

TECHNIQUE TYPE TWENTY-FOUR

This is the first of 7 types of mathematical reasoning questions.

Within this section, three different Kinds can be identified. I shall explain each Kind separately. It is essential you read each Kind of question carefully, and if you are able, work out each part as you go along.

TYPE 24.1:

Example:

What is the number when:
8 is 2 smaller than half this number?
10

Technique:

- As you read the question, stop at the word 'than' and consider your answer –
Carry on 8 is 2 smaller than (10)
 half this number.
- If 10 is half the number - then we must DOUBLE it.
Answer: 20

Example:

What is the number when:
14 is 6 larger than twice this number?

Technique:

- 14 is 6 larger than (8)
 twice this number.
- If 8 is twice the number - then we must HALVE it.
Answer: 4

Example:

What is the number when:
15 is 2 more than half this number?

Technique:

- 15 is 2 more than..... (13)
 half this number.
- If 13 is half the number - then we must DOUBLE it.
Answer: 26

TYPE 24.2:**Example:**

4 is 8 times smaller than this number.

Technique:

1. 4 is SMALLER - 8 times smaller - so the answer is going to be LARGER - 8 times larger.
2. Here we must MULTIPLY.
3. $8 \times 4 = 32$
Answer: 32

Example:

10 is 2 times larger than this number.

Technique:

1. 10 is LARGER - 2 times larger - so the answer is going to be SMALLER - 2 times smaller.
2. Here we DIVIDE.
3. $10 \div 2 = 5$
Answer: 5

3 lar

You are allowed 30 seconds per question.

Now turn to the next page for Practice of Types 24.1 and 24.2.

PRACTICE TYPE TWENTY-FOUR

Read the following questions which are concerned with numbers and write your answers in the brackets.

24.1: Remember: Do these in 2 parts - stop at the 'than'

- 15 is 3 more than half this number (24) ✓
- 9 is 4 more than half this number (10) ✓
- 18 is 4 less than twice this number (11) ✓
- 36 is 8 more than twice this number (14) ✓
- 45 is 9 less than six times this number (9)
- 23 is 7 less than three times this number (10)
- 24 is 6 less than six times this number (5)
- 6 is 6 less than twice this number (6)
- 14 is 10 less than half this number (24) × 48
- 4 is 11 less than half this number (30)

**24.2: Remember: If it is smaller make it larger - multiply
If it is larger make it smaller - divide**

- 6 is 5 times smaller than this number (30)
- 8 is 7 times smaller than this number (56)
- 200 is 20 times larger than this number (10)
- If this number is made 6 times larger the answer is 42 (7)
- 8 is 20 times smaller than this number ()
- 14 is 7 times bigger than this number ()
- 4 is 9 times smaller than this number ()
- 250 is 10 times larger than this number ()
- 150 is 3 times larger than this number ()
- 9 is 3 times smaller than this number (27)

TYPE 24.3:

Example:

If I add 2 to this number and then another 2 I get 12.
What is the number?

wh
wh
wh

Technique:

1. Sometimes it is an idea to draw a little sketch to sort out your ideas:



2. To get back to the number I want (A), I must reverse the operations. Here, I must subtract 2 and then another 2 (total 4). This takes me back to 8. So A = 8

w
blue
red

3. Always check your answer:

Does $8 + 2 + 2 = 12$?

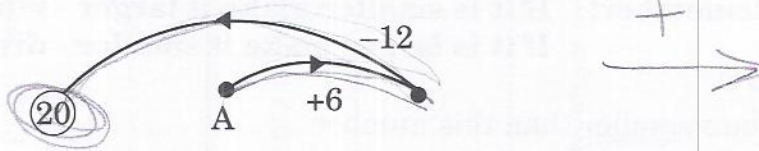
$$\begin{array}{r} 8 \\ +6 \\ \hline 14 \\ -2 \\ \hline 12 \end{array} = 12$$

Example:

If I add 6 and subtract 12 from this number the answer is 20.
What is the number?

Technique:

Draw a sketch:



* When the two operations ADDITION and SUBTRACTION are involved in one question, there are TWO methods of solving the problem.

Method ONE:

1. Start at 20 and reverse the operations.

20	add	12	=	32	
32	minus	6	=	26	So A = 26
2. Check: Does $26 + 6 - 12 = 20$?

Method TWO:

1. Find the DIFFERENCE between 12 and 6. This means SUBTRACT 6 from 12. Answer: 6

- Reverse the sign of the LARGER of the two numbers.
Here, 12 is larger than 6. It was MINUS 12.
Change the minus to a PLUS, and place it in front of the 6.

- Add 6 then to the answer given - here, 20.

$$20 \quad \text{add} \quad 6 \quad = \quad 26 \quad A = 26$$

- Check: Does $26 + 6 - 12 = 20$?

* Try both the Methods to see with which one you feel most proficient.

NOTE:

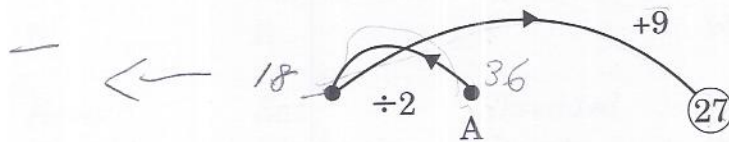
Only Method ONE can be used in examples which involve the operations of division and multiplication, such as in the two Examples below.

Example:

If we half this number and add 9 the answer is 27.
What is the number?

Technique:

- Draw a sketch of the information.



- Start at 27 (the answer) and reverse the operations:

$$\begin{array}{rclcl} 27 & - & 9 & = & 18 \\ 18 & \times & 2 & = & 36 \quad A = 36 \end{array}$$

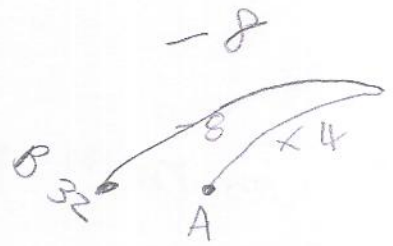
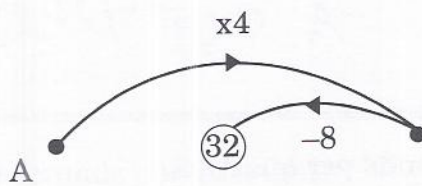
- Check: Does $36 \div 2 + 9 = 27$?

Example:

If I times this number by 4 and then subtract 8 the answer is 32. What is the number?

Technique:

- Draw a sketch of the information.



