# National 5 Mathematics

# 5-A-Day Flashcards

- Attempt five randomly selected cards per day – repetition is okay but trawling through for ones you can do is not.
- Keep a record of the questions you are stuck on and the topic(s) they assess.
- If you are consistently getting stuck on the same topics then use the blog or seek the support of your teacher to address this.
- Some cards are marked with a non-calculator symbol – this means you could reasonably asked a question like this in paper 1.

Simplify $\dfrac{\sqrt{5}\sqrt{10}}{\sqrt{18}}$ giving your answer with a rational denominator.

Express each trinomial in the form $(x + p)^2 + q$

a) $x^2 - 8x - 1$

b) $x^2 + 5x + 4$

c) $7 - 4x - x^2$

One of the trinomials could also be expressed in the form $(x + m)(x + n)$, which is it?

Express $3^{-2} + 2^{-4}$ in the form $\frac{a}{b}$ where $a$ and $b$ are whole numbers.

Express $\sqrt{45} + 6\sqrt{5} - \sqrt{20}$ as a surd in its simplest form.

Expand and simplify:

a) $\left(2x - \frac{1}{5}\right)\left(3x + \frac{2}{3}\right)$

b) $(2x + 3)(x^2 - 3x + 7)$

c) $(x + 5)^3 - (x + 5)^2$

Identify the expressions that cannot be factorised, factorise the ones that can.

$x^2 + 3x + 4$

$7x^2y + 14xz + 12y^2z$

$9x^2 - 36$

$a^2 + 7a - 18$

$a^2 + b^2$

$16x^2 - \frac{4}{9}$

Simplify $\dfrac{5p^7 \times (2p^2)^3}{4p^{15}}$ giving your answer such that the exponent of $p$ is positive.

A company buys £750 000 worth of machinery.

The machinery depreciates in value by 20% per year.

The machinery will be replaced at the end of the year in which its value falls below half of its original value.

After how many years will the machinery need replaced?

Evaluate $\dfrac{2}{3} \div \left(1\dfrac{1}{4} + 2\dfrac{3}{5}\right)$

Express as a single fraction:

a) $\dfrac{3}{g} + \dfrac{9}{h}$

b) $\dfrac{3x}{5} \div \dfrac{4}{x}$

c) $\dfrac{2}{\sqrt{5}} + \dfrac{3}{\sqrt{8}}$   give your answer with a rational denominator.

Evaluate without the use of a calculator:

a) $3^{-4}$

b) $64^{\frac{5}{6}}$

c) $16^{-\frac{1}{2}}$

A couple have saved £18000 for a deposit towards a new house. The mortgage company informs them that their deposit must be at least 15% of the value of the property. What is the maximum they can spend on a property with the deposit they have saved?
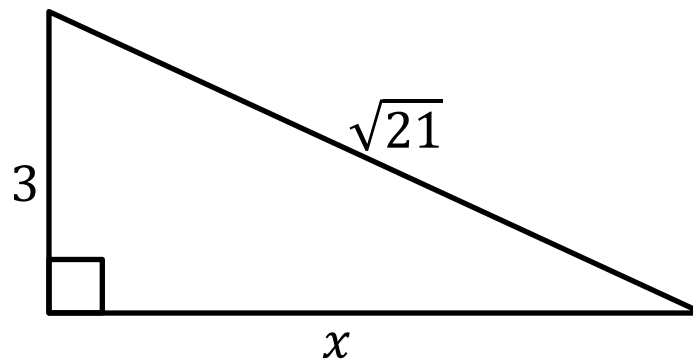
A cube has a surface area of $12x + 30$ units$^2$.

Find an expression for its volume.

Find the length of x giving your answer as a surd in its simplest form.



$\sqrt{21}$

3

$x$

A special offer bag of coffee contains 20% extra free.  If the special offer pack contains 570g, how much will the standard pack contain?

