



MATHEMATICS



Final Exam Revision Questions Sheets 1 – 6

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2} ab \sin C$

Volume of a sphere: $V = \frac{4}{3} \pi r^3$

Volume of a cone: $V = \frac{1}{3} \pi r^2 h$

Volume of a pyramid: $V = \frac{1}{3} Ah$

Standard deviation: $s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{\sum x^2 - (\sum x)^2 / n}{n-1}}$

where n is the sample size

Unit 1 Expressions and Formulae

Q1-8 non-calculator

- (a) Simplify $\sqrt{27} + \sqrt{12}$ (b) Rationalise the denominator $\frac{4}{\sqrt{6}}$
- Evaluate $16^{\frac{3}{4}} + 2^{-1}$
- Work out $7 \times 10^5 \times 197$. Write your answer in scientific notation.
- Simplify

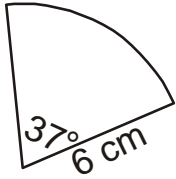
(a) $(3x-2)(2x+1)$ (b) $(x-2)(3x^2+2x-4)$
- Solve the following equations

(a) $6x^2 - 3x = 0$ (b) $4x^2 - 9 = 0$ (c) $x^2 + 7x - 30 = 0$
- Express $y = x^2 + 4x + 5$ in the form $y = (x+a)^2 + b$
- Simplify $\frac{x^2 - 4}{x^2 - 3x - 10}$
- Find the gradient of the line joining A(-4, 3) to B(4, -3).

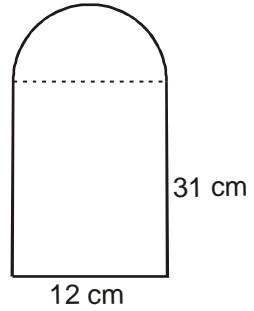
9. Find the area and perimeter of the following shapes.

Give your answer correct to 2 significant figures.

(a)

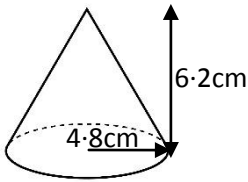


(b)

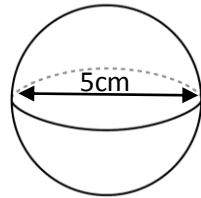


10. Calculate the volume of the following shapes

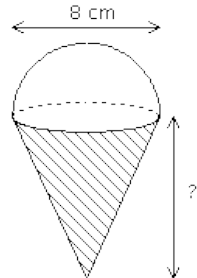
(a)



(b)



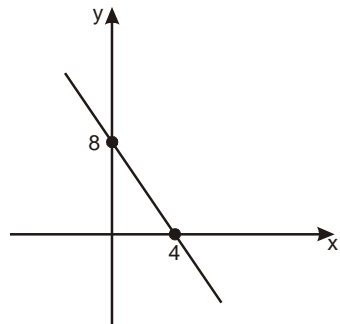
11. If the volume of the following shape is 399 cm^3 calculate the height of the cone



Unit 2 Relationships

Q12-19 non-calculator

12. Find the equation of this straight line



13. Solve the following:

(a) $4(a+1)+3(a-4)=13$ (b) $3b+5>10b-3$

14. (a) A man buys 4 CDs and 5 DVDs from a shop and the cost is £59.
Write down an equation for this.

(b) A woman buys 5 CDs and 3 DVDs from the same shop and the cost is £51. Write an equation for this.

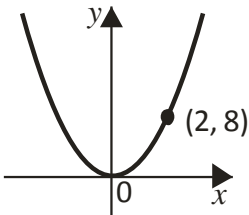
(c) Find, algebraically, the cost of a CD and a DVD.

15. Change the subject of the formula $v^2 = 2gh$ to h

16. (a) Find the roots of $y = x^2 - 8x + 15$ and hence sketch its graph.

(b) Express $y = x^2 + 4x + 9$ in the form $y = (x+a)^2 + b$ and hence sketch its graph.

17. The parabola is in the form $y = kx^2$. What is the value of k ?

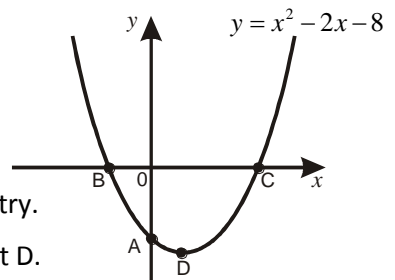


18. (a) Find the coordinates of A.

(b) Find the coordinates of B and C.

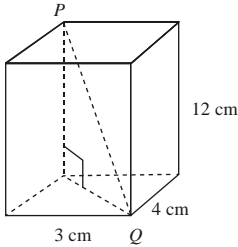
(c) State the equation of the axis of symmetry.

(d) Find the coordinates of the turning point D.

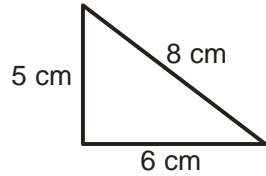


19. (a) Find the discriminant and the nature of the roots of $4x^2 - 2x - 3 = 0$.
- (b) Find the value(s) of p for which the equation $x^2 + 2px + 64 = 0$ has only one real root. ($p \neq 0$)

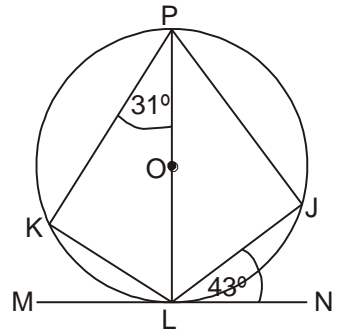
20. (a) Work out the length of PQ
- (b) Is this triangle right angled?



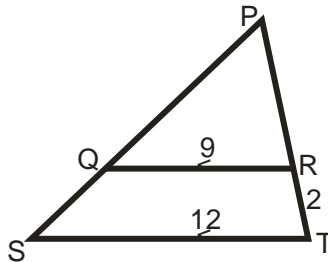
You must give a reason.



21. The tangent MN touches the circle, centre O, at L. Find the size of angle KLJ.

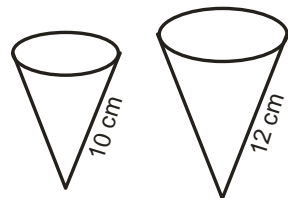


22. (a) Find PR



- (b) The 2 ice cream cones **are similar** in shape. The costs of the 2 cones are directly related to their volumes.

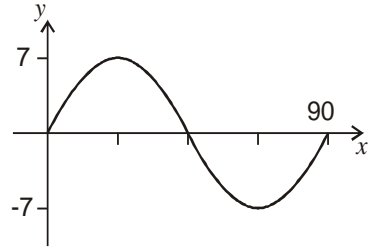
If the cost of the smaller cone is 48p, what is the cost of the lar one?



23. Solve correct to 1 decimal place $x^2 - 4x + 2 = 0$.

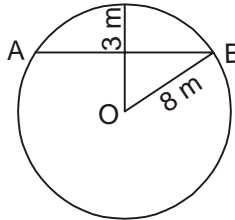
24. This graph shows the equation $y = a \sin bx$.

State the values of a and b .



25. Solve the equation $5 \tan x + 3 = 0$, $0 \leq x \leq 360$.

26. Find the length of the line AB.

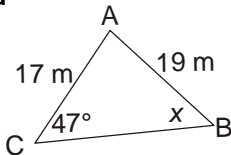


Unit 3 Applications

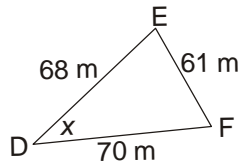
Q30, 31, 36, 37 & 38 non-calculator

27. Find x in the following diagrams.

a



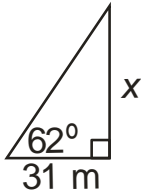
b



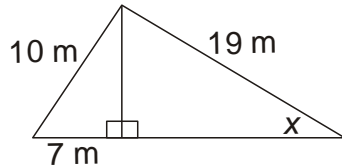
28. A ship leaves a port P and travels for 195 km on a bearing of 076° to Q. It then turns on a bearing of 147° and sails for 110 km to R. How far is it from R to P?

