National 5 Mathematics

Booster Papers

Name _____

Teacher _____

Mathematics

Paper 1

National 5 Booster Paper A1

Duration: 1 hour 15 minutes

Total Marks – 50

Attempt **ALL** questions.

You may NOT use a calculator

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

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet.

Use **blue** or **black** ink.

Notes:

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FORMULAE LIST

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

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

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

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

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

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

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

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

or $s=\sqrt{\dfrac{\sum x^2-\dfrac{\left(\sum x\right)^2}{n}}{n-1}}$, where *n* is the sample size.

Total marks - 50

Attempt ALL questions

MARKS

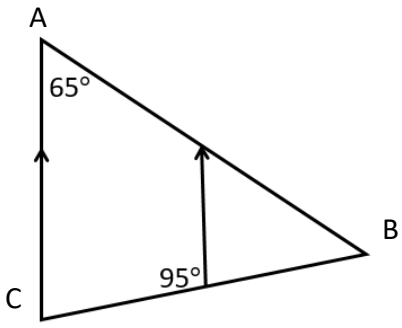
1. Multiply the brackets and simplify

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

2. Evaluate $17\frac{2}{3}-8\frac{3}{5}$ Leave your answer as a mixed number. 3

3. Decrease 840 by 13% 3

4. Calculate the size of angle ABC in the diagram below.



3

5. (a) Factorise $12x - 18$ 1

(b) Factorise $x^2 - 25$ 2

6. Express $x^2 - 6x + 11$ in the form $(x - a)^2 + b$ by completing the square. 2

7. Change the subject of the formula to k

$$\sqrt{\frac{k+7}{9}} = y$$

3

8. Fish food is on special offer.

Each jar on offer contains 30% more than the standard jar.

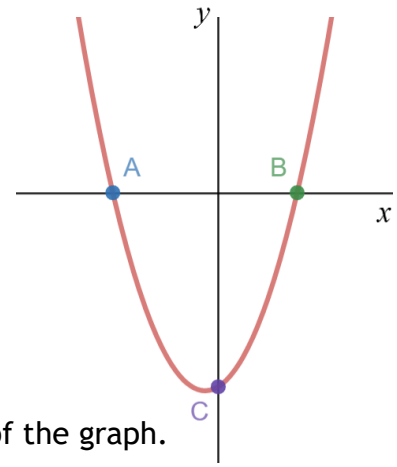
A jar on offer contains 390 grams of fish food.

How much does the standard jar contain?

3

9. Simplify $\left(2x^5\right)^3$ 2

10. The diagram shows part of the graph of a quadratic function with equation $y = x^2 + x - 20$.



(a) Calculate the **coordinates** of A and B, the roots of the graph. 3

(b) Find the **coordinates** of C, the $y-$ intercept of the graph. 1

11. Point $A(-3,7)$ and point $B(1,-3)$ are joined by a straight line

(a) Determine the gradient of this line. 2

(b) Determine the equation of the line. 2

(c) Give the coordinates of the point where this line crosses the $y-$axis. 1

12. (a) Fully simplify $\sqrt{27} - \sqrt{12}$. 3

(b) Write $\frac{15}{\sqrt{3}}$ with a rational denominator in its simplest form. 2

13. At a florist shop, Steve buys 3 roses and 2 tulips for £9.40

(a) Write an equation to represent this information. 1

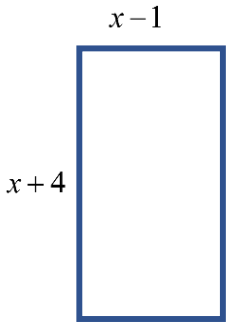
At the same florist shop, Natalie buys 2 roses and 4 tulips for £8.40

(b) Write an equation to represent this information. 1

(c) Find, algebraically, the cost of 1 rose and the cost of 1 tulip. 3

14. This rectangle has length given by $x+4$ and breadth given by $x-1$.
All lengths are in centimetres.

(a) Show that the area can be written as x^2+3x-4. 2



The actual area of the rectangle measures 6 square centimetres.

(b) Find, algebraically, the value(s) of x. 4

End of Booster Paper

Name _____

Teacher _____

Mathematics

Paper 2

National 5 Booster Paper A2

Duration: 1 hour 50 minutes

Total Marks - 60

Attempt **ALL** questions.

You may use a calculator

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

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or $s=\sqrt{\dfrac{\sum x^2-\dfrac{\left(\sum x\right)^2}{n}}{n-1}}$, where *n* is the sample size.

MARKS

Total marks - 60

Attempt ALL questions

1. A car was bought for £24000.
   The value of the car depreciated at a rate of 8.5% every year.
   Calculate the value of the car after 4 years. 3

2. Radio signals travel at a speed of approximately 3×10^{8} metres per second.
   A radio signal from Earth to a space probe takes 1.5 seconds.
   Calculate the distance (in metres) from Earth to the space probe.
   Give your answer in scientific notation. 3

3. The results (in metres) of the top six athletes in the Women's long jump final at the 2004 Olympic Games in Athens are shown below.

7.07	7.05	7.05	6.96	6.85	6.83

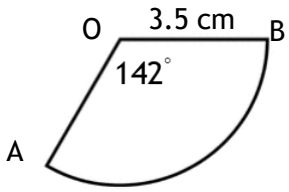
(a) Calculate (correct to 2 decimal places) the mean and standard deviation of these distances. 4

In the 2016 Olympic Games in Rio, the mean distance for the top six athletes in the Women's long jump final was 7.02 metres and the standard deviation was 0.14 metres.

(b) Make two valid comparisons between the athletes. 2

4. Solve algebraically $6(x+7)=5(4-x)$ 3

5. The sector AOB shown here has radius of 3.5 centimetres and a sector angle of 142°.



Find the length of the arc AB.

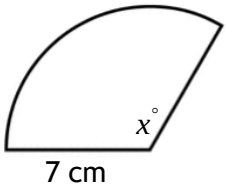
3

6. A shirt has been reduced in price by 40% to £27

Calculate the original price. 3

7. Simplify $\frac{3x^2 \times 4x^6}{6x^2}$ 2

8. This sector has an area of 55.6 square centimetres and radius 7 centimetres.



Calculate the size of angle x°

Give your answer to the nearest degree. 4

9. Use the discriminant to determine the nature of the roots of $y = 4x^2 - 20x + 25$. 3

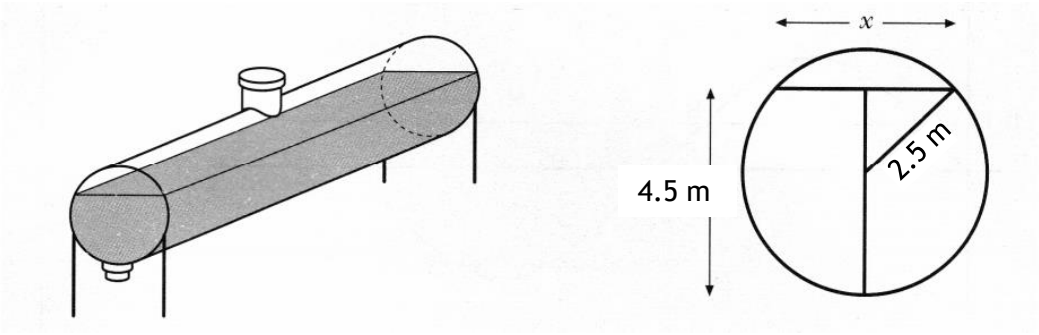
10. These two candles are mathematically similar.

