

Q1

When adding mixed number fractions, what are the main steps?

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Q2

To divide by a fraction, you multiply by the _____ of that fraction.

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Q3

To estimate the answer to 1.79×0.0892 , what calculation would you perform?

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Q4

List all the factors of 20.

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Q5

A prime number is _____.

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Q6

List the first 5 prime numbers.

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Q7

The general expression for writing a number in standard form is $a \times 10^b$. What are the criteria for a and b ?

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Q8

List all the index laws.

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A2

reciprocal

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A1

1. Convert them into improper fractions.
2. Multiply to create a common denominator.
3. Add the numerators.
4. Convert the answer back into a mixed number fraction.

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A4

1, 2, 4, 5, 10, 20

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A3

2×0.09
(Round each number to 1 significant figure.)

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A6

2, 3, 5, 7, 11

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A5

A number which has exactly two factors – one and itself.

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A8

$$x^a \times x^b = x^{a+b} \text{ (add the powers)}$$

$$x^a \div x^b = x^{a-b} \text{ (subtract the powers)}$$

$$(x^a)^b = x^{ab} \text{ (multiply the powers)}$$

$$x^0 = 1$$

$$x^{-a} = \frac{1}{x^a} \text{ (the reciprocal)}$$

$$x^{\frac{a}{b}} = (\sqrt[b]{x})^a \text{ (a root)}$$

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A7

$$1 \leq a < 10$$

b is an integer.

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Q9

List the steps you would take to work out 12% of a number without using a calculator.

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Q10

Write down the decimal multiplier that you would use to work out a 2.5% increase.

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Q11

A car depreciates by 2% per annum. It cost £8000 when it was new. Ben wants to work out how much it would cost after 3 years. Fill in the gap in his calculation.

$$8000 \times \underline{\hspace{2cm}}^3$$

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Q12

The cost of a car service increases by 10% to £540. Write down the calculation you would use to work out the cost of the car service before the increase.

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Q13

List the steps you would take to convert $0.2\dot{3}$ to a fraction.

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Q14

To share £72 in the ratio 2:7, you begin by dividing 72 by what number?

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Q15

State the equations that describe the following:

1. y is directly proportional to x .
2. y is inversely proportional to x .
3. A is directly proportional to the square of r .
4. p is inversely proportional to the cube root of q .

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Q16

What is the reciprocal of 7?

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A10

1.025

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A9

Find 10% by dividing by 10.

Find 1% by dividing by 100 (or dividing the 10% value by 10 again).

Make 12% by adding 10% and $2 \times 1\%$.

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A12

 $540 \div 1.1$

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A11

0.98

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A14

 $2 + 7 = 9$

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A13

1. Let $x = 0.2\dot{3}$
2. Multiply by 10 and by 100 to get $10x$ and $100x$.
3. Subtract $10x$ from $100x$.
4. Solve this equation for x .

e.g.

$$100x = 23.\dot{3}$$

$$10x = 2.\dot{3}$$

$$90x = 21$$

$$x = \frac{21}{90} = \frac{7}{30}$$

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A16

 $\frac{1}{7}$

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A15

1. $y = kx$

2. $y = \frac{k}{x}$

3. $A = kr^2$

4. $p = \frac{k}{\sqrt[3]{q}}$

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Q17

Evaluate:

- a. 2^5
- b. 7^2
- c. $\sqrt{64}$
- d. $\sqrt[3]{125}$

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Q18

A number, x , rounded to 1 decimal place is 2.8. What are the upper and lower bounds of x ?

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Q19

What does it mean to rationalise the denominator of $\frac{1}{\sqrt{3}}$?

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Q20

What is the product rule for counting?

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Q21

Give the general form of an error interval for a number, x .

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Q22

Which of the following are like terms?

$$3x^2$$

$$2x$$

$$x^3$$

$$4x^6$$

$$5x$$

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Q23

Explain the process for expanding three brackets such as $(x + 1)(x + 2)(x + 3)$.

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Q24

What does factorising mean?

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A18

Upper bound: 2.85
Lower bound: 2.75

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A17

- a. 32
- b. 49
- c. 8
- d. 5

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A20

This rule says that if there are m ways of choosing one item and n ways of choosing another, the total number of combinations is mn .

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A19

$\sqrt{3}$ is an irrational number. By multiplying the denominator by $\sqrt{3}$, you get 3, which is a rational number. You must do the same to the numerator though!

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A22

$2x$ and $5x$. Different powers of x are not alike.

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A21

Lower bound $\leq x <$ upper bound

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A24

Factorising means to put an expression back into brackets.

