{-5})^{-3}}$$

b.

$$\frac{2^{-2}3^52^5}{(2^{-4}3^{-2})^3}$$

7. Solve the system of equations.

a)
$$\begin{aligned} 2x - 3y &= -16 \\ 3x + 4y &= 10 \end{aligned}$$

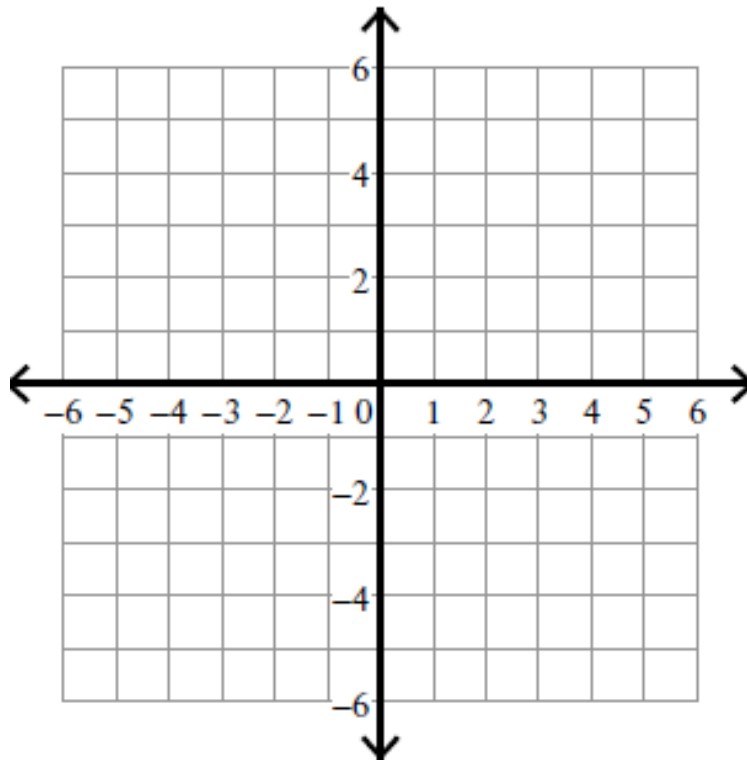
7.

$$z = \frac{17x^2}{a-b}$$

- a. Find the value of z when $x = 12.5$, $a = 0.572$ and $b = 0.447$. Write down your full calculator display.
- b. Write down your answer to part (a)
 - (i) correct to the nearest 1000 ;
 - (ii) correct to three significant figures.
- c. Write your answer to **part (b)(ii)** in the form $a \times 10^k$, where $1 \leq a < 10$, $k \in \mathbb{Z}$.

8. a. Draw the graph for the following Inequality.

$$3x - y \geq 5$$



b. The line $f(x) = -2x + 30$ intersects with the graph (question 8a). Find the point of intersection.

9. Thor and Steve Rogers each borrowed some money from Tony Stark. Thor borrowed €120 while Steve Rogers borrowed €144. Thor is slowly paying back his loan at €12 every week while Steve Rogers is paying €16 a week.

a. Find the equations that show the amount of money Thor and Steve Rogers owe (still need to pay) based on the number weeks. Write down the week at which both Thor and Steve Rogers owe the exact same amount.

b. Write down the name of the person that pays off his loan first. Find the amount of money the second person owes at this time.

10. Find the equation in terms of $f(x) = ax^2 + bx + c$.

If the graph has a shape of parabola and passes through points W(2, 0) and S(4, -8) and T(6, 0)

11.

a. Graph the following equation.

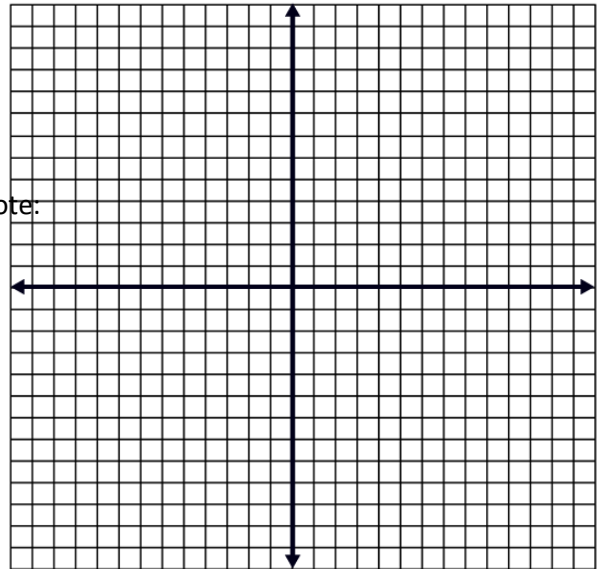
$$f(x) = -2\left(\frac{3}{4}\right)^x + 4$$

