

# GCSE MATHEMATICS Higher Tier REVISION SHEET

1. Evaluate the following.

- a)  $25^{\frac{1}{2}}$ ,      b)  $3^{-2}$ ,      c)  $2^{-3} \times 2^6$ ,      d)  $8^{\frac{2}{3}}$ ,  
 e)  $1000^0$ ,      f)  $16^{-\frac{3}{4}}$ ,      g)  $1^4$ .

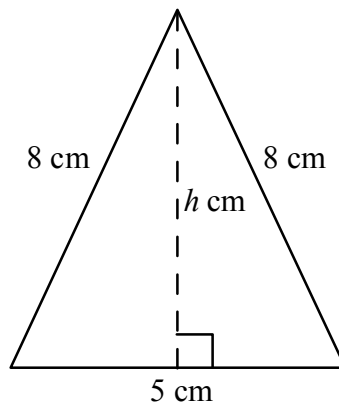
2. The volume of a cylinder is given as 880 ml correct to 2 significant figures. John measures its height as 11.2 cm (to the nearest mm). Between what limits must the radius of the cylinder lie?

3. Solve 
$$\begin{aligned} 3x + y &= 4 \\ y &= x + 2 \end{aligned}$$

4. Find, in terms of  $n$ , the  $n$ th term of the sequence

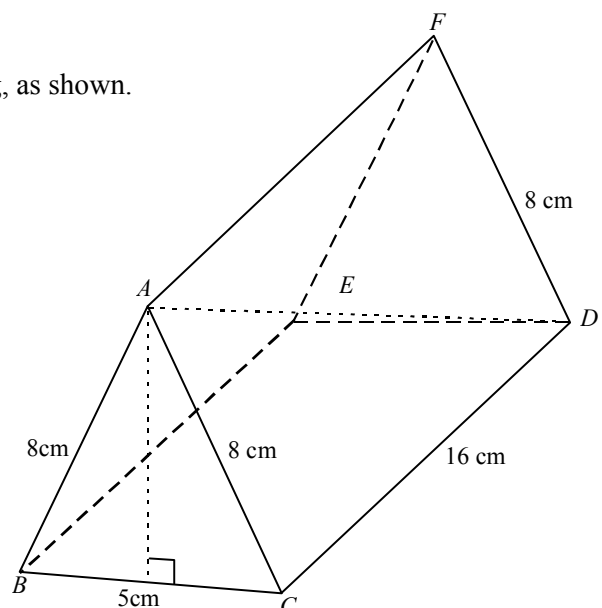
$$\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{9}, \frac{5}{11}, \dots$$

5. (a) An isosceles triangle has sides 8 cm, 8 cm and 5 cm. Use Pythagoras' Theorem to calculate the length of the height marked  $h$  on the diagram.



(b)  $ABCDEF$  is a triangular prism, 16 cm long, as shown.

Calculate the size of the angle between  $AD$  and the base  $BCDE$ .



6. Sanjay has four possible ways home from school.  
From school he takes either a bus or a train.  
The probability that he will go by train is  $\frac{3}{5}$ .  
If he goes by train, he completes his journey by walking or by getting a lift.  
The probability that he gets a lift is  $\frac{1}{5}$ .  
If he catches a bus, the second part of his journey can be completed by catching another bus or he can walk.  
The probability that he will walk is  $\frac{7}{8}$ .  
What is the probability that Sanjay:
- catches a bus from school and then walks?
  - walks for part of his journey home?

7. A formula for working out the area  $A$  of a triangle with sides  $x$  cm,  $y$  cm and  $z$  cm is given by

$$A = \sqrt{s(s-x)(s-y)(s-z)}$$

where  $s = \frac{(x+y+z)}{2}$

Calculate the area of a triangle with  $x = 2\frac{1}{2}$ ,  $y = 3\frac{1}{4}$  and  $z = 4\frac{3}{8}$ .