2. Start at 32 (the answer) and reverse the operations:

$$\begin{array}{r} 32 + 8 = 40 \\ 40 \div 4 = 10 \quad A = 10 \end{array}$$

3. Check: Does $10 \times 4 - 8 = 32$?

NOTE:

Know how many there are in:

- a. a century
- b. a decade
- c. a dozen
- d. days in a week
- e. days in each month
- f. months in a year

Many of these quantities are used in these questions.
Revise and become quick and efficient in your Times-Tables.

$$\begin{array}{r} 19 - 11 = 7 \\ \underline{11} \\ 8 + 7 = 15 \end{array}$$

$$11 - 7 = 4$$

$$50 - 13$$

④ -30: Sept Apr June Nov

→ 31: J m m Jul A Oct Dec

① (28 Feb
29 leap

31 Jan m m Jul A Oct Dec

You are allowed 30 seconds per question.

Now turn to the next page for Practice of Type 24.3.

PRACTICE TYPE TWENTY-FOUR

18

TYPE 24.3:

- If we halve it and add 6 the answer is 24 (36)
- If we add 7 and subtract 3 the answer is 18 (14)
- If we add 5 to this number and then another 7 the answer is 24 (12)
- If we subtract 9 from this number and then add 11 the answer is 16 ... (14)
- If we add 5 and then another 8 the answer is 20..... (7)
- If we add 8 and subtract 3 the answer is 17..... (12)
- If we subtract 6 and add 3 we get 17 (20)
- If we subtract 2 and then another 8 we get 31..... (41)
- If we add 6 and subtract 5 from this number the answer is 13 (12)
- If we subtract 7 and add 11 the answer is 19 (~~23~~)
- This number is 13 less than half a century (37)
- If we multiply this number by the number of days in a week the answer is 63. (9)
- If we add this number to half the number of days in June the answer is 31. (16)
- Halve the number of months in a year and multiply by half the number of years in a decade. (30)
- If we add this number to two dozen we get 35..... (11)
- If we multiply this number by the number of sides of a pentagon the answer is 45 (9)
- If we add this number to the number of days in August the answer is 42. (11)
- Half this number added to half a dozen is 14 (~~14~~)
- If we add the number of sides of a hexagon to half this number the answer is 11 (10)
- Half the number of days in April subtracted from this number is 45 (~~30~~)

* Revise and learn any words you are not too sure about.

TECHNIQUE TYPE TWENTY-FIVE

For each of the following questions you must choose numbers from those on the left-hand side and place them between the signs in the brackets on the right-hand side to make the answer given. Each number can be used only ONCE.

There are TWO methods for solving these problems.

Method ONE:

Working from the FRONT of the brackets.

Technique:

AS A GENERAL RULE:

1. If the operations in the brackets include a SUBTRACTION or a DIVISION, you should begin with a fairly large number as in both cases you are going to reduce this number and so make it smaller.
2. If the operations in the brackets include an ADDITION or a MULTIPLICATION, you should begin with a small number as in both cases you are going to add on, or multiply this number and so make it larger.
3. In both cases, once you have chosen your first number you must calculate what other numbers are needed to achieve the answer you require.

Let us look at four Examples using **Method ONE**.

Example One:

$$4 \quad 6 \quad 7 \quad 10 \quad 20 \quad : \quad 7 \quad = \quad (\quad - \quad - \quad)$$

Technique:

Here, you can be certain to start with 20. If you began with 10 (the only other large number) it would be impossible, as you need to reduce by 3 only (10 - 7) in two operations, to reach the number you require (7).

1. Put 20 into the FRONT of your brackets.

$$7 = (20 - \overset{A}{-})$$

Now ask yourself:

2. What is A?
What do I need to subtract in TOTAL from 20 to achieve 7?

$$(20 - ? = 7) \quad (20 - 13 = 7) \quad A = 13$$

$$42 = (2 \times 21)$$

$$42 - 2 \times 21 = 42$$

$48 \div 12 = 4$

- Look at the choice of digits.
Can I make up a TOTAL of 13 with two of the digits?
(I must ADD these two digits to make 13.)
(6 + 7 = 13)

- Insert and check.
The 7 and 6 can be in any order but you must begin with 20.

(20 - (6 - 7)) ✓ (6 - 20 - 7) ✗

Example Two:

2 3 4 12 48 : 4 = (÷ ÷)

Technique:

Here I must begin with a large number as I am going to reduce.

- Try 48.

4 = (48 ÷ $\overset{A}{\div}$)

Now ask yourself:

- What is A?
By what must I divide 48 in TOTAL to achieve 4?
(48 ÷ ? = 4) (48 ÷ 12 = 4) A = 12

- Are there two digits from those I can choose which will give me a TOTAL of 12?
(I must MULTIPLY these two digits together to give me 12.)
(4 x 3 = 12)

- Insert the digits you choose and check your answer is correct.
The 4 and 3 can be in any order but 48 must be the first digit.

4 = (48 ÷ 4 ÷ 3)

Example Three:

2 3 5 7 11 : 42 = (2 x 3 x 7)

Technique:

Here I must begin with a small number as I am going to make it larger by multiplication.

- Try 2.

42 = (2 x $\overset{A}{x}$)

Now ask yourself:

2. What is A?

By what do I need to multiply the 2 in TOTAL to achieve 42?

$$(2 \times ? = 42) \quad (2 \times 21 = 42) \quad A = 21$$

3. Are there 2 digits from those I can choose which will give me a total of 21 when multiplied together?

$$(3 \times 7 = 21)$$

4. Insert the digits and check your answer is correct.

$$42 = (2 \times 3 \times 7) \quad (\text{ in any order })$$

Example Four:

$$4 \quad 8 \quad 10 \quad 12 \quad 20 \quad : \quad 24 = (\quad + \quad + \quad)$$

Technique:

Operations here involve addition, so begin by testing the smallest number.

1. Try 4.

$$24 = (4 + \overset{A}{+})$$

Now ask yourself:

2. What is A?

What do I need to add to 4 in TOTAL to achieve 24?

$$(4 + ? = 24) \quad (4 + 20 = 24) \quad A = 20$$

3. Which two digits from those I can choose give me 20 when added together?

$$(8 + 12 = 20)$$

4. Insert and check the answer is correct.

$$24 = (4 + 8 + 12) \quad (\text{ in any order })$$

NOTE:

1. If the first number you try does not work, try each number one at a time until you find a combination that achieves the answer you require.

2. Unless it specifies otherwise you must use each number only ONCE.

$$24 = 4 + 20$$

$$4 + 12 + 8$$

Method TWO

Working from the END of the brackets.

Technique:

AS A GENERAL RULE:

ALWAYS begin by putting in the SMALLEST digit at the END of the brackets. If you cannot find a combination which gives you the answer you require, try the next smallest digit. Keep trying until you find the correct combination. Remember here you are ALWAYS working up from the smallest digit.

