Intermediate 2 Units 1, 2, 3 Paper 2 2005

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1. Given the temperature in the greenhouse drops 4% per hour and the temperature at 8 pm is 28°C. Then at 11 pm the temperature will be:

$$Temperature = 28(0.96)^3 = 24.77^o C$$

2. Given the fruit loaves data and that the mean is 400g.

395 400 408 390 405 402

(a) The standard deviation is:

x	x^2
395	156025
400	160000
408	166464
390	152100
405	164025
402	161604
$\Sigma x =$ 2400	$\Sigma x^2 =$ 960218

$(\Sigma x)^2 =$ 5760000

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

$$s = \sqrt{\frac{960218 - 5760000/6}{6-1}}$$

$$s = \sqrt{\frac{218}{5}}$$

$$s = 6.6$$

2. (b) Given the new method has mean 400g and standard deviation 5.8g. It is true to say that the new method ensures a more consistent weight since new method is less than the original standard deviation i.e. new deviation means less spread in data values.

3. Given straight line equation $3y = 12 - 4x$.

The line crosses x-axis when $y = 0$

$12-4x = 0$ $4x = 12$ $x = 3$ Coordinates $(3, 0)$

4. Given the diagram of the two jewellery arrangements.

The length of a bead and a pearl can be found by:

$2b + 5p = 5.2$ eqn 1
$3b + 2p = 5.6$ eqn 2

multiply eqn 1 by 3 and eqn 2 by 2
$6b + 15p = 15.6$ eqn 3
$6b + 4p = 11.2$ eqn 4

sub tract eqn3 from eqn 4

$11p = 4.4 \qquad p = 0.4cm$

sub in eqn 1 to find b

$2b + 5 \times 0.4 = 5.2 \qquad 2b = 3.2 \qquad b = 1.6cm$

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

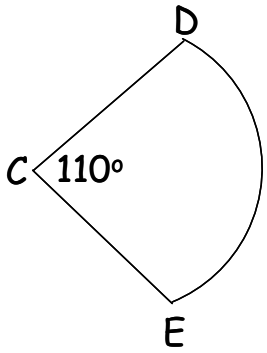
5 Given the sector of a circle diagram.

Calculating the sector area we get:

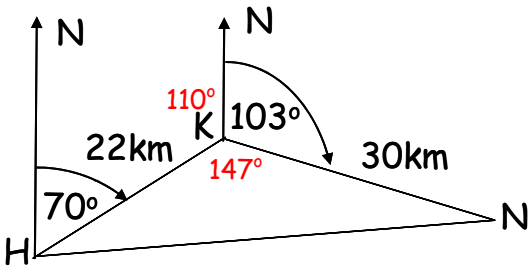
$$Area_{sector} = \frac{sector^o}{full\ circle^o} \times \pi r^2$$

$$Area_{sector} = \frac{110^o}{360^o} \times \pi (12.5)^2$$

$$Area_{sector} = 150cm^2$$



Q6. Given the diagram representing the three towns:
Red values are calculated from diagram



(a)(i) The size of angle HKM is 360° – 103° – 110° = 147°

(ii) Distance HN can be calculated using cosine rule. (2lengths and angle in between)

$$k^2 = h^2 + m^2 - 2hm\cos k^o$$

$$k^2 = 30^2 + 22^2 - 2 \times 30 \times 22 \times \cos 147^o$$

$$k^2 = 2491$$

$$k = 50$$

Total distance travelled is 22 + 30 + 50 = 102km

Q6. (b) The area of the triangle is given by:

$$Area = \frac{1}{2}hm\sin k^o$$
$$Area = \frac{1}{2} \times 30 \times 22 \times \sin 147^o$$
$$Area = 179.7km^2$$

Q7. (a) Given the pharmaceutical company makes a pill that is sphere and has radius 0.5cm. The volume is given by:

$$Volume = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(0.5)^3 = 0.52cm^3$$ (2 sig. figs)

Given the shape of the pill is now cylindrical. The volume is the same as before. The diameter is 1.4cm.

