CREDIT 2007 – Paper 2

1. Increase of 4.5%. Multiplier is 1.045
After 3 years it is worth:
$600 \times 1.045^3 = £684.70$

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2. $3x^2 - 2x - 10 = 0$

Use the formulae: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = 3 \quad b = -2 \quad c = -10$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-10)}}{2(3)}$$

Start to simplify:

$$x = \frac{2 \pm \sqrt{4 + 120}}{6} \rightarrow x = \frac{2 \pm \sqrt{124}}{6}$$

Use calculator:

$$x = \frac{2 + \sqrt{124}}{6} = 2.189....$$

$$x = \frac{2 - \sqrt{124}}{6} = -1.5225...$$

So x = 2.2 or −1.5 (2 sig figs.)

3a)

x	$x - \bar{x}$	$(x - \bar{x})^2$
28	4	16
32	8	64
14	-10	100
19	-5	25
18	-6	36
26	2	4
31	7	49
168		**294**

Mean: $\bar{x} = \dfrac{168}{7} = 24$

Standard Deviation: $s = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n - 1}}$

$$s = \sqrt{\frac{294}{6}} = \sqrt{49} = 7$$

Mean = 24 and standard deviation is 7 birds

3b) Erin's mean is 25 and standard deviation 5.
Erin has a **slightly higher number** of birds
Erin's recordings are **less variable**.

3b) *continued*
Another way of saying this is:
Luke's recordings are a **little lower** on average than Erin's, and are **more variable**.

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4. $\dfrac{x}{4} - \dfrac{1}{2} < 5$ Remove fraction ~ multiply by 4.

$$4 \times \frac{x}{4} - 4 \times \frac{1}{2} < 4 \times 5$$

$$x - 2 < 20 \quad \rightarrow \quad x < 22$$

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5. This is reversing the change.

Meal + 10% = £148.5

So: Meal x 1.1 = 148.5

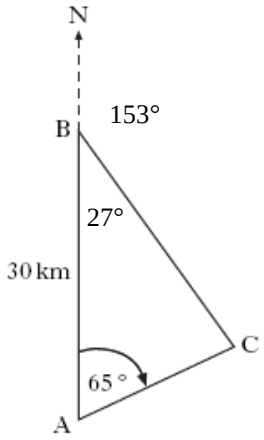
Meal = $\dfrac{148.5}{1.1}$ → £135.00

An alternative method:

110%	=	148.50
1%	=	148.50 ÷ 110
100%	=	148.50 ÷ 110 × 100

i.e. £135.00

6.



Bearing of C from B is 153°,
so ∠ABC = 180° − 153° = 27°

Configuration of triangle is ASA

Use sine rule. $\dfrac{BC}{\sin A} = \dfrac{AB}{\sin C}$

Angle C is: 180° − (27° + 65°) = 88°

So:

$$\frac{BC}{\sin 65°} = \frac{30}{\sin 88°} \rightarrow BC = \frac{30 \sin 65°}{\sin 88°}$$

Hence: BC = 27.205...= 27.2 km

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7. Area of sector: $\frac{64}{360} \times$ Area of circle

Area of circle = $\pi r^2 = \pi \times 5^2$

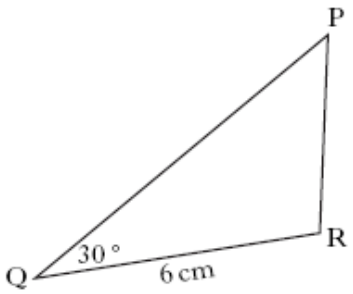
Area of one blade: $\frac{64}{360} \times \pi \times 5^2$

= 13.962...

There are 4 blades, so total area required

= $4 \times 13.962...$ = 55.85 ... = 55.9 cm^2

8.



Area of triangle: 15 square cm.

