

Intermediate 2 Units 1, 2, 3 Paper 2 2004

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Graduate Bsc (Hons) MathsSci (Open) GIMA

1. Given the average house price is £77 900. The prices are increasing at 2.5% per month. In 3 months time the average value will be:

$$\text{Price} = 77900(1.025)^3 = \text{£}83900 \text{ to 3 sig. figs.}$$

2. Given the heights of seedlings in millimetres.

15    18    14    17    16    19

(a)(i) The mean is:

$$\frac{(15+18+14+17+16+19)}{6} = 16.5 \text{ millimetres}$$

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Q2. (ii) The standard deviation is:

$x$	$x^2$
15	225
18	324
14	196
17	289
16	256
19	361
$\Sigma x =$ <u>99</u>	$\Sigma x^2 =$ <u>1651</u>

$$(\Sigma x)^2 = 9801$$

$$s = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2 / n}{n - 1}}$$

$$s = \sqrt{\frac{1651 - 9801 / 6}{6 - 1}}$$

$$s = \sqrt{\frac{17.5}{5}}$$

$$s = 1.87$$

(b)(i) The seeds are measured again some time later.

$$\text{New mean} = \frac{24}{6} + 16.5 = 20.5$$

(ii) The standard deviation will still be 1.87 since all values increased by the same amount.

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3 (a) Given  $5x + (x - 4)(3x + 1)$

Multiplying out and gathering terms we have:

$$\begin{aligned} &5x + (x - 4)(3x + 1) \\ &= 5x + x(3x + 1) - 4(3x + 1) \\ &= 5x + 3x^2 + x - 12x - 4 \\ &= 3x^2 - 6x - 4 \end{aligned}$$

(b) Using FOIL (or any other suitable method) to factorise the expression we get:

$$\begin{aligned} &3x^2 - 7x + 2 \\ &= (3x - 1)(x - 2) \end{aligned}$$

Q4. Given the diagram.  
Red value added to diagram  $360 \div 5 = 72^\circ$

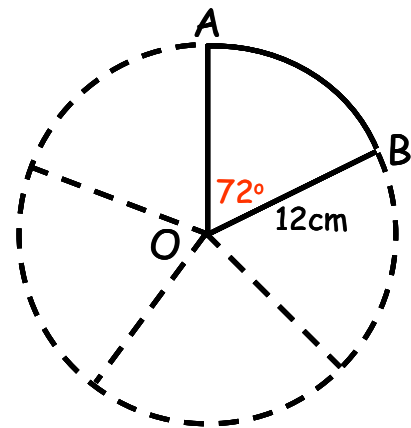
The perimeter of sector AOB is:

$r + r + \text{length of arc}$

$$Perimeter_{\text{sector}} = 12 + 12 + \frac{\text{sector}^\circ}{\text{full circle}^\circ} \times 2\pi r$$

$$Perimeter_{\text{sector}} = 24 + \frac{72^\circ}{360^\circ} \times 2 \times \pi \times 12$$

$$Perimeter_{\text{sector}} = 39.1\text{cm}$$



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5. Given the information about entry to the sports centre.  
14 adults and 4 children total cost was £55.00.

(a) Equation for above would be  $14x + 4y = 55.00$ .

13 adults and 6 children total cost was £54.50.

(b) Equation for above would be  $13x + 6y = 54.50$ .

- (c) Fee for an adult and the fee for a child are:

$$14x + 4y = 55.00 \quad \text{eqn 1}$$

$$13x + 6y = 54.50 \quad \text{eqn 2}$$

multiply eqn 1 by 3 and multiply eqn 2 by 2

$$42x + 12y = 165 \quad \text{eqn 3}$$

$$26x + 12y = 109 \quad \text{eqn 4}$$

subtract eqn4 from eqn 3

$$16x = 56 \quad x = \text{£}3.50 \text{ adult fee}$$

sub in eqn 1 to find y

$$14 \times 3.5 + 4y = 55.00 \quad y = \text{£}1.50 \text{ child fee}$$

remember you can check values by substituting them  
into any of the other equations.

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6. Solving the equation we get:

$$4x^2 + 7x - 3 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

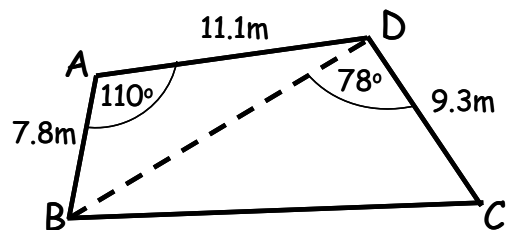
$$x = \frac{-7 \pm \sqrt{49 + 24}}{4}$$

$$x = \frac{-7 \pm \sqrt{73}}{4}$$

$$x = \frac{-7 + \sqrt{73}}{4} \quad \text{and} \quad x = \frac{-7 - \sqrt{73}}{4}$$

$$x = 0.4 \quad \text{and} \quad x = -3.9$$

Q7. Given the diagram of the quadrilateral.