Express as a single fraction:

i) $\dfrac{5}{x} + \dfrac{3}{y}$
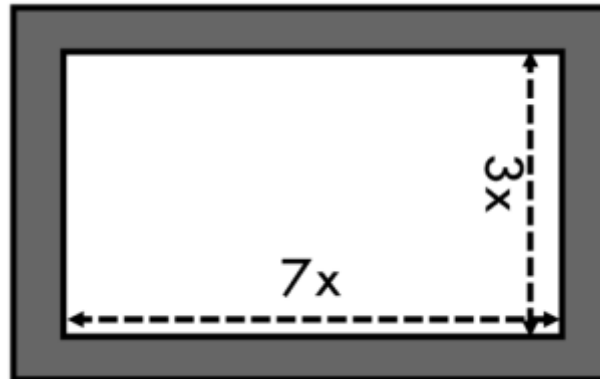
ii) $\dfrac{4x}{y} \div \dfrac{x}{12}$

iii) $\dfrac{3}{x+5} - \dfrac{7}{x-2}$

Expand and simplify $(4x - 2)(3x^2 - 5x + 6)$

The grey border is 5cm thick all the way round.  Find an expression for its area.



3x

7x

Evaluate $\quad 2\frac{2}{3} - 3\frac{2}{5} \times 1\frac{3}{8}$

It takes light approximately 8 minutes to reach the Earth from the Sun.

If the speed of light is $3 \times 10^8 m/s$, work out the distance from the Sun to the Earth.

Give your answer in scientific notation rounded to 2 significant figures.

A snail crawls 3km in 16 days.

What is the average speed of the snail in metres per second?

Give your answer in scientific notation correct to 2 significant figures.

Jack weighs 94kg.

On the 1$^{st}$ of January he starts a diet designed to reduce his weight by 7% per month.

During which month will he achieve his target weight of 73kg?

Express as a single fraction:

a) $\dfrac{5}{x} - \dfrac{3}{y}$

b) $\dfrac{3x+1}{y} + \dfrac{5}{x+2}$

c) $\dfrac{8}{x^2} \div \dfrac{10}{x^3}$

Simplify the fraction $\dfrac{2x^2 - x - 10}{x^2 - 4}$

Factorise $a^2 - b^2$.

Hence or otherwise evaluate $0 \cdot 73^2 - 0 \cdot 27^2$

Explain in your own words how you would change a trinomial written in the form

$x^2 + ax + b$ to the form $(x + p)^2 + q$

$$3^n = \frac{1}{81}$$

What is the value of $n$?

Multiply out the brackets and express your answer as a surd in its simplest form

$$\sqrt{2}(\sqrt{6} - \sqrt{2})$$

Express $\dfrac{b^{\frac{1}{2}} \times b^{\frac{1}{2}}}{b}$ in its simplest form.

Factorise      $3x^2 - 5x - 2$

Paul bought a car last year.

It has lost 12.5% of its value since then.

It is now valued at £10 500.

How much did Paul pay for his car?

What is the formula for calculating the volume of a sphere?

Find the gradient of the line that joins the points:

   i)    A(-2,6) and B(4,14)

   ii)   C(-5,-10) and D(2, -14)

   iii)  $E\left(\frac{2}{3}, 5\right)$ and $F\left(\frac{3}{8}, 8\right)$

i) Find the equation of the line that joins the points A(-4,7) and B(-2,11).

ii) Find the coordinates of the point where the line intercepts the x and y axes.

Solve the following equations:

