

Dr Oliver Mathematics
Mathematics: National Qualifications N5
2018 Paper 1: Non-Calculator
1 hour 15 minutes

The total number of marks available is 46.

You must write down all the stages in your working.

1. Evaluate (2)

$$2\frac{1}{3} + \frac{4}{5}.$$

2. Expand and simplify (3)

$$(3x + 1)(x - 1) + 2(x^2 - 5).$$

3. Solve, algebraically, the system of equations (3)

$$4x + 5y = -3$$

$$6x - 2y = 5.$$

4. Two vectors are given by (2)

$$\mathbf{u} = \begin{pmatrix} 1 \\ 5 \\ 1 \end{pmatrix} \text{ and } \mathbf{u} + \mathbf{v} = \begin{pmatrix} 6 \\ -4 \\ 3 \end{pmatrix}.$$

Find vector \mathbf{v} .

Express your answer in component form.

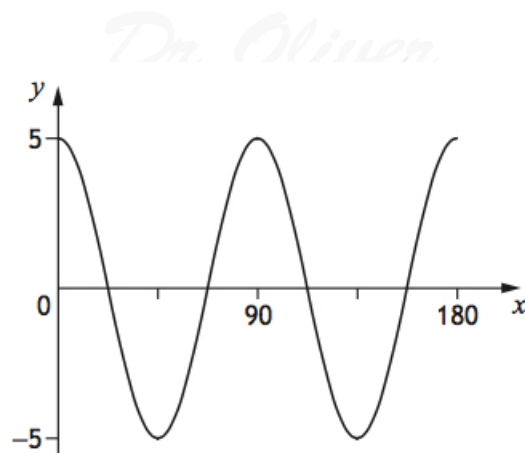
5. Solve (2)

$$x^2 - 11x + 24 = 0.$$

6. Part of the graph of (2)

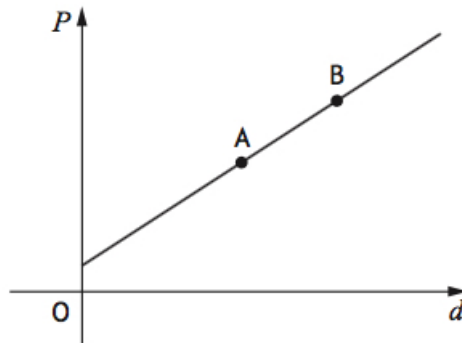
$$y = a \cos bx^\circ$$

is shown in the diagram.



State the values of a and b .

7. The cost of a journey with Tom's Taxis depends on the distance travelled. The graph below shows the cost, P pounds, of a journey with Tom's Taxis against the distance travelled, d miles.



Point A represents a journey of 8 miles which costs £14.
 Point B represents a journey of 12 miles which costs £20.

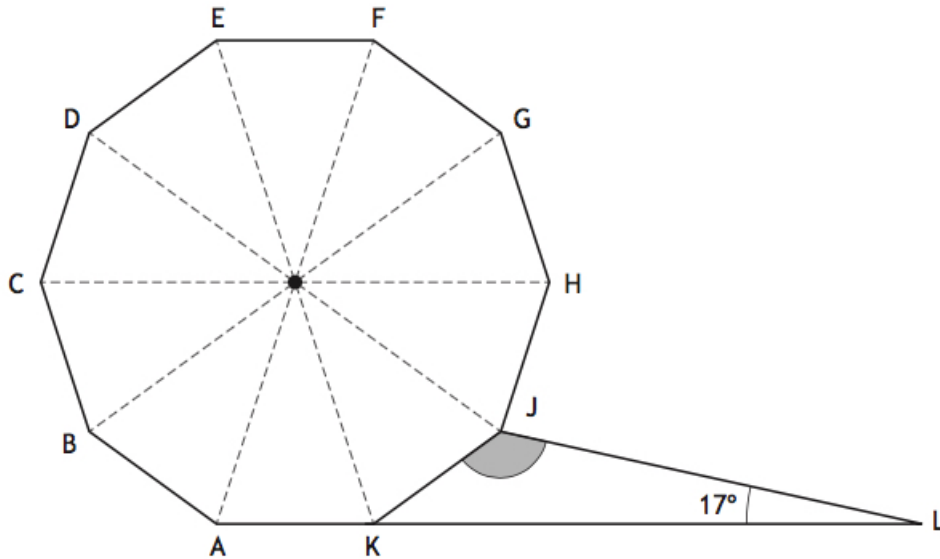
- (a) Find the equation of the line in terms of P and d . (3)
 Give the equation in its simplest form.
- (b) Calculate the cost of a journey of 5 miles. (1)
8. Determine the nature of the roots of the function (2)

$$f(x) = 2x^2 + 4x + 5.$$

9. In the diagram shown below, $ABCDEFGHIJK$ is a regular decagon. (2)

- Angle KLJ is 17° .