(a) The length of the diagonal BD is:

$$BD^2 = AD^2 + AB^2 - 2 \times AD \times AB \times \cos A^\circ$$

$$BD^2 = 7.8^2 + 11.1^2 - 2 \times 7.8 \times 11.1 \times \cos 110^\circ$$

$$BD = \sqrt{243.27}$$

$$BD = 15.6m$$

(b) The area is made up of 2 triangles.

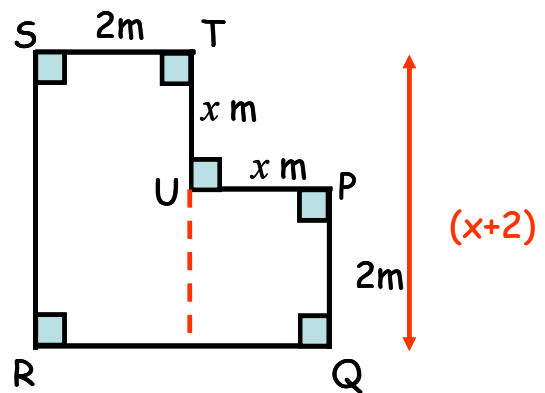
$$\text{Area} = \frac{1}{2}(AD)(AB)\sin A^\circ + \frac{1}{2}(BD)(BC)\sin B^\circ$$

$$\text{Area} = 0.5 \times 7.8 \times 11.1 \times \sin 110^\circ + 0.5 \times 15.6 \times 9.3 \times \sin 78^\circ = 111.6m^2$$

8. Given the diagram. Red lines have been added to diagram.

- (a) The area is given by:

$$\begin{aligned}
 \text{Area} &= (l \times b) + (l \times b) \\
 &= 2 \times (x + 2) + x \times 2 \\
 &= 2x + 4 + 2x \\
 &= 4x + 4
 \end{aligned}$$



- (b) Given the area is  $18\text{m}^2$ .  
To find  $x$ :

$$A = 4x + 4$$

$$18 = 4x + 4$$

$$14 = 4x$$

$$x = 3.5\text{m}$$

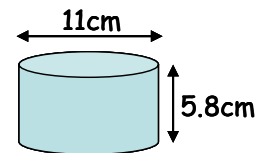
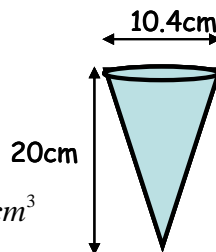
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9. Given the diagram of ice cream tubs and that they both cost the same.

The best value tub will be:

$$V_{\text{cone}} = \frac{1}{3} \pi r^2 h = \frac{1}{3} \times \pi \times 5.2^2 \times 20 = 566.3 \text{ cm}^3$$



$$V_{\text{cylinder}} = \pi r^2 h = \pi \times 5.5^2 \times 5.8 = 551.2 \text{ cm}^3$$

Since the cone has the bigger volume it is the better value for money.

10. Solving the equation we get:

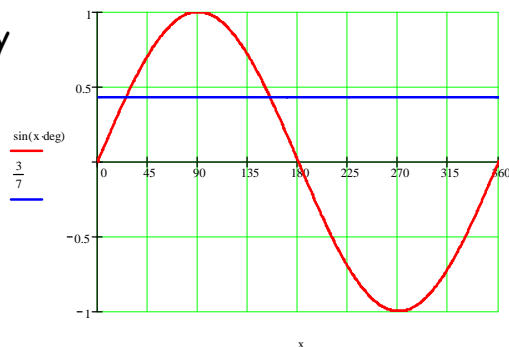
$$7 \sin x^\circ - 3 = 0 \quad 0 \leq x^\circ \leq 360^\circ$$

Remember there will be 2 solutions in the range  $0 \leq x^\circ \leq 360^\circ$

$$\sin x^\circ = \frac{3}{7}$$

$$x^\circ = \sin^{-1}\left(\frac{3}{7}\right) = 25.4^\circ \quad \text{and} \quad 180^\circ - 25.4^\circ = 154.6^\circ$$

Graphically



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11. (a) Expressing  $\frac{4}{x+3} + \frac{3}{x}$  as a single fraction in its simplest form:

$$\frac{4x + 3(x+3)}{(x+3)x} = \frac{4x + 3x + 9}{x^2 + 3x} = \frac{7x + 9}{x^2 + 3x}$$

- (b) Change the subject of the formula to  $x$  we get:

$$\begin{aligned} m &= \frac{3x + 2y}{p} \\ mp &= 3x + 2y \\ mp - 2y &= 3x \\ 3x &= mp - 2y \\ x &= \frac{mp - 2y}{3} \end{aligned}$$

- (c) Simplify we get:

$$\frac{3a^5 \times 2a}{a^2} = \frac{6a^{5+1}}{a^2} = \frac{6a^6}{a^2} = 6a^{6-2} = 6a^4$$