The surface area of the small candle is 12.5 square centimetres

Find the surface area of the larger candle. 3

10. An oil tank has a circular cross section of radius 2.5 metres.

The tank is filled to a depth of 4.5 metres.

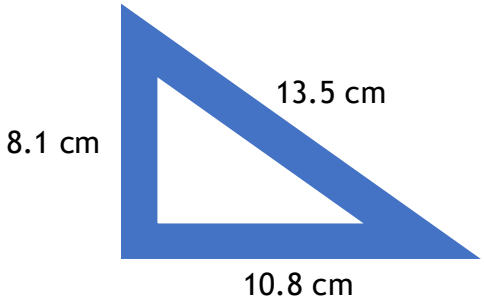


(a) Calculate x, the width (in metres) of the oil surface. 3

(b) What other depth would give the same surface width? 1

12. A company is producing a new size of set square which must have a perfect right angle at one of its corners.

The company produce a prototype with sides of length 8.1 cm, 10.8 cm and 13.5 cm.



Is this set square acceptable?

You must justify your answer. 3

13. Solve the equation

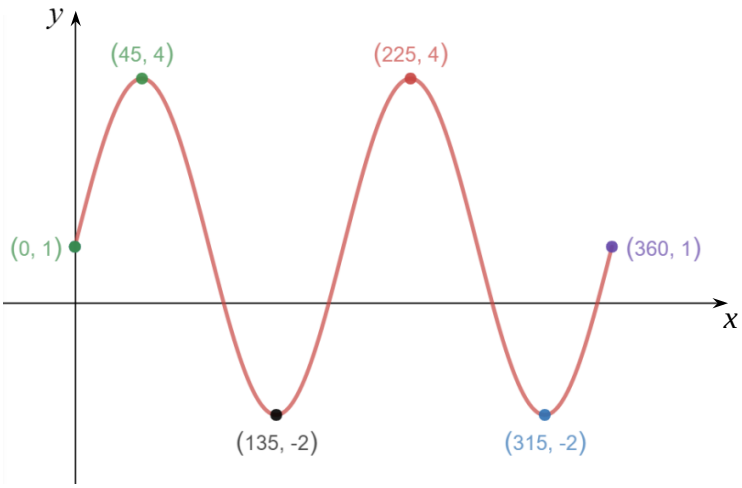
$$2x^2 + 5x - 11 = 0$$

Give your answer(s) correct to two decimal places. 4

14. Solve the equation $\frac{4x-5}{6} = 2x$

Give your answer in its simplest form. 3

15. This graph has an equation of the form $y = a\sin bx + c$



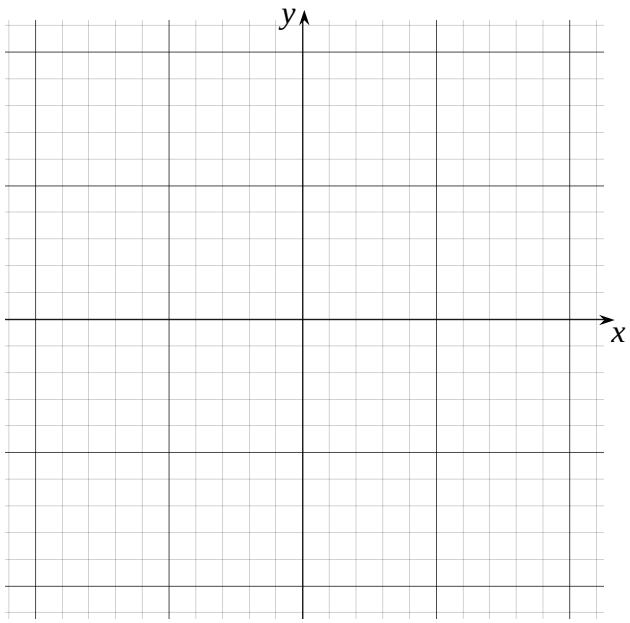
Write down the values of a, b and c. 3

16. (a) Write down the coordinates of the turning point of the graph of $y = (x-2)^2 + 1$. 2

(b) Write down equation of the axis of symmetry. 1

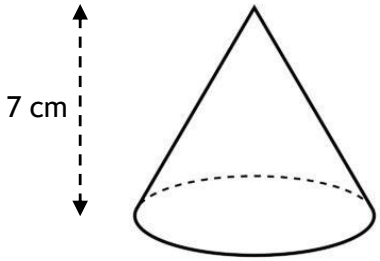
(c) Write down the coordinates of the point where the graph meets the $y-$axis. 1

(d) Sketch and annotate fully the graph of $y = (x-2)^2 + 1$. 2



17. The cone shown has diameter 3 centimetres and vertical height 7 centimetres.

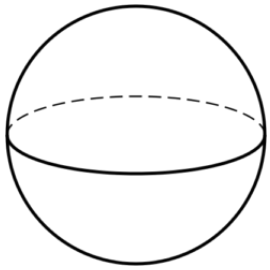
(a) Calculate the volume of this cone.



2

The sphere shown here has volume 268.08 cubic centimetres.

(b) Find (to the nearest centimetre) the radius of this sphere.



3

End of Booster Paper A2

Name _____

Teacher _____

Mathematics

Paper 1

National 5 Booster Paper B1

Duration: 1 hour 15 minutes

Total Marks - 50

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or $s=\sqrt{\dfrac{\sum x^2-\dfrac{\left(\sum x\right)^2}{n}}{n-1}}$, where n is the sample size.

Total marks - 50

Attempt ALL questions

MARKS

1. Multiply the brackets and simplify

$$(3x-2)^2-(3x-2)$$ 3

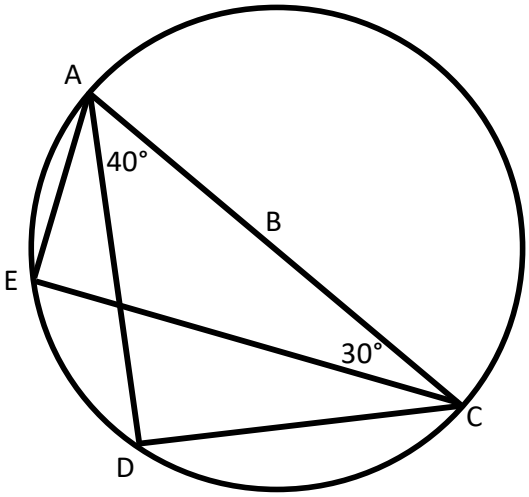
2. Evaluate $8\frac{3}{4}\div 3\frac{1}{2}$ Leave your answer as a mixed number. 3

3. Decrease 280 by 32% 3

4. This circle has its centre at B. AC is a diameter.

Angle DAB = 40° and angle BCE = 30°.

