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Final Push Maths 3

Foundation Paper Revision

Answers

NUMBER OPERATIONS: LONG MULTIPLICATION AND LONG DIVISION

1 17.834×69.7

1243.0298

$$\begin{array}{r}
 17.834 \\
 \times 69.7 \\
 \hline
 124838 \\
 1605060 \\
 10702400 \\
 \hline
 12430298
 \end{array}$$

- ① Ignore the decimal points.
- ② Perform multiplication as normal remembering the place holders.
- ③ Count the number of digits to the right of the decimal points in the question.
- ④ Count those same digits out from the right in the answer.

2 14.8×0.035

$$\begin{array}{r}
 0.035 \\
 \times 14.8 \\
 \hline
 02840 \\
 01400 \\
 003500 \\
 \hline
 00.5180
 \end{array}
 = 0.518$$

3 $1951.6 \div 82 = 23.8$

$\div \times \downarrow$

$$\begin{array}{r}
 23.8 \\
 82 \overline{) 1951.6} \\
 \underline{-164} \\
 311 \\
 \underline{-246} \\
 656 \\
 \underline{-656} \\
 0
 \end{array}$$

1	82	6	492
2	164	7	574
3	246	8	656
4	328	9	738
5	410	10	820

Division: write the times table of the divisor

4 $31156.4 \div 73$

$$\begin{array}{r}
 426.8 \\
 73 \overline{) 31156.4} \\
 \underline{-292} \\
 195 \\
 \underline{-146} \\
 486 \\
 \underline{438} \\
 584 \\
 \underline{584} \\
 0
 \end{array}$$

1	73
2	146
3	219
4	292
5	365
6	438
7	511
8	584
9	657
10	730



VECTORS

$$1 \quad \mathbf{a} = \begin{pmatrix} 6 \\ -5 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -7 \\ 9 \end{pmatrix}$$

Find the solution to $5\mathbf{a} - 7\mathbf{b}$

$$5\mathbf{a} - 7\mathbf{b} = 5 \begin{pmatrix} 6 \\ -5 \end{pmatrix} - 7 \begin{pmatrix} -7 \\ 9 \end{pmatrix} = \begin{pmatrix} 30 \\ -25 \end{pmatrix} - \begin{pmatrix} -49 \\ 63 \end{pmatrix} = \begin{pmatrix} 79 \\ -88 \end{pmatrix}$$

$$2 \quad \mathbf{a} = \begin{pmatrix} 9 \\ 2 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -4 \\ 9 \end{pmatrix}$$

Find the solution to $3\mathbf{a} - 5\mathbf{b}$

$$3\mathbf{a} - 5\mathbf{b} = 3 \begin{pmatrix} 9 \\ 2 \end{pmatrix} - 5 \begin{pmatrix} -4 \\ 9 \end{pmatrix} = \begin{pmatrix} 27 \\ 6 \end{pmatrix} - \begin{pmatrix} -20 \\ 45 \end{pmatrix} = \begin{pmatrix} 47 \\ -39 \end{pmatrix}$$

$$3 \quad \mathbf{a} = \begin{pmatrix} 7 \\ -4 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}$$

Find the solution to $2\mathbf{a} - 8\mathbf{b}$

$$2\mathbf{a} - 8\mathbf{b} = 2 \begin{pmatrix} 7 \\ -4 \end{pmatrix} - 8 \begin{pmatrix} -3 \\ -2 \end{pmatrix} = \begin{pmatrix} 14 \\ -8 \end{pmatrix} - \begin{pmatrix} -24 \\ -16 \end{pmatrix} = \begin{pmatrix} 38 \\ 8 \end{pmatrix}$$

BEST BUYS

- 1 Barnaby sells 11 chocolate bars for £6.71. Juliet sells 6 chocolate bars for £3.30. Who provides the best value for money?

Barnaby $11 \overline{) 6.71} \begin{array}{r} 0.61 \\ \underline{66} \\ 11 \\ \underline{11} \\ 0 \end{array}$

Juliet $6 \overline{) 3.30} \begin{array}{r} 0.55 \\ \underline{33} \\ 00 \\ \underline{00} \\ 0 \end{array}$

Juliet provides the best value for money.

- 2 Three taxi companies operate in a town. Their prices are as follows:

Cars n Cabs Collection £1.99 27p per mile	ABC Carriages Collection £1.0 29p per mile	Green Taxis Collection £5.00 14p per mile
--	---	--

David wants to travel 17 miles.

Which company offers the cheapest price?

Cabs n Cars

$$\begin{array}{r} 0.27 \\ 17 \times \\ \hline 18^9 \\ 270 \\ \hline 4.59 \\ 3 \end{array}$$

$$\begin{array}{r} 4.59 \\ 1.99 \\ \hline \pounds 6.58 \end{array}$$

ABC

$$\begin{array}{r} 0.29 \\ 17 \times \\ \hline 20^3 \\ 290 \\ \hline 4.93 \end{array}$$

$$\begin{array}{r} 4.93 \\ 1.00^+ \\ \hline 5.93 \end{array}$$

Green Taxis

$$\begin{array}{r} 0.14 \\ 17 \times \\ \hline 9^8 \\ 140 \\ \hline 2.38 \end{array}$$

$$\begin{array}{r} 2.38 \\ 5.00^+ \\ \hline 7.38 \end{array}$$

A bag costs £83 in a shop. Online, the same bag can be purchased for \$125 plus \$11 postage and packaging.

The exchange rate is £1.00 : \$1.51.

Where is the best place to buy the bag?

Online price

$$125 + 11 = 136$$

GB → US price

$$\begin{array}{l} 1.00 : 83 \\ \times 1.51 \downarrow \\ 1.51 \end{array}$$

$$\begin{array}{l} 125 \\ \times 1.51 \\ \hline 125.33 \end{array}$$

$$\begin{array}{r} 1.51 \\ 83 \times \\ \hline 453 \\ 12^0 80 \\ \hline 125^3 33 \end{array}$$

So the UK price is better.

