

Dr Oliver Mathematics
Mathematics: National Qualifications N5
2026 Paper 1: Non-Calculator
1 hour

The total number of marks available is 40.

To earn full marks you must show your working in your answers.

1. Expand and simplify

$$(y + 4)(y^2 - 3y + 2).$$

(3)

Solution

Well,

$\times$	y^2	$-3y$	$+2$
y	y^3	$-3y^2$	$+2y$
$+4$	$+4y^2$	$-12y$	$+8$

and so

$$(y + 4)(y^2 - 3y + 2) = \underline{\underline{y^3 + y^2 - 10y + 8.}}$$

2. An electric car shows that it has enough charge remaining in its battery to travel 180 miles.

(3)

The battery has 60% of its charge remaining.

Calculate the number of miles the car can travel when the battery is fully charged.

Solution

Well,

$$\begin{aligned}
 60\% \leftrightarrow 180 \text{ miles} &\Rightarrow 10\% \leftrightarrow \frac{180}{60} \text{ miles} \\
 &\Rightarrow 10\% \leftrightarrow 30 \text{ miles} \\
 &\Rightarrow 100\% \leftrightarrow 10 \times 30 \text{ miles} \\
 &\Rightarrow 100\% \leftrightarrow \underline{\underline{300 \text{ miles.}}}
 \end{aligned}$$

3. A restaurant recorded the waiting times to be seated from a sample of its customers.

The waiting times, in minutes, of ten customers were:

2 20 5 14 2 4 8 18 6 15

- (a) Calculate the median and interquartile range of the waiting times.

(2)

Solution

Ascending order:

2 2 4 5 6 8 14 15 18 20

The 'middle number' is the

$$\frac{10 + 1}{2} = 5\frac{1}{2} \text{ th place}$$

and, hence, the median is

$$\frac{6 + 8}{2} = \underline{\underline{7}}.$$

Now,

$$\frac{10 + 1}{4} = 2.75 \rightarrow 3 \text{ rd : LQ} = 4$$

and

$$\frac{3(10 + 1)}{4} = 8.25 \rightarrow 8 \text{ th : UQ} = 15;$$

hence,

$$\begin{aligned} \text{interquartile range} &= 15 - 4 \\ &= \underline{\underline{11}}. \end{aligned}$$

A café also recorded the waiting times to be seated from a sample of its customers.

The median waiting time at the café was 5 minutes and the interquartile range was 12 minutes.

- (b) Make two valid comments comparing the waiting times at the restaurant and at the café.

(3)

Solution

Average

Since the median for café is higher than the median for restaurant, the café

seated the customers quicker.

Spread

Since the IQR for the restaurant is smaller than the IQR for the café, the waiting times were more consistent in the restaurant.

4. Solve, algebraically, the inequation

(3)

$$x + 8 < 3(x - 2) + 20.$$

Solution

Now,

$$\begin{aligned}x + 8 < 3(x - 2) + 20 &\Rightarrow x - 12 < 3(x - 2) \\&\Rightarrow x - 12 < 3x - 6 \\&\Rightarrow -6 < 2x \\&\Rightarrow \underline{\underline{x > -3.}}\end{aligned}$$

5. Sam walked $2\frac{3}{4}$ miles to a park and then walked a further $1\frac{2}{3}$ miles to a shop.

(2)

Calculate the total distance Sam walked.

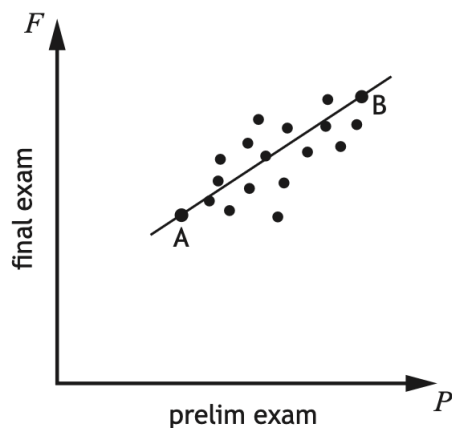
Solution

Well,

$$\begin{aligned}\text{total distance} &= 2\frac{3}{4} + 1\frac{2}{3} \\&= 3 + \frac{9}{12} + \frac{8}{12} \\&= 3 + 1\frac{5}{12} \\&= \underline{\underline{4\frac{5}{12} \text{ miles.}}}\end{aligned}$$

6. A teacher records the marks scored by the pupils in her class for the prelim exam and the final exam.

The scattergraph shows the relationship between the marks scored in the prelim exam, P , and the final exam, F .



A line of best fit is drawn.