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A23

Begin by expanding two brackets using a method like F.O.I.L.

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

Then, multiply each of these terms by each term in the remaining bracket.

$$(x^2 + 3x + 2)(x + 3) = x^3 + 6x^2 + 11x + 6$$

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Q25

The numerator and denominator of this algebraic fraction have been fully factorised. What is this fraction in its simplest form?

$$\frac{x^2 + 3x - 10}{x^2 + 10x + 25} = \frac{(x + 5)(x - 2)}{(x + 5)^2}$$

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Q26

What is the 12th term in the sequence with n^{th} term $4n + 3$?

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Q27

Find the n^{th} term of the sequence whose first 4 terms are 1, 5, 9, 13.

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Q28

Alex is working out the value of $2x^2$ when $x = 3$. He writes the following:

$$2 \times 3 = 6$$

$$6^2 = 36$$

What is his mistake?

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Q29

List the first two steps required to solve the equation

$$x^2 + 5x - 1 = 5$$

(in a non-calculator exam).

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Q30

Lily is rearranging a formula to make x the subject. What should her next step be?

$$3x + r = p - qx$$

$$3x + r + qx = p$$

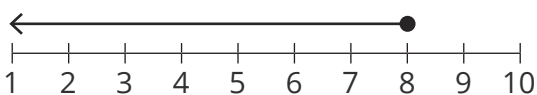
$$3x + qx = p - r$$

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Q31

Which inequality is represented on this number line?



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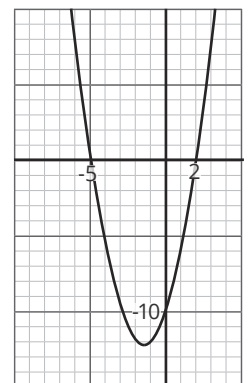
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Q32

Gaia is solving the inequality $x^2 + 3x - 10 > 0$.

She draws the graph of $y = x^2 + 3x - 10$.

What are the solutions to her inequality?



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A26

$$4 \times 12 + 3 = 51$$

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BEYOND

A25

$$\frac{(x - 2)}{(x + 5)}$$

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BEYOND

A28

Alex has not used the order of operations. He should have squared 3 first to get 9, then multiplied this by 2 to get 18.

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A27

$$4n - 3$$

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BEYOND

A30

She should factorise $3x + qx$ to get $x(3 + q)$ then she can divide by $(3 + q)$.

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A29

1. Subtract 5 from both sides to get $x^2 + 5x - 6 = 0$
2. Factorise the quadratic expression to get $(x - 1)(x + 6) = 0$

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A32

$$x < -5 \text{ and } x > 2$$

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A31

$$x \leq 8$$

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Q33

What do the m and c stand for in the equation for a straight line, $y = mx + c$?

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Q34

Give the equation of a line that is parallel to $y = 4x + 5$.

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Q35

A line passes through the point $(0, 2)$ and is perpendicular to the line given by $y = \frac{1}{3}x + 9$. What is the equation of the line?

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Q36

What is the equation to find the gradient of a line passing through two points?

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Q37

Explain how to solve a pair of simultaneous linear equations using the elimination method.

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Q38

List what you know about angles in parallel lines.

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Q39

What are the three things you need to remember when working with bearings?

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Q40

The bearing of A from B is 070° . What is the bearing of B from A?

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A34

$y = 4x + a$, where a is any number not including 5.

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BEYOND

A33

m is the gradient of the line and c is the value of the y -intercept.

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A36

change in y or $\frac{\text{rise}}{\text{run}}$ or $\frac{y_2 - y_1}{x_2 - x_1}$
change in x

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BEYOND

A35

$$y = -3x + 2$$

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BEYOND

A38

Corresponding angles are equal (the ones that look like the letter F).

Alternate angles are equal (the ones that look like the letter Z).

Co-interior/supplementary angles sum to 180° (the ones that look like the letter C).

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A37

1. Make sure the coefficients of either the x or y variables are the same. If not, multiply one or both equations until they are.
2. If the signs of the variable with the same coefficient are the same, subtract the equations. If not, add the equations.
3. Solve this equation.
4. Substitute the answer back into one of the original equations and solve this to find the other variable.

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A40

There is always a difference of 180° in "reverse bearings".

$$70 + 180 = 250^\circ$$

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A39

1. Measure from the North line.
2. Measure in a clockwise direction.
3. Use 3 digits, e.g. 83° would be 083° .

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Q41

What is the formula to calculate the sum of the interior angles (in degrees) in an n -sided polygon?

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Q42

What is the sum of the exterior angles of a polygon?

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Q43

What is a bisector?