29. Calculate x in each diagram:

(a)

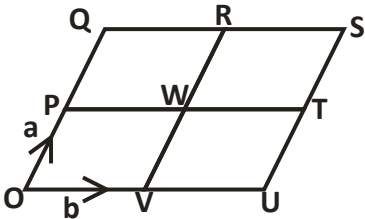


(b)

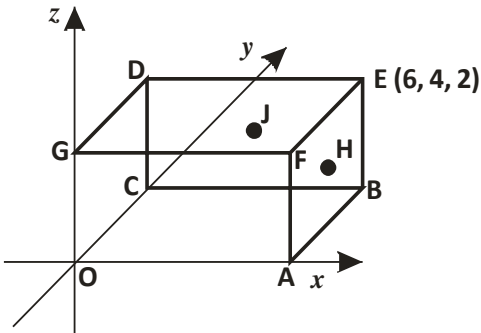


30. OQSU is made up from 4 congruent parallelograms.

Express \overrightarrow{VS} and \overrightarrow{SP} in terms of \mathbf{a} and \mathbf{b} .



31. OABCDEFG is a cuboid



H is the centre of face $ABEF$.

J is the centre of face $BCDE$.

E is the point $(6, 4, 2)$.

(a) Write down the coordinates of all the vertices.

(b) Write down the coordinates of points H and J .

32. Given $\mathbf{a} = \begin{pmatrix} 4 \\ -2 \\ 1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 3 \\ 2 \\ 4 \end{pmatrix}$ find the vector $2\mathbf{a} - \mathbf{b}$ and the magnitude of this resultant vector.

33. A car's value is £11 500 when bought new. If it depreciates by 7% per year, find its value after 3 years.

34. A man deposits £3450 in a new bank account which pays 4.2% compound interest per annum. How much is in the account after 5 years?

35. A one year old car is worth £7330. This is a decrease of 18% of its value from new. What was the price of the new car?

36. (a) $\frac{4}{5} - \frac{2}{3} \times \frac{1}{6}$ (b) 0.07×0.52

37. Draw a box plot for the following data

1 | 2 4 6

2 | 1 1 2 3

3 | 2 9 9

4 | 0 1 4 7

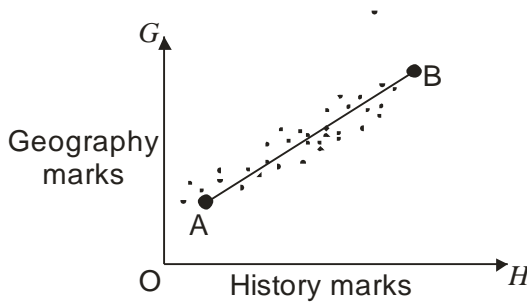
5 | 2

n = 15 2 | 1 = 21

38. Find the mean and standard deviation of 4, 5, 6, 9 and 11.

39. The prelim results were analysed in a school. The following graph shows the relationship between the Geography (G) and History (H) marks.

AB is a line of best fit.



Point A represents 20 marks for History and 20 marks for Geography.

Point B represents 35 marks for History and 32 marks for Geography.

- Find the equation of the straight line AB in terms of H and G .
- Brian scored 45 marks in History. Estimate his Geography mark.

Unit 1 Expressions and Formulae

Q1-8 non-calculator

- (a) Simplify $\sqrt{125} - \sqrt{45}$ (b) Rationalise the denominator $\frac{3}{\sqrt{7}}$
- Evaluate $25^{\frac{1}{2}} + 3^{-1}$
- Work out $6 \times 10^4 \times 218$. Write your answer in scientific notation.
- Simplify

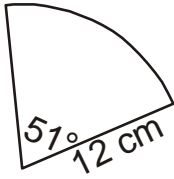
(a) $(5x - 4)^2$ (b) $(x + 3)(2x^2 - 4x + 1)$
- Solve the following equations

(a) $10x^2 - 4x = 0$ (b) $x^2 - 25 = 0$ (c) $x^2 + 4x - 45 = 0$
- Express $y = x^2 - 6x + 3$ in the form $y = (x + a)^2 + b$
- Simplify $\frac{4x^2 - 6x}{6x^2 - 5x - 6}$
- Find the gradient of the line joining A(2, 6) to B(-4, 8).

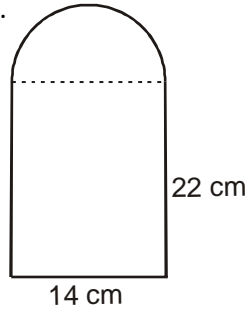
9. Find the area and perimeter of the following shapes.

Give your answer correct to 2 significant figures.

(a)

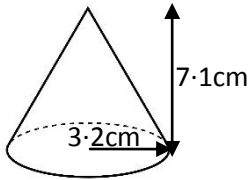


(b)

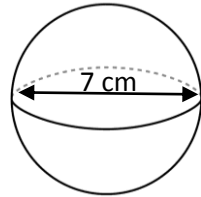


10. Calculate the volume of the following shapes

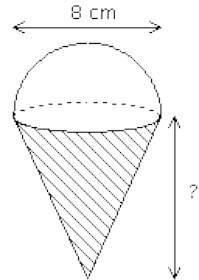
(a)



(b)



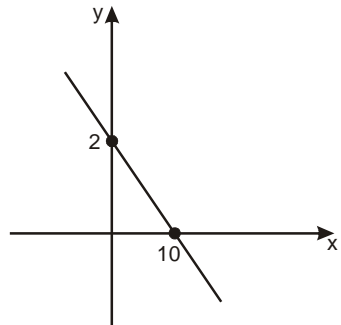
11. If the volume of the following shape is 459 cm^3 calculate the height of the cone



Unit 2 Relationships

Q12-19 non-calculator

12. Find the equation of this straight line



13. Solve the following:

(a) $5(x-2) - 2(x-3) = 12$ (b) $4c + 3 < 6c + 9$

14. (a) A mother is 4 times the age of her daughter.

Write down an equation for this.

(b) Their ages add up to 45.

Write an equation for this.

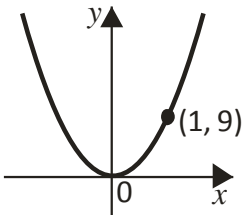
(c) Find, algebraically, the ages of the mother and the daughter.

15. Change the subject of the formula $r = 4g^2h$ to g

16. (a) Find the roots of $y = x^2 - 2x - 8$ and hence sketch its graph.

(b) Express $y = x^2 + 6x + 7$ in the form $y = (x+a)^2 + b$ and hence sketch its graph.

17. The parabola is in the form $y = kx^2$. What is the value of k ?

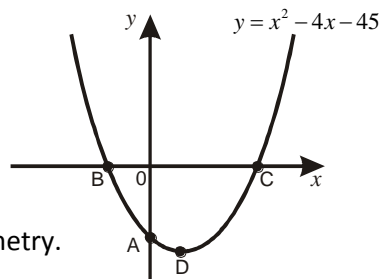


18. (a) Find the coordinates of A.

(b) Find the coordinates of B and C.

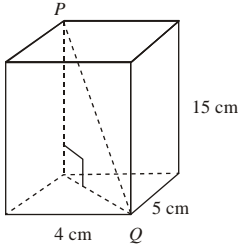
(c) State the equation of the axis of symmetry.

(d) Find the coordinates of the turning point D.

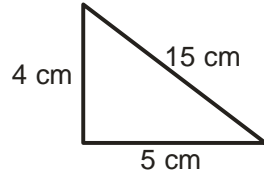


19. (a) Find the discriminant and the nature of the roots of $2x^2 - 3x - 2 = 0$.
- (b) Find the value(s) of p for which the equation $x^2 + 4x - 3p = 0$ has no real roots. ($p \neq 0$)

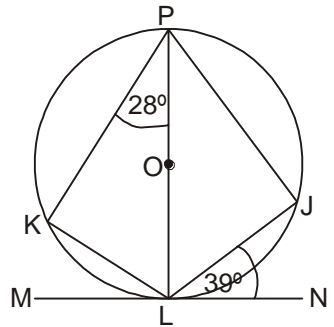
20. (a) Work out the length of PQ
- (b) Is this triangle right angled?



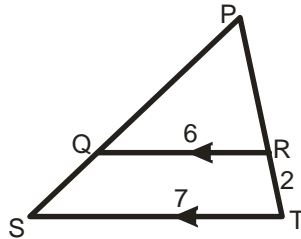
You must give a reason.



21. The tangent MN touches the circle, centre O, at L. Find the size of angle KLJ.

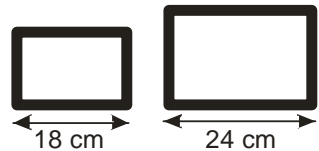


22. (a) Find PR



- (b) These 2 mirrors **are similar**. The costs of the 2 mirrors are directly related to their areas.

