Intermediate 2 Units 1, 2, 3 Paper 2 2004

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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:

$$Price = 77900(1.025)^3 = £83900$$ 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
$\Sigma x =$	99	$\Sigma x^2 =$	1651

$(\Sigma x)^2 =$ 9801

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

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

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

$$s = 1.87$$

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

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 about.

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

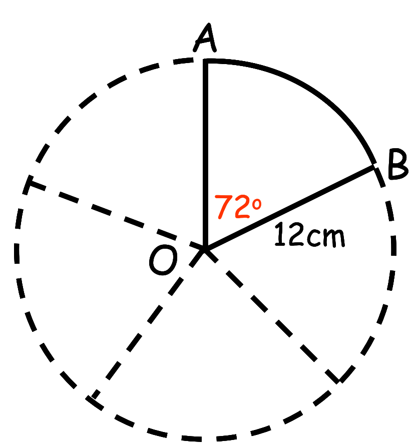
Multiplying out and gathering terms we have:

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

(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 ÷ 5 = 72°



The perimeter of sector AOB is:

r + r + length of arc

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

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

$$Perimeter_{sector} = 39.1cm$$

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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:

$14x + 4y = 55.00$ eqn 1
$13x + 6y = 54.50$ eqn 2

multiply eqn 1 by 3 and multiply eqn 2 by 2
$42x + 12y = 165$ eqn 3
$26x + 12y = 109$ eqn 4

subtract eqn4 from eqn 3

$16x = 56$ $x = £3.50$ adult fee

sub in eqn 1 to find y

$14 \times 3.5 + 4y = 55.00$ $y = £1.50$ child fee

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

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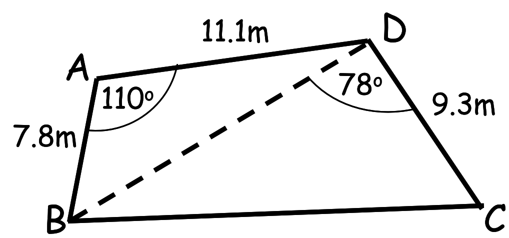
6. Solving the equation we get:

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
$$x = \frac{-7 \pm \sqrt{49 + 24}}{4}$$
$$x = \frac{-7 \pm \sqrt{73}}{4}$$
$$x = \frac{-7 + \sqrt{73}}{4} \quad \text{and} \quad x = \frac{-7 - \sqrt{73}}{4}$$
$$x = 0.4 \quad \text{and} \quad x = -3.9$$

Q7. Given the diagram of the quadrilateral.



(a) The length of the diagonal BD is:

$$BD^2 = AD^2 + AB^2 - 2 \times AD \times AB \times \cos A^o$$
$$BD^2 = 7.8^2 + 11.1^2 - 2 \times 7.8 \times 11.1 \times \cos 110^o$$
$$BD = \sqrt{243.27}$$
$$BD = 15.6m$$

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

$$Area = \frac{1}{2}(AD)(AB)\sin A^o + \frac{1}{2}(BD)(BC)\sin B^o$$
$$Area = 0.5 \times 7.8 \times 11.1 \times \sin 110^o + 0.5 \times 15.6 \times 9.3 \times \sin 78^o = 111.6m^2$$

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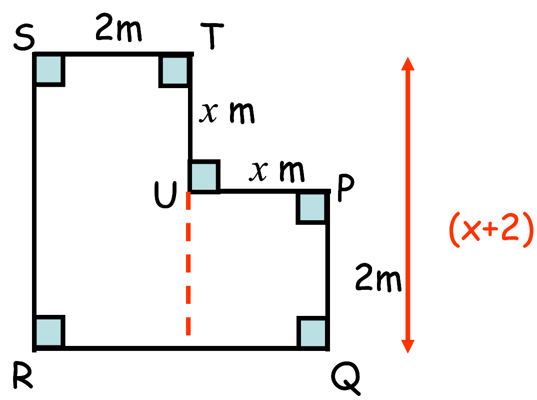
8. Given the diagram. Red lines have been added to diagram.

(a) The area is given by:



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

(b) Given the area is 18m^2.
To find x:

$$
\begin{aligned}
A &= 4x + 4 \\
18 &= 4x + 4 \\
14 &= 4x \\
x &= 3.5m
\end{aligned}
$$

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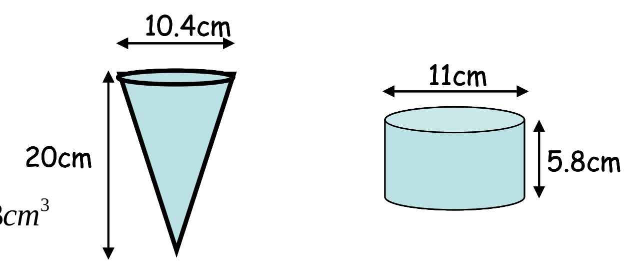
9. Given the diagram of ice cream tubs and that they both cost the same.

The best value tub will be:



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

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

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

10. Solving the equation we get:

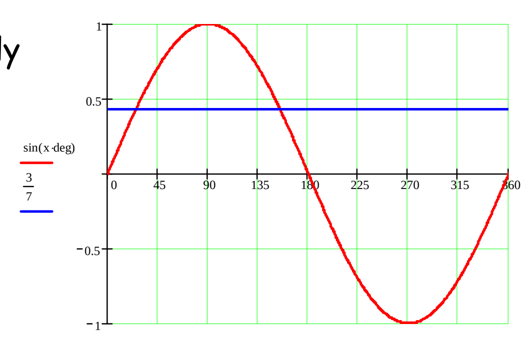
$7\sin x^o - 3 = 0 \qquad 0 \leq x^o \leq 360^o$

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

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

$$x^o = \sin^{-1}\left(\frac{3}{7}\right) = 25.4^0 \quad \text{and} \quad 180^o - 25.4^o = 154.6^o$$

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:

$$m=\frac{3x+2y}{p}$$
$$mp=3x+2y$$
$$mp-2y=3x$$
$$3x=mp-2y$$
$$x=\frac{mp-2y}{3}$$

(c) Simplify we get:

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