- Point A represents a pupil who scored 30 in the prelim exam and 54 in the final exam.
 - Point B represents a pupil who scored 90 in the prelim exam and 94 in the final exam.
- (a) Find the equation of the line of best fit in terms of F and P .
Give the equation in its simplest form. (3)

Solution

Well, $A(30, 54)$ and $B(90, 94)$. Now,

$$\begin{aligned} m_{AB} &= \frac{94 - 54}{90 - 30} \\ &= \frac{40}{60} \\ &= \frac{2}{3}, \end{aligned}$$

and the equation of the line of best fit is

$$\begin{aligned} F - 54 &= \frac{2}{3}(P - 30) \Rightarrow F - 54 = \frac{2}{3}P - 20 \\ &\Rightarrow \underline{\underline{F = \frac{2}{3}P + 34.}} \end{aligned}$$

A pupil scored 33 marks in the prelim exam.

- (b) Use your equation from part (a) to estimate their mark in the final exam. (1)

Solution

Finally,

$$\begin{aligned}P = 33 &\Rightarrow F = \frac{2}{3}(33) + 34 \\&\Rightarrow F = 2(11) + 34 \\&\Rightarrow F = 22 + 34 \\&\Rightarrow \underline{\underline{F = 56.}}\end{aligned}$$

7. Find $|\mathbf{d}|$, the magnitude of vector (3)

$$\mathbf{d} = \begin{pmatrix} 4 \\ -5 \\ 7 \end{pmatrix}.$$

Express your answer as a surd in its simplest form.

Solution

Well,

$$\begin{aligned}|\mathbf{d}| &= \sqrt{4^2 + (-5)^2 + 7^2} \\&= \sqrt{16 + 25 + 49} \\&= \sqrt{90} \\&= \sqrt{9 \times 10} \\&= \sqrt{9} \times \sqrt{10} \\&= \underline{\underline{3\sqrt{10}}}.\end{aligned}$$

8. Change the subject of the following formula to T : (2)

$$P = \sqrt{T - 3L}.$$

Solution

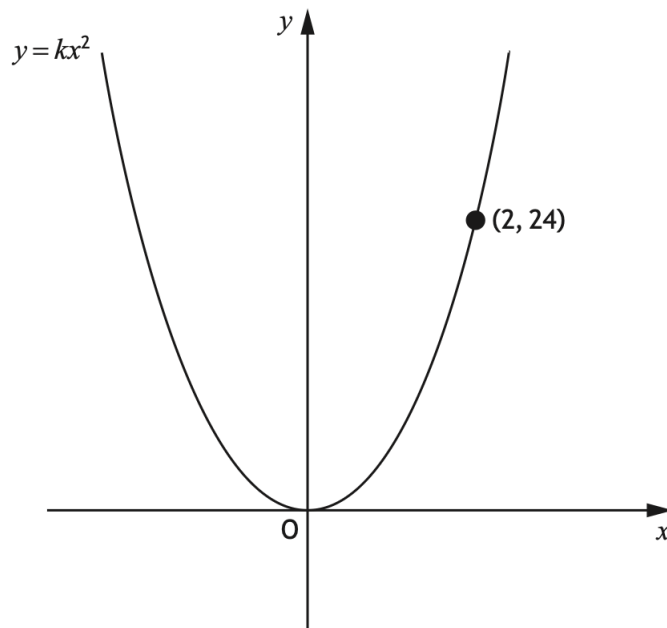
Now,

$$\begin{aligned}P &= \sqrt{T - 3L} \Rightarrow P^2 = T - 3L \\&\Rightarrow \underline{\underline{T = P^2 + 3L.}}\end{aligned}$$

9. The diagram shows part of the graph of

(2)

$$y = kx^2.$$



Find the value of k .