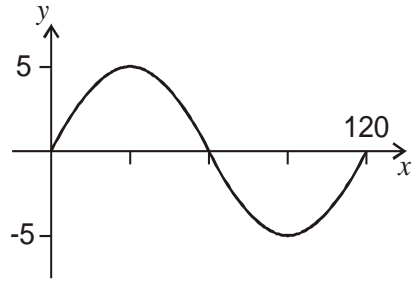
If the cost of the larger mirror is £80, find the cost of the smaller one?



23. Solve correct to 1 decimal place $2x^2 + 5x - 4 = 0$.

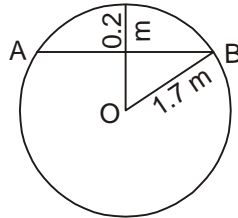
24. This graph shows the equation $y = a \sin bx$.

State the values of a and b .



25. Solve the equation $3 \sin x - 1 = 0$, $0 \leq x \leq 360$.

26. Find the length of the line AB.

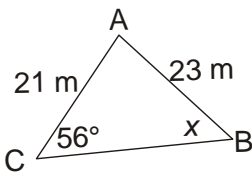


Unit 3 Applications

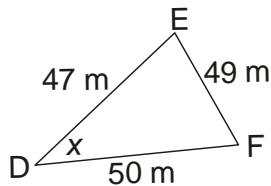
Q30, 31, 36, 37 & 38 non-calculator

27. Find x in the following diagrams.

a



b

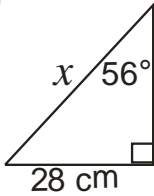


28. A ship leaves a port P and travels for 210 km on a bearing of 047° to Q. It then turns on a bearing of 132° and sails for 170 km to R.

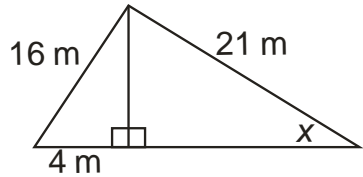
How far is it from R to P?

29. Calculate x in each diagram:

(a)

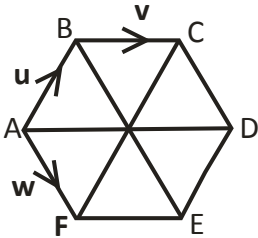


(b)

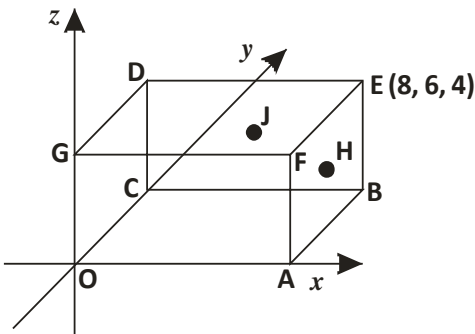


30. ABCDEF is a regular hexagon ie AB is parallel to ED etc.

Express \overrightarrow{FD} and \overrightarrow{EB} in terms of \mathbf{u} , \mathbf{v} and \mathbf{w} .



31. OABCDEFG is a cuboid



H is the centre of face $ABEF$.

J is the centre of face $BCDE$.

E is the point $(8, 6, 4)$.

(a) Write down the coordinates of all the vertices.

(b) Write down the coordinates of points H and J .

32. Given $\mathbf{a} = \begin{pmatrix} 2 \\ -1 \\ 5 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 6 \\ -3 \\ -2 \end{pmatrix}$ find the vector $4\mathbf{a} - 2\mathbf{b}$ and the magnitude of this resultant vector.

33. A house's value is £72 000 when bought new. If it appreciates by 6% per year, find its value after 4 years.

34. A man deposits £6145 in a new bank account which pays 2.9% compound interest per annum. How much is in the account after 4 years?

35. A carton of juice has an extra 15% free in it. If it now contains 690ml, how much did it contain before the extra?

36. (a) $\frac{3}{4} \times \left(\frac{1}{5} + \frac{1}{3} \right)$ (b) 2.4×0.00005

37. Draw a box plot for the following data

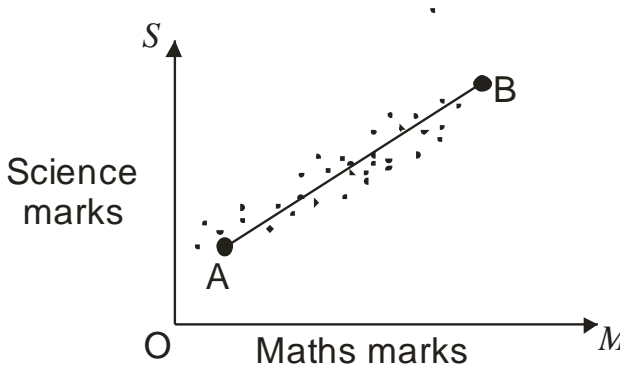
1		7	8	8		
2		1	4	5	5	7
3		1	6	8		
4		2	2	2	9	
5		2				

n= 16 1 | 7 = 17

38. Find the mean and standard deviation of 11, 16, 21, 24, 28 and 32.

39. The prelim results were analysed in a school. The following graph shows the relationship between the Maths (M) and Science (S) marks.

AB is a line of best fit.



Point A represents 16 marks for Maths and 19 marks for Science.

Point B represents 28 marks for Maths and 28 marks for Science.

- (a) Find the equation of the straight line AB in terms of M and S .
- (b) David scored 44 marks in Maths. Estimate his Science mark.

Unit 1 Expressions and Formulae

Q1-8 non-calculator

- (a) Simplify $\sqrt{20} - \sqrt{80}$ (b) Rationalise the denominator $\frac{3}{\sqrt{5}}$
- Evaluate $9^{\frac{3}{2}} + 6^{-1}$
- Work out $5 \times 10^3 \times 694$. Write your answer in scientific notation.
- Simplify

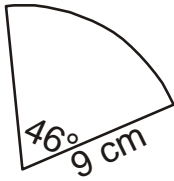
(a) $(6x+5)(3x-4)$ (b) $(x+4)(2x^2 - 5x + 2)$
- Solve the following equations

(a) $5x^2 - 15x = 0$ (b) $9x^2 - 16 = 0$ (c) $x^2 + 6x - 27 = 0$
- Express $y = x^2 + 8x + 2$ in the form $y = (x+a)^2 + b$
- Simplify $\frac{x^2 - 9}{x^2 - 8x + 15}$
- Find the gradient of the line joining A(-2, -4) to B(0, 8).

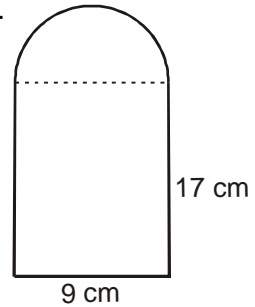
9. Find the area and perimeter of the following shapes.

Give your answer correct to 2 significant figures.

(a)

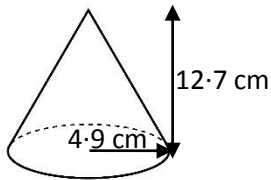


(b)

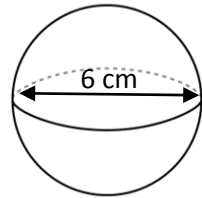


10. Calculate the volume of the following shapes

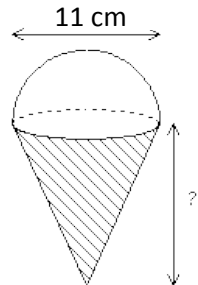
(a)



(b)



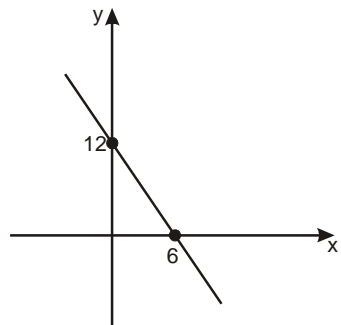
11. If the volume of the following shape is 612 cm^3 calculate the height of the cone



Unit 2 Relationships

Q12-19 non-calculator

12. Find the equation of this straight line



13. Solve the following:

(a) $2(y+5)+3(y-1)=10$ (b) $2a-2>4a+10$

14. (a) A man buys 3 CDs and 2 DVDs from a shop and the cost is £46. Write down an equation for this.

(b) A woman buys 2 CDs and 5 DVDs from the same shop and the cost is £71. Write an equation for this.