Fill in all the missing angles.



3

5. (a) Factorise $30x^2 - 18x$ 1

(b) Factorise $32x^2 - 18$ 2

6. Express $x^2 - 8x + 21$ in the form $(x - a)^2 + b$ by completing the square. 2

7. Change the subject of the formula to b

$$\sqrt{\frac{b-5}{7}} = m$$

3

8. Polyfilla is on special offer.

Each tube on offer contains 10% more than the standard tube.

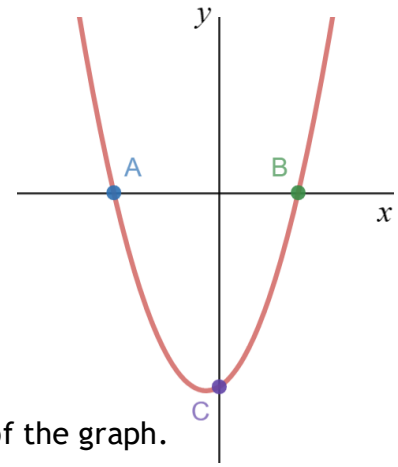
A tube on offer contains 330 grams.

How much does the standard tube contain?

3

9. Simplify $\left(4x^3\right)^2$ 2

10. The diagram shows part of the graph of a quadratic function with equation $y = x^2 + x - 6$.



(a) Calculate the **coordinates** of A and B, the roots of the graph. 3

(b) Write down the **coordinates** of C, the $y-$ intercept of the graph. 1

11. Point A$\left(2,\frac{1}{2}\right)$ and point B$(3,1)$ are joined by a straight line.

(a) Determine the gradient of this line. 2

(b) Determine the equation of the line. 2

(c) Find the **coordinates** of the point where this line crosses the $y-$axis. 1

12. (a) Fully simplify $\sqrt{125} - \sqrt{5} + \sqrt{20}$. 3

(b) Write $\frac{10}{3\sqrt{2}}$ with a rational denominator in its simplest form. 2

13. A bag contains 40 coins. The coins are either 50 pence or 20 pence coins.

Let x represent the number of 50 pence coins and let y represent the number of 20 pence coins.

(a) Write an equation to represent this information. 1

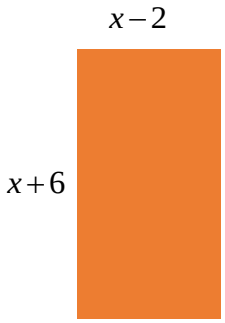
The total value of all the coins in the bag is £15.50.

(b) Write an equation to represent this information. 1

(c) Find, algebraically, the number of 50 pence coins and the number of 20 pence coins. 4

14. This rectangle has length given by $x+6$ and breadth given by $x-2$.
All lengths are in centimetres.

(a) Show that the area can be written as $x^2+4x-12$. 2



The actual area of the rectangle measures 9 square centimetres.

(b) Find, algebraically, the value(s) of x. 4

End of Booster Paper B1

Name _____

Teacher _____

Mathematics

Paper 2

National 5 Booster Paper B2

Duration: 1 hour 50 minutes

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MARKS

Total marks - 60

Attempt ALL questions

1. Solve $5\cos x^\circ + 1 = 3$ where $0 \leq x \leq 360^\circ$ 3

2. Solve, algebraically, $3x + 38 \geq 7x + 6$ 3

3. The number of electric cars using a charging point was counted and recorded every day for 5 days in 2015. The results are shown below.

3	3	2	3	4

(a) Calculate (correct to 1 decimal place) the mean and standard deviation for this data. 4

The same survey was conducted over a week in 2019.
The mean number of cars was 7 and the standard deviation was 1.5

(b) Make two valid comparisons between the data for 2015 and 2019. 2

4. Solve, algebraically, $\frac{x+9}{2}+\frac{x-3}{3}=5$ 3

5. Find the resultant vector $3\boldsymbol{u}-2\boldsymbol{v}$ when $u=\begin{pmatrix}4\\-2\\3\end{pmatrix}$ and $v=\begin{pmatrix}-5\\3\\-2\end{pmatrix}$.

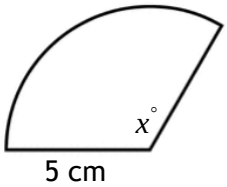
Express your answer in component form. 3

6. A house has reduced in value by 20% to £86000.

Calculate the original value. 3

7. Simplify $\dfrac{24x^6}{5x^3 \times 4x^2}$ 2

8. This sector has an area of 28.6 square centimetres and radius 5 centimetres.



Calculate the size of angle x°

Give your answer to the nearest degree. 4

9. Use the discriminant to determine the nature of the roots of $y = 9x^2 - 12x + 4$. 3

10. These two juice bottles are mathematically similar.

The volume of the smaller bottle is 28 cubic centimetres.

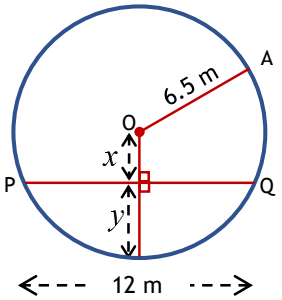
Find the volume of the larger bottle. 3

11. OA is a radius with length 6.5 metres.

PQ is a chord with length 12 metres.

All lengths are in metres.

The line marked x joins the centre to the chord.



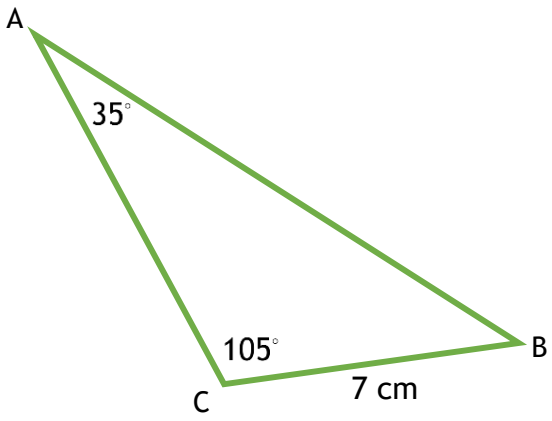
(a) Find the length of the line marked x. 3

The line marked y meets the chord PQ at 90° and joins the chord to the circumference.

(b) Find the length of the line marked y. 1

12. Calculate the length of side AB.

Give your answer to 3 significant figures.