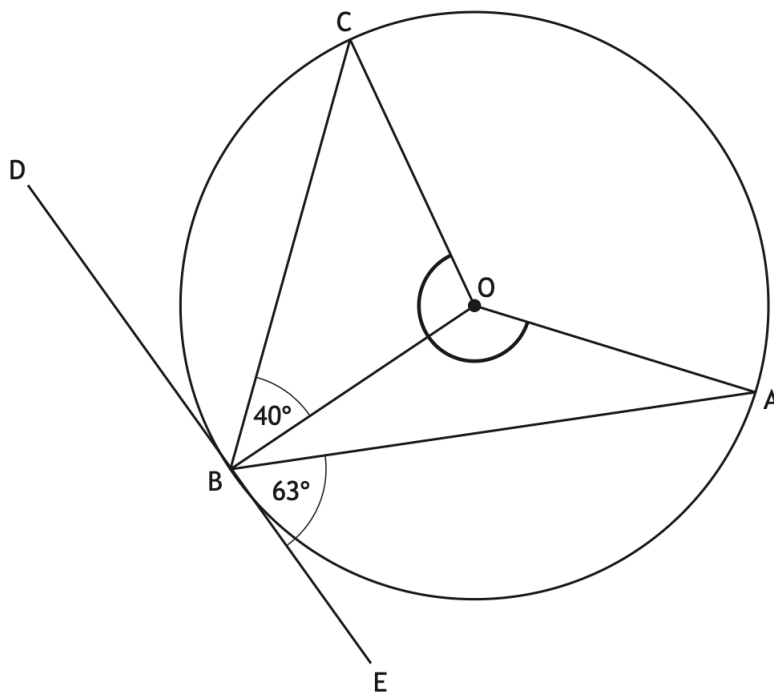
Solution

Well,

$$\begin{aligned}x = 2, y = 24 &\Rightarrow 24 = k \times 2^2 \\&\Rightarrow 4k = 24 \\&\Rightarrow \underline{\underline{k = 6.}}\end{aligned}$$

10. The diagram shows a circle with centre O .

(3)



- DE is a tangent to the circle at the point B .
- Angle $OBC = 40^\circ$.
- Angle $ABE = 63^\circ$.

Calculate the size of the **reflex** angle AOC .

Solution

Well, $\angle BCO = 40^\circ$ (base angles)

$\angle BOC = 180 - (40 + 40) = 100^\circ$ (completing the triangle)

Now, $\angle OBA = 90 - 63 = 27^\circ$ (angle OBE is a right-angle)

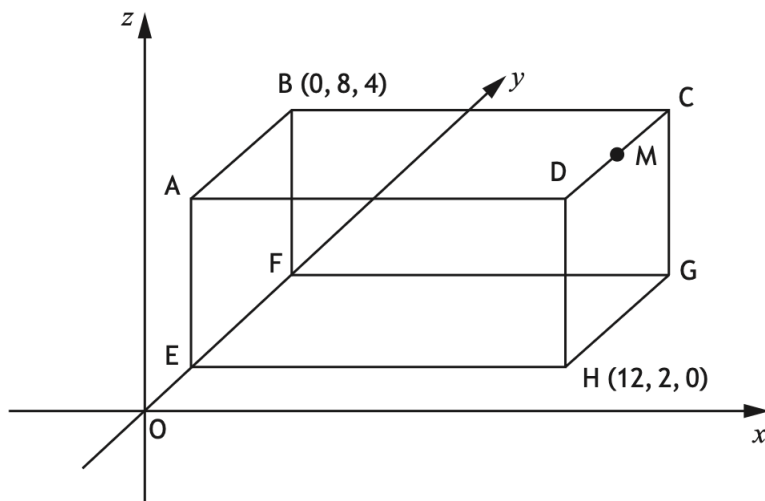
$\angle OAB = 27^\circ$ (base angles)

$\angle AOB = 180 - (27 + 27) = 180 - 54 = 126^\circ$ (completing the triangle)

Finally,

$$\begin{aligned}\angle AOC &= \angle BOC + \angle AOB \\ &= 100 + 126 \\ &= \underline{\underline{226^\circ}}.\end{aligned}$$

11. The diagram shows a cuboid, $ABCDEFGH$, relative to the coordinate axes.



- B has coordinates $(0, 8, 4)$.
- H has coordinates $(12, 2, 0)$.
- EH is parallel to the x -axis.

(a) State the coordinates of G .

(1)

Solution

$G(12, 8, 0)$.

M is the midpoint of CD .

(b) State the coordinates of M .

(1)

Solution

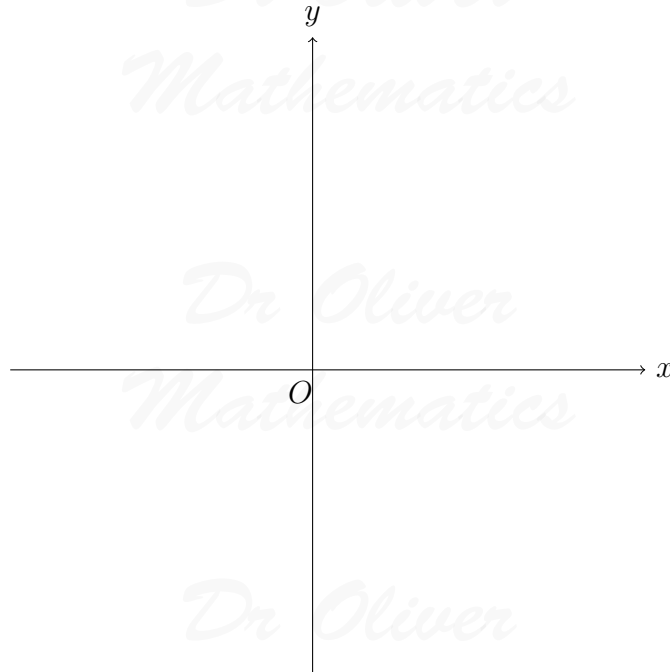
$M(12, 5, 4)$.