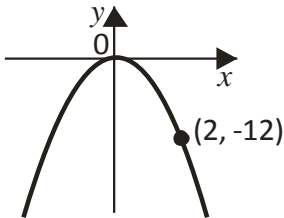
(c) Find, algebraically, the cost of a CD and a DVD.

15. Change the subject of the formula $q=2m^2-3n$ to m

16. (a) Find the roots of $y=x^2-4x+3$ and hence sketch its graph.

(b) Express $y=x^2-4x+2$ in the form $y=(x+a)^2+b$ and hence sketch its graph.

17. The parabola is in the form $y=kx^2$. What is the value of k ?

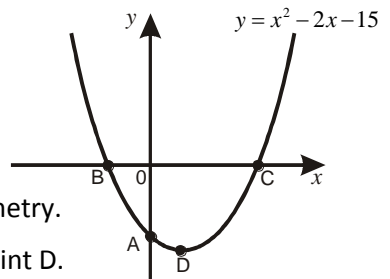


18. (a) Find the coordinates of A.

(b) Find the coordinates of B and C.

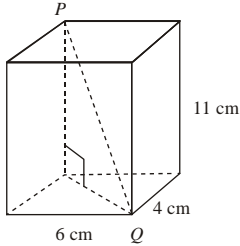
(c) State the equation of the axis of symmetry.

(d) Find the coordinates of the turning point D.



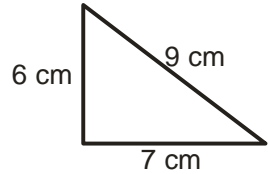
19. (a) Find the discriminant and the nature of the roots of $3x^2 + 2x + 5 = 0$.
- (b) Find the value(s) of p for which the equation $x^2 + 2px + 36 = 0$ has only one real root. ($p \neq 0$)

20. (a) Work out the length of PQ

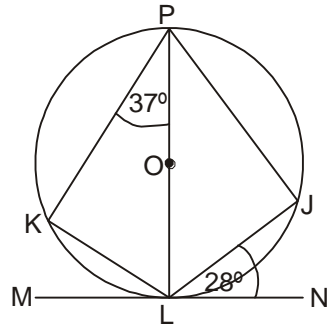


- (b) Is this triangle right angled?

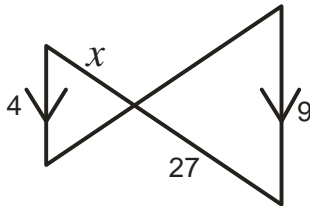
You must give a reason.



21. The tangent MN touches the circle, centre O, at L. Find the size of angle KLJ.

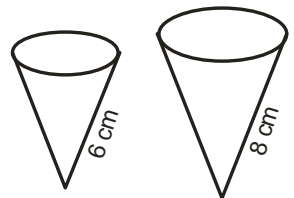


22. (a) Find x



- (b) The 2 ice cream cones **are similar** in shape. The costs of the 2 cones are directly related to their volumes.

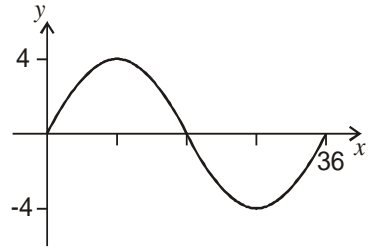
If the cost of the larger cone is £1.28, what is the cost of the smaller one?



23. Solve correct to 1 decimal place $x^2 - 6x + 3 = 0$.

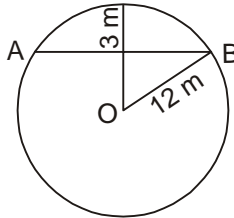
24. This graph shows the equation $y = a \sin bx$.

State the values of a and b .



25. Solve the equation $7 \tan x = -4$, $0 \leq x \leq 360$.

26. Find the length of the line AB.

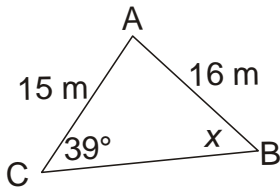


Unit 3 Applications

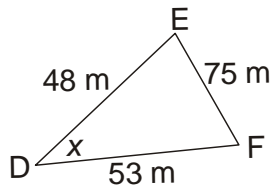
Q30, 31, 36, 37 & 38 non-calculator

27. Find x in the following diagrams.

a



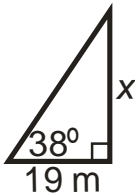
b



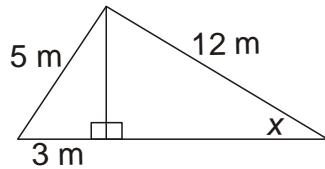
28. A ship leaves a port P and travels for 265 km on a bearing of 037° to Q. It then turns on a bearing of 156° and sails for 155 km to R. How far is it from R to P?

29. Calculate x in each diagram:

(a)

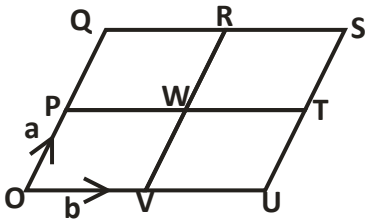


(b)

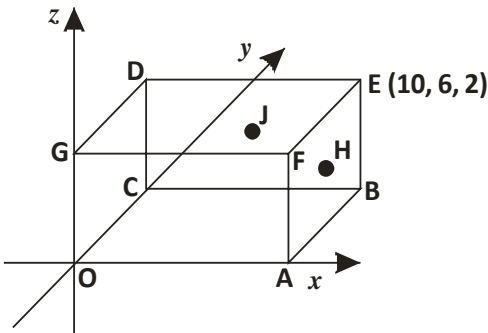


30. OQSU is made up from 4 congruent parallelograms.

Express \overrightarrow{QU} and \overrightarrow{OT} in terms of \mathbf{a} and \mathbf{b} .



31. OABCDEFG is a cuboid



H is the centre of face $ABEF$.

J is the centre of face $BCDE$.

E is the point $(10, 6, 2)$.

(a) Write down the coordinates of all the vertices.

(b) Write down the coordinates of points H and J .

32. Given $\mathbf{a} = \begin{pmatrix} 4 \\ 0 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -3 \\ 5 \\ 2 \end{pmatrix}$ find the vector $2\mathbf{a} + \mathbf{b}$ and the magnitude of this resultant vector.

33. A car's value is £24 700 when bought new. If it depreciates by 6.5% per year, find its value after 4 years.

34. A man deposits £756 in a new bank account which pays 6.1% compound interest per annum. How much is in the account after 7 years?

35. A one year old car is worth £17760. This is a decrease of 12% of its value from new. What was the price of the new car?

36. (a) $\frac{3}{7} + \frac{2}{3} \times \frac{1}{8}$ (b) 0.46×0.08

37. Draw a box plot for the following data

1 | 3 6 9

2 | 0 1 5 6

3 | 4 7 7 6

4 | 2 4

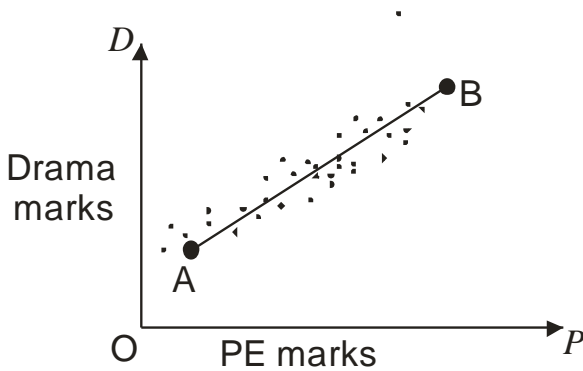
5 | 6

n= 14 2 | 0 = 20

38. Find the mean and standard deviation of 5, 7, 10, 14 and 19.

39. The prelim results were analysed in a school. The following graph shows the relationship between the PE (P) and Drama (D) marks.

AB is a line of best fit.



Point A represents 10 marks for PE and 4 marks for Drama.

Point B represents 40 marks for PE and 22 marks for Drama.

- (a) Find the equation of the straight line AB in terms of P and D .
- (b) Yvonne scored 35 marks in PE. Estimate her Drama mark.