Example One:

$$3 \quad 5 \quad 7 \quad 10 \quad 13 \quad : \quad 14 = (\quad + \quad - 3)$$

14+3=17

Technique:

- Put in the 3 AT THE END OF THE BRACKET.

$$14 = (\overset{A}{\text{+}} - 3)$$

Now ask yourself:

- What is A?
What TOTAL number must I BEGIN with if I need 14 AFTER I have subtracted 3?

$$(? - 3 = 14) \quad (17 - 3 = 14) \quad A = 17$$

NOTE:

To calculate A, change the sign immediately in front of the digit you have inserted (+ to -, - to +, x to ÷, ÷ to x). Here, change the minus 3 to plus 3 and add to the 14 (the answer you require).

$$(14 + 3 = 17)$$

- Are there two digits from those I can choose which when added together give me a TOTAL of 17?

$$(10 + 7 = 17)$$

- Insert and check.
The 10 and 7 can be in any order but the 3 must follow the minus sign.

$$14 = (10 + 7 - 3)$$

Example Two:

$$2 \quad 3 \quad 4 \quad 5 \quad 6 \quad : \quad \frac{26}{28} = (\quad \times \quad - 2)$$

Technique:

- Test 2 AT THE END OF THE BRACKET.

$$26 = (\overset{A}{\times} - 2)$$

2. What is A? (26 + 2 = 28)

3. Are there two digits in my choice which, when multiplied together give me this total? No.

4. BEGIN AGAIN. Insert the next smallest digit.
Test 3 at the end of the bracket.

$$26 = (\overset{\text{A}}{\text{x}} - 3)$$

5. What is A? (26 + 3 = 29)

6. Are there two digits amongst those I can choose which, when multiplied together give me this total? No.

7. Begin again. Insert the next smallest digit.
Test 4 at the end of the bracket.

$$26 = (\overset{\text{A}}{\text{x}} - 4)$$

8. What is A? (26 + 4 = 30)

9. Are there two digits from those I can choose which when multiplied together give me this total? Yes.

$$(5 \times 6 = 30)$$

10. Insert and check.

The 5 and the 6 can be in any order but the 4 must follow the subtraction sign.

$$26 = (5 \times 6 - 4)$$

This Example has been specifically chosen to show you the worst possible case of this Type of calculation - that the equation does not work out correctly quickly. This is not typical, but is good practice.

NOTE:

Occasionally you are asked to use one number TWICE in the calculation. Either of the two Methods above can be used successfully inserting TWICE the number you choose and from that estimating the third number.

Try both Method One and Method Two to decide which Method you prefer and with which one you feel more proficient. Whichever you choose, practise your Method until you are confident you can answer any one of these calculations in 30 seconds.

You are allowed 30 seconds per question.

Now turn to the next page for Practice of this Type.

$$15 - 9 = 6$$

PRACTICE TYPE TWENTY-FIVE

Choose any three numbers from the left-hand side of the page and place them between the signs in the brackets on the right-hand side of the page to make the number given. Each number can be used only ONCE.

For Example:

4 6 7 10 20 : 7 = (20 - 7 - 6)

Now try these:

$12=3$
 $36=A=3$
 $18=$
 36
 $4 \times 9 = 2 = 18$

3 4 6 20 36 : 3 = (36 ÷ 4 ÷ 3)
~~2~~ 4 5 9 10 : 18 = (8 x ÷ 2)
~~2~~ 4 5 6 8 : 60 = (5 x 6 x 2)
~~4~~ 5 7 21 26 : 12 = (21 - 5 - 4)
 $18=$
 36
 $4 \times 9 = 2 = 18$
~~2~~ 7 21 42 : 2 = (42 ÷ 7 ÷ 3) $\frac{054}{3162}$
~~2~~ 3 4 5 10 : 150 = (10 x 5 x 3)
~~2~~ 3 4 5 6 7 10 : 26 = (5 x 6 - 4)
~~2~~ 3 4 6 8 : 64 = (8 x 4 x 2)
~~6~~ 9 12 21 23 : 6 = (21 - 6 - 9)
~~3~~ 6 9 12 15 : 162 = (9 x 6 x 3)
~~2~~ 3 5 10 21 : 9 = (21 - 10 - 2)
~~3~~ 4 5 8 10 : 5 = (10 - 8 + 3)
~~2~~ 3 4 5 6 : 40 = (4 x 5 x 2)
~~15~~ 23 25 33 35 : 37 = (25 + 35 - 1523)
~~2~~ 3 5 50 60 : 4 = (60 ÷ 5 ÷ 3)

In these you are asked to complete the brackets choosing numbers from the left-hand side to place between the signs in order to make the number given. One of the numbers must be used TWICE.

For Example:

2 3 4 5 9 : 18 = (5 x 3 + 3)

Now try these:

$9=15-$
 $9=$
 $11=A-2$
 $13=A$

$14-5=9$
 $15-3-2=9$
 $24=22$
 $8+2=10=$

~~26~~ ~~13~~
~~2~~ 3 5 10 15 : 9 = (15 - 3 - 3) = 9
~~2~~ 3 4 12 13 : 26 = (12 x + 4)
~~2~~ 3 4 15 20 : 8 = (20 ÷ 2 - 2)
~~2~~ 3 5 7 9 : 6 = (9 ÷ 3 + 3)
~~2~~ 4 6 12 21 : 80 = (21 x 4 - 4)

TECHNIQUE TYPE TWENTY-SIX

These number patterns, sometimes called number series, are a very popular verbal reasoning question and occur frequently on verbal reasoning selection tests. They are calculated in exactly the same way as the letter series except here of course we are dealing with numbers.

You are looking for a pattern in the numbers. Once you have found it you must continue the pattern and write your answer in the brackets (one number per bracket).

Example:



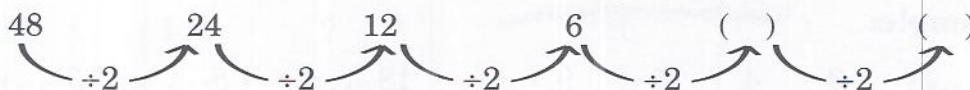
Technique:

1. Ask: How has the 2 become a 1?
Answer: -1 Record -1 on your paper (as above).
2. How has the 1 become a 4?
 $+3$ Record.
3. How has the 4 become a 3?
 -1 Record.
4. How has the 3 become a 6?
 $+3$ Record.
5. Is there a pattern here?
Yes -1 $+3$ -1 $+3$
6. Continue the pattern and insert your answers. Answer: (5) (8)

NOTE:

If the numbers REDUCE QUICKLY try DIVIDING.
 If the numbers INCREASE QUICKLY try MULTIPLYING.
 If the numbers REDUCE GRADUALLY just SUBTRACT.
 If the numbers INCREASE GRADUALLY just ADD.