3

13. Solve the equation

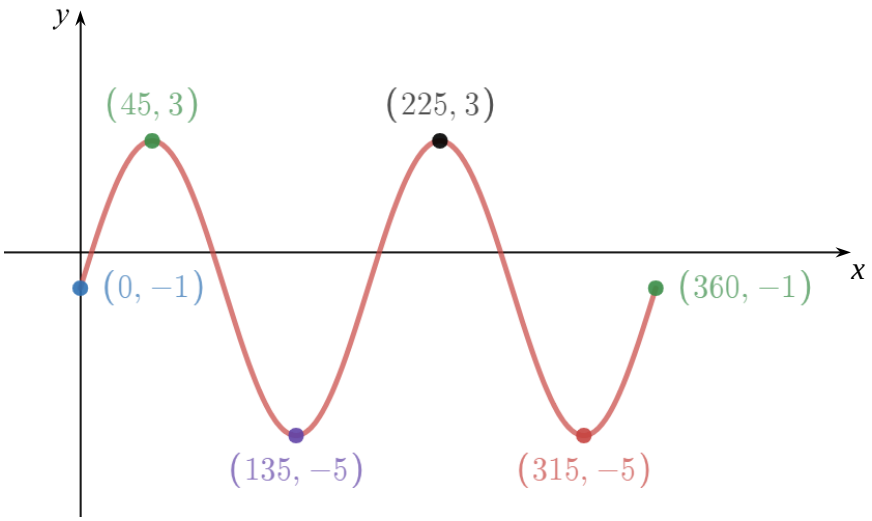
$$5x^2 - 3x - 7 = 0$$

Give your answer(s) correct to two decimal places. 4

14. Solve the equation $\frac{2x+3}{2} = 4x$

Give your answer in its simplest form. 3

15. This graph has an equation of the form $y = a\sin bx + c$



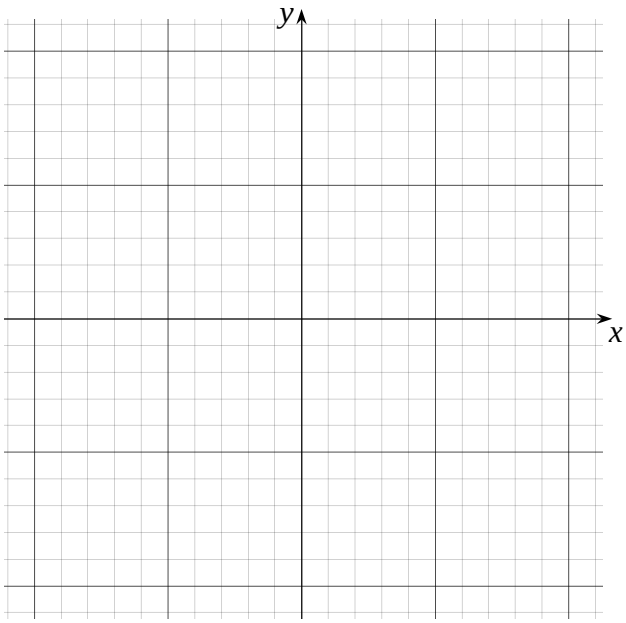
Write down the values of a, b and c. 3

16. (a) Write down the coordinates of the turning point of the graph of $y = (x+3)^2 + 1$. 2

(b) Write down equation of the axis of symmetry. 1

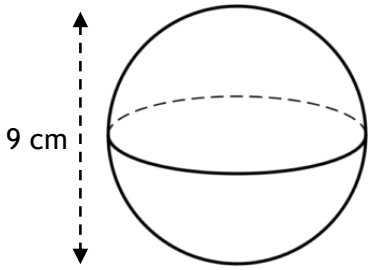
(c) Write down the coordinates of the point where the graph meets the $y-$axis. 1

(d) Sketch and annotate fully the graph of $y = (x+3)^2 + 1$. 2



17. The sphere shown has diameter 9 centimetres.

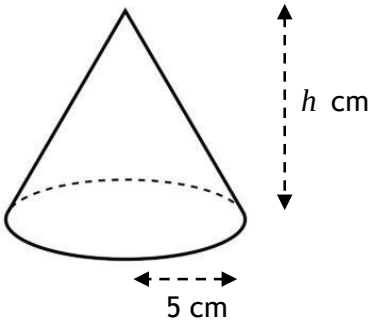
(a) Calculate the volume of this sphere.



2

The cone shown here has radius 5 centimetres and volume 209.44 cubic centimetres.

(b) Find (to the nearest centimetre) the height (h) of this cone.



3

End of Booster Paper B2

Name _____

Teacher _____

Mathematics

Paper 1

National 5 Booster Paper C1

Duration: 1 hour 15 minutes

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

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

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

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

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

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

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

or $s=\sqrt{\dfrac{\sum x^2-\dfrac{\left(\sum x\right)^2}{n}}{n-1}}$, where *n* is the sample size.

Total marks - 50

Attempt ALL questions

MARKS

1. Multiply the brackets and simplify

$$3x-(3x-2)^2$$ 3

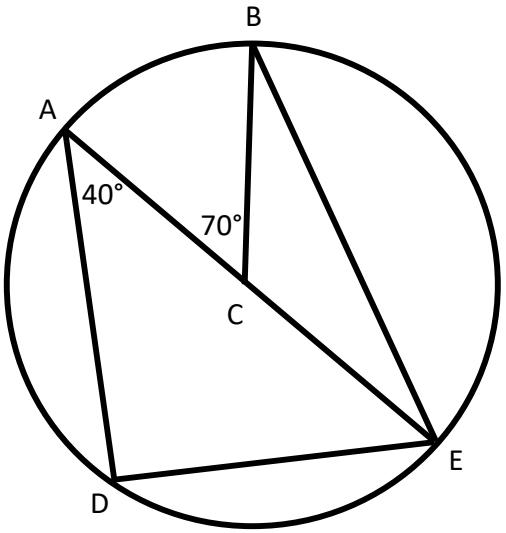
2. Evaluate $7\frac{1}{3}-2\frac{4}{5}$ Leave your answer as a mixed number. 3

3. Express the increase from 24 to 30 as a percentage. 3

4. This circle has its centre at C.

- CB and CE are radii
- AE is a diameter
- Angle DAE = 40° and angle BCA = 70°

Find the size of angle BED.



3

5. (a) Factorise $10x - 24x^2$ 1

(b) Fully factorise $18 - 50x^2$ 2

6. Express $x^2 + 10x - 7$ in the form $(x + a)^2 - b$ and write down the values of a and b. 2

7. Change the subject of this formula to q.

$$\frac{8h-7q}{5}=3$$

3

8. This hoodie is on special offer.

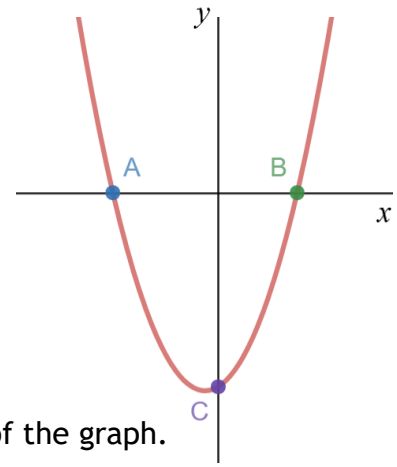
The price of the hoodie has been reduced by 20%.

The reduced price is £60.

How much did the hoodie cost before the reduction? 3

9. Simplify $\left(2x^{-5}\right)^3$ 2

10. The diagram shows part of the graph of a quadratic function with equation $y = x^2 + x - 12$.



(a) Calculate the **coordinates** of A and B, the roots of the graph. 3

(b) Write down the **coordinates** of C, the $y-$ intercept of the graph. 1

11. A straight line has equation $3x + 2y = 8$.

(a) Determine the gradient of this line. 2

(b) Find the **coordinates** of the point where this line crosses the $y-$axis. 1

(c) Determine whether the line passes through the point $(-2,7)$. 2

12. (a) Fully simplify $\sqrt{32}+\sqrt{8}-\sqrt{18}$. 3

(b) Write $\frac{15}{4\sqrt{5}}$ with a rational denominator in its simplest form. 2

13. A bag contains 23 coins. The coins are either 10 pence or 50 pence coins.

Let x represent the number of 10 pence coins and let y represent the number of 50 pence coins.