Unit 1 Expressions and Formulae

Q1-8 non-calculator

- (a) Simplify $\sqrt{48} - \sqrt{27}$ (b) Rationalise the denominator $\frac{2}{\sqrt{10}}$
- Evaluate $4^{-1} + 36^{\frac{1}{2}}$
- Work out $4 \times 10^{-3} \div 800$. Write your answer in scientific notation.
- Simplify

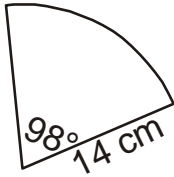
(a) $(2x+3)(3x-7)$ (b) $(x+2)(x-3)(x+1)$
- Solve the following equations

(a) $18x^2 - 6x = 0$ (b) $25x^2 - 16 = 0$ (c) $x^2 - 9x + 20 = 0$
- Express $y = 4 + 6x - x^2$ in the form $y = (x+a)^2 + b$
- Simplify $\frac{x^2 + 5x + 6}{4x^2 + 11x - 3}$
- Find the gradient of the line joining A(-5, 3) to B(1, -1).

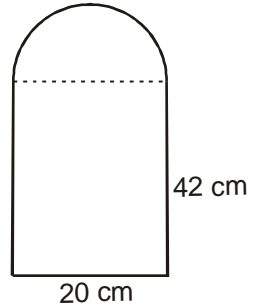
9. Find the area and perimeter of the following shapes.

Give your answer correct to 2 significant figures.

(a)

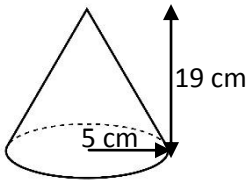


(b)

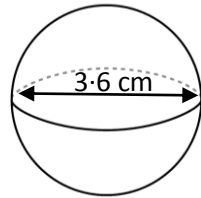


10. Calculate the volume of the following shapes

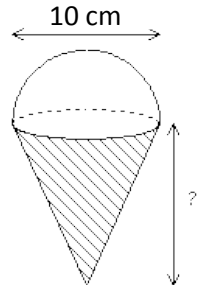
(a)



(b)



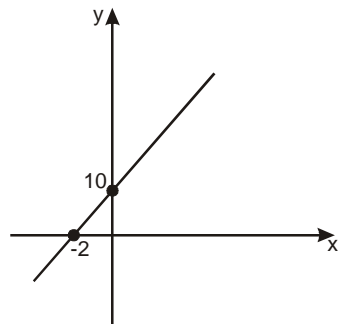
11. If the volume of the following shape is 500 cm^3 calculate the height of the cone



Unit 2 Relationships

Q12-19 non-calculator

12. Find the equation of this straight line



13. Solve the following:

(a) $3(b+3) - 5(3-b) = 8$ (b) $5a+1 \leq 2a-8$

14. (a) There are 4 cars and 5 lorries in a queue of length 52 m.
Write down an equation for this.

(b) There are 2 cars and 6 lorries in another queue of length 54 m.
Write an equation for this.

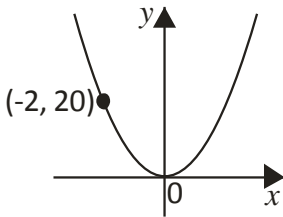
(c) Find, algebraically, the length of a car and the length of a lorry.

15. Change the subject of the formula $r = \frac{5v}{6q}$ to q

16. (a) Find the roots of $y = x^2 + 4x - 12$ and hence sketch its graph.

(b) Express $y = x^2 - 8x - 1$ in the form $y = (x+a)^2 + b$ and hence sketch its graph.

17. The parabola is in the form $y = kx^2$. What is the value of k ?

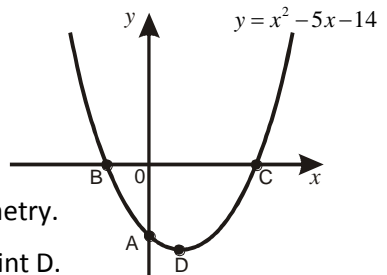


18. (a) Find the coordinates of A.

(b) Find the coordinates of B and C.

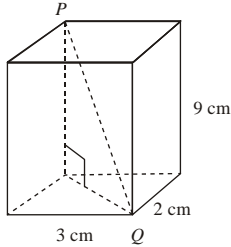
(c) State the equation of the axis of symmetry.

(d) Find the coordinates of the turning point D.

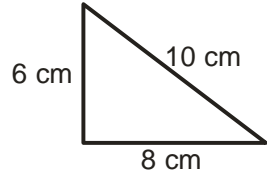


19. (a) Find the discriminant and the nature of the roots of $2x^2 + 4x + 1 = 0$.
- (b) Find the value(s) of p for which the equation $px^2 + 2x + 4 = 0$ has no real roots. ($p \neq 0$)

20. (a) Work out the length of PQ (b) Is this triangle right angled?

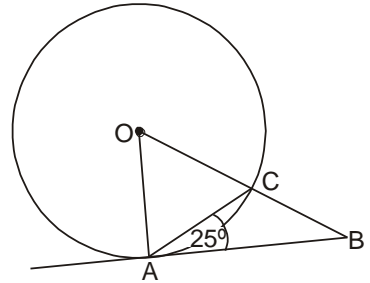


You must give a reason.

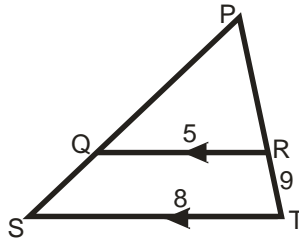


21. The tangent AB touches the circle, centre O, at A.

Find the size of angle ABC.

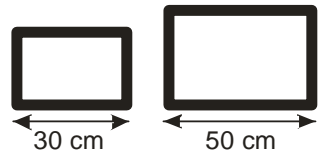


22. (a) Find PR



- (b) These 2 mirrors **are similar**. The costs of the 2 mirrors are directly related to their areas.

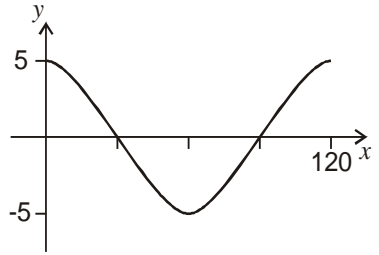
If the cost of the larger mirror is £150, find the cost of the smaller one?



23. Solve correct to 1 decimal place $3x^2 - 2x - 3 = 0$.

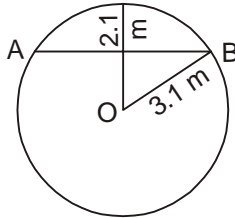
24. This graph shows the equation $y = a \cos bx$.

State the values of a and b .



25. Solve the equation $4 \cos x + 1 = 0$, $0 \leq x \leq 360$.

26. Find the length of the line AB.

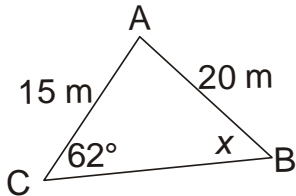


Unit 3 Applications

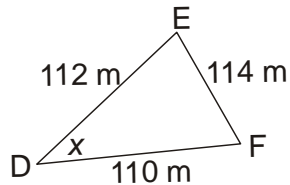
Q30, 31, 36, 37 & 38 non-calculator

27. Find x in the following diagrams.

a



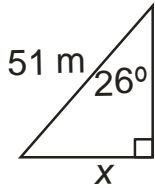
b



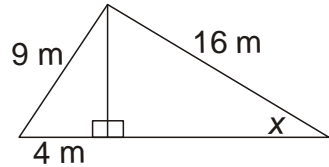
28. A ship leaves a port P and travels for 312 km on a bearing of 063° to Q. It then turns on a bearing of 134° and sails for 210 km to R. How far is it from R to P?

29. Calculate x in each diagram:

(a)

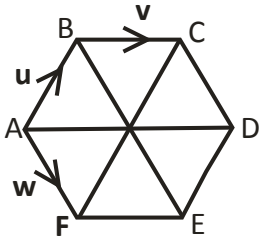


(b)

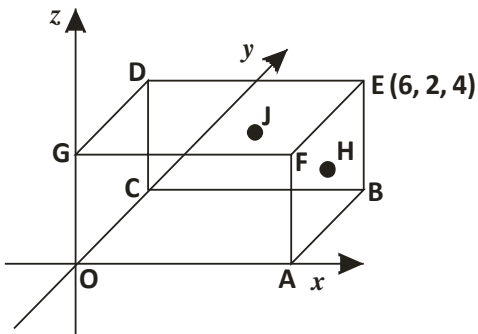


30. ABCDEF is a regular hexagon ie AB is parallel to ED etc.

Express \overrightarrow{BD} and \overrightarrow{FC} in terms of \mathbf{u} , \mathbf{v} and \mathbf{w} .



31. OABCDEFG is a cuboid



H is the centre of face ABEF.

J is the centre of face BCDE.

E is the point (6, 2, 4).