Example:



Technique:

In this Example you could consider DIVIDING.

1. Ask: How has the 48 become 24?
Answer: -24 OR $\div 2$ Record.
2. How has the 24 become 12?
 -12 OR $\div 2$ Record.

3. How has the 12 become 6?
 -6 OR $\div 2$ Record.

4. Is there a pattern?
 Yes. EITHER -24 -12 -6
 OR $\div 2$ $\div 2$ $\div 2$

5. Complete. Answer: (3) (1.5)

NOTE:

Here, either pattern can be used. This is OFTEN the case, that is, there is no set pattern. As long as you have not made a mistake, either pattern will give you the correct answer.

Now try these Examples:

a. $3 \xrightarrow{\times 2} 6 \xrightarrow{\times 2} 12 \xrightarrow{\times 2} 24 \xrightarrow{\times 2} () \xrightarrow{\times 2} ()$

b. $() \xrightarrow{-3} 3 \xrightarrow{-3} 6 \xrightarrow{-3} 9 \xrightarrow{-3} () \xrightarrow{-3} 15 \xrightarrow{-3} 18 \xrightarrow{-3} 21$

In b the brackets are near to the beginning of the series. Try working backwards from 21 to 18 to 15...

c. $10 \xrightarrow{-11} 8 \xrightarrow{-13} 6 \xrightarrow{-15} () \xrightarrow{-17} ()$

In c try skipping every other digit - 'jump' from 10 to 8 to 6 (descending even numbers), and from -11 to -13 to -15 (ascending negative odd numbers).

d. $81 \quad 64 \quad 49 \quad () \quad 25 \quad ()$

Know your SQUARE NUMBERS. A series of square numbers is often given amongst number patterns. A square number is the result of, or product of, multiplying a number by itself. These are square numbers: 9 (3 x 3), 16 (4 x 4), 25 (5 x 5), 36 (6 x 6) etc. Learn them, so you can recognise this number pattern quickly and so save valuable seconds in an examination.

e. $() \xrightarrow{+4} 5 \xrightarrow{+3} 8 \xrightarrow{+2} 13 \xrightarrow{+1} 20 \xrightarrow{+0} 29 \xrightarrow{-1} ()$

In e ignore the first bracket and work from the 5 forwards. Once you have established the pattern continue 'backwards' to calculate the first bracket.

The answers to the above Examples are:

a. (48) (96) b. (0) (12) c. (4) (-17) d. (36) (16) e. (4) (40)

You are allowed 30 seconds per question.

Now turn to the next page for Practice of this Type.

PRACTICE TYPE TWENTY-SIX

In each of the following number series there is a different connection between the numbers. Find each connection and continue the series placing your answer in the brackets.

For Example:

5 7 10 14 19 (25) (32)

Now try these:

2 4 8 14 (22)

3 6 12 (16) (18)

11 () 10 13 9 14 ()

() 20 23 28 35 44 ()

9 16 25 () 49 64 ()

() 34 36 33 37 32 ()

() 22 26 32 40 ()

400 () 100 50 () 12.5

37 39 36 40 35 () ()

123 234 345 456 () ()

() 26 34 40 44 ()

5 10 30 () 600 ()

3 60 () 24000 480000 9600000

2 8 32 128 ()

31 27 24 () ()

29 38 47 56 () ()

5 7 35 37 () 187

5.0 7.5 15.0 17.5 35 ()

164 82 80 40 38 () ()

35 5 30 6 24 () 16 16

TECHNIQUE TYPE TWENTY-SEVEN

In these calculations you are required to fill in the missing digit marked with an asterisk * .

To do these there are specific techniques.

ADDITION:

Addition is the most simple.

Technique:

1. UNITS - if the ANSWER is SMALLER than the one number you are given, then you must assume the answer to the addition comes to more than 10.

Example:

$$\begin{array}{r} 3 * 7 \\ + * 6 * \\ \hline 8 5 1 \end{array}$$

7 added to * cannot give the answer 1.

The 1 must be part of 11.

If you are aware of this, you will easily see that the * here represents 4.

$$(7 + * = 11) \quad (7 + 4 = 11)$$

But : DO NOT FORGET TO CARRY THE ONE.

If you do, you will get the whole addition wrong!

Put down the 1 to carry.

Fill in the 4.

2. Now work on the same principle as before remembering to add in the 1 you have carried.

$$\begin{array}{r} 3 * 7 \\ + * 6 4 \\ \hline 8 5 1 \\ \hline 1 \end{array}$$

Here, $6 + 1 = 7$. The answer 5 must therefore be part of 15.

The tens * then must be 8, as $7 + 8 = 15$.

DO NOT FORGET TO CARRY THE ONE over to the hundreds column.

Put down the 1 to carry.

Fill in the 8.

3. Hundreds : here the * must represent 4.

$$(4 + * = 8) \quad (4 + 4 = 8)$$

Fill in the 4.

Answer:

$$\begin{array}{r} 387 \\ + 464 \\ \hline 851 \\ \hline 11 \end{array}$$

4. Always check your answer.

NOTE:

If you are getting these simple additions wrong, you are probably forgetting to carry over the 1, or perhaps to count it in. . . . Take care!

SUBTRACTION:

Please study:

$$\begin{array}{r} 12 \\ - 4 \\ \hline 8 \end{array} \qquad \begin{array}{r} 12 \\ \dots\dots\dots \\ - 4 \\ \hline 8 \end{array} \quad \begin{array}{c} \uparrow \\ \text{ADD} \end{array}$$

Here the answer is 8.

If I add the answer 8 to the 4 that was taken away, it will give me 12, the number I began with. In other words, to subtract downwards in these sums is the same as adding upwards, or, if I add the answer to the amount taken away, it will give me the amount I must begin with. We shall use this idea below.

Example:

$$\begin{array}{r} 2 * 6 \\ \dots\dots\dots \\ - 9 * \\ \hline * 4 3 \end{array} \quad \begin{array}{c} \uparrow \\ \text{ADD} \end{array}$$

Technique:

1. Draw a line as I have done.
2. Draw an arrow to remind yourself that you are calculating (adding) upwards.
3. The top line is now the answer to an ADDITION sum.
4. Now ADD UPWARDS.

Beginning with the units,

Say:	3	+	*	=	6	(* = 3. Insert 3.)
	4	+	9	=	*	(* = 13. Insert 3.)
	1	+	*	=	2	Carry the 1 in the usual way.)
						(* = 1 Insert 1.)