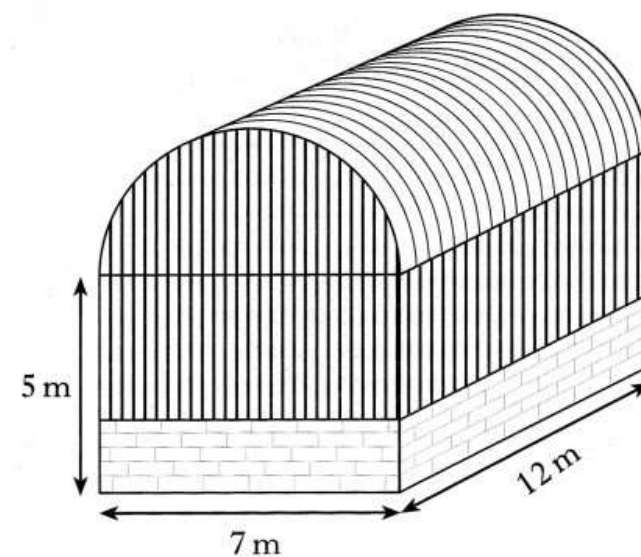a) $6x + 19 = 2x + 7$

b) $\frac{5x-3}{2} = x + 4$

c) $3(2x - 5) = 5(3x + 2)$

A storage barn has constant cross-sectional area, as shown in the diagram.

The cross-section consists of a rectangle and a semi-circle.

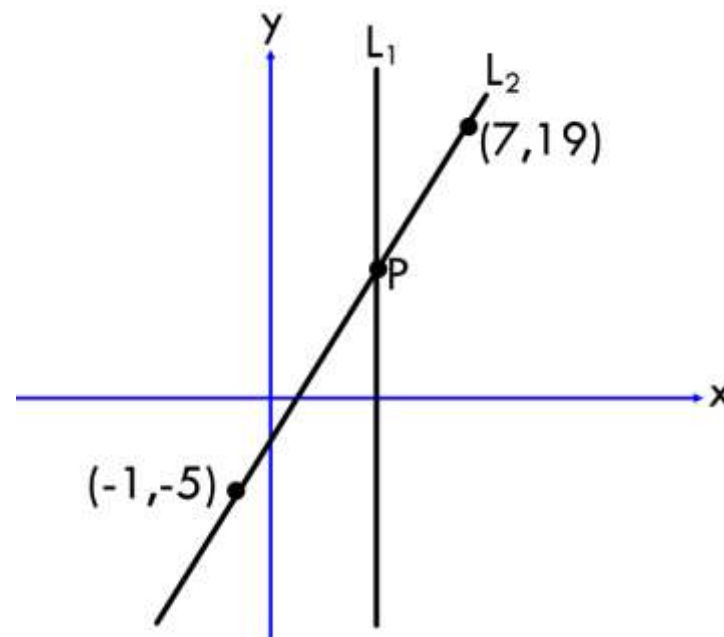Calculate the volume of the barn in square metres.

Round your answer to 2 significant figures.



5 m

7 m

12 m

Two lines are drawn as shown in the diagram. $L_1$ is vertical and crosses the x axis at the point (5,0).

L2 passes through the points (-1,-5) and (7,19)



a)   Write down the equation of $L_1$

b)   Find the equation of $L_2$

c)   Find the coordinates of P, the point where $L_1$ intersects $L_2$.

Simplify the following.  Write answers containing only positive powers.

a) $\dfrac{y^3 \times y^5}{y^{10}}$

b) $\dfrac{\left(3a^3\right)^2 \times 2a^{-3}}{6a^{-4}}$

c) $\dfrac{\sqrt[3]{p} \times \sqrt{p^5}}{p}$

Harry bids successfully for a painting at an auction.

An "auction tax" of 8% is added to his bid price. He pays £324 in total.

Calculate his bid price

Radio signals travel at a speed of $3 \times 10^8$ metres per second.

A radio signal from Earth to a space probe takes 8 hours.

What is the distance from Earth to the probe?
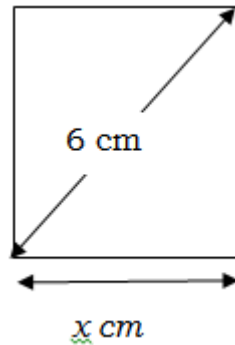
**Give your answer in scientific notation**.

Solve the inequality     $5 - x > 2(x + 1)$

Solve algebraically the equation $$2x - \frac{(3x-1)}{4} = 4$$

6 cm

*x cm*

A square of side *x* centimetres

has a diagonal 6 centimetres long.

Calculate the value of *x,* giving your answer as a surd in its simplest form.