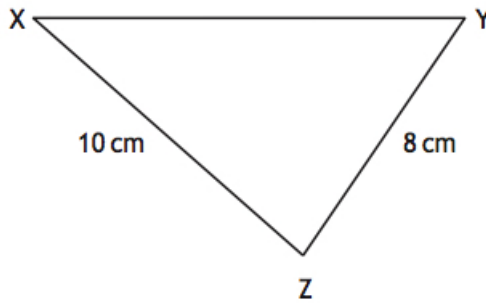
- AKL is a straight line.



Calculate the size of shaded angle KJL .

10. In triangle XYZ :

- $XZ = 10$ centimetres,
- $YZ = 8$ centimetres, and
- $\cos Z = \frac{1}{8}$.



Calculate the length of XY .

11. Express

$$\frac{9}{\sqrt{6}}$$

with a rational denominator.

Give your answer in its simplest form.

12. Given that

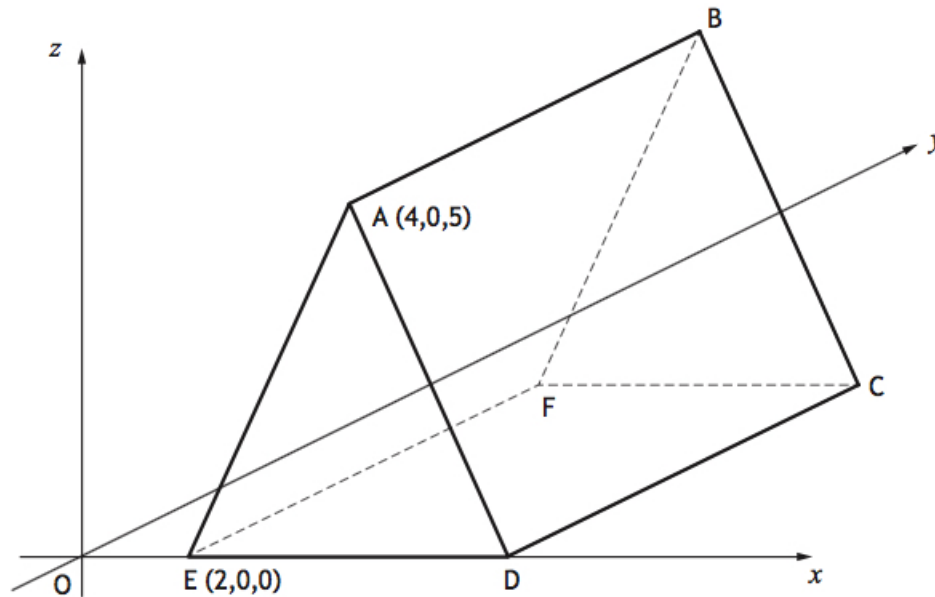
$$\cos 60^\circ = 0.5,$$

state the value of $\cos 240^\circ$.

(1)

13. The diagram shows a triangular prism, $ABCDEF$, relative to the coordinate axes.

(2)



- $AD = AE$.
- $DC = 8$ units.
- Edges EF , DC , and AB are parallel to the y -axis.

Write down the coordinates of B and C .

14. 3] Change the subject of the formula

$$y = g\sqrt{x} + h$$

to x .

15. Remove the brackets and simplify

$$\left(\frac{2}{3}p^4\right)^2.$$

(2)

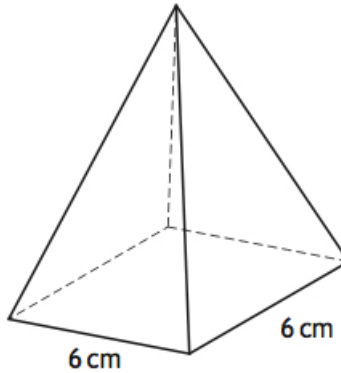
16. Sketch the graph of

$$y = (x - 6)(x + 4).$$

(3)

On your sketch, show clearly the points of intersection with the x -axis and the y -axis, and the coordinates of the turning point.

17. A square based pyramid is shown in the diagram below. (3)



The square base has length 6 centimetres.

The volume is 138 cubic centimetres.

Calculate the height of the pyramid.

18. Express (2)

$$\sin x^\circ \cos x^\circ \tan x^\circ$$

in its simplest form.

Show your working.

19. (a) (i) Express (2)

$$x^2 - 6x - 81$$

in the form

$$(x - p)^2 + q.$$

- (ii) Hence state the equation of the axis of symmetry of the graph of (1)

$$y = x^2 - 6x - 81.$$

The roots of the equation

$$x^2 - 6x - 81 = 0$$

can be expressed in the form $x = d \pm d\sqrt{e}$.

- (b) Find, algebraically, the values of d and e . (4)