Answer:

$$\begin{array}{r}
 236 \\
 - \quad 93 \\
 \hline
 143 \\
 \hline
 1
 \end{array}$$

↑
ADD

5. Always check your answer: Does $236 - 93 = 143$?

NOTE:

Check your answer in the 'normal' way that is, by subtracting downwards.

MULTIPLICATION:

Example:

$$\begin{array}{r}
 * * * \\
 x 3 \\
 \hline
 1026
 \end{array}$$

Technique:

1. Simply DIVIDE the answer by the number you are multiplying (here, 3).

$$\begin{array}{r}
 342 \\
 3 \overline{) 1026}
 \end{array}$$

Answer: 342

2. Check (in the usual way): Does $342 \times 3 = 1026$?

DIVISION:

Example:

$$\begin{array}{r}
 123 \\
 3 \overline{) * * *}
 \end{array}$$

Technique:

1. Here, simply MULTIPLY the answer 123 by the number by which you are dividing (here, 3).

$$\begin{array}{r} 123 \\ \times 3 \\ \hline 369 \end{array}$$

Answer: 3 6 9

2. Check your answer: Does $369 \div 3 = 123$?

You are allowed 30 seconds per question.

Now turn to the next page for Practice of this Type.

PRACTICE TYPE TWENTY-SEVEN

In the following sums a * has taken the place of some of the numbers which are missing. Write these missing numbers over the *.

$$\begin{array}{r} *204 \\ *39 \\ + 200* \\ \hline 86*2 \\ \hline \end{array}$$

$$\begin{array}{r} 7*20 \\ 2*7 \\ + 89* \\ \hline *520 \\ \hline \end{array}$$

$$\begin{array}{r} 9*4 \\ *231 \\ + 1*2* \\ \hline 8780 \\ \hline \end{array}$$

$$\begin{array}{r} 8*09 \\ *9 \\ + 38* \\ \hline *395 \\ \hline \end{array}$$

$$\begin{array}{r} 4* \\ *204 \\ + 3*08 \\ \hline 52*8 \\ \hline \end{array}$$

$$\begin{array}{r} *26 \\ 7*9 \\ + *92* \\ \hline 3784 \\ \hline \end{array}$$

$$\begin{array}{r} 67* \\ *067 \\ + 7**6 \\ \hline 9987 \\ \hline \end{array}$$

$$\begin{array}{r} 200* \\ 3*47 \\ + *5*4 \\ \hline 7835 \\ \hline \end{array}$$

$$\begin{array}{r} *007 \\ - 2*1* \\ \hline 15*1 \\ \hline \end{array}$$

$$\begin{array}{r} 520* \\ - **27 \\ \hline 02*3 \\ \hline \end{array}$$

$$\begin{array}{r} 3*72 \\ - 9** \\ \hline *483 \\ \hline \end{array}$$

$$\begin{array}{r} 6*02 \\ - *02* \\ \hline 37*5 \\ \hline \end{array}$$

$$\begin{array}{r} *280 \\ - 53*7 \\ \hline 2*8* \\ \hline \end{array}$$

$$\begin{array}{r} 30** \\ - **76 \\ \hline 0971 \\ \hline \end{array}$$

$$\begin{array}{r} 55*2 \\ - *47* \\ \hline 2*73 \\ \hline \end{array}$$

$$\begin{array}{r} *1*0 \\ - 1*3* \\ \hline 0926 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 7 \\ \hline 6923 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 8 \\ \hline 6048 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 9 \\ \hline 6975 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 6 \\ \hline 2310 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 5 \\ \hline 1280 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 8 \\ \hline 3592 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 4 \\ \hline 1072 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 8 \\ \hline 2632 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 6 \\ \hline 1536 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 3 \\ \hline 2574 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 7 \\ \hline 1932 \\ \hline \end{array}$$

$$\begin{array}{r} *** \\ x \quad 4 \\ \hline 1476 \\ \hline \end{array}$$

$$\begin{array}{r} 36 \\ 9 \overline{) ***} \end{array}$$

$$\begin{array}{r} 29 \\ 8 \overline{) ***} \end{array}$$

$$\begin{array}{r} 37 \\ 7 \overline{) ***} \end{array}$$

$$\begin{array}{r} 48 \\ 5 \overline{) ***} \end{array}$$

TECHNIQUE TYPE TWENTY-EIGHT

Here we are looking for a mathematical relationship between the three numbers on the left-hand side and by applying the same relationship to the three numbers on the right-hand side, to fill in the empty brackets.

Example:

$$3 \quad (9) \quad 27 \quad : \quad 4 \quad (\quad) \quad 64$$

Technique:

1. Ask: How has the three become a nine?
(It has been multiplied by itself - three.)
2. How has the nine become twenty-seven?
(The number in the brackets has been multiplied by the same number.
Here, three.)

Here, then, you are multiplying the first digit by itself (3) and the number in the brackets by the same number. Hence,



3. On the right-hand side, test the relationship you have found.
Multiply the four by itself.
(The number in the brackets would be $4 \times 4 = 16$.)
4. Continue this process: multiply the 16 by the same number.
Do we arrive at the answer 64 which is given?

If so, we can assume our answer of 16 is correct as the solution 'fits' the given answer.

Answer:

$$3 \quad (9) \quad 27 \quad : \quad 4 \quad (16) \quad 64$$

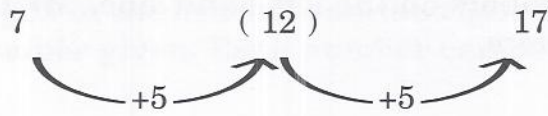
Example:

$$7 \quad (12) \quad 17 \quad : \quad 8 \quad (\quad) \quad 18$$

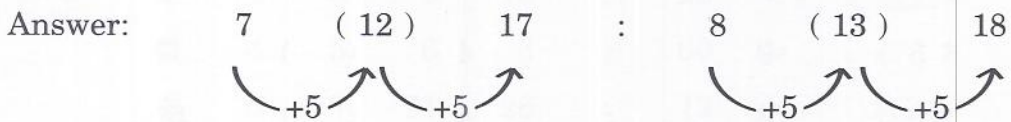
Technique:

1. Ask: How has the 7 become 12?
(5 has been ADDED.)

2. How has the 12 become 17?
(5 has been added.)



3. Now test the relationship you have found.
If we add 5 to 8 to make 13, do we get 18 if we continue this process?
Does $13 + 5 = 18$? Yes. So,



We can assume we have identified the correct relationship.

These are not complicated. As with many verbal reasoning questions you just need to take care.

You are allowed 30 seconds per question.