EXPANDING AND FACTORISING

1 Expand $6(7x + 3) = 42x + 18$

$$\begin{array}{r|l} 7x & +3 \\ \hline 6 & 42x + 18 \end{array}$$

2 Expand $7x(3x - 13) = 21x^2 - 91x$

$$\begin{array}{r|l} 3x & -13 \\ \hline 7x & 21x^2 - 91x \end{array}$$

3 Expand and simplify $(6x - 9)(2x - 7) = 12x^2 - 60x + 63$

$$\begin{array}{r|l} 6x & -9 \\ \hline 2x & 12x^2 - 18x \\ \hline -7 & -42x + 63 \end{array}$$

4 Factorise $15x^3 + 27x^2$

$15x^3 \quad \cancel{3} \times 5 \times x \times \cancel{x} \times \cancel{x}$

$27x^2 \quad \cancel{3} \times 3 \times 3 \times \cancel{x} \times \cancel{x}$

$3x^2(5x + 9)$

↑
Common Factors $3 \times x \times x$

5 Factorise $40x^2 - 32x$

$40x^2 \quad \cancel{2} \times \cancel{2} \times \cancel{2} \times 5 \times \cancel{x} \times x$

$32x \quad \cancel{2} \times \cancel{2} \times \cancel{2} \times 2 \times 2 \times \cancel{x}$

Comm. fact. = $2 \times 2 \times 2 \times x$

↗ $8x(5x - 4)$

6 Expand and simplify $5(7x + 2) - 6(5x - 3) = 5x + 28$

$$\begin{array}{r|l} 7x & +2 \\ \hline 5 & 35x + 10 \end{array} \quad \begin{array}{r|l} 5x & -3 \\ \hline 6 & 30x - 18 \end{array}$$

$35x + 10 - 30x + 18 = 5x + 28$

SIMULTANEOUS EQUATIONS

1 Solve for x and y.

$$6x + 5y = 107 \quad \text{---(i)}$$

$$9x - 2y = 37 \quad \text{---(ii)}$$

Multiply (i) $\times 3$, (ii) $\times 2$

$$18x + 15y = 321 \quad \text{---(iii)}$$

$$18x - 4y = 74 \quad \text{---(iv)}$$

Subtract (iii) - (iv)

$$19y = 247$$

$$\therefore y = \frac{247}{19}$$

$$= 13$$

Check in (ii)

$$9x - 2y = 37$$

$$9(7) - 2(13) = 63 - 26 = 37$$

Substitute in (i)

$$6x + 5(13) = 107$$

$$\therefore 6x = 107 - 65$$

$$= 42$$

$$\therefore x = \frac{42}{6}$$

$$= 7$$

2 Solve for w and v.

$$12w + 6v = 12 \quad \text{---(i)}$$

$$8w + 12v = 72 \quad \text{---(ii)}$$

Multiply (i) $\times 2$

$$24w + 12v = 24 \quad \text{---(iii)}$$

Subtract (iii) - (ii)

$$(24w - 8w) + (12v - 12v) = (24 - 72)$$

$$\therefore 16w = -48$$

$$\therefore w = \frac{-48}{16}$$

$$= -3$$

Substitute in (i)

$$12w + 6v = 12$$

$$-36 + 6v = 12$$

$$6v = 12 + 36$$

$$12w + 6v = 12$$

$$8w + 12v = 72$$

$$6v = 48$$

$$\therefore v = \frac{48}{6}$$

$$= 8$$

Check in (ii)

$$8w + 12v = 72$$

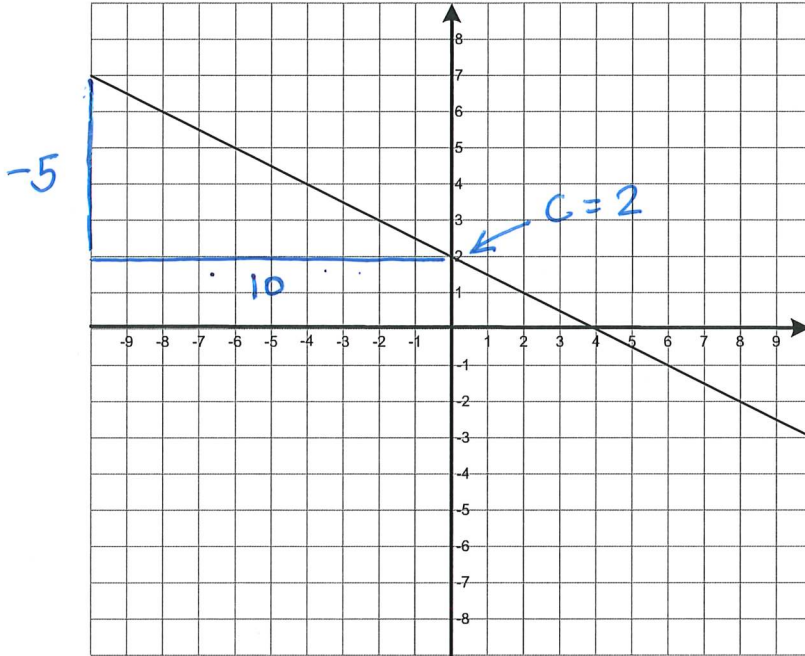
$$8(-3) + 12(8) = 72$$

$$-24 + 96 = 72$$



GRAPHS

- 1 L is a line segment shown on the graph below.
Write down the equation for line L.



$$\begin{aligned}
 m &= \frac{\text{rise}}{\text{run}} \\
 &= \frac{-5}{10} \\
 &= -\frac{1}{2}
 \end{aligned}$$

$$y = mx + c$$

$$\begin{aligned}
 \therefore y &= -\frac{1}{2}x + 2 \\
 &= 2 - \frac{1}{2}x \\
 &= 2 - \frac{x}{2}
 \end{aligned}$$

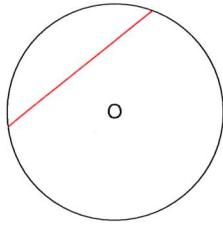
all three of these would get the answer mark.

