Perth Academy National 5 Applications Homework 7

1. Calculate:

(a) $3\frac{1}{5}+4\frac{1}{2}$ (b) $6\frac{3}{4}-4\frac{2}{3}$ (c) $2\frac{4}{7}\times1\frac{5}{9}$

(d) $2\frac{2}{5}\div4\frac{1}{2}$ (e) $\frac{3}{5}$ of $2\frac{1}{2}+1\frac{3}{4}$ (f) $1\frac{1}{2}\left(2\frac{1}{3}-1\frac{3}{4}\right)$

2. When a ball is dropped it bounces to 70% of its starting height.
A ball is dropped from a height of 4 metres and bounces three times.
How high does it reach on its third bounce? Answer to the nearest cm.

3. Due to tides, the depth of water in a harbour is given by the formula $D=6+4\cos\ 32t+108^\circ$, where D is the depth in metres and t is the time in hours after midnight on Monday night.

(a) What are the greatest and least depths of water in the harbour?

(b) At what time was low tide on Tuesday morning?

(c) A boat needs at least 4 metres of water to leave the harbour.
Can the boat leave the harbour at 3.00 p.m. on Tuesday? Justify your answer.

4. (a) Expand and simplify $3x+1\quad x^2-5x+4$

(b) A car is valued at £3780.
This is 16% less than last year's value.
What was the value of the car last year?

(c) Simplify as far as possible $\frac{x^3\times x^{-4}}{x^{-2}}$

(d) $I=\sqrt{\frac{W}{R}}$. Change the subject to R.

5. Two variables, V and t, are related by the formula $V=at+b$, where a and b are constants.

When $t=2,\ V=11$ and when $t=3,\ V=14$.

Find the values of a and b and hence find the value of V when $t=5$.

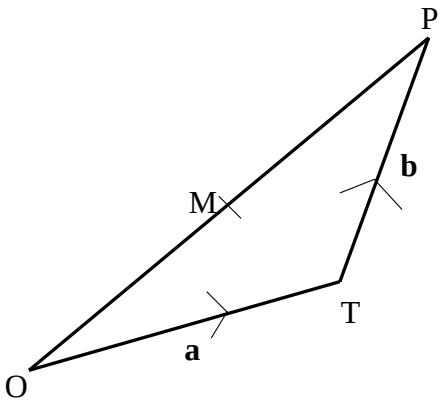
6. Solve these quadratic equations

(a) $7x+2x^2=0$ (b) $2x^2+7x-15=0$

7. Solve $2x^2+6x-1=0$, giving the roots correct to one decimal place.

8. Express $f\ x\ =x^2-8x+23$ in the form $x-a\ ^2+b$.
Hence sketch the graph of $f\ x\ $, remembering to show the coordinates of the turning point and the point of intersection with the y-axis.

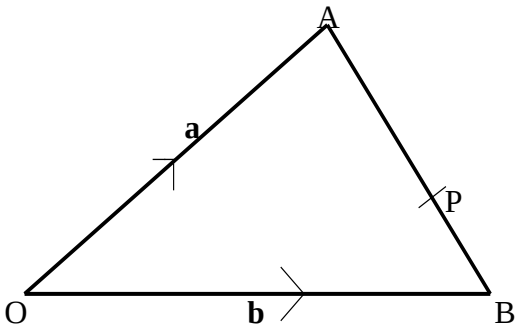
9. OPT is a triangle. M is the mid-point of OP.
$\overrightarrow{OT} = \mathbf{a}$ and $\overrightarrow{TP} = \mathbf{b}$.



(a) Express $\overrightarrow{OM}$ in terms of **a** and **b**.

(b) Express $\overrightarrow{TM}$ in terms of **a** and **b**. Give your answer in its simplest form.

10.

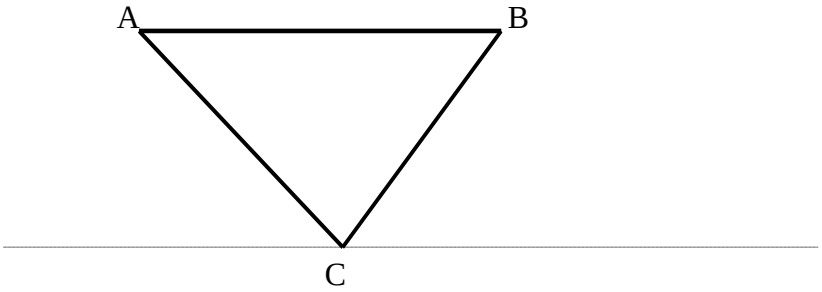


OAB is a triangle. $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
P is the point on AB such that $AP : PB = 2 : 1$.

(a) Find the vector $\overrightarrow{AB}$ in terms of **a** and **b**.

(b) Find the vector $\overrightarrow{OP}$ in terms of **a** and **b**. Give your answer in its simplest form.

11.



Points A, B and C lie in a vertical plane. AB is horizontal and the dotted line is horizontal.
The length of AB is 20 metres.
The angle of depression from A to C is 50° and the angle of depression from B to C is 70°.
Find the height of AB above C.