Now turn to the next page for Practice of this Type.

PRACTICE TYPE TWENTY-EIGHT

Three numbers on the right-hand side should go together in the same way as the three numbers on the left-hand side. Write the missing number in the brackets.

For Example:

2 (8) 14 : 3 (9) 15

Now try these:

1	(5)	9	:	4	()	12
2	(232)	3	:	4	()	5
3	(9)	27	:	2	()	8
4	(16)	64	:	5	()	125
1	(121)	2	:	8	()	9
5	(11)	17	:	8	()	20
6	(36)	216	:	7	()	343
1	(5)	9	:	3	()	11
60	(40)	20	:	100	()	60
125	(25)	5	:	64	()	4
10	(5)	2.5	:	12	()	3
3	(12)	48	:	2	()	32
6	(868)	8	:	5	()	7
144	(12)	1	:	72	()	0.5
21	(14)	7	:	35	()	21
7	(49)	343	:	6	()	216
3	(10)	17	:	4	()	18
147	(21)	3	:	196	()	4
5	(15)	45	:	6	()	54
200	(20)	2	:	500	()	5

TECHNIQUE TYPE TWENTY-NINE

On verbal reasoning tests there is frequently a timetable/chart type of question where you are asked questions about the tabulated data given.

It is a good idea if you are able easily to read and understand timetables and tabulated data. To achieve this you should attempt to gain as much practice as possible in your everyday life. Read train and bus timetables, charts referring to the calorific value of food on the side of cereal packets, tabulated information in holiday brochures and any other tabulated data you may encounter. Then persuade an adult to ask you, at speed, questions which test your ability to find information quickly - so you have to look across the columns for some answers, up and down the columns for other information. The object of this is so you gain the maximum experience and practice in reading tabulations **QUICKLY** and **ACCURATELY**.

Example:

1. Regarding tabulations in holiday brochures which relate to date, costs and location, an adult could ask:

How much is a holiday for 4 people in Spain during the month of October?

How much cheaper is it for 4 people to have 2 weeks in Spain in May than July?

These, and other similar questions, should be asked at speed.

2. Regarding bus or train timetables, one could ask:

What time does the bus from arrive at ?

How long does it take to travel from to ?

If I wanted to be at by which bus would I have to catch from ?

Which bus takes the least amount of time to travel from to ?

If I go to , stop over for 40 mins to shop, what would be the earliest I could arrive in assuming I caught the next available bus? And so on

NOTE:

1. Know how to look for improved or decreased performance each week/month/year.

2. Know how to find the **TOTAL** of something.

3. Know how to find the **DIFFERENCE** between two things.

4. Know what 'variation' means and how to calculate it.

5. Know what previous, adjacent, successive, maximum and minimum mean.

6. Any word you do not understand on any timetable/tabulated data question, look up in your dictionary and make a note of its meaning. Learn it.

You are allowed 30 seconds per question.

Now turn to the next page for Practice of this Type.

PRACTICE TYPE TWENTY-NINE

Here is part of a train timetable:

	Train A	Train B	Train C
Tamworth	14.02	15.11	16.07
Dawtry	14.21	15.32	16.26
Jamesville	14.29	15.40	16.38
Sarestown	14.43	15.54	16.52

Now answer the following questions:

Which train takes the longest time to travel from Tamworth to Sarestown?

(Train) ↓

How long does it take Train C to travel from Dawtry to Jamesville?

(12 mins) ↓

Which two adjacent stations would you think are the greatest distance apart?

(16:38) × and (16:52) ×
Tamworth *connected* *Dawtry*

Mr. Jones lives in Dawtry and has to be in Sarestown by 4.30 p.m. Which is the latest train he can catch?

(Train 16:26) ×

Mrs. Wade catches the 14.02 train from Tamworth and travels to Dawtry where she stops over to do some shopping. If she catches the next available train, what time will she arrive in Jamesville?

(~~15:26~~ 15:40)

100 children sat an examination. The pass mark was 40.

Marks	No. of children
90 or over	5
80 - 89	13
70 - 79	15
60 - 69	20
50 - 59	25
40 - 49	14
30 - 39	7
Under 30	1

Now answer the following questions:

- How many children gained fewer than 50 marks? (47)
- How many children failed? (1)
- What percentage of children gained between 40 and 59? (15)
- How many children gained 60 marks or more? (53)
- Between which marks did the largest number of children score? ... (~~90-90~~)

The following table shows the volume of sales of books in a particular book shop in four different towns during the years 1989 and 1993. The figures are in thousands:

	1989	1990	1991	1992	1993
Duckworth	24.1	26.7	25.6	28.0	29.9
Pinesville	21.3	19.6	22.8	24.1	23.7
Brisworth	22.6	22.7	23.4	25.8	27.2
Tamcaster	22.2	24.6	19.9	26.5	27.8

Now answer the following questions:

- Which town had the highest total sales? (Duckworth 1993)
- Which town's sales increased in each successive year? (~~Pinesville~~ Duckworth)
- Which town had the smallest variation in sales? (Pinesville)
- Which town's sales fell in 1990 but recovered in the following year? (Pinesville)
- Which town's maximum sales were the same as another town's minimum sales? (Brisworth)

TECHNIQUE TYPE THIRTY

Verbal reasoning tests, and in particular 11+ and 12+ county selection tests, usually include miscellaneous mathematical problems.

They are often quite straightforward but, of course, they require a logical approach as well as the application of the computational skills the child should have acquired at this stage of his education. **Favourites are questions on time, age, money, speed, measurement and direction.**

TIME

Example:

My watch is 5 minutes slow and the bus which should have arrived at 1.35 p.m. is 10 minutes late. What time does my watch show when the bus arrives?

Technique:

THIS PROBLEM HAS TWO PARTS. DEAL WITH EACH PART SEPARATELY.

1. If the bus is late, it is BEHIND schedule.
To calculate its arrival you must ADD on minutes.

Q: What time does the bus arrive if it is 10 mins late?
A: 1.35 p.m. ADD 10 minutes = 1.45 p.m.

2. If your watch is slow it is BEHIND the correct time.
To calculate what it says you must SUBTRACT minutes.

Q: If my watch is 5 minutes slow, what time does it say when the bus arrives at the REAL time of 1.45p.m.?
A: 1.45 p.m. MINUS 5 minutes = 1.40 p.m.

Answer: 1.40 p.m.

NOTE:

1. To CORRECT a watch which is fast you must SUBTRACT minutes.
2. To CORRECT a watch which is slow you must ADD ON minutes.

AGES:

Technique:

1. In questions based on ages you must always look for a STARTING POINT.
If you do not do this, they will seem impossible.