12. On the axes below, sketch the graph of

(3)

$$y = (x + 2)^2 + 3.$$

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

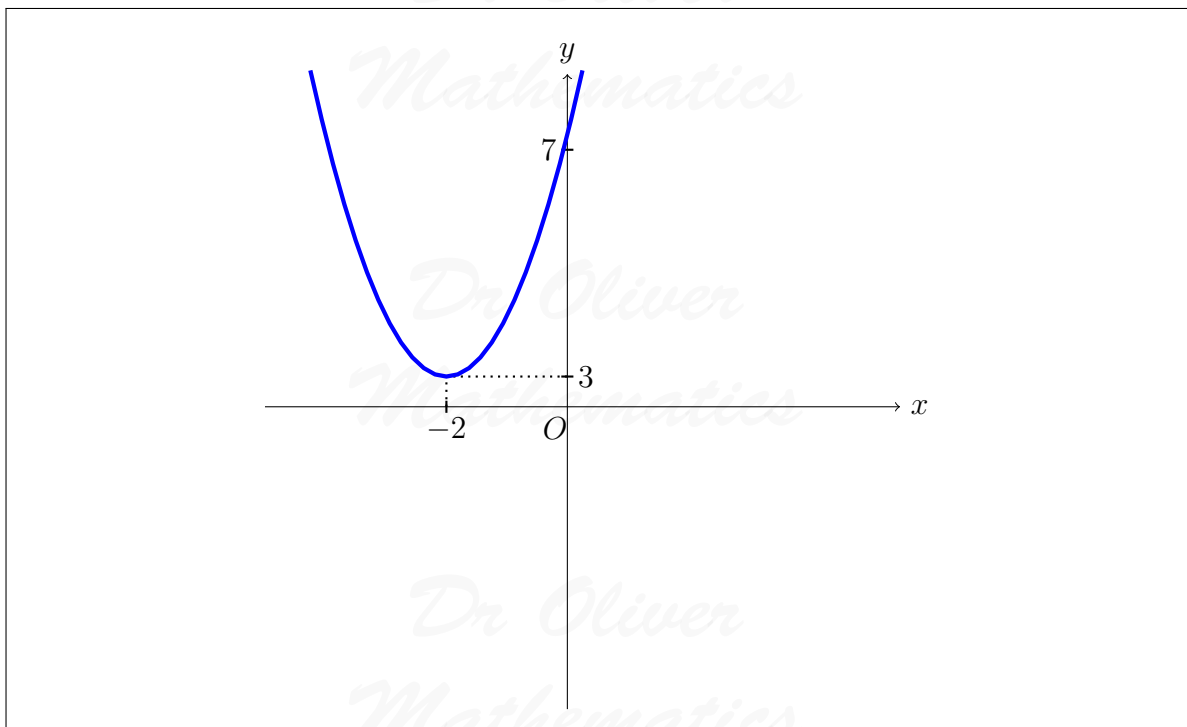
**Solution**

Well,

$$x = 0 \Rightarrow y = 2^2 + 3 = 7$$

so the minimum is $(-2, 3)$ and the graph goes through the point $(0, 7)$.

Hence, the graph looks like this:



13. Given that

$$f(x) = 5 \cos 2x^\circ,$$

(2)

evaluate

$$f(90).$$

Solution

Well,

$$\begin{aligned} f(90) &= 5 \cos(2 \times 90^\circ) \\ &= 5 \cos(180^\circ) \\ &= \underline{\underline{-5}}. \end{aligned}$$

14. Solve the equation **by factorising**:

(3)

$$10x^2 + 11x - 6 = 0.$$

Solution

Well,

$$\left. \begin{array}{l} \text{add to:} \\ \text{multiply to: } (+10) \times (-6) = -60 \end{array} \right\} +11, -4$$

and so, e.g.,

$$\begin{aligned} 10x^2 + 11x - 6 = 0 &\Rightarrow 10x^2 + 15x - 4x - 6 = 0 \\ &\Rightarrow 5x(2x + 3) - 2(2x + 3) = 0 \\ &\Rightarrow (5x - 2)(2x + 3) = 0 \\ &\Rightarrow 5x - 2 = 0 \text{ or } 2x + 3 = 0 \\ &\Rightarrow \underline{\underline{x = \frac{2}{5} \text{ or } x = -\frac{3}{2}}}. \end{aligned}$$