- 2 Fill the missing values into the table below for the graph $y = x^2 + 2x$ in the range $-3 \leq x \leq 3$.

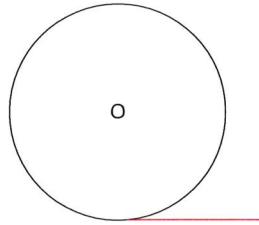
x	-3	-2	-1	0	1	2	3
y	+3	0	0 -1	0	3	8	15
x^2	+9	+4	+1	0	+1	+4	+9
$2x$	-6	-4	-2	0	+2	+4	+6

CIRCLES

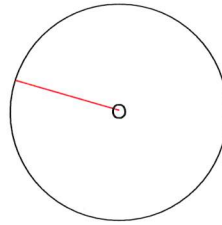
1 Name the lines shown on these circles in red.



chord



tangent



radius

2 The radius of a circle is 18cm. Calculate its circumference. Give an exact answer.

$$C = 2\pi r$$

$$= 2 \times \pi \times 18$$

$$= 36\pi \text{ cm}$$

3 The diameter of a circle is 2.8cm. Calculate its area giving the answer correct to 3 significant figures. Take $\pi = 3.14$.

$$A = \pi r^2$$

$$r = \frac{d}{2}$$

$$= \frac{2.8}{2} = 1.4$$

$$A = \pi \times 1.4 \times 1.4$$

$$= 1.96\pi \text{ cm}^2$$

$$= 6.1544$$

$$\approx 6.15 \text{ cm}^2$$

$$\begin{array}{r} 1.96 \\ \times 3.14 \\ \hline 7824 \\ 1960 \\ 58800 \\ \hline 61544 \end{array}$$

4 What is the area of the shaded section in the diagram below when the ratio of the radius of unshaded to shaded is 3:2?

① $3 + 2 = 5$

$\frac{3}{5} \times 60 = 36 \text{ mm}$

③ Area of inner sector
 $= \pi \times 36 \times 36 \times \frac{38}{360} = \frac{1368\pi}{10}$

② Area of Sector = $\pi \times 60 \times 60 \times \frac{38}{360}$
 $= \frac{10}{360} \pi \times 38$
 $= 380\pi$

④ Area of shaded = $380\pi - 136.8\pi$
 $= 243.2\pi \text{ mm}^2$

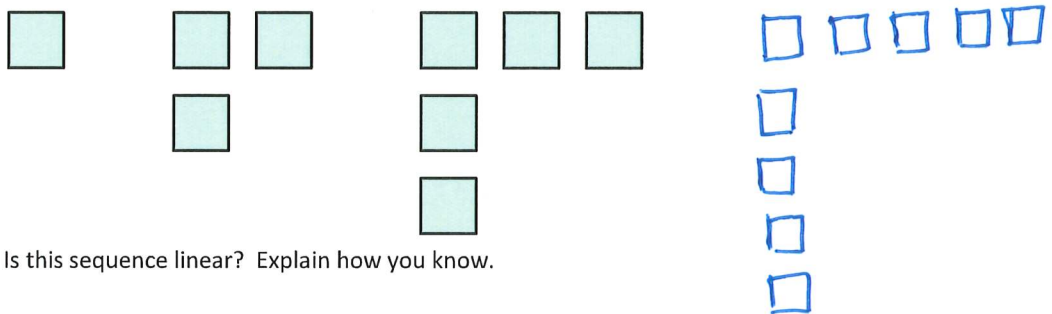
SEQUENCES

1 Below is the start of a sequence. Write the next three terms in the sequence.

1, 5, 25, 125, 625, 3125, 15625

2 Below is a sequence.

a Draw a diagram for the **fifth** term in the sequence.



b Is this sequence linear? Explain how you know.

Yes. The number of blocks increases by 2 each time.

3 $\frac{n-8}{5}$ is the nth term for a sequence.
What is the fortieth term in the sequence?

$$\frac{40-8}{5} = \frac{32}{5} = 6\frac{2}{5} = 6.4$$

4 Below is a linear sequence.

-6, 2, 10, 18, 26

Find the nth term.

$$8n$$

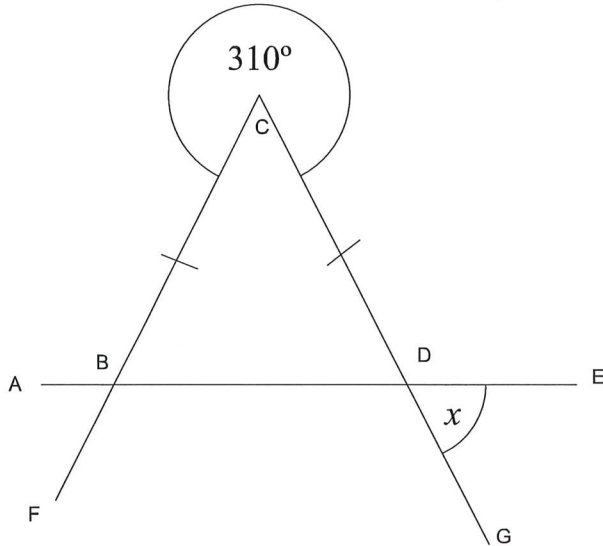
If $n=1$, $8n=8$ but $t_1=-6$

$$8-14=-6$$

So nth term = $8n-14$

GEOMETRY

- 1 AE is a straight line.
BCD is an isosceles triangle.
Find the size of angle x. GIVE REASONS



$$\angle BCD = 360 - 310 = 50^\circ \text{ (Angles about a point total } 360^\circ)$$

$$\angle BDC = \frac{180 - 50}{2} = \frac{130}{2} = 65^\circ \text{ (Base angles in an isosceles triangle are equal; Angles in a triangle total } 180^\circ)$$

$$\angle x = 65^\circ \text{ (Vertically opposite angles are equal)}$$

RATIO

- 1 Bill, Mary and Jacob share 117 sweets in the ratio 6:4:3.
How many sweets does each person get?