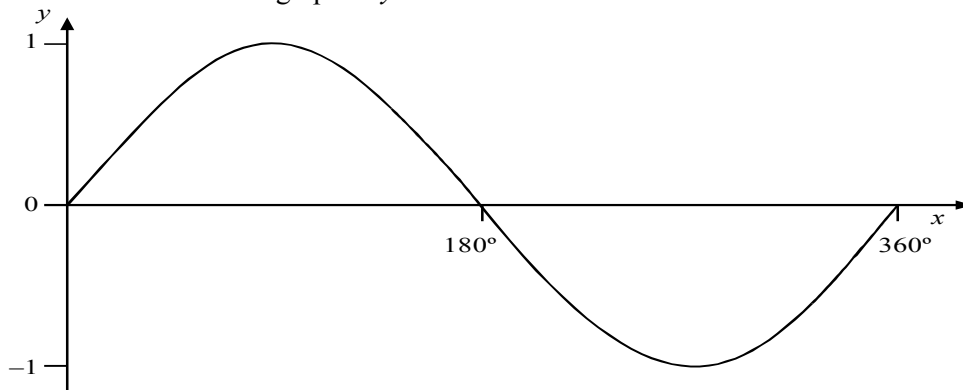
8. (a) Write the formula  $y = \frac{kl}{t^2}$  ( $k = \text{constant}$ ) in a sentence using the two phrases 'varies directly as' and 'varies inversely as'.
- (b)  $y = 3$  when  $l = 12$  and  $t = 2$ . Find the value of  $y$  when  $l = 20$  and  $t = 5$ .

9. Simplify  $\frac{5x^2 + 14x - 3}{x^2 - 9}$

10. It is given that  $x^2 - 6x + 13 = (x - a)^2 + b$ .

- Find the values of  $a$  and  $b$ .
- Hence find the minimum value of  $x^2 - 6x + 13$ .

11. Here is a sketch of the graph of  $y = \sin x$  for  $0^\circ \leq x \leq 360^\circ$



- Show on the sketch the locations of the two solutions of the equation  $\sin x = \frac{1}{2}$
- Work out accurately the two solutions of the equation  $4 \sin x = -3$  in the range  $0^\circ \leq x \leq 360^\circ$

Answers.

1. a)  $25^{\frac{1}{2}} = \sqrt{25} = 5$       b)  $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$   
c)  $2^{-3+6} = 2^3 = 8$       d)  $8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 2^2 = 4$   
e)  $1000^0 = 1$       f)  $16^{-\frac{3}{4}} = \frac{1}{16^{\frac{3}{4}}} = \frac{1}{(16^{\frac{1}{4}})^3} = \frac{1}{2^3} = \frac{1}{8}$   
g)  $1^4 = 1 \times 1 \times 1 \times 1 = 1.$

2. Volume lies between 875 and 885 ml (1 ml = 1 cm<sup>3</sup>).  
Height lies between 11.15 and 11.25 cm.

$$\text{Radius} = \sqrt{\frac{\text{volume}}{\pi \times \text{height}}}.$$

$$\text{Smallest radius} = \sqrt{\frac{875}{\pi \times 11.25}} = 4.97\dots \text{ cm.}$$

$$\text{Largest radius} = \sqrt{\frac{885}{\pi \times 11.15}} = 5.02\dots \text{ cm.}$$

3.  $x = 0.5, y = 2.5.$

4.  $\frac{n}{2n + 1}.$

5. (a)  $h = 7.599342077$  cm.  
(b) {Use Pythagoras in triangle  $ACD$  to calculate  $AD = 17.88854382$  cm.  
Then use  $S^{\text{O}}_H C^{\text{A}}_H T^{\text{O}}_A$  to get the required angle.}  
Answer =  $25.13902602^\circ$ .

6. Draw a tree diagram!

(a)  $\frac{7}{20}.$   
(b)  $\frac{83}{100}.$

7. 4.02059024.

8. (a) **Note that  $k$  being a constant means that it is a fixed value which does not change.**

$y$  varies directly with  $l$  and inversely as  $t^2$ .

- (b) Put  $y = 3, l = 12$  and  $t = 2$  to get

$$3 = \frac{12k}{2^2}$$

$$\text{i.e. } 3 = \frac{12k}{4} = 3k.$$

This means that  $k = 1$  and hence  $y = \frac{l}{t^2}.$

$$\text{Now put } t = 5 \text{ and } l = 20 \text{ to get } y = \frac{20}{5^2} = \frac{20}{25} = \frac{4}{5}.$$

9. (a) Factorise both the numerator and denominator.  
 $\frac{(5x - 1)(x + 3)}{(x - 3)(x + 3)}$  which cancels down to give  $\frac{5x - 1}{x - 3}$ .
10. (a) Complete the square to get  $x^2 - 6x + 13 = (x - 3)^2 + 4$ .  
 $x = 3, b = 4$ .  
(b) Minimum value is 4.
11. (b)  $228.6^\circ$  and  $311.4^\circ$ .