Perth Academy National 5 Applications Homework 13

1. Cleano washing powder is on special offer.
Each box on special offer contains 20% more powder than the standard box.
A box on special offer contains 900 grams of powder.
How many grams of powder does the standard box contain?

2. A toy hangs from a ceiling on a spring. Its distance *d* centimetres below the ceiling is given by the formula

$$d = 100 + 15\cos(270t)^\circ$$

where *t* is the time in seconds after the toy is released.

(a) How far below the ceiling is the toy when it is released?
(b) How close to the ceiling does the toy rise?
(c) How many seconds pass before the toy returns to its starting position?

3. A rectangle has length 17cm and breadth 11cm.
When the length and breadth are each increased by *x* cm the resulting rectangle has area 487 sq cm.
Find the value of *x* correct to 1 decimal place.

4. The area of triangle ABC is 20 sq units.
If $AB = 8$ units and $BC = 6$ units, find the possible sizes of angle ABC.

5. (a) Expand $(x+2)^2$

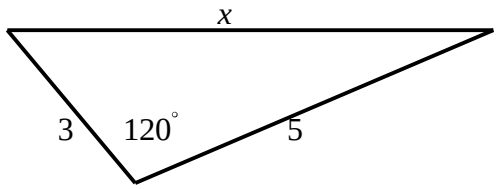
(b) Hence expand $(x+2)^3$

6. (a) Explain why the product of two consecutive whole numbers is even.
(b) Hence prove that the product of two consecutive even numbers is a multiple of 8.

7. A ship leaves port P and sails a distance of 20 km on a bearing 059°, reaching port B.
At B, the ship changes direction and sails for 25 km on a bearing of 132° to port C.

(a) Draw a sketch to show this information.
(b) Calculate the direct distance from P to C.

8. Given that $\cos 60^\circ = \frac{1}{2}$, find, without the use of a calculator, the exact value of $\cos 120^\circ$ and find the value of *x* in the triangle sketched below.



9. Large distances are measured in light years.
A camera on a space telescope photographs a galaxy 50 million light years away.
One light year is approximately $9{\cdot}46\times10^{12}$ kilometres.
Calculate the distance of the galaxy from the space telescope in kilometres, answering in scientific notation.

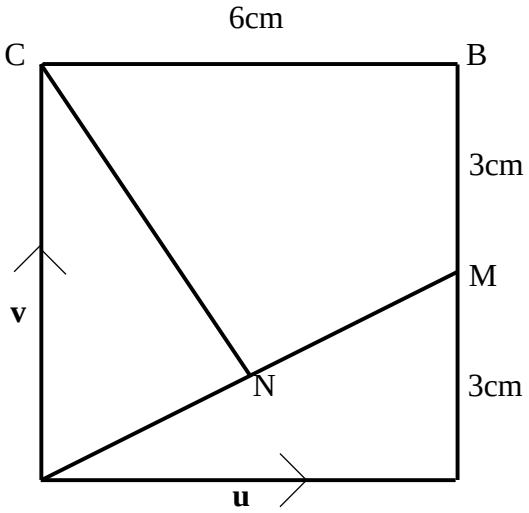
10. Express $x^2-4x+11$ in the form $x-a\ ^2+b.$

Hence sketch the graph of $f\ x\ =x^2-4x+11,$ showing the coordinates of the turning point and The *y*-intercept.

11. A tank contains 10 litres of water.
A further 30 litres of water is pumped into the tank at a steady rate of 5 litres per minute.

(a) Draw a graph of the volume *V* litres against the time *t* minutes.
(b) Find an equation connecting V and *t*.

12. The diagram below shows a square OABC of side 6 cm. M and N are the mid-points of AB and OM respectively.
$\overrightarrow{OA}$ represents the vector **u** and $\overrightarrow{OC}$ represents the vector **v**.



(a) Find the value of $\left|\mathbf{u}+\frac{1}{2}\mathbf{v}\right|$ leaving your answer as a surd in its simplest form.

(b) Find an expression in terms of **u** and/or **v** for (i) $\overrightarrow{ON}$ (ii) $\overrightarrow{CN}$

13. The value of a Unit Trust has fallen by 30% in the last two years.
If an investment in this trust is now worth £6020, what was the investment worth 2 years ago?