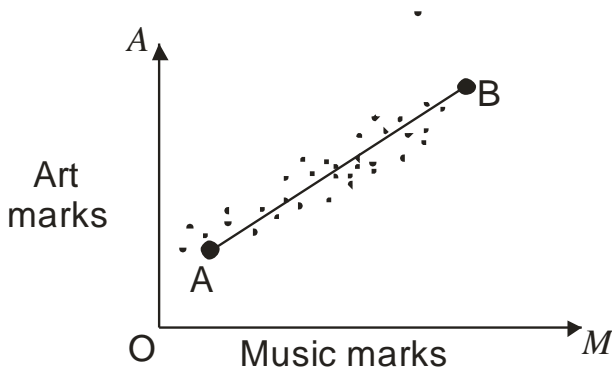
(a) Write down the coordinates of all the vertices.

(b) Write down the coordinates of points H and J.

32. Given $\mathbf{a} = \begin{pmatrix} -8 \\ -2 \\ 4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 5 \\ 6 \end{pmatrix}$ find the vector $\mathbf{a} - 2\mathbf{b}$ and the magnitude of this resultant vector.
33. A car's value is £20 300 when bought new. If it depreciates by 8.5% per year, find its value after 3 years.
34. A man deposits £9478 in a new bank account which pays 3.8% compound interest per annum. How much is in the account after 2 years?
35. A carton of juice has an extra 10% free in it. If it now contains 605ml, how much did it contain before the extra?
36. (a) $\frac{1}{5} + \frac{7}{9} \times \frac{3}{14}$ (b) 0.0004×0.79
37. Draw a box plot for the following data
- | | | | |
|---|---|---|-----|
| 1 | 6 | 7 | 8 |
| 2 | 0 | 0 | 1 7 |
| 3 | 3 | 4 | 6 |
| 4 | 1 | 2 | 8 9 |
| 5 | 1 | | |
- n= 15 2|0 = 20
38. Find the mean and standard deviation of 14, 19, 21 and 38.

39. The prelim results were analysed in a school. The following graph shows the relationship between the Music (M) and Art (A) marks.

AB is a line of best fit.



Point A represents 12 marks for Music and 20 marks for Art.

Point B represents 36 marks for Music and 40 marks for Art.

- (a) Find the equation of the straight line AB in terms of M and A .
- (b) Emily scored 60 marks in Music. Estimate her Art mark.

Unit 1 Expressions and Formulae

Q1-8 non-calculator

- (a) Simplify $\sqrt{28} + \sqrt{63}$ (b) Rationalise the denominator $\frac{4}{\sqrt{14}}$
- Evaluate $8^{\frac{2}{3}} + 4^{-1}$
- Work out $4.8 \times 10^{-3} \div 2000$. Write your answer in scientific notation.
- Simplify

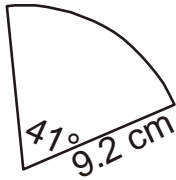
(a) $(5x-3)(2x-5)$ (b) $(x-3)(2x^2 + 6x - 5)$
- Solve the following equations

(a) $8x^2 - 2x = 0$ (b) $9x^2 - 4 = 0$ (c) $x^2 - 8x + 15 = 0$
- Express $y = 3 + 4x - x^2$ in the form $y = (x+a)^2 + b$
- Simplify $\frac{x^2 - 16}{x^2 + x - 12}$
- Find the gradient of the line joining A(-2, 3) to B(5, -1).

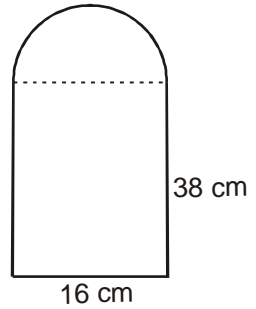
9. Find the area and perimeter of the following shapes.

Give your answer correct to 2 significant figures.

(a)

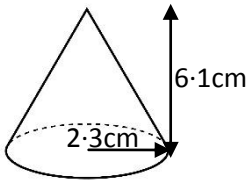


(b)

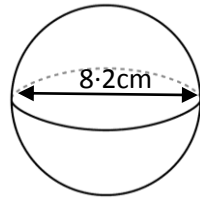


10. Calculate the volume of the following shapes

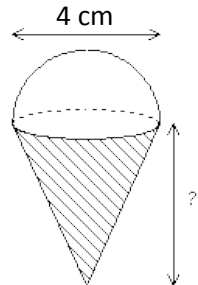
(a)



(b)



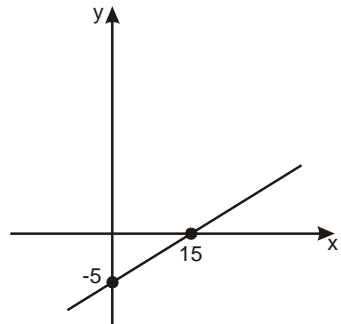
11. If the volume of the following shape is 360 cm^3 calculate the height of the cone



Unit 2 Relationships

Q12-19 non-calculator

12. Find the equation of this straight line



13. Solve the following:

(a) $4(2x-1)+2(x+3)=42$ (b) $3x+7 \geq 7x-5$

14. (a) A man buys 3 CDs and 4 DVDs from a shop and the cost is £58.
Write down an equation for this.

(b) A woman buys 2 CDs and 2 DVDs from the same shop and the cost is £32. Write an equation for this.

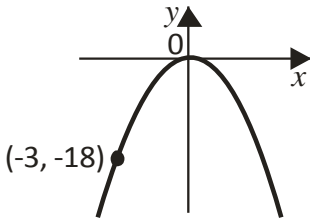
(c) Find, algebraically, the cost of a CD and a DVD.

15. Change the subject of the formula $a = 2(3m + 4n^2)$ to n

16. (a) Find the roots of $y = x^2 - 6x + 8$ and hence sketch its graph.

(b) Express $y = x^2 + 2x + 5$ in the form $y = (x+a)^2 + b$ and hence sketch its graph.

17. The parabola is in the form $y = kx^2$. What is the value of k ?

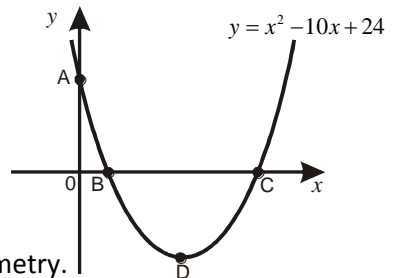


18. (a) Find the coordinates of A.

(b) Find the coordinates of B and C.

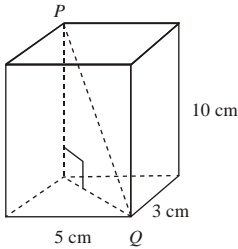
(c) State the equation of the axis of symmetry.

(d) Find the coordinates of the turning point D.

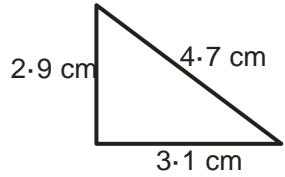


19. (a) Find the discriminant and the nature of the roots of $x^2 + 6x + 9 = 0$.
- (b) Find the value(s) of p for which the equation $x^2 + 2px + 9 = 0$ has only one real root. ($p \neq 0$)

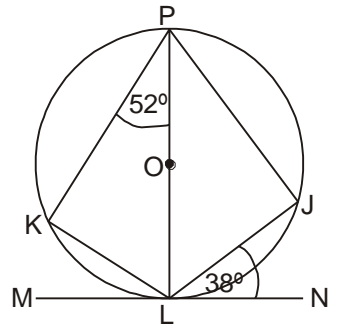
20. (a) Work out the length of PQ
- (b) Is this triangle right angled?



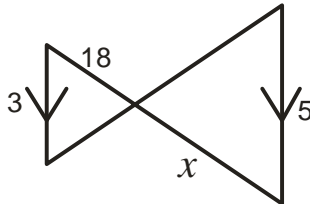
You must give a reason.



21. The tangent MN touches the circle, centre O, at L. Find the size of angle KLJ.

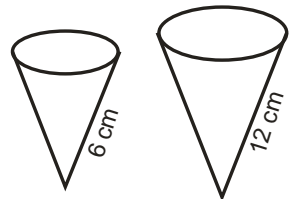


22. (a) Find x



- (b) The 2 ice cream cones **are similar** in shape. The costs of the 2 cones are directly related to their volumes.