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Q44

What is the formula for the area of a trapezium?

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Q45

State the formulae for the area and circumference of a circle.

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Q46

State the formulae for the arc length and area of a sector with an angle of θ° .

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Q47

What is the formula for the volume of a prism?

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BEYOND

Q48

How could you use Pythagoras' theorem to prove that a triangle with dimensions 6cm, 8cm and 10cm is right-angled?

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A42

$$360^\circ$$

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BEYOND

A41

$$180(n - 2)$$

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BEYOND

A44

$\frac{1}{2}(a + b)h$ where a and b are the lengths of the parallel sides and h is the height between them.

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A43

A bisector is a line that cuts another line or an angle in half. We construct bisectors using a ruler and a pair of compasses (and a pencil).

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A46

$$\text{Arc length} = \frac{\theta}{360} \times \pi d \text{ or } \frac{\theta}{360} \times 2\pi r$$

$$\text{Area} = \frac{\theta}{360} \times \pi r^2$$

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BEYOND

A45

$$\text{Area} = \pi r^2$$

$$\text{Circumference} = \pi d \text{ or } 2\pi r$$

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BEYOND

A48

Find the sum of the squares of the smaller sides.

$$6^2 + 8^2 = 100$$

Square the remaining side.

$$10^2 = 100$$

Since these are equal, this triangle satisfies Pythagoras' theorem and must be right-angled.

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A47

$$\text{Volume} = \text{area of cross-section} \times \text{length}$$

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BEYOND

Q49

What are the three trigonometric ratios?

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BEYOND

Q50

Rearrange the equation for the cosine rule to make $\cos\theta$ the subject:

$$a^2 = b^2 + c^2 - 2bc\cos\theta$$

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Q51

State the values of:

- a. $\sin 60^\circ$
- b. $\cos 45^\circ$
- c. $\tan 30^\circ$

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Q52

What is the formula for the volume of a cone?

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BEYOND

Q53

A shape has been translated by a vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$. What does this look like?

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Q54

List the three things you need to include when describing a rotation.

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BEYOND

Q55

What does a negative scale factor for enlargement look like?

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Q56

Two cylinders, A and B, are similar. The radius of cylinder A is 8cm. The radius of cylinder B is 16cm. The volume of cylinder A is 12cm^3 . What is the volume of cylinder B?

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A50

$$\cos\theta = \frac{b^2 + c^2 - a^2}{2bc}$$

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A49

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

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A52

$$V = \frac{1}{3}\pi r^2 h$$

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BEYOND

A51

a. $\frac{\sqrt{3}}{2}$

b. $\frac{\sqrt{2}}{2}$

c. $\frac{\sqrt{3}}{3}$ or $\frac{1}{\sqrt{3}}$

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A54

1. centre of rotation
2. angle
3. direction

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A53

The shape slides 3 units right
and 2 units up.

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A56

Length scale factor = $\frac{16}{8} = 2$
 Volume scale factor = $2^3 = 8$
 Volume B = $8 \times 12 = 96\text{cm}^3$

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BEYOND

A55

The enlargement appears on
the other side of the centre of
enlargement.

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BEYOND

Q57 The diagram shows a circle with a triangle inscribed in it. Angle $CAB = 32^\circ$ and angle $ABC = 48^\circ$. Is AB the diameter of the circle? Explain your answer.

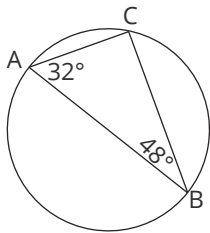


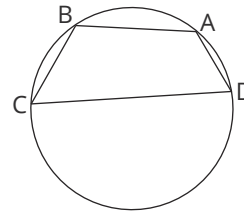
Diagram NOT accurately drawn

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BEYOND

Q58

Which circle theorem can be applied to this diagram?

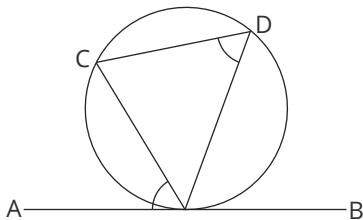


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BEYOND

Q59

Which circle theorem can be applied to this diagram?



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BEYOND

Q60

What is the trigonometric formula for the area of a triangle?

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BEYOND

Q61

Write as a single vector:

$$\begin{pmatrix} 1 \\ 5 \end{pmatrix} - 3\begin{pmatrix} 2 \\ -2 \end{pmatrix}$$

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Q62

What does the area between a speed-time graph and the x -axis represent?

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Q63

A car travels at 45mph for 20 minutes. What calculation would you perform to find the distance travelled in miles?