(a) Write an equation to represent this information. 1

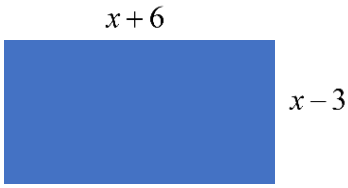
The total value of all the coins in the bag is £5.50.

(b) Write an equation to represent this information. 1

(c) Find, algebraically, the number of 10 pence coins and the number of 50 pence coins. 4

14. This rectangle has length given by $x+6$ and breadth given by $x-3$.
All lengths are in centimetres.

(a) Show that the area can be written as $x^2+3x-18$. 2



The actual area of the rectangle measures 10 square centimetres.

(b) Find, algebraically, the value(s) of x. 4

End of Booster Paper C1

Name _____

Teacher _____

Mathematics

Paper 2

National 5 Booster Paper C2

Duration: 1 hour 50 minutes

Total Marks - 60

Attempt **ALL** questions.

You may use a calculator

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

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet.

Use **blue** or **black** ink.

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

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

or $s=\sqrt{\dfrac{\sum x^2-\dfrac{\left(\sum x\right)^2}{n}}{n-1}}$, where *n* is the sample size.

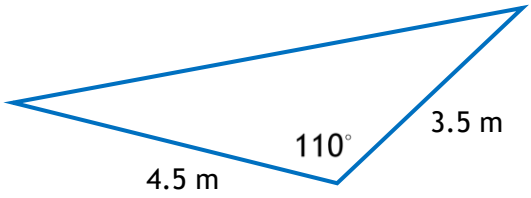
MARKS

Total marks - 60

Attempt ALL questions

1. Solve $4\sin x^\circ + 3 = 1$ where $0 \leq x \leq 360^\circ$ 3

2. Calculate the area of this triangle.



2

3. The number of butterflies visiting a garden was recorded each day for 10 days in July of 2008. The results are shown below.

12 18 10 18 11 17 17 19 14 15

(a) Find the median value **and** the semi-interquartile range for this data set. 3

The procedure was repeated in the same garden for 7 days in July of 2018.

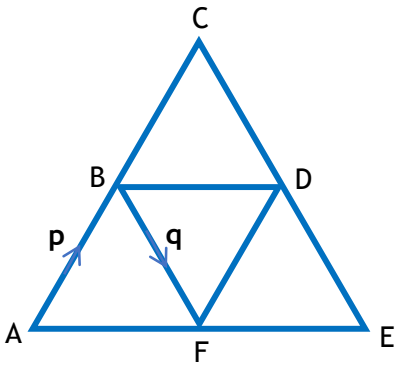
The median number of butterflies was 14 and the semi-interquartile range was 5.

(b) Make two valid comparisons between the 2008 and the 2018 data sets. 2

4. Solve, algebraically, $\frac{3x+8}{4}+\frac{3x+2}{2}=8$ 3

5. This diagram is formed from four congruent equilateral triangles.

In the diagram, $\overrightarrow{AB}$ and $\overrightarrow{BF}$ represent the vectors **p** and **q** respectively.



(a) Express $\overrightarrow{AF}$ in terms of **p** and **q**. 1

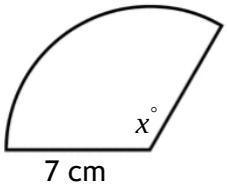
(b) Express $\overrightarrow{EB}$ in simplest form in terms of **p** and **q**. 2

6. A shirt has been increased in price by 24% to £49.60.

Calculate the original value. 3

7. Simplify $x^3\left(2x^5 + x^{-2}\right)$ 2

8. This sector has an arc length of 16.5 centimetres and radius 7 centimetres.



Calculate the size of angle x°

Give your answer to the nearest degree. 3

9. Use the discriminant to determine the nature of the roots of $y = 9x^2 - 12x + 4$. 3

10. These two milk cartons are mathematically similar in shape.

12 cm

h cm

The volume of the smaller carton is 135 cubic centimetres.

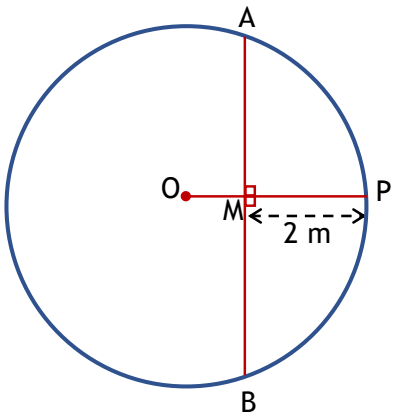
The volume of the larger carton is 625 cubic centimetres.

Find the height (h) of the larger carton. 3

11. This circle has its centre at O.

OP is a radius with length 3.25 metres.

The line MP has length 2 metres.

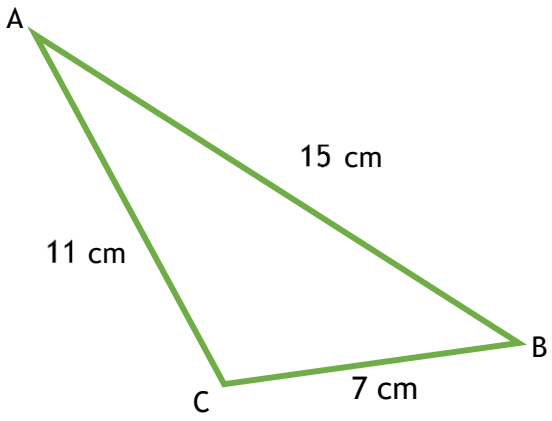


(a) Find the length of the line OM. 1

(b) Hence, find the length of the chord AB. 3

12. Calculate the size of angle CAB.

Round your answer to one decimal place.