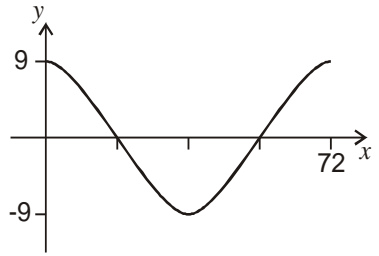
If the cost of the smaller cone is 48p, what is the cost of the larger one?



23. Solve correct to 1 decimal place $x^2 - 6x - 2 = 0$.

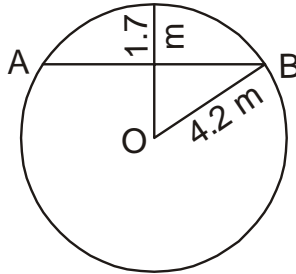
24. This graph shows the equation $y = a \cos bx$.

State the values of a and b .



25. Solve the equation $4 - 7 \sin x = 0$, $0 \leq x \leq 360$.

26. Find the length of the line AB.

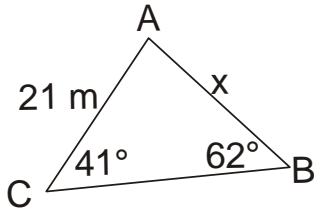


Unit 3 Applications

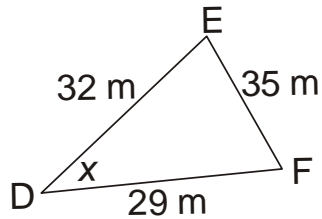
Q30, 31, 36, 37 & 38 non-calculator

27. Find x in the following diagrams.

a



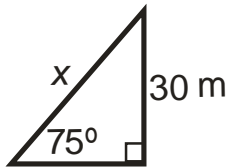
b



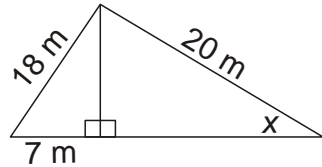
28. 2 planes leave an airport at the same time. Plane A flies at 214 km/hr on a bearing of 064° . Plane B flies at 350 km/hr on a bearing of 149° . How far apart will they be after 3 hours?

29. Calculate x in each diagram:

(a)

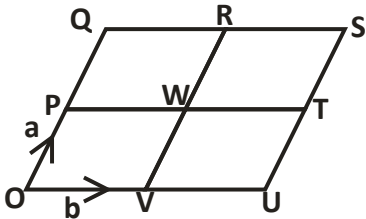


(b)

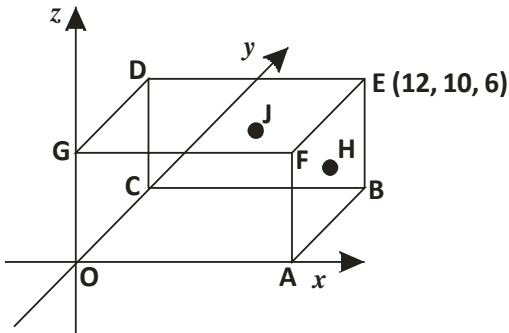


30. OQSU is made up from 4 congruent parallelograms.

Express \overrightarrow{PU} and \overrightarrow{RO} in terms of \mathbf{a} and \mathbf{b} .



31. OABCDEFG is a cuboid



H is the centre of face $ABEF$.

J is the centre of face $BCDE$.

E is the point $(12, 10, 6)$.

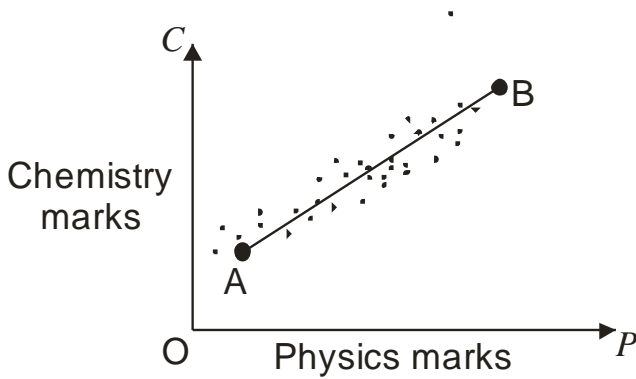
(a) Write down the coordinates of all the vertices.

(b) Write down the coordinates of points H and J .

32. Given $\mathbf{a} = \begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 0 \\ -9 \\ -2 \end{pmatrix}$ find the vector $2\mathbf{a} + 3\mathbf{b}$ and the magnitude of this resultant vector.
33. A country's population is 5 000 000. If it increases by 4% every year, find its population after 3 years.
34. A man deposits £21421 in a new bank account which pays 6.3% compound interest per annum. How much is in the account after 4 years?
35. A one year old car is worth £11562. This is a decrease of 6% of its value from new. What was the price of the new car?
36. (a) $\frac{2}{3} \times \left(\frac{1}{5} + \frac{1}{4} \right)$ (b) 0.94×0.008
37. Draw a box plot for the following data
- | | | | | | |
|---|---|---|---|---|---|
| 1 | 0 | 0 | 1 | | |
| 2 | 6 | 7 | 7 | 8 | |
| 3 | 1 | 2 | 3 | 4 | 7 |
| 4 | 0 | 1 | 5 | 7 | 9 |
| 5 | 2 | | | | |
- n= 18 1 | 0 = 10
38. Find the mean and standard deviation of 2, 6, 9 and 11.

39. The prelim results were analysed in a school. The following graph shows the relationship between the Physics (P) and Chemistry (C) marks.

AB is a line of best fit.



Point A represents 30 marks for Physics and 16 marks for Chemistry.

Point B represents 42 marks for Physics and 24 marks for Chemistry.

- (a) Find the equation of the straight line AB in terms of P and C .
- (b) Stuart scored 33 marks in Physics. Estimate his Chemistry mark.

Unit 1 Expressions and Formulae

Q1-8 non-calculator

- (a) Simplify $\sqrt{54} - \sqrt{24}$ (b) Rationalise the denominator $\frac{5}{\sqrt{11}}$
- Evaluate $32^{\frac{2}{5}} - 4^{-1}$
- Work out $8 \times 10^6 \times 207$. Write your answer in scientific notation.
- Simplify

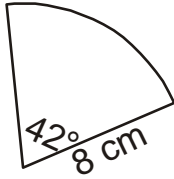
(a) $(4x+2)(2x-3)$ (b) $(x+2)(4x^2 - 6x + 3)$
- Solve the following equations

(a) $5x^2 - 3x = 0$ (b) $x^2 - 36 = 0$ (c) $x^2 - 2x - 24 = 0$
- Express $y = x^2 - 2x + 5$ in the form $y = (x+a)^2 + b$
- Simplify $\frac{2x^2 - 8}{x^2 + 4x - 12}$
- Find the gradient of the line joining A(6, 2) to B(-4, -3).

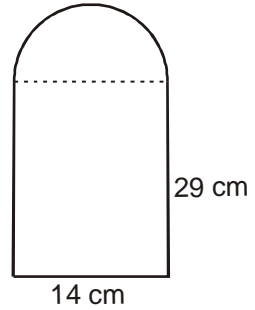
9. Find the area and perimeter of the following shapes.

Give your answer correct to 2 significant figures.

(a)

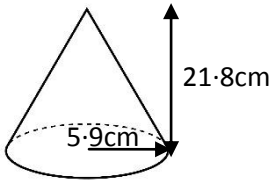


(b)

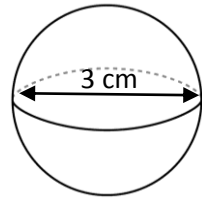


10. Calculate the volume of the following shapes

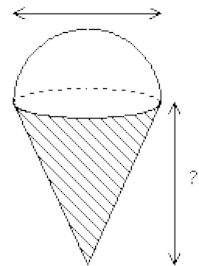
(a)



(b)



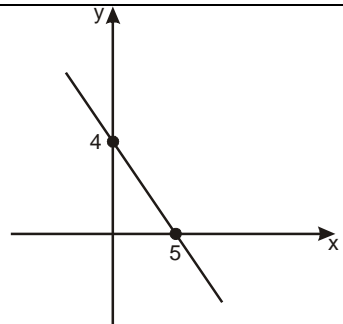
11. If the volume of the following shape is 819 cm^3 calculate the height of the cone



Unit 2 Relationships

Q12-19 non-calculator

12. Find the equation of this straight line



13. Solve the following:

(a) $3(2x+5) - 2(x-3) = 45$ (b) $6x - 4 \leq x - 19$

14. (a) A man buys 3 CDs and 1 DVD from a shop and the cost is £23.
Write down an equation for this.