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Q64

The mass of a block is 100g and its volume is 25cm^3 . What is its density? Give the units to your answer.

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A58

Opposite angles in a cyclic quadrilateral sum to 180° .

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BEYOND

A57

Angles in a triangle add to 180° .
 Angle $ACB = 180 - (32 + 48) = 100^\circ$
 No, angles in a semi-circle are 90° and $90 \neq 100$ so AB is not the diameter of the circle.

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BEYOND

A60

$$\frac{1}{2}absinC$$

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BEYOND

A59

Alternate segment theorem

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BEYOND

A62

The distance travelled.

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BEYOND

A61

$$\begin{pmatrix} -5 \\ 11 \end{pmatrix}$$

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BEYOND

A64

$$\text{Density} = \frac{100}{25} = 4\text{g/cm}^3$$

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BEYOND

A63

$$\text{Distance} = 45 \times \frac{1}{3} = 15 \text{ miles}$$

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Q65

What is the formula for pressure?

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Q66

List the four criteria for proving congruency in triangles.

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Q67

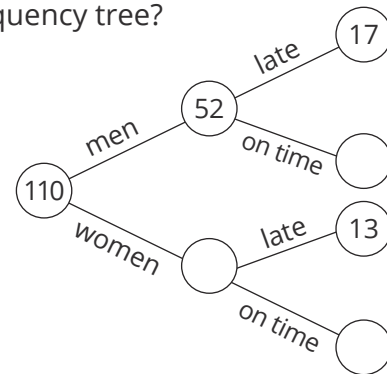
What does it mean for a point to be invariant under a transformation?

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Q68

What are the missing numbers in this frequency tree?



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BEYOND

Q69

What kind of data is a two-way table used to present?

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Q70

List the steps required to draw a pie chart.

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Q71

What are the types of correlation that can be represented in a scatter graph?

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Q72

What is the formula for frequency density?

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A66

SSS, ASA, SAS, RHS

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BEYOND

A65

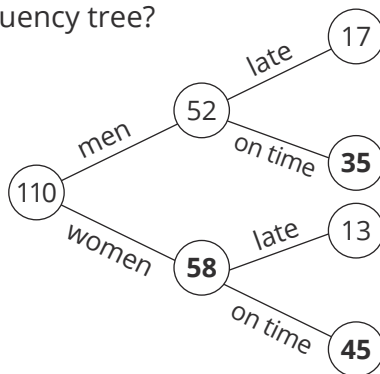
$$\text{Pressure} = \frac{\text{force}}{\text{area}}$$

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A68

What are the missing numbers in this frequency tree?



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A67

The point remains unchanged after the transformation.

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A70

1. Find the total frequency.
2. Divide 360 by this number.
3. Multiply each frequency by this new number.
4. Draw each angle carefully and label each sector.

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A69

Bivariate data – data that uses two variables.

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A72

$$\text{Frequency density} = \frac{\text{frequency}}{\text{class width}}$$

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A71

Positive correlation – as one variable increases, so does the other.

Negative correlation – as one variable decreases, the other increases.

No correlation – there is no clear relationship between the variables.

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Q73

How can you quickly calculate the frequency from a bar on a histogram?

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Q74

How do you plot the x -coordinates when drawing a frequency polygon?

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Q75

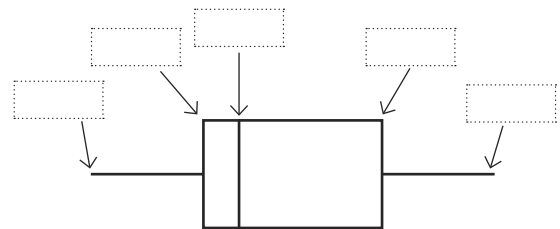
How do you plot the x -coordinates when drawing a cumulative frequency graph?

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Q76

Label the box plot diagram.



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Q77

How do you calculate an estimate for the mean from this frequency table?

Age, x , years	Frequency
$0 \leq x < 10$	3
$10 \leq x < 20$	4
$20 \leq x < 30$	7
$30 \leq x < 40$	1

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Q78

In probability, what is the AND rule for independent events?

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Q79

What does $P(A \cup B)$ mean?

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Q80

What does it mean for two events to be mutually exclusive?

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A74

Use the midpoint of each interval.

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BEYOND

A73

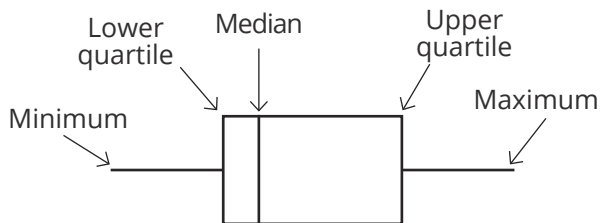
Work out its area.