Someone's age will either be given or can easily be calculated.
This is your starting point.

From this, all other ages can be calculated.

So, remember, ASK:

Where do I start?

What information am I given?

- 2. Decide WHO the information is referring to.

Ask: WHO IS ?

Tom

Example: WHO are we talking about here?

Tom is three years older than Mary and four years younger than Harry.

WHO IS 4 years younger than Harry? Mary or Tom?

Answer: Tom is. We are still talking about Tom.

The word 'and' indicated that we were talking about Tom all the time.

Now try this: WHO are we talking about here?

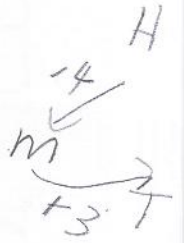
Tom is three years older than Mary who is four years younger than Harry.

WHO IS 4 years younger than Harry? Mary or Tom?

Answer: Mary is.

The word 'who' meant that half way through the sentence we stopped talking about Tom and switched to talking about Mary.

It is Mary who is 4 years younger than Harry now.



Get an adult to make up some more 'age' questions like this to give you practice in this Technique.

So be careful - always ask WHO IS ?

- 3. Make a drawing to help you relate the information of one person to another. It does not matter of what your drawing consists as long as you are showing relative differences.

On to the drawing you will record all the important information you are given.

I draw arrows.

I begin with the information given (the starting point) and relate all the other information to it by way of different lengths of arrow.

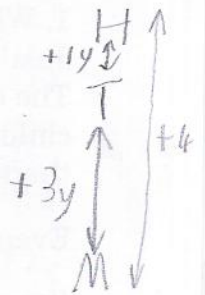
Let us try an Example together to practise all these points.

Example:

Tom is three years older than Mary who is four years younger than Harry.

- a. What is Mary's age if Harry will be 21 years old in two years time?

- b. Who is younger, Tom or Harry, and by how many years?



Technique:

1. Where is the **STARTING POINT** ?

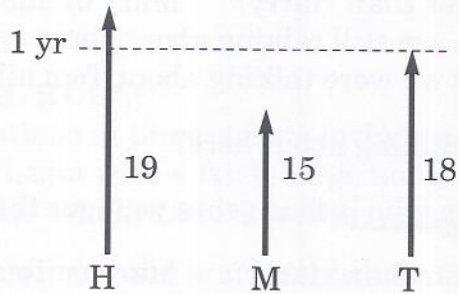
What information are you given?

Answer: That Harry will be 21 years old in 2 years time.

ALWAYS GO TO THE 'NOW'.

So, how old is Harry NOW? ($21 - 2 = 19$)

2. Draw an arrow with H for Harry at the bottom of it.
Place his age NOW (19) next to it.



3. Now relate the other information to it.

Q: WHO IS 4 years younger than Harry?

A: Mary.

The word 'who' here means we switch from talking about Tom to talking about Mary.

So, Mary must be $19 - 4 = 15$ years.

Draw a shorter line for Mary.

Tom we are told, is three years older than Mary.

Tom must be $15 + 3 = 18$ years.

Draw a line to represent Tom.

Answer: Mary is 15 years old now, and I can tell from my diagram that Tom is one year younger than Harry.

Points to remember relating to age and time questions:

1. Who is born first - the oldest or the youngest?

Just think.

The oldest must be born first, after all, he/she is already alive when the younger child is born. So, if Jo is three years older than Sally and Jo was born in 1987, then Sally must have been born in 1984 or 1990?

Even though 1984 is the smaller number the correct answer is 1990. Take care!

Remember: THE OLDEST IS BORN FIRST, THE YOUNGEST BORN LAST.

2. When given an age question remember ALWAYS GO TO THE 'NOW'.

3. For all these types of problem, whether age, time related, height, likes and dislikes, positioning of things - always draw a diagram of the information you are given whenever you can. Drawings which illustrate the information are of considerable help. (This technique is worth perfecting as it will assist you with mental arithmetic problems in general at school.)

4. For problems such as:

There are four books A, B, C and D in a pile. Book B is 2 books below book A which is immediately beneath C . . .

Draw your diagram as you are given the information. Draw B two books below A and then put in C etc. DO NOT draw 4 books first and try to fit in the information - draw the diagram book by book as you are given the information.

Remember also:

5. Clocks which are FAST need to have minutes TAKEN AWAY to correct.

Clocks which are SLOW need to have minutes ADDED ON to correct.

6. Learn the points of a compass -

N	E	S	W	
<i>Never</i>	<i>Eat</i>	<i>Shredded</i>	<i>Wheat</i>	or
<i>Naughty</i>	<i>Elephants</i>	<i>Squirt</i>	<i>Water</i>	

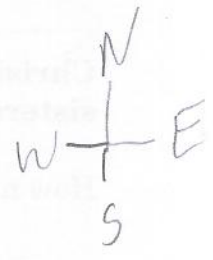
and all the points in between -

NE	SE	SW	NW
----	----	----	----

A lot of practice can be gained in general from regular mathematical problem books, but set on the next page are a selection of typical mathematical verbal reasoning questions.

You are allowed 30 seconds per question.

Now turn to the next page for Practice of this Type.



PRACTICE TYPE THIRTY

My watch is 5 minutes slow and the 8.15 a.m. train from Paddington is 10 minutes late. What time does my watch show when the train arrives?

(8:20 ✓ a.m.)

My watch is 15 minutes slow. In 20 minutes it will say 2.35 p.m. What is the correct time now?

(~~2:00~~ p.m.)

2:15
now

Last year I was 12. In 2 years time I shall be

(15)

13

Jade is 4 cm taller than Dale who is 6 cm shorter than Liam.

Who is the tallest?

(Liam)

Who is the shortest?

(Dale)

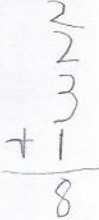
How many cm difference is there between Liam and Jade? (2cm cms)



Christopher is one of twins. He has two younger brothers, three older sisters and an older brother.

How many children are there in Christopher's family?

(8)



John is 3 years older than Jane who is twice the age of Beth. Jane will be 17 next birthday.

How old is John?

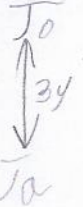
(19)

Who is the youngest?

(Beth)

When Jane is 19 how old will Beth be?

(11)



The 9.50 a.m. train is 15 minutes late. My watch is 10 minutes fast. What time does my watch say when it arrives? ...

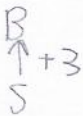
(10.15 am)

10.05

5 boxed games, C, B, G, S and M are stacked one on top of the other. Battleships (B) is 3 boxes above Snakes and Ladders (S) and immediately under Cluedo (C). Monopoly (M) is two boxes below (C). Now answer the following questions:

Which game is on the bottom of the pile?