3

13. Solve the equation

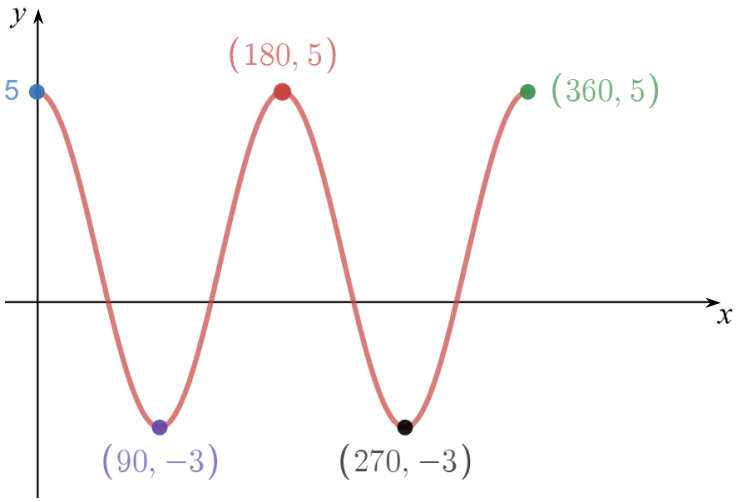
$$3x^2 - 4x - 8 = 0$$

Give your answer(s) correct to three significant figures. 4

14. Solve the equation $\frac{1}{4x} + \frac{8}{x} = 11$

Give your answer in its simplest form. 3

15. This graph has an equation of the form $y = a\cos bx + c$



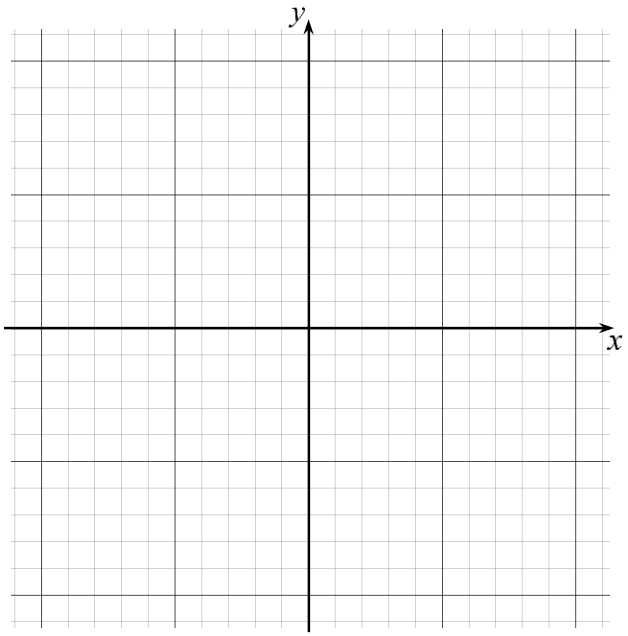
Write down the values of a, b and c. 3

16. (a) Write down the coordinates of the turning point of the graph of $y = (x-1)^2 + 2$. 2

(b) Write down equation of the axis of symmetry. 1

(c) Write down the coordinates of the point where the graph meets the $y-$axis. 1

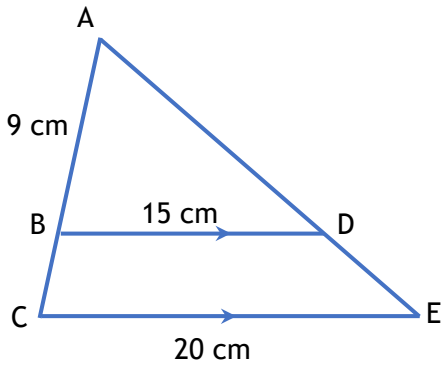
(d) Sketch and annotate fully the graph of $y = (x-1)^2 + 2$. 2



17. In the figure opposite, BD = 14, CE = 20 and AB = 9.

Find BC.

All lengths are in centimetres.

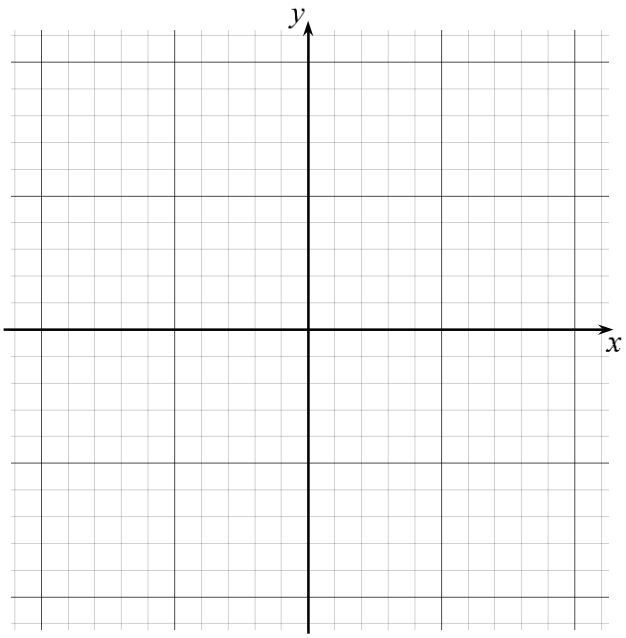


3

18. Simplify $\dfrac{\cos x \tan x}{\sin x}$ 2

19. On the axes provided, draw the straight line with equation $y = -2x + 7$.

Mark on the coordinates of the points where the line crosses the axes. 2



End of Booster Paper C2

Name _____

Teacher _____

Mathematics

Paper 1

National 5 Booster Paper D1

Duration: 1 hour 15 minutes

Total Marks – 50

Attempt **ALL** questions.

You may NOT use a calculator

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

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

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

or $s = \sqrt{\dfrac{\sum x^2 - \dfrac{(\sum x)^2}{n}}{n-1}}$, where n is the sample size.

Total marks - 50

Attempt ALL questions

MARKS

1. Multiply the brackets and simplify

$$8-5(2x-1)^2$$ 3

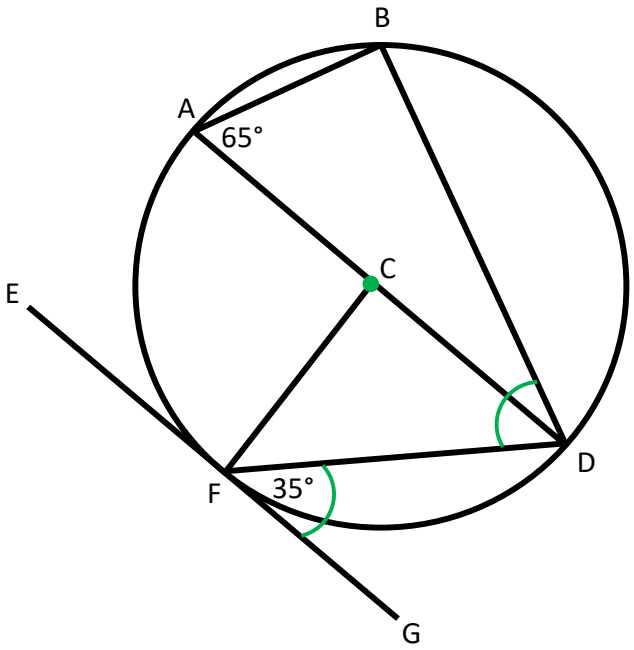
2. Evaluate $12-4\frac{1}{6}\times 1\frac{4}{5}$ Leave your answer as a mixed number. 3

3. Find the percentage decrease from 80 to 28. 3

4. This circle has its centre at C.

- EF is a tangent to the circle at F
- Angle BAC = 65° and angle DFG = 35°

Find the size of angle BDF.



3

5. (a) Factorise $x^2 - 9$ 1

(b) Fully simplify $\frac{x^2 - 9}{x - 3}$ 2

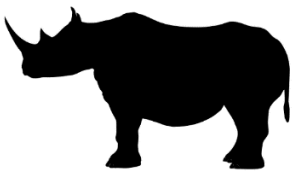
6. Express $x^2 - 12x + 26$ in the form $(x - a)^2 + b$ and write down the values of a and b. 2

7. Change the subject of this formula to p.

$$px - 4 = 3p + q$$

3

8. During the last century, due to poaching and habitat destruction, the black rhino suffered the most drastic decline in total number of all the rhino species.



