

## FORMULAE LIST

The roots of  $ax^2 + bx + c = 0$  are  $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule:  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule:  $a^2 = b^2 + c^2 - 2bc \cos A$  or  $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle:  $\text{Area} = \frac{1}{2} ab \sin C$

Volume of a sphere:  $\text{Volume} = \frac{4}{3} \pi r^3$

Volume of a cone:  $\text{Volume} = \frac{1}{3} \pi r^2 h$

Volume of a Pyramid:  $\text{Volume} = \frac{1}{3} Ah$

Standard deviation:  $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$ , where n is the sample size.

## All questions should be attempted

Marks

1. Solve algebraically the system of equations

$$\begin{aligned}y &= 3x + 2 \\ 2x + 3y &= 50\end{aligned}$$

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2. Simplify  $\frac{\sqrt{72} - \sqrt{8}}{16}$  expressing your answer as a surd in its simplest form.

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3. The function  $f(x)$  is given by the formula  $f(x) = 2x^2 - 5$ , where  $x$  is a real number.

(a) Find the value of  $f(-3)$ .

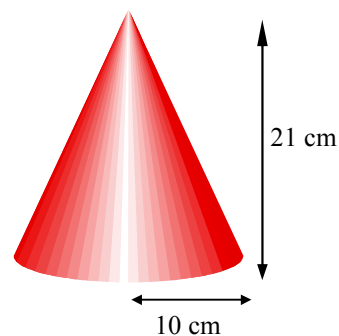
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(b) Find the **values** of  $a$  for which  $f(a) = 45$ .

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4. The diagram shows a cone with radius 10 centimetres and height 21 centimetres.

Taking  $\pi = 3.14$ , calculate the volume of the cone.

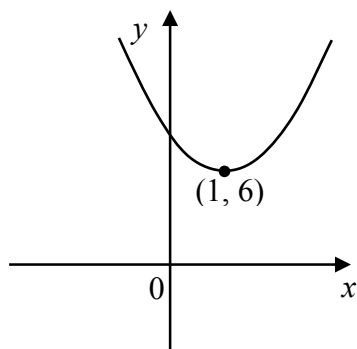


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5. Simplify  $\frac{(x+2)^2}{x^2 - 2x - 8}$

2

6.



The equation of the parabola is of the form

$$y = (x + p)^2 + q.$$

Write down the equation of the parabola and state the equation of the axis of symmetry

2

8.

(a)

Simplify

$$\frac{6x^3y^{-\frac{2}{3}}}{3xy^{-\frac{1}{3}}}$$

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(b)

Evaluate the expression if  $x = -2$  and  $y = 27$

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9. Given that  $P = \frac{3b - c}{b}$ , express  $b$  in terms of  $A$  and  $c$ .

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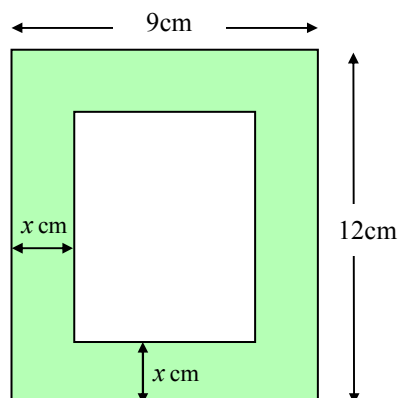
10. Sketch the graph of

$$f(x) = \sin(x - 60)^\circ,$$

$$0 \leq x \leq 360$$

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11. Sandy found a small photo-frame and decided to put one of her favourite photographs in it. The diagram below shows the dimensions of the frame.



The width of the wooden surround is  $x$  cm.

Unfortunately the glass in the centre of the frame was cracked and had to be replaced.

- (a) Show that the area of glass needed for the centre of the frame can be given by the formula

$$A = (4x^2 - 42x + 108) \text{ cm}^2 \quad 3$$

- (b) If the area of glass needed was  $54 \text{ cm}^2$ , find a possible value for  $x$ . 4

12. Simplify  $\frac{6 - 6\sin^2 x}{3\cos x}$  3

*End of question paper*