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A76

Label the box plot diagram.



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A75

Use the end point of each interval.

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A78

$$P(A \text{ and } B) = P(A) \times P(B)$$

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A77

Find the midpoints of the intervals.

Multiply these values by the frequency to calculate fx .

Divide the sum of these values by the total frequency: $\frac{\sum fx}{\sum f}$

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A80

The events cannot occur at the same time.

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A79

The probability of (A union B), which is the probability of A, or B, or both occurring.

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Q81

A circle has equation $x^2 + y^2 = 4$.
Describe the circle.

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Q82

State the equation of a line whose
gradient is -2 and which passes
through (0, 3).

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Q83

What does $P(A \cap B)$ mean?

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Q84

What does $P(A')$ mean?

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Q85

If two lines are perpendicular,
what can we say about their
gradients?

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Q86

$f(x) = 4x$ and $g(x) = x + 5$.
What is $fg(x)$?

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Q87

List the steps for finding the
inverse $f^{-1}(x)$ of a function $f(x)$.

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Q88

Fill in the gaps:

To sketch the graph of $y = x^2 + 5x + 4$, begin by
factorising the expression $x^2 + 5x + 4$ to get the
following:

$$y = (x + 4)(x + 1)$$

Solving $(x + 4)(x + 1) = 0$ gives $x = -4$ and $x = -1$
which are the _____ of the graph.

The graph passes through the y -axis at _____.

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A82

$$y = -2x + 3$$

A81

A circle, centred at $(0, 0)$, with a radius of $\sqrt{4} = 2$ units.

A84

The complement of A. It's the probability of A not occurring.

A83

The probability of (A intersection B), which is the probability of A and B occurring. In a Venn diagram, it represents the overlap.

A86

$$\begin{aligned} fg(x) &= f(g(x)) \\ &= f(x + 5) \\ &= 4(x + 5) \\ &= 4x + 20 \end{aligned}$$

A85

The product of the gradients is -1 (when we multiply them together, we get -1).

Alternatively, the gradients will be the "negative reciprocal" of one another.

A88

Solving $(x + 4)(x + 1) = 0$ gives $x = -4$ and $x = -1$ which are the **x-intercepts** of the graph.

The graph passes through the y-axis at **4**.

A87

Write the equation as $y = f(x)$.

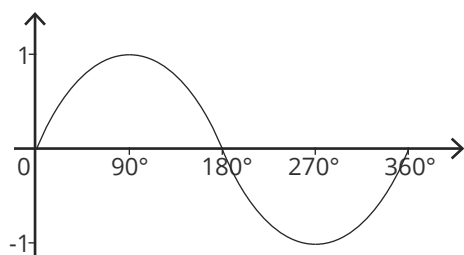
Switch the y and the x .

Make y the subject.

This equation is now the inverse function.

Q89

Which trigonometric equation does this graph represent?



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Q90

What are the x - and y -intercepts of the graph of $y = \cos(x)$ for $0 \leq x \leq 360^\circ$?

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Q91

The graph of $y = 2^x$ passes through the y -axis at _____

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Q92

Use algebra to describe the following:

- An even number
- An odd number
- Three consecutive integers
- A multiple of 5

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Q93

What is the quadratic formula for an equation of the form $ax^2 + bx + c = 0$?

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Q94

A quadratic equation in completed square form is $y = (x - 3)^2 + 2$. What is the coordinate of the turning point of its graph?

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Q95

Describe the transformation that maps the graph of $y = f(x)$ onto the graph of $y = f(x + 1)$.

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Q96

Describe the transformation that maps the graph of $y = f(x)$ onto the graph of $y = f(x) + 3$.

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A90

y -intercept = 1
 x -intercepts = 90° and 270°

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A89

$$y = \sin(x)$$

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A92

- An even number is $2n$
- An odd number is $2n + 1$
- Three consecutive integers are n , $n + 1$ and $n + 2$
- A multiple of 5 is $5n$

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A91

1

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A94

(3, 2)

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A93

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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A96

A translation by $\begin{pmatrix} 0 \\ 3 \end{pmatrix}$.

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A95

A translation by $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$.

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Q97

An iterative formula is given as

$$x_{(n+1)} = \frac{2}{x_n} - 8.$$

If $x_0 = 3$, explain how you would calculate x_1 .

A97

Substitute $x_0 = 3$ into the formula:

$$x_1 = \frac{2}{3} - 8$$