$6 + 4 + 3 = 13$ (total parts)
 $117 \div 13 = 9$ (value of 1 part)
 Bill: $6 \times 9 = 54$
 Mary: $4 \times 9 = 36$
 Jacob: $3 \times 9 = 27$

- 2 John, Julie and Joel put some money into a pot. The ratio that they put in is 8:5:7.
Joel puts in £560. How much money is there in total?

$640 + 400 + 560 = \pounds 1600$ in total.
 Joel: $560 \div 7 = 80$ (value of 1 part)
 John: $8 \times 80 = \pounds 640$ Julie: $5 \times 80 = \pounds 400$ Joel: $\pounds 560$

- 3 Beatrice, Ben and Billy play a game. The ratio of scores is 23:17:9. Billy scores 88 fewer points than Ben. How many points does Beatrice score?

No of parts difference: ~~23-17=6~~ ~~23-9=14~~ $17-9=8$
 Value of 1 part: $88 \div 8 = 11$ Beatrice: $23 \times 11 = 253$

- 4 Write the ratios 24:42:72 as fractions in their simplest form.

Common Factor: 6 Denominator = ~~23~~ $12 + 4 + 7 = 23$
 $72 \div 6 = 12$ $24 \div 6 = 4$ $42 \div 6 = 7$ $\frac{4}{23} ; \frac{7}{23} ; \frac{12}{23}$

- 5 Write 10:35 in the form 1:n

$\div 10 \left(\begin{array}{l} 10 : 35 \\ 1 : 3.5 \end{array} \right) \div 10$

- 6 The ratio of sand to cement of a concrete mixture is 5:3. The mixture of sand to gravel is 3:7.
Lilly-May wants to make 600kg of concrete. How much sand, cement and gravel does she need?

	S	C	G	S : C : G	$\frac{600}{59} = 10 \frac{10}{59}$	$15 \times 10 \frac{10}{59} = 152 \frac{32}{59} \text{ kg}$
$\times 3$	5	3	7	15 : 9 : 35	$\frac{600}{59}$	$9 \times 10 \frac{10}{59} = 91 \frac{31}{59}$
$\times 5$	$\frac{3}{15}$	9	35	$15 + 9 + 35 = 59$		$35 \times 10 \frac{10}{59} = 355 \frac{55}{59}$

Charlotte fills a bucket with water. She adds concentrate cleaner so that the ratio of concentrate to water is 2:15. She uses 20% of the mixture cleaning the kitchen floor. There are 2 litres of mixture left in the bucket. How much concentrate did she use?

$\frac{20}{100} \times 2 = \frac{2}{5} \text{ l}$ $100 \times \frac{2000}{80} = 25 \times 100 = 2500 \text{ ml mixture to start with}$

$\frac{2}{2+15} \times 2500 = \frac{2}{17} \times 2500 = \frac{5000}{17} = 294 \frac{2}{17} \text{ ml. Concentrate}$



WRITING EQUATIONS FROM PROBLEMS

Geometry: With these, it might be helpful to draw a diagram. It is essential to write the equation.

- Angle BED is twice the size of angle EDB.
 Angle EBD is 20 degrees greater than BED.
 Angle ABE is three times the size of DBC.
 What is the size of ABE?

$x + 2x + 2x + 20 = 180$ (sum of angles in $\triangle EBD$)
 $5x + 20 = 180$
 $5x = 160$
 $x = 32$
 $4y + 84 = 180$ (sum of angles on a straight line total 180)
 $4y = 96$
 $y = 24$
 $\underline{\underline{L ABE = 72^\circ}}$

Everyday problems

- David thinks of a number. He trebles his number then adds ten. He divides the result by 5 and ends up with 8. What was David's original number?

$$\frac{3x + 10}{5} = 8$$

$$3x + 10 = 40$$

$$3x = 30$$

$$x = 10$$

- Anita is twice as old as Barry. Barry is seven years younger than Charlie. The total of their ages is 65. How old is each person?

$b + 2b + b + 7 = 65$
 $4b = 58$
 $b = 14\frac{1}{2}$

- Harley is twice Lilly-Ella's age. Selina is 6 years younger than Harley. Their total age is 39. How old is each person?

$$2e + e + 2e - 6 = 39$$

$$5e = 45$$

$$e = 9$$

Harley is 18 years old
 Lilly-Ella is 9 years old
 Selina is 12 years old

TWO WAY TABLES AND PROBABILITY

A travel company ran holidays to three different destinations: South Africa, Australia and Brazil.

People could book a single room or a double room.

In a single room, the occupant paid 25% more for the room than each of the occupants in a double room.

Seventeen of the forty-nine people who booked to go to Australia needed a single room.

Altogether, there were forty people staying in double rooms in Brazil.

Nineteen people booked single occupancy in South Africa.

In total, 87 of the 183 people travelling booked a single occupant room.

a Fill in the table below.

	Australia	Brazil	South Africa	Total
Single Room Occupants	17	$87 - (17 + 19)$ 51	19	87
Double Room Occupants	$49 - 17$ 32	40	$43 - 19$ 24	$183 - 87$ 96
Total	49	$51 + 40$ 91	$19 + 24$ 43	183

b The cost for a pair of travellers sharing a room in South Africa was £200 per night. How much money did the travel company need to collect from all the single room occupants in South Africa per night?

$$200 \div 2 = 100$$

$$100 + 25\% = 100 \times 1.25 = 125$$

$$19 \times 125 = \text{£}2375$$

c Giving your answer to two decimal places, what percentage of the single travellers stayed in Brazil?

$$\frac{51}{87} \times 100 = 58.62068966 \approx 58.62\%$$

d The travel company took 15% profit from the total takings. Each person in double occupancy rooms paid the following for their holidays: Australia £2300, Brazil £1750 and South Africa £1800.

How much profit did the company make altogether?