(S)



Which game is one below M? (S)

Which game is two above G? (B)

Which game is on the top of the pile? (C)

The 4.52 p.m. train from York is 20 minutes late. My watch is 13 minutes slow. What time does my watch say when the train arrives?

..... (4:59 pm)

Four years ago James was 8 years old and his mother was then four times his age.

How old is his mother now? (36)

How old will James be when his mother is 40? .. (16)

David is half as old as Sara who is three years younger than Louise.

What is Sara's age if Louise will be 15 in 2 years time? (.....)

How old will David be when Sara is twice as old as she is now?
(.....)

In two years time I will be four times older than my brother is now. My brother is now 5.

How old am I now? (18)

How old will I be when I am twice as old as my brother?
(.....)

Mrs. Walters was born in 1960. Her daughter was born when she was 26 and her son 4 years previously.

In which year was Mrs. Walter's son born? (1952)

In which year was her daughter born? (1986)

How old will her son be when she is 44? (22)

PRIZE CERTIFICATE

Pupil's Name:

This is to certify that the above-named pupil has completed the Practice Exercises in Verbal Reasoning Technique and Practice 3 and has achieved:

a BEST SCORE of within the time allowed.

I (Parent)

am extremely proud of these achievements and undertake to

(insert details of Special Award)

.....

.....

in recognition of this achievement and to show my appreciation of all the hard work and effort that has gone into doing so well.

Well Done!
Congratulations!

ADDITIONAL EXERCISES

Additional exercises to improve your child's speed and accuracy.

A. To improve ability to listen to instructions and carry them out quickly and accurately.

Take any story book, and ask your child to find certain things in it, for instance:

- a. What is the third word on the fourth line on page 15?
- b. How many letters are in the last word on the bottom of page 16?
- c. How many vowels are there in the seventh word on the fourteenth line of page 10?
- d. How many a's are there in the sixth word on the ninth line on page 7, and so on.

B. To improve your child's ability to work through the alphabet quickly and accurately.

Take a dictionary and ask your child to open the page at the letter 'M', 'N', 'B' and so on, so he learns to judge the position of the letters in the alphabet and is able to estimate where to open the dictionary to find a particular letter.

C. To give your child a concept of 30 seconds and so be able to pace himself in an examination that requires him to answer one question in 30 seconds.

- a. While checking with your own watch ask your child to tell you when he thinks 30 seconds has passed. Repeat until he can judge it accurately within 5 seconds either side.
- b. 'Speed handwriting' - see how many times he can write his name in 30 seconds. Try again. Can he improve his 'record'? Many children I have taught can achieve up to 30 five-letter words in 30 seconds!

TRY TO AWAKEN YOUR CHILD'S INNATE SPEED
WHILE MAINTAINING ACCURACY.

PERSONAL RECORD TABLE

Name:

DATE	TYPE	No.of Qs	SCORE	MAX. TIME	ACTUAL TIME	COMMENTS
	24.1	10		5		
	24.2	10		5		
	24.3	20		10		
	25	20		10		
	26	20		10		
	27	32		16		
	28	20		10		
	29	15		7.5		
	30	25		12.5		

How to fill in the PERSONAL RECORD TABLE:

- The parent should fill in the Date of the test in Column 1.
- What is your child's score? Enter in Column 4.
- Enter your child's Actual Time in Column 6.
- Do you need to make a note of anything?
- Could your child do with more practice?
- Was his score high enough?
- There are more Practice Exercises of all these Types in Verbal Reasoning Further Practice Exercises.
- What about your child's time? Is that: Good? Bad? Getting better?
- Record your Comments in Column 7.



ANSWERS

TYPE TWENTY-FOUR:	TYPE TWENTY-FIVE:	TYPE TWENTY-SIX:	TYPE TWENTY-SEVEN:	TYPE TWENTY-EIGHT:
24	$36 \div 4 \div 3$ or $36 \div 3 \div 4$	22	$6204 + 439 + 2009 = 8652$	8
10	$9 \times 4 \div 2$ or $4 \times 9 \div 2$	24	$7420 + 207 + 893 = 8520$	454
11	$6 \times 5 \times 2$ (in any order)	12	$924 + 6231 + 1625 = 8780$	4
14	$21 - 5 - 4$ or $21 - 4 - 5$	19	$8909 + 99 + 387 = 9395$	25
9	$42 \div 7 \div 3$ or $42 \div 3 \div 7$	36	$46 + 2204 + 3008 = 5258$	898
10	$10 \times 5 \times 3$ (in any order)	35	$126 + 729 + 2929 = 3784$	14
5	$6 \times 5 - 4$ or $5 \times 6 - 4$	20	$674 + 2067 + 7246 = 9987$	49
6	$8 \times 4 \times 2$ (in any order)	200	$2004 + 3247 + 2584 = 7835$	7
48	$21 - 9 - 6$ or $21 - 6 - 9$	34	$4007 - 2416 = 1591$	80
30	$9 \times 6 \times 3$ (in any order)	41	$5200 - 4927 = 0273$	16
30	$21 - 10 - 2$ or $21 - 2 - 10$	567	$3472 - 989 = 2483$	6
56	$10 - 8 + 3$	16	$6802 - 3027 = 3775$	8
10	$5 \times 4 \times 2$ (in any order)	120	$8280 - 5397 = 2883$	757
16	$35 + 25 - 23$ or $25 + 35 - 23$	1200	$3047 - 2076 = 0971$	6
30	$60 \div 5 \div 3$ or $60 \div 3 \div 5$	512	$5552 - 3479 = 2073$	28
160	$15 - 3 - 3$	22	$2160 - 1234 = 0926$	36
9	$12 \times 2 + 2$ or $2 \times 12 + 2$	65	$989 \div 756 = 256$	11
36	$20 \div 2 - 2$	185	$775 \div 385 = 276$	858
25	$9 \div 3 + 3$	37.5	$256 \div 449 = 324$	369
50	$21 \times 4 - 4$ or $4 \times 21 - 4$	19	$268 \div 329 = 259$	232
27		8		240

TYPE TWENTY-NINE:

- Train C
- 12 minutes
- Tamworth/Dawtry
- Train B
- 15.40
- 22
- 8
- 39
- 53
- 50 - 59
- Duckworth
- Brisworth
- Pinesville
- Pinesville
- Pinesville

TYPE THIRTY:

- 8.20 a.m.
- 2.30 p.m.
- 15
- Liam
- Dale
- 2 cms
- 8
- 19
- Beth
- 11
- 10.15 a.m.
- S
- G
- B
- C
- 4.59 p.m.
- 36
- 16
- 10
- 15