Use: Area = $\frac{1}{2}ab\sin C$

So: $15 = \frac{1}{2}PQ \times 6 \times \sin 30°$

$\rightarrow \; 30 = PQ \times 6 \times \sin 30°$

$\rightarrow \; \frac{30}{6 \times \sin 30°} = PQ \; \rightarrow \; PQ = 10$ cm

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9. **5 parts copper : 7 parts gold**

Try with copper first. 5 parts = 160 gm

1 part = 160 ÷ 5 = 32 gm

He needs 7 parts of gold.

32 gm × 7 = 224 gm of gold

He has enough gold (he has 245 gm)

The 5 parts of copper are 160 gm

The 7 parts of gold are 224 gm.

Maximum weight of 14 carat gold he can make: 160 + 224 = 384 gm

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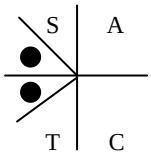
10. $5\cos x° + 4 = 0, \qquad 0 \le x < 360$

Rearrange:

$\cos x° = -\frac{4}{5}$ acute $x = \cos^{-1}\left(\frac{4}{5}\right) = 36.9°$

Use ASTC : Cosine is negative

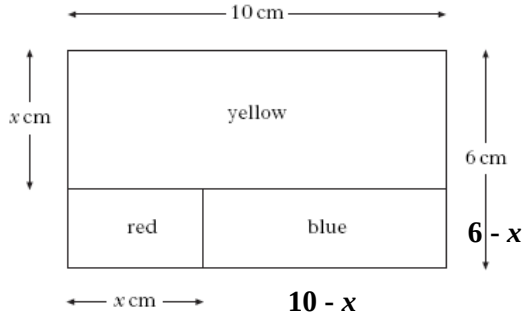
angles in (quadrants 2, 3)



x = 180 – 36.9 = 143.1°

x = 180 + 36.9 = 216.9°

11a)



Mark on dimensions of blue rectangle:

Area of blue rectangle: $A = (10 - x)(6 - x)$

Remove brackets:

$A = 60 - 10x - 6x + x^2$ now simplify

$A = 60 - 16x + x^2 \; \rightarrow \; A = x^2 - 16x + 60$

b) Whole area of logo = $10 \times 6 = 60\,cm^2$

Area of blue rectangle = $\frac{1}{5} \times 60 = 12$ cm^2

Hence: $12 = x^2 - 16x + 60$ now rearrange

$x^2 - 16x + 48 = 0$ now factorise

$(x - 4)(x - 12) = 0 \rightarrow \; x = 4, \; x = 12$

Not possible to have x = 12; so x = 4

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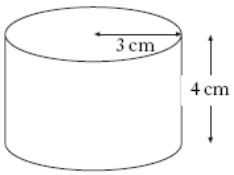
12. Vol of cylinder:

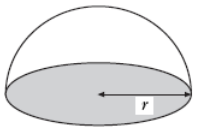
$V = \pi r^2 h$

$V = \pi \times 3^2 \times 4 = 113.1$



Vol of hemisphere:

$V = \frac{2}{3}\pi r^3$



$113.1 = \frac{2}{3}\pi r^3$

Re-arrange: $113.1 \times 3 = 2\pi r^3$

$r^3 = \frac{113.1 \times 3}{2\pi} = 54.0$

$r = \sqrt[3]{54} = 3.77... = 3.8$ cm $\left(\sqrt[3]{54} = 54^{\frac{1}{3}}\right)$

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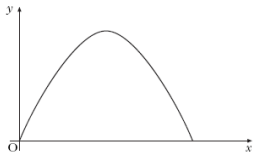
13. $y = 4x(140 - x)$



Find roots

$4x(140 - x) = 0$

Hence x = 0, x = 140

Maximum is on line of symmetry

Mid-way between roots i.e. x = 70

When x = 70, $y = 4 \times 70\,(140 - 70)$

$y = 280 \times 70 = £19,600$ maximum profit.

END OF QUESTION PAPER