Between 1970 and 1992, the population decreased by 96%.

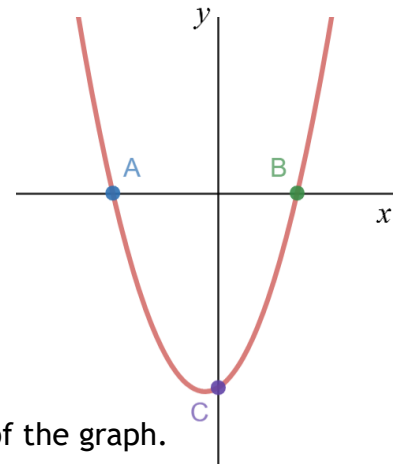
In 1992, there were only 2400 surviving in the wild.

How many black rhinos were estimated to be in the wild in 1970?

3

9. Find $f(8)$ if $f(x) = x^{\frac{2}{3}}$ 2

10. The diagram shows part of the graph of a quadratic function with equation $y = 2x^2 + x - 3$.



(a) Calculate the **coordinates** of A and B, the roots of the graph. 3

(b) Write down the **coordinates** of C, the $y-$ intercept of the graph. 1

11. A straight line has equation $3y - 2x + 7 = 0$.

(a) Determine the gradient of this line. 2

(b) Find the **coordinates** of the point where this line crosses the $y-$axis. 1

(c) Determine whether the line passes through the point $(5,1)$. 2

12. (a) Fully simplify $\frac{\sqrt{96}}{18}$. 3

(b) Write $\frac{4}{\sqrt{54}}$ with a rational denominator in its simplest form. 2

13. Tickets for a roller-coaster ride are sold as either child tickets or adult tickets.

Last Saturday, 212 people rode the roller-coaster.

(a) Write an equation to represent this information. 1

The tickets cost £6 for a child and £10 for an adult.

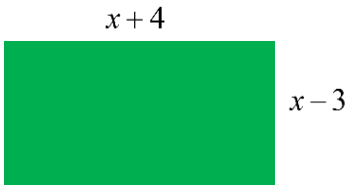
Last Saturday, a total of £1688 was taken in ticket sales.

(b) Write an equation to represent this information. 1

(c) Find, algebraically, the number of child tickets sold and the number of adult tickets sold. 4

14. This rectangle has length given by $x+4$ and breadth given by $x-3$.
All lengths are in centimetres.

(a) Show that the area can be written as x^2+x-12. 2



The actual area of the rectangle measures 18 square centimetres.

(b) Find, algebraically, the value(s) of x. 4

End of Booster Paper D1

Name _____

Teacher _____

Mathematics

Paper 2

National 5 Booster Paper D2

Duration: 1 hour 50 minutes

Total Marks - 60

Attempt **ALL** questions.

You may use a calculator

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or $s = \sqrt{\dfrac{\sum x^2 - \dfrac{(\sum x)^2}{n}}{n-1}}$, where *n* is the sample size.

MARKS

Total marks - 60

Attempt ALL questions

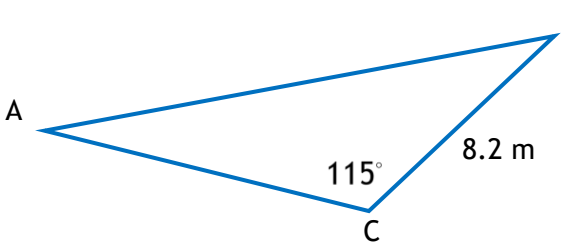
1. Solve $7\tan x^\circ = 5\tan x^\circ - 3$ where $0 \leq x \leq 360^\circ$ 3

2. The area of this triangle is 40.3 square metres.

All lengths are in metres.

Find the length of side AC.

Round your answer to 1 decimal place.



2

3. Mr Campbell has been working hard on the indoor running machine. Over 5 days, he recorded how many metres he ran in 6 minutes. The results are shown below.

1200 1250 1350 1300 1350

(a) Find the mean and standard deviation of these distances. 3

A few weeks later, Mr Campbell changed to running outside on an athletics track. Again, he recorded how many metres he ran in 6 minutes over a period of 5 days.

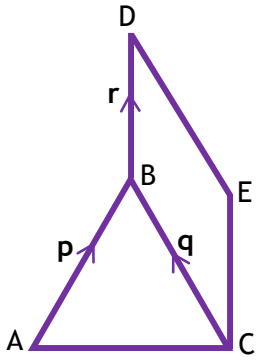
His mean distance was 1450 metres and the standard deviation was 75 metres.

(b) Make two valid comparisons between the distances run indoors on the machine and those run outside on the track. 2

4. Solve, algebraically, $\frac{4x+1}{2} - \frac{x+2}{3} = 2$ 3

5. This diagram is formed from an equilateral triangle and a parallelogram.

In the diagram, $\overrightarrow{AB}$, $\overrightarrow{CB}$ and $\overrightarrow{BD}$ represent the vectors **p**, **q** and **r** respectively.



(a) Express $\overrightarrow{AD}$ in terms of **p** and **r**. 1

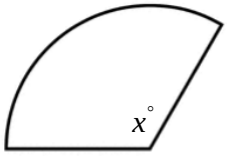
(b) Express $\overrightarrow{AE}$ in terms of **p**, **q** and **r**. 2

6. A house was valued in April 2015. By April 2016, the value had fallen by 13%.
Between April 2016 and April 2017, the house value increased by 5% to £45675.
Find the value of the house in April 2015. 3

7. Simplify $2x^{\frac{3}{2}}\left(x^{\frac{1}{2}}+3x^{-\frac{1}{2}}\right)$ 2

8. This sector has an arc length of 95 centimetres and radius 45 centimetres.

The sector angle is labelled x°



Calculate the area of the sector.

Round your answer to the nearest whole number. 3

9. Find the range of values of k so that $y = kx^2 - 6x + 1$ has no real roots. 3

10. These two tins are mathematically similar in shape.

V = 72 cm^3

V = 243 cm^3

The volume of the smaller tin is 72 cubic centimetres.

The volume of the larger tin is 243 cubic centimetres.

The surface area of the smaller tin is 140 square centimetres.

Find the surface area of the larger tin. 3

11. Mr Smith has made some chocolate dipped biscuits.

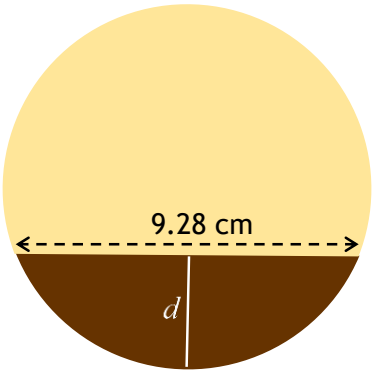
Each biscuit has diameter 10 centimetres.

One biscuit is shown in the diagram below.