b. What is the y-intercept:

c. Write down the equation of the asymptote:

d. Find $f(2)$

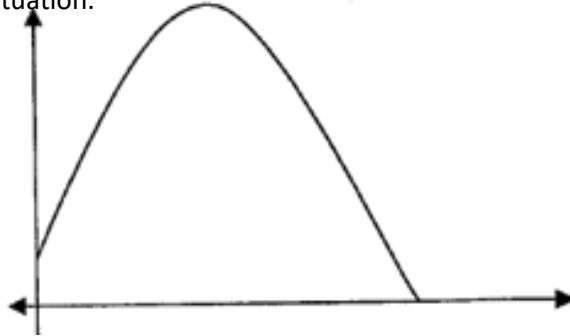
e. Find x given $f(x) = -10$



12. A ball is hit by a baseball player. The flight of the ball takes the shape of a parabola. The relationship between the height of the ball and the time elapsed since it was hit can be expressed by the formula

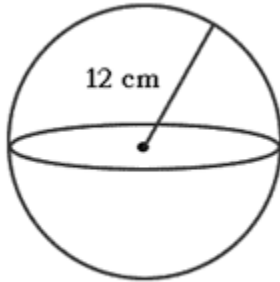
$$h(t) = -8t^2 + 32t + 1$$

Where the $h(t)$ is the height of the ball in meters and t is time in seconds. The graph below represents the situation.



- At what height is the ball as soon as it is hit?
- How long does the ball stay in flight?
- What is the highest point the ball reach in the air?

13. Find the Surface area of the following 3D shape.



14. The following is a set of data based on the ages of 14 people.

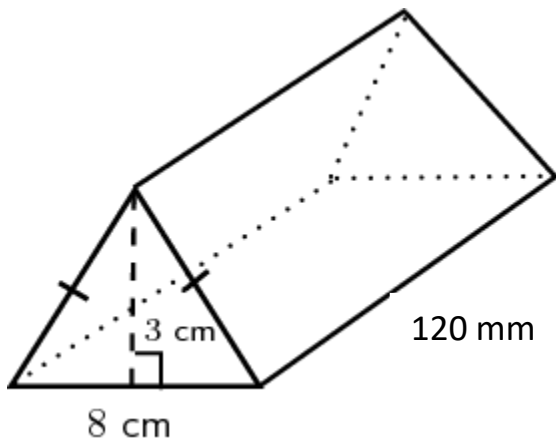
Data: ages of people

11, 12, 12, 13, 14, 16, 19, 26, 30, 33, 37
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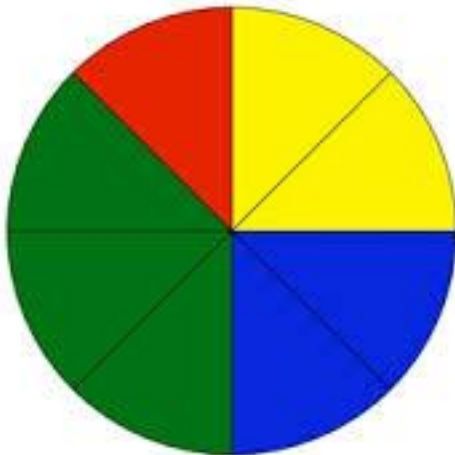
Find:

- The mean:
 - Create a box and whisker plot.
-
- What percentage of people are older than the upper quartile?

15. Find the Volume of the following 3D shape.



16. Lucas first flips a coin then spins the wheel in the diagram below. Construct a tree diagram that represents this situation. 10 marks



What is the probability of choosing tails and green?

17. Which of the following angles is equivalent to 210° ?

A) $\frac{5\pi}{6}$ rad

B) $\frac{7\pi}{6}$ rad

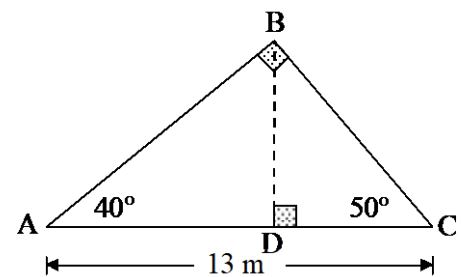
C) $\frac{4\pi}{3}$ rad

D) $\frac{5\pi}{4}$ rad

18. Right triangle ABC is illustrated at the right.

Segment BD is the height.

Find the Area of the triangle.



19. Solve for x. Make sure to show all your work.

a. $\log 5x = \log(3x - 12)$

b. $3^{x-2} = 27$