(b) A woman buys 2 CDs and 2 DVDs from the same shop and the cost is £30. Write an equation for this.

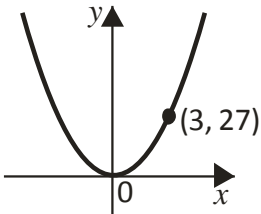
(c) Find, algebraically, the cost of a CD and a DVD.

15. Change the subject of the formula $k = \frac{2m-4}{6q}$ to m

16. (a) Find the roots of $y = x^2 + 2x - 15$ and hence sketch its graph.

(b) Express $y = x^2 - 4x - 1$ in the form $y = (x+a)^2 + b$ and hence sketch its graph.

17. The parabola is in the form $y = kx^2$. What is the value of k ?

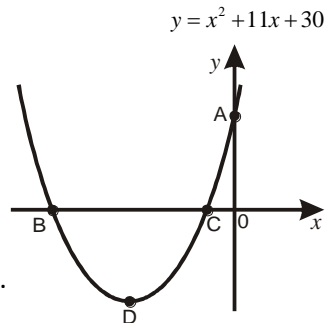


18. (a) Find the coordinates of A.

(b) Find the coordinates of B and C.

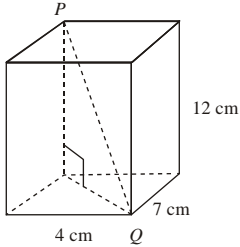
(c) State the equation of the axis of symmetry.

(d) Find the coordinates of the turning point D.



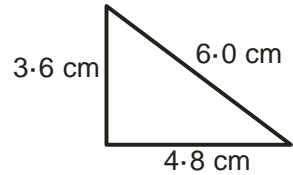
19. (a) Find the discriminant and the nature of the roots of $4x^2 - 2x + 5 = 0$.
- (b) Find the value(s) of p for which the equation $x^2 - 3x + 2p = 0$ has 2 real roots. ($p \neq 0$)

20. (a) Work out the length of PQ



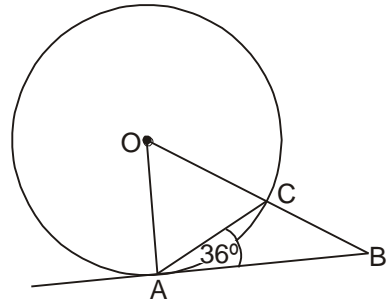
- (b) Is this triangle right angled?

You must give a reason.

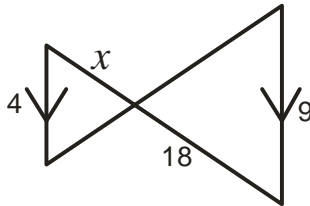


21. The tangent AB touches the circle, centre O, at A.

Find the size of angle ABC.

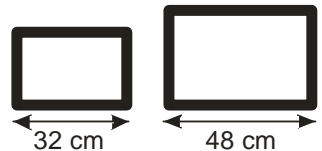


22. (a) Find x

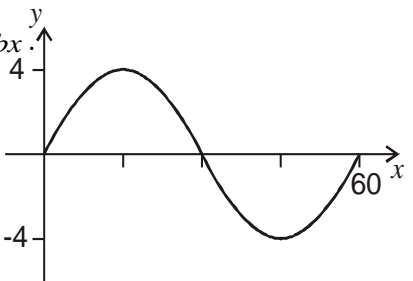


- (b) These 2 mirrors **are similar**. The costs of the 2 mirrors are directly related to their areas.

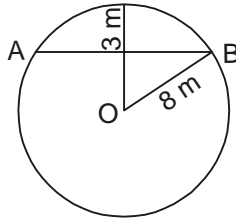
If the cost of the smaller mirror is £92, find the cost of the larger one?



23. Solve correct to 1 decimal place $2x^2 + 6x - 7 = 0$.

24. This graph shows the equation $y = a \sin bx$.
State the values of a and b .
- 
25. Solve the equation $3 \cos x + 1 = 0$, $0 \leq x \leq 360$.

26. Find the length of the line AB.

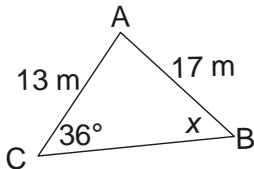


Unit 3 Applications

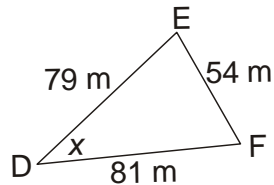
Q30, 31, 36, 37 & 38 non-calculator

27. Find x in the following diagrams.

a



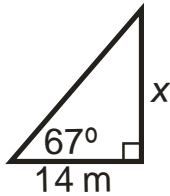
b



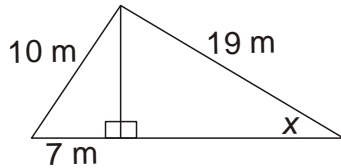
28. A ship leaves a port P and travels for 180 km on a bearing of 056° to Q. It then turns on a bearing of 130° and sails for 190 km to R. How far is it from R to P?

29. Calculate x in each diagram:

(a)

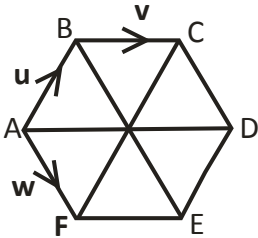


(b)

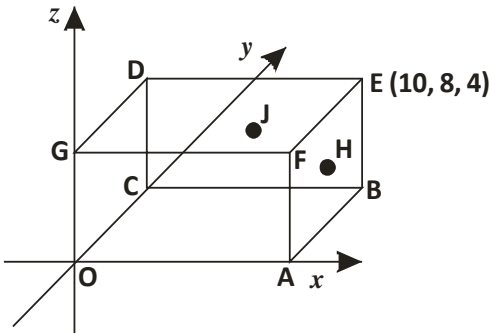


30. ABCDEF is a regular hexagon ie AB is parallel to ED etc.

Express \overrightarrow{AE} and \overrightarrow{AD} in terms of \mathbf{u} , \mathbf{v} and \mathbf{w} .



31. OABCDEFG is a cuboid



H is the centre of face ABEF.

J is the centre of face BCDE.

E is the point (10, 8, 4).

(a) Write down the coordinates of all the vertices.

(b) Write down the coordinates of points H and J.

32. Given $\mathbf{a} = \begin{pmatrix} -5 \\ 1 \\ -4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -3 \\ -2 \\ -1 \end{pmatrix}$ find the vector $4\mathbf{a} + \mathbf{b}$ and the magnitude of this resultant vector.

33. A sports car's value is £82 000 when bought new. If it depreciates by 8% per year, find its value after 4 years.

34. A man deposits £208 in a new bank account which pays 7% compound interest per annum. How much is in the account after 3 years?

35. A carton of juice has an extra 8% free in it. If it now contains 486ml, how much did it contain before the extra?

36. (a) $\frac{1}{3} \times \frac{4}{5} - \frac{1}{5}$ (b) 0.009×0.41

37. Draw a box plot for the following data

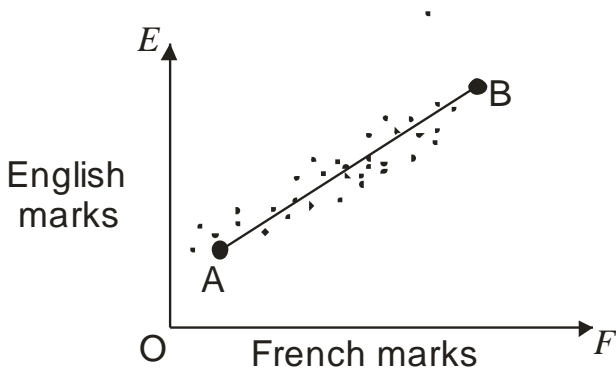
2		3	5	7	8	
3		1	1	3	4	
4		3	7	8	8	9
5		0	1	5	8	
6		2	4	6		

n = 20 2 | 3 = 23

38. Find the mean and standard deviation of 5, 8, 10, 11 and 16

39. The prelim results were analysed in a school. The following graph shows the relationship between the French (F) and English (E) marks.

AB is a line of best fit.



Point A represents 21 marks for French and 28 marks for English.

Point B represents 42 marks for French and 43 marks for English.

- Find the equation of the straight line AB in terms of F and E .
- Karen scored 49 marks in French. Estimate her English mark.