	Double	No.	Single	No.	Takings	Single cost = Double \times 1.25 cost
Australia	2300	32	2875	17	$(2300 \times 32) + (2875 \times 17)$ $= 122,475$	
Brazil	1750	40	2187.50	51	$(1750 \times 40) + (2187.50 \times 51)$ $= 181,562.50$	
South Africa	1800	24	2250	19	$(1800 \times 24) + (2250 \times 19)$ $= 85,950$	

$$\text{Total takings} = 122475 + 181562.50 + 85950 = \text{£}389,987.50$$

$$\text{Travel Co. Profit} = \frac{15}{100} \times 389,987.50 = \text{£}58,498.125$$



INDICES

- 1 What is the value of
- $27^0 \times 9$
- ?

$$x^0 = 1$$

$$27^0 \times 9 = 1 \times 9 = 9$$

- 2 What is
- $m^7 \times 3m^6 \times 4m^1 \times 5m^1$
- ?

$$60m^{7+6+1+1} = 60m^{15}$$

- 3 What is the value of
- $\left(\frac{4}{5}\right)^3$
- ?

$$\frac{4^3}{5^3} = \frac{64}{125}$$

- 4 What is
- $\frac{u^9 \times u^{11}}{u \times u^8 \times u^3}$
- ?

$$u^{9+11-1-8-3} = u^{20-12} = u^8$$

- 5 Write
- $\frac{9 \times 9^{11}}{9^3 \times 9^4}$
- in the form
- 9^n
- where
- n
- is an integer.

$$\frac{9^{12}}{9^7} = 9^5$$

- 6 Write
- $\frac{1024^3 \times 256^7 \times 16^5}{4096^{11} \times 64^{12}}$
- in the form
- 4^n
- where
- n
- is an integer.

$$\frac{(4^5)^3 \times (4^4)^7 \times (4^2)^5}{(4^6)^{11} \times (4^3)^{12}} = \frac{4^{15} \times 4^{28} \times 4^{10}}{4^{66} \times 4^{36}} = \frac{4^{53}}{4^{102}} = \frac{1}{4^{49}} = 4^{-49}$$

PIE CHARTS

- 1 In a school, St James' School of the Arts, students are given the options of studying French, German, Italian or Spanish.

The table below shows how many students study each language.

French	35
German	23
Italian	17
Spanish	15

②

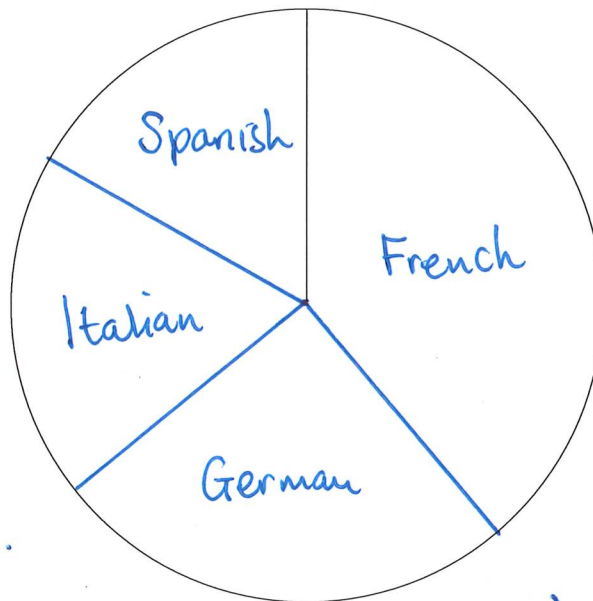
$$35 \times 4 = 140$$

$$23 \times 4 = 92$$

$$17 \times 4 = 68$$

$$15 \times 4 = 60$$

- a Use the circle below to draw a pie chart displaying this information.



①

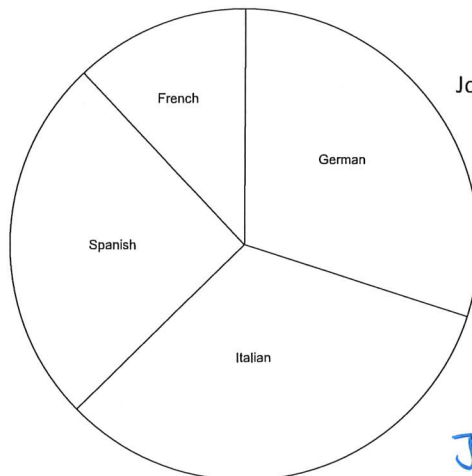
$$35 + 23 + 17 + 15 = 90$$

$$\frac{360}{90} = 4^\circ \text{ each}$$

- b What percentage of students study Spanish?

$$\frac{15}{90} \times 100 = 16\frac{2}{3}\%$$

- c Another school, Rochwell Grammar School, offers the same four subjects.



n = ?

Joanne says that more people study Spanish at Rochwell Grammar School than at St James' School of the Arts.

- d Is Joanne correct? Explain how you know.

We don't know how many people attend Rochwell Grammar School so we can't say whether Joanne is correct or not. Pie charts show relative proportions, not absolute values.

FRACTIONS

- 1 Change $7\frac{9}{16}$ into an improper fraction.

$$\frac{(7 \times 16) + 9}{16} = \frac{121}{16}$$

- 2 Solve and simplify $\frac{15}{18} \times \frac{21}{30} = \frac{1}{6} \times \frac{7}{2} = \frac{7}{12}$

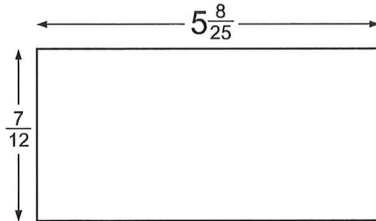
- 3 Solve and simplify $\frac{10}{11} \div 15 = \frac{10}{11} \div \frac{15}{1} = \frac{10}{11} \times \frac{1}{15} = \frac{2}{33}$

- 4 Multiply $6\frac{4}{9} \times 6\frac{3}{8} = \frac{58}{9} \times \frac{51}{8} = \frac{29}{9} \times \frac{51}{4} = \frac{1479}{36} = 41\frac{1}{12}$

- 5 Solve and simplify $\frac{8}{13} + \frac{9}{26} = \frac{16}{26} + \frac{9}{26} = \frac{25}{26}$

- 6 Solve and simplify $9\frac{4}{7} - 8\frac{3}{7} = 1\frac{4}{7} - \frac{3}{7} = 1\frac{1}{7}$

- 7 What is the area of the rectangle below. All dimensions are given in cm.