Calculating the height of the pill we get:

$$V = \frac{1}{3}\pi r^2 h$$
$$h = \frac{3V}{\pi r^2} = \frac{3 \times 0.52}{\pi \times (0.7)^2} = 1cm$$

8. Solving the equation we get:

$$4x^2 - 7x + 1 = 0$$

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

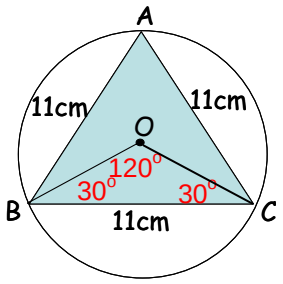
$$x = \frac{7 \pm \sqrt{49 - 16}}{8}$$

$$x = \frac{7 \pm \sqrt{33}}{8}$$

$$x = \frac{7 + \sqrt{33}}{8} \quad \text{and} \quad x = \frac{7 - \sqrt{33}}{8}$$

$$x = 1.6 \quad \text{and} \quad x = 0.2$$

9. Given the diagram of the circle with an equilateral triangle inside it.



Red values have been calculated.

(a) The size of angle OBC is 30°.

(b) The length of OB is:

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

$$\frac{11}{\sin 120^o} = \frac{c}{\sin 30^o}$$

$$c = \frac{11 \times \sin 30^o}{\sin 120^o} = 6.35cm$$

10. (a) Expressing $\frac{7}{\sqrt{2}}$ as a fraction with a rational denominator we get:

$$\frac{7}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{7\sqrt{2}}{2}$$

(b) Expressing $\frac{a}{b} \times \frac{3b}{a^2}$ as a single fraction in its simplest form we get:

$$\frac{1\cancel{a}}{\cancel{b}_1} \times \frac{3\cancel{b}^{1}}{\cancel{a}^{2}_{1}} = \frac{3}{a}$$

(c) Change the subject of the formula to r we get:

$$p = q + 2r^2$$
$$2r^2 = p - q$$
$$r^2 = \frac{p-q}{2}$$
$$r = \pm\sqrt{\frac{p-q}{2}}$$

11. (a) Solving the equation we get:

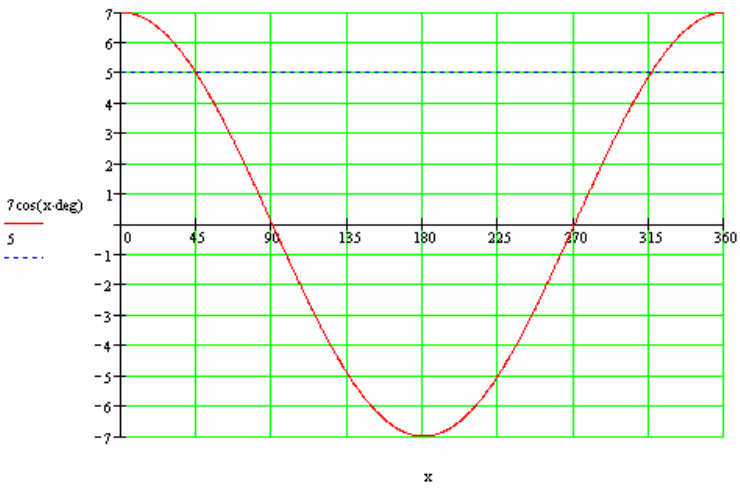
$7\cos x^o - 5 = 0 \qquad 0 \le x^o \le 360^o$

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

$$\cos x^o = \frac{5}{7}$$

$$x^o = \cos^{-1}\left(\frac{5}{7}\right) = 44.4^0 \quad \text{and} \quad 360^o - 44.4^o = 315.6^o$$

Graphical the solution is:



(b) Simplifying the express we get:

$$\tan x^o \cos x^o = \frac{\sin x^o}{\cos x^o} \cos x^o = \sin x$$