The width of chocolate at its widest point is 9.28 centimetres.

Calculate the depth (d) to which the biscuit was dipped.

Give your answer to two decimal places. 3



12. The diagram shows the position of three oil rigs.

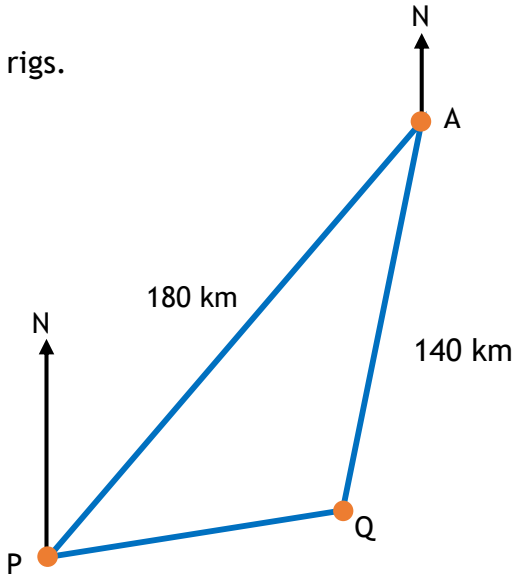
P is 180 kilometres from A

Q is 140 kilometres from A.

From P, the bearing of A is 062°

From A, the bearing of Q is 208°

How far apart are oil rigs P and Q?



4

13. Solve the equation

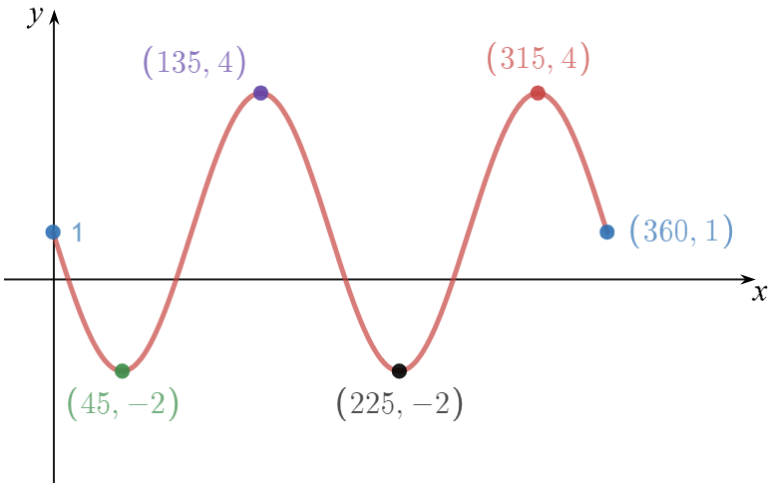
$$7x^2 + 2x - 3 = 2x^2 + 5x - 2$$

Give your answer(s) correct to three significant figures. 4

14. Solve the equation $\frac{5}{2x} - \frac{1}{4x} = 6$

Give your answer in its simplest form. 3

15. This graph has an equation of the form $y = a\sin bx + c$



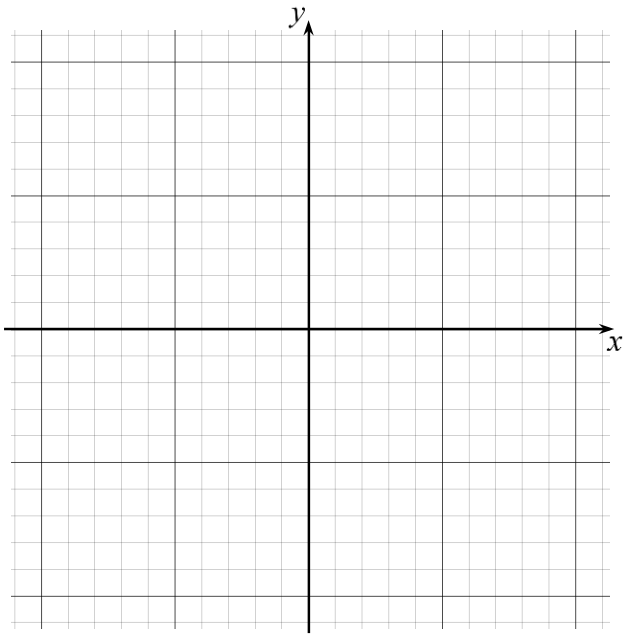
Write down the values of a, b and c. 3

16. (a) Write down the coordinates of the turning point of the graph of $y = 5 - (x+3)^2$. 2

(b) Write down equation of the axis of symmetry. 1

(c) Write down the coordinates of the point where the graph meets the $y-$axis. 1

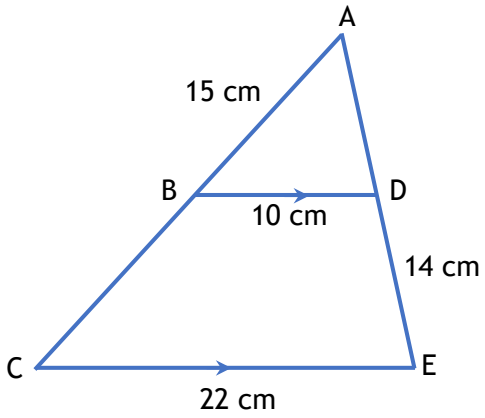
(d) Sketch the graph of $y = 5 - (x+3)^2$. Mark on the coordinates of the turning point and the point of intersection with the $y-$axis. 2



17. In the figure opposite, BD = 10, CE = 22, AB = 15 and DE = 14.

Find the length of BC.

All lengths are in centimetres.

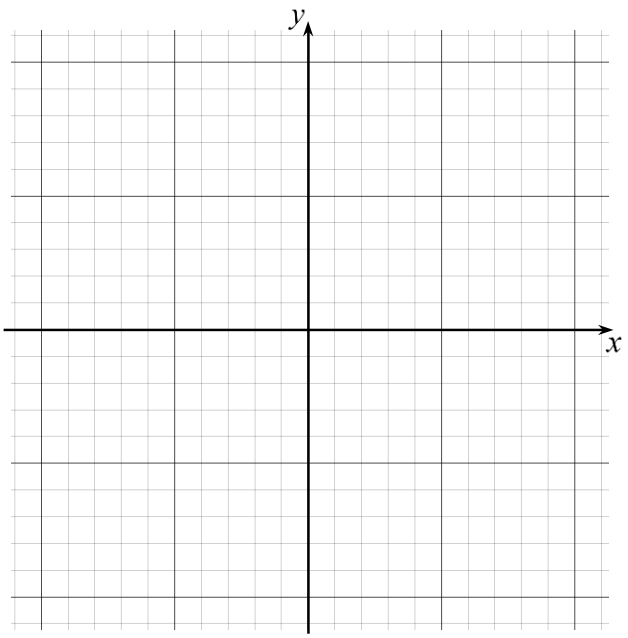


3

18. Simplify $\sin x(\sin x + 1) + \cos x(\cos x + 1) - 1$ 2

19. On the axes provided, draw the straight line with equation $2y = x - 6$.

Mark on the coordinates of the points where the line crosses the axes. 2



End of Booster Paper D2