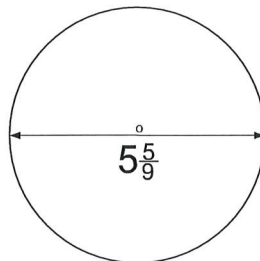
$$5\frac{8}{25} = \frac{133}{25}$$

$$\frac{133}{25} \times \frac{7}{12} = \frac{931}{300} = 3\frac{31}{300} \text{ cm}^2$$

- 8 What is the area of the circle? All dimensions given in cm.

$$5\frac{5}{9} = \frac{(5 \times 9) + 5}{9} = \frac{50}{9} = \text{diameter}$$

$$\text{radius} = \frac{50}{9} \times \frac{1}{2} = \frac{25}{9}$$



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

$$= \pi \times \frac{25}{9} \times \frac{25}{9}$$

$$= \pi \times \frac{625}{81}$$

$$= \frac{625\pi}{81} \text{ cm}^2 \approx 24.24068406 \text{ cm}^2$$

PERCENTAGES AND DECIMALS

1 Write 3½% as a decimal. 0.035

2 Write 0.004 as a percentage. 0.4%

3 Change $\frac{7}{20}$ into a percentage. 35% as $\frac{1}{20} = 5\%$

4 Change $\frac{3}{8}$ into a decimal. 0.375
 $8 \overline{) 3.000}$

5 What is 64% of 400?
 $0.64 \times 400 = 256$

6 Bill, Charlie and Dave try to save money in their savings account. Bill earns £2800 a month and has a ratio of spend: savings of 3:2. Charlie earns £2600 each month and saves $\frac{7}{8}$ ths of this amount. Dave spends 68% of the £3100 that he earns each month. Who saves the most money?

Bill $3+2=5$
 $\frac{2}{5} \times 2800 = 1120$

Charlie
 $\frac{7}{8} \times 2600 = 2275$

Dave
 $100-68=32$
 $0.32 \times 3100 = 992$

Charlie saves the most money.

7 A car was in a sale where you saved 40%. The sale price of the car was £12500. How much was the original price of the car?

$$100 - 40 = 60$$

$$12500 \div 60 = 208\frac{1}{3} \text{ (one percent)}$$

$$208.3333 \times 100 = \pounds 20833.33$$

8 Gabriella puts £2500 into her savings account and leaves it there for ~~three~~ ^{four} years. Her bank account pays 4.2% compound interest per annum. How much money is in her bank account at the end of the four years?

$$2500 \times 1.042^4 = \pounds 2947.21 \text{ (to the nearest penny)}$$

9 Round 201.952 to three significant figures.

202

10 Round 162.9576 to two decimal places.

162.96

FACTORS, MULTIPLES AND PRIMES

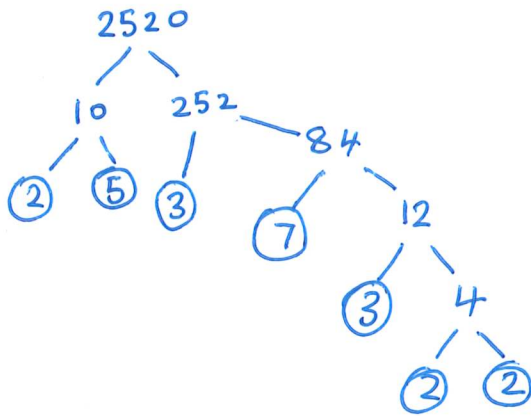
- 1 A rectangle has a perimeter of 32cm. Each length of each side is an integer.
 a. How many different sized rectangles can be made with these parameters?

$1 \times 15, 2 \times 14, 3 \times 13, 4 \times 12, 5 \times 11, 6 \times 10, 7 \times 9, 8 \times 8$
 8 different rectangles.

- b. What is the range in the area of the rectangles?

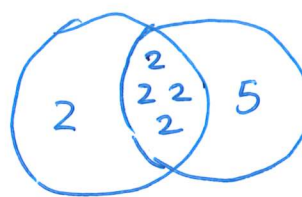
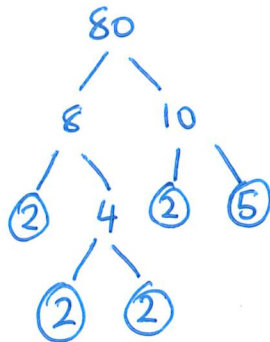
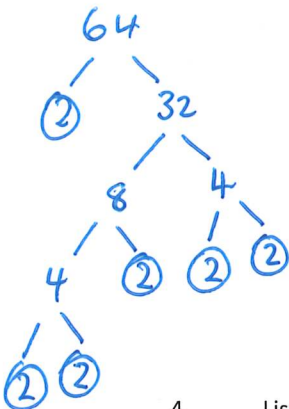
$1 \times 15 = 15 \text{ cm}^2$
 $8 \times 8 = 64 \text{ cm}^2$
 $64 - 15 = 49$ range = 49 cm^2

- 2 Write 2520 as a product of its prime factors.



$2520 = 2^3 \times 3^2 \times 5 \times 7$

- 3 Sophie and Mary both drive buses. When they can, they like to share their breaks. On Wednesday, Sophie's bus takes a round trip that takes 64 minutes. Mary's bus takes a round trip that takes 80 minutes. If they both start work and their first bus sets off at precisely 6am, what time would they be both back at the station when they could meet up again?



8:40 am

$LCM = 2 \times 2 \times 2 \times 2 \times 2 \times 5 = 160$

$160 \div 60 = 2 \text{ h } 40 \text{ mins}$

- 4 List all the factors of 128 that are greater than 20.

$1 \times 128, 2 \times 64, 4 \times 32, 8 \times 16$
 So factors > 20 are $\{32, 64, 128\}$

RECIPES

Charlotte loves baking. She wants to make some buns for a cake stall. She needs to make **50 buns** altogether.

Recipe for Chocolate Cupcakes with Buttercream (Serves 10)	
175g unsalted butter, softened	x5
375g caster sugar	
6 medium free-range eggs	
5 tbsp cocoa powder, dissolved in 3 tbsp boiling water	
275g self-raising flour	
280g icing sugar	
3½ tbsp vanilla extract	
2½ tbsp milk	

10
↙
50

Charlotte’s dad is going shopping and Charlotte has asked him to get some ingredients. She has looked and sees that she only needs butter, icing sugar, self-raising flour and cocoa powder.

How much of each ingredient does Charlotte’s dad have to buy?

$$175 \times 5 = 875g$$

$$280 \times 5 = 1400g$$

$$275 \times 5 = 1375g$$

$$5 \times 5 = 25 \text{ tbsp}$$

Butter 875 g
 Icing sugar 1400 g
 Self raising flour 1375 g
 Cocoa Powder 25tbsp

TRIGONOMETRY AND PYTHAGORAS' THEOREM

- 1 ABC is a right-angled triangle. Find the length of the side AC.

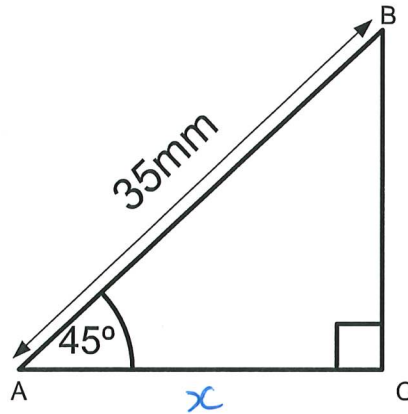
Some Officers Have
Curly Auburn Hair
'Til Old Age

$$\cos 45 = \frac{x}{35}$$

$$\therefore x = 35 \cos 45$$

$$= \frac{35}{\sqrt{2}}$$

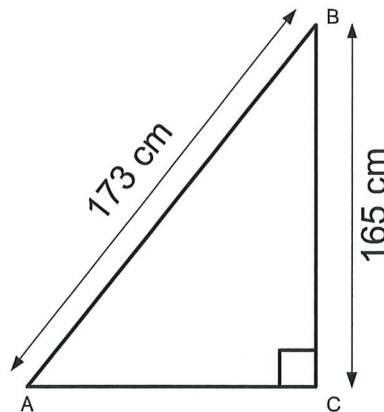
$$\approx 24.74873734 \text{ mm}$$



- 2 ABC is a right angled triangle. What is the length of side AC?

$$AC = \sqrt{173^2 - 165^2}$$

$$= 52 \text{ cm}$$



FREQUENCY TABLES

In a netball competition, the organisers collect data from each hole to see if they have set the scores correctly.

The score for the round is shown in the table below.

Score	Frequency f	Cum. Freq	x Midpoint	fx Midpoint \times frequency
$0 \leq s < 12$	11	11	6	$6 \times 11 = 66$
$12 \leq s < 18$	23	34	15	$15 \times 23 = 345$
$18 \leq s < 25$	17	51	22.5	$17 \times 22.5 = 382.5$
$25 \leq s < 32$	11	62	28.5	$28.5 \times 11 = 313.5$
$32 \leq s < 45$	4	66	38.5	$38.5 \times 4 = 154$

- a What is the modal class?

$$12 \leq s < 18$$

- b In which class interval does the median fall?

$$\frac{66}{2} = 33$$

Even number
so 33rd and 34th
number.

33rd & 34th number are both
within the class

$$12 \leq s < 18$$

- c Calculate an estimate of the mean average points scored.

Calculate midpoint for each class interval thus:

$$18 \leq s < 25 \quad \text{midpoint} = \frac{18+25}{2} = \frac{43}{2} = 22\frac{1}{2}$$

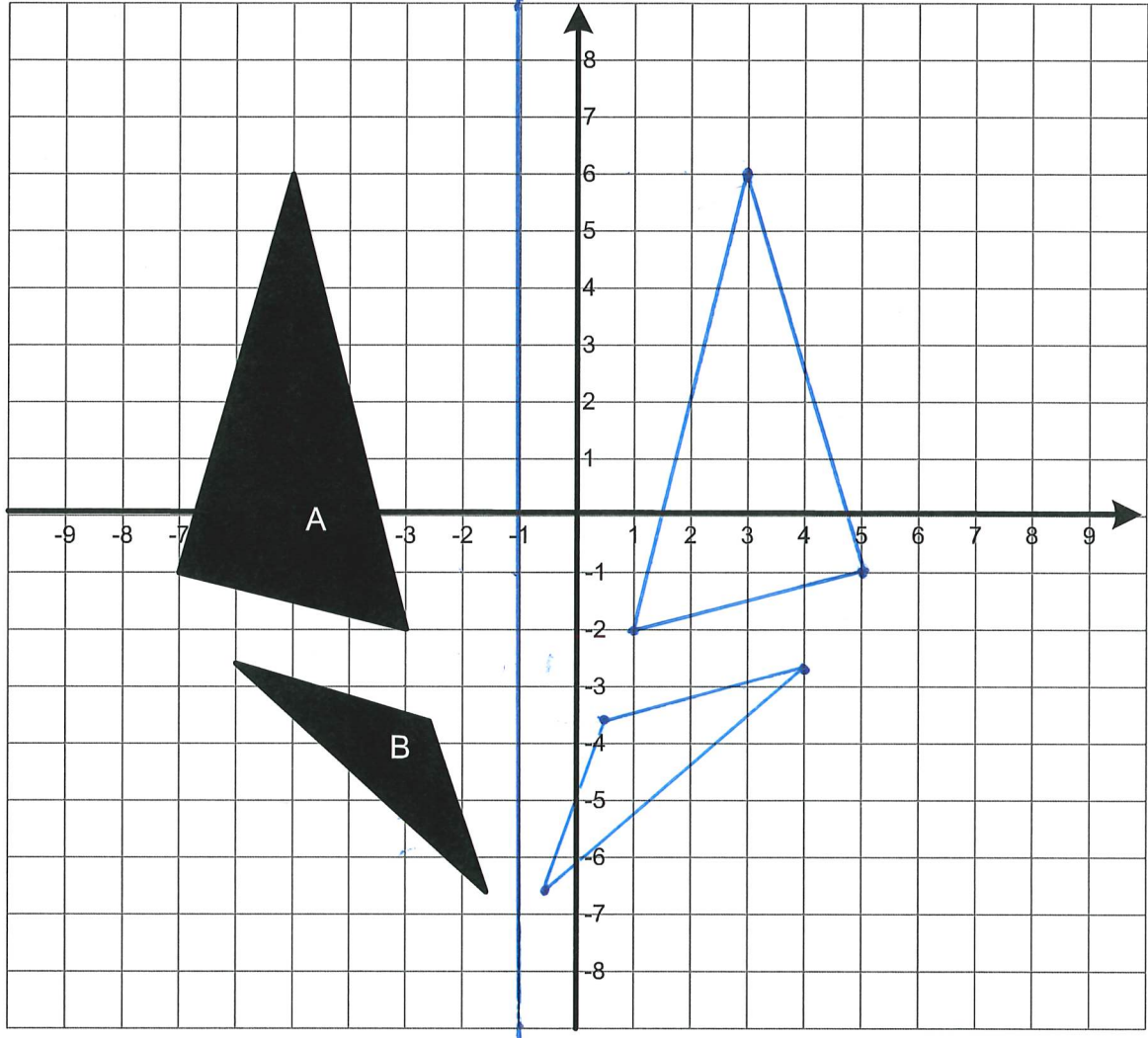
$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{66 + 345 + 382.5 + 313.5 + 154}{66} = \frac{1261}{66} \approx 19.10606\bar{0}6 \approx 19.11$$

make sure you read the question!

REFLECTIONS

Reflect the shapes below in the line $x = -1$.

mirror line



Write down the co-ordinates of the reflection of each triangle.

A $(3, 6), (1, -2), (5, -1)$

B $(\frac{1}{2}, -3\frac{1}{2}), (4, -2.75), (-\frac{1}{2}, -6\frac{1}{2})$

$0.75 = \frac{3}{4}$ $0.5 = \frac{1}{2}$

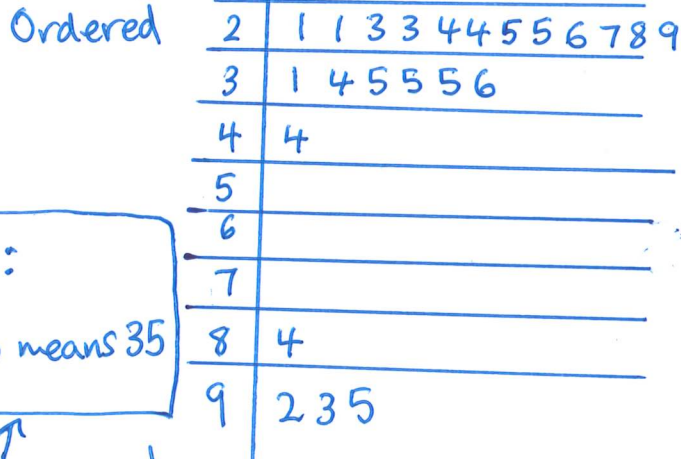
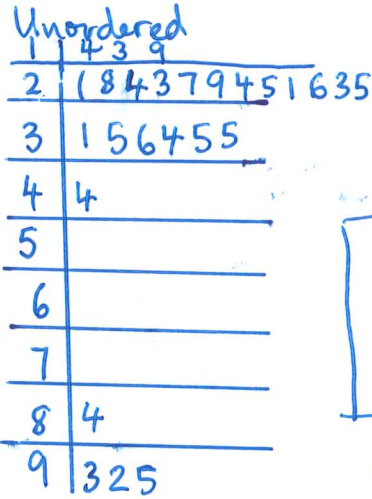
So if you have decimal or fractional equivalents, that is fine.

STEM AND LEAF DIAGRAMS

Below is data representing the amount of money different people collected for a charity.

93 31 21 28 44 14 24 23 27 29 24 25 92
 35 21 36 26 23 13 19 34 35 35 95 25 84

1 Put this information into a stem and leaf diagram.



Key:
 3 | 5 means 35
 ↑
 Don't forget!

2 What is the range of the amount of money collected by each participant?

$$95 - 13 = 82$$

3 What is the median of the data that has been collected?

$$\frac{27 + 28}{2} = 27.5 \quad (\text{13th \& 14th numbers})$$

4 Is there a mode and if so, what is it?

The mode is 35 as there are 3 of them.

LINEAR EQUATIONS WITH FRACTIONS

Solve each of these equations giving your answers as mixed numbers or fractions.

$$\begin{aligned}
 1 \quad 9x - 5 &= 13 & 9x &= 13 + 5 \\
 & & &= 18 \\
 & \Rightarrow x &= \frac{18}{9} \\
 & & &= 2
 \end{aligned}$$

$$\begin{aligned}
 2 \quad 7x + 2 &= 30 \\
 7x &= 30 - 2 \\
 &= 28 \\
 \Rightarrow x &= \frac{28}{7} \\
 &= 4
 \end{aligned}$$

$$\begin{aligned}
 3 \quad \frac{x}{5} + x &= 12 & \frac{x}{5} &= 12 - x \\
 & \Rightarrow x &= 5(12 - x) \\
 & &= 60 - 5x \\
 & \Rightarrow x + 5x &= 60 \\
 & 6x &= 60 \\
 & x &= \frac{60}{6} = 10
 \end{aligned}$$

$$\begin{aligned}
 4 \quad 5x + 51 &= 8x - 39 \\
 5x + 51 + 39 &= 8x \\
 5x + 90 &= 8x \\
 90 &= 8x - 5x \\
 90 &= 3x \\
 \therefore x &= \frac{90}{3} \\
 